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## **SOLDIER'S MANUAL AND TRAINING GUIDE**

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### **Cavalry Scout**

### **MOS 19D**

### **Skill Level 1**

**JANUARY 2021**



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## Preface

STP 17-19D1-SM-TG contains standardized training objectives in the form of task summaries that are used to train and evaluate Soldiers on critical tasks that support unit missions during wartime.

The principal audience for STP 17-19D1-SM-TG is Soldiers holding military occupational specialty 19D, Cavalry Scout, skill level 1, and for their trainers and first-line supervisors.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate in accordance with the law of war and the rules of engagement. (See FM 6-27.)

STP 17-19D1-SM-TG applies to the active Army, Army National Guard/Army National Guard of the United States, and the United States Army Reserve unless otherwise stated.

The proponent of this publication is the United States Army Maneuver Center of Excellence. The preparing agency is the United States Army Maneuver Center of Excellence, Directorate of Training and Doctrine, Doctrine and Collective Training Division. Send comments and recommendations on DA Form 2028 (*Recommended Changes to Publications and Blank Forms*) to Commander, Maneuver Center of Excellence, Task Development Branch, ATTN: ATZB-TDT, 1 Karker Street, Fort Benning, GA 31905 5410; by email to usarmy.benning.mcoe.mbxdoctrine@mail.mil; by calling COM 706-545-8874 or DSN 835-8874; or submit an electronic DA Form 2028.

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## **Chapter 1**

# **Introduction**

1-1. Soldier training publications (STPs) contain critical tasks and Soldier training information that standardize individual training for the Army; provide information and guidance for conducting individual training in the unit; and aid the Soldier, noncommissioned officer, officer, and commander in training critical tasks. Unit trainers use Soldier training publications to train and sustain both leader and Soldier task proficiency. The Soldier training publication identifies the individual military occupational specialty (MOS) training requirements. Leaders should use the Soldier training publication to plan, conduct, and evaluate individual training in units.

1-2. The Soldier training publication is the primary MOS reference to support the training and self-development of every Soldier in the unit. The Soldier training publication is used in conjunction with the Soldier's Manual of Common Tasks, ADP 7-0, and FM 7-0 to establish effective training plans and programs tailored to unit missions.

1-3. This publication identifies the critical tasks for 19D skill level 1 Soldiers. It is designed to support preparation of individual and unit training plans that satisfies integration, cross-training, training up, and sustainment training requirements for Soldiers in this MOS. Units have different training needs and requirements based on differences in environment, location, equipment, dispersion, and other similar factors, so all tasks in this manual may not be relevant and some tasks may not be included.

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## Chapter 2

# Trainer's Guide

### **General**

2-1. In order to fight and win in a chaotic, ambiguous, and complex environment, the Army trains to provide forces ready to conduct unified land operations. Unit and individual training occurs all the time at home station, at combat training centers, and while deployed. Army training includes a system of techniques and standards that allow units and Soldiers to determine, acquire, and practice necessary skills. The foundation of a unit's readiness ties directly to its individual Soldiers' proficiencies and the way performance of specified tasks relates to an assigned duty position and skill level. Success in battle does not happen by accident; it is a direct result of tough, realistic, and challenging training. For more information on training development, management, and responsibilities, see the following publications:

- ADP 7-0 describes the fundamentals of how the Army trains to conduct operations as a unified action partner employing the Army's operational concept-unified land operations. ADP 7-0 is founded on the concept that unit training is a logical extension of the Army's operations process and establishes the principles and concepts of training and introduces the training procedures further expanded upon in FM 7-0.
- FM 7-0 expands on the fundamental concepts of the Army's training doctrine introduced in ADP 7-0.

### **Preparation and Evaluation of Task**

2-2. Trainers will provide Soldiers with the equipment needed as outlined in the condition statement of the task to be evaluated. Trainers will tell the Soldier what is required to successfully complete the task by reviewing the conditions and standards. Trainers will stress the importance of any cautions, warnings, or dangers associated with the task to avoid injury or damage to equipment, if applicable.

2-3. Score the Soldier GO if all performance measures are passed. Score the Soldier NO-GO if any performance measure is failed. If the Soldier scores a NO-GO, show the Soldier what was done wrong and how to do it correctly by reviewing the conditions and standards.

### **Individual Critical Task List**

2-4. The 19D skill level individual critical task list (see table 2-4 on pages 2-3 to 2-10) identifies tasks by number and name. The tasks are organized numerically within subject areas and include initial training location, recommended sustainment training frequency, and sustainment training skill levels.

2-5. Subject areas are used to group similar tasks. The numbers and titles of subject areas in this Soldier training publication are identified in table 2-1, page 2-2.

**Table 2-1. Subject areas**

<b>Number</b>	<b>Titles</b>
1	Chemical, Biological, Radiological, and Nuclear/Improvised Explosive Device
2	Communications And Computers
3	Maintenance/Accountability
4	Mines/Demolitions
5	Sights, Sensors, And Optics
6	Tactical Operations
7	Vehicle - Crewmember
8	Vehicle Gunner
9	Weapons

2-6. The initial training location identifies where the task is first trained to Soldier training publication standards, whether in a course or the unit. Table 2-2 identifies brevity codes used for training locations.

**Table 2-2. Initial training locations**

<b>Initial Training Location</b>
INT – Institutional (course)
OP – Operational (unit)

2-7. Sustainment training frequency shows the suggested training frequency to maintain proficiency. However, unit commanders will determine training frequency. Table 2-3 identifies brevity codes used for training frequencies.

**Table 2-3. Sustainment training frequency**

<b>Sustainment Training Frequency</b>
BA - Biennially
AN - Annually
SA - Semi-annually
QT - Quarterly
BM - Bimonthly
MO - Monthly
BW - Biweekly
WK - Weekly
DA - Daily
HR - Hourly
OT - One time
Other

2-8. Sustainment training skill levels lists the skill levels of the MOS for which Soldiers must receive sustainment training to ensure they maintain proficiency.

**Table 2-4. 19D, skill level 1, critical task list**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
<b>Subject Area 1 CBRNE DEVICE</b>				
031-74D-1019	Detect Chemical Warfare Agents Vapors Using the Joint Chemical Agent Detector	OP	SA	1
031-74D-1026	Detect Neutron/Gamma Radiation Dose and Gamma Radiation Dose Rate with an AN/UDR-13/14 Radiac Set	OP	SA	1
<b>Subject Area 2 COMMUNICATIONS AND COMPUTERS</b>				
113-COM-7046	Navigate using the Defense Advanced Global Positioning System Receiver	INST	SA	1
113-COM-1016	Operate Simple Key Loader AN/PYQ-10	INST	QT	1-2
113-589-2001	Input Program Data in the TACSAT Radio Set AN/PRC-117()	OP	QT	1-2
113-589-1009	Program Radio Set AN/PRC-117() Tactical Satellite Radio	OP	QT	1-2
113-589-2004	Operate Tactical Satellite Radio Set AN/PRC-117() in All Modes of operation	OP	QT	1-2
171-300-0063	Operate the Single Channel Ground and Airborne Radio System Advanced System Improvement Program Radio	INST	QT	1-2
113-589-2028	Operate Secure Single-Channel Tactical Satellite Radio Set in SATCOM Mode	OP	QT	1-2
171-170-0072	Perform Startup Procedures for Force XXI Battle Command, Brigade and Below/Blue Force Tracking with Joint Capabilities Release	OP	SA	1-2
171-170-0073	Perform Shutdown Procedures for Force XXI Battle Command, Brigade and Below/Blue Force Tracking with Joint Capabilities Release	OP	SA	1-2
171-000-0099	Perform Startup Procedures with JBC-P Vehicle System AN/UYK-128B(V)3	OP	SA	1-2
171-170-0100	Perform Shutdown Procedures with JBC-P Vehicle System AN/UYK-128B (V) 3	OP	SA	1-2
071-217-0068	Operate Vehicular Intercommunication Set AN-VIC-3(V) on the Stryker Vehicle	OP	SA	1
071-810-0010	Maintain Intercommunication Set, AN/VIC-Series on a Tactical Vehicle	OP	BA	1
<b>Subject Area 3 MAINTENANCE/ACCOUNTABILITY</b>				
171-123-1023	Maintain Operator's Part of Equipment Record Folder	INST	SA	1
171-123-1090	Perform Preventive Maintenance on Basic Issue Items	OP	SA	1
551-88M-1352	Perform Preventive Maintenance Checks	INST	SA	1
<b>Subject Area 4 MINES/DEMOLITIONS</b>				
052-193-1311	Prime Military Explosives	INST	AN	1
052-193-1312	Construct Demolition Initiating Systems	INST	AN	1
052-193-1310	Construct Demolition Firing Systems	OP	AN	1
052-193-3554	Clear Misfires	OP	AN	1
<b>Legend:</b> AN – annually, BA – biennially, CBRN – chemical, biological, radiological, nuclear and explosives, INST – institutional, Int Tng Loc – initial training location, JBC-P – Joint Battle Command-Platform, QT – quarterly, OP – operational, SA – semi-annually, SATCOM – satellite communications, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level, TACSAT – tactical satellite				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
<b>Subject Area 5 SIGHTS, SENSORS, AND OPTICS</b>				
071-318-2252	Mount the Telescopic Sight on an 84-millimeter Recoilless, M3 Rifle	OP	SA	1-2
071-704-0001	Operate a Mini Eyesafe Laser Infrared Observation Set AN/PVS-6	OP	AN	1
071-704-0005	Operate the Laser Target Locator Module AN/PED-5	INST	SA	1-2
071-704-0006	Maintain the Laser Target Locator Module AN/PED-5	INST	SA	1-2
171-134-0001	Mount the Long-Range Advanced Scout Surveillance System on a High Mobility Multipurpose Wheeled Vehicle	INST	SA	1-2
171-134-0007	Remove the Long-Range Advanced Scout Surveillance System from a High Mobility Multipurpose Wheeled Vehicle	INST	SA	1-2
171-157-0001	Install Long Range Advanced Scout Surveillance System on a Reconnaissance Vehicle	OP	SA	1-2
171-157-0002	Remove Long Range Advanced Scout Surveillance System from Reconnaissance Vehicle	OP	SA	1-2
171-134-0002	Prepare the Long Range Advanced Scout Surveillance System for Operation in Dismounted (Tripod) Configuration	INST	SA	1-2
171-134-0008	Remove the Long-Range Advanced Scout Surveillance System from the Tripod	INST	SA	1-2
171-134-0004	Operate the Long-Range Advanced Scout Surveillance System	INST	SA	1-2
171-134-0005	Boresight the Forward Looking Infrared and Day TV on the Long-Range Advanced Scout Surveillance System	OP	SA	1-2
171-134-0006	Troubleshoot the Long-Range Advanced Scout Surveillance System	OP	SA	1-2
171-134-0003	Perform Operator Maintenance on the Long-Range Advanced Scout Surveillance System	INST	SA	1-2
809-100-0001	Assemble Small Unmanned Aircraft System	OP	QT	1-2
809-100-0008	Conduct Small Unmanned Aircraft System Before Takeoff Checks	OP	QT	1-2
809-100-0009	Launch Small Unmanned Aircraft System	OP	QT	1-2
809-100-0018	Conduct Small Unmanned Aircraft System Preventative Maintenance Checks and Services	OP	QT	1-2
809-100-0006	Conduct Small Unmanned Aircraft System Preflight Checks	OP	QT	1-2
809-100-0013	Conduct Small Unmanned Aircraft System Post Flight Procedures	OP	QT	1-2
809-100-0017	Disassemble a Small Unmanned Aircraft System	OP	QT	1-2
071-705-0010	Maintain the M150 Rifle Combat Optic	INST	AN	1
071-705-0002	Operate an M68 Sight (Close Combat Optic)	INST	AN	1
<b>Legend:</b> AN – annually, INST – institutional, Int Tng Loc – initial training location, QT – quarterly, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level, TV – television				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
071-705-0001	Maintain an M68 Sight (Close Combat Optic)	INST	AN	1
071-705-0016	Boresight a Sight System on an M16-Series Rifle or M4-Series Carbine	OP	AN	1
071-COM-0031	Zero an M16-Series Rifle/M4-Series Carbine	INST	AN	1
071-COM-0030	Engage Targets with an M16-Series Rifle/M4-Series Carbine	INST	AN	1
071-701-0008	Mount an AN/PEQ-15-Series Aiming Light on a Weapon System	INST	AN	1
071-701-0009	Dismount an AN/PEQ-15-Series Aiming Light on a Weapon System	OP	AN	1
071-701-0002	Operate an AN/PEQ-15 Series Aiming Light	INST	AN	1
071-701-0007	Boresight an AN/PEQ-15 to an M16-Series Rifle/M4-Series Carbine	OP	AN	1
071-701-0006	Zero an AN/PEQ-15 Aiming Light to an M16-Series Rifle/M4-Series Carbine	INST	AN	1
071-701-0005	Engage Targets with an M16-Series Rifle or M4-Series Carbine Using an AN/PEQ-15 Aiming Light	OP	AN	1
071-025-0038	Engage Targets with an M240B or M240L Machine Gun using an AN/PEQ-15 Aiming Light	OP	AN	1-2
071-701-0001	Maintain an AN/PEQ-15 Aiming Light	INST	AN	1
071-008-0018	Mount an AN/PAS-13 Thermal Weapon Sight on a Weapon System	OP	SA	1
071-008-0019	Dismount an AN/PAS-13 Thermal Weapon Sight from a Weapon System	OP	AN	1
071-008-0021	Zero an AN/PAS-13 Thermal Weapon Sight to a Weapon System	INST	SA	1-2
071-008-0020	Engage Targets using an AN/PAS-13 Thermal Weapon Sight	OP	AN	1-2
071-703-0001	Operate the M145 Telescope	OP	AN	1
071-703-0002	Maintain the M145 Telescope	OP	AN	1
071-706-0006	Install the AN/PSQ-20 Night Vision Goggle on the Army Combat Helmet	OP	SA	1
071-706-0007	Operate the AN/PSQ-20 Night Vision Goggle	OP	SA	1
071-706-0005	Maintain the AN/PSQ-20 Night Vision Goggle	OP	SA	1
071-706-0001	Operate the AN/PVS-14 Monocular Night Vision Device	INST	SA	1
071-706-0002	Maintain the AN/PVS-14 Night Vision Device	INST	SA	1
<b>Subject Area 6 TACTICAL OPERATIONS</b>				
052-COM-1271	Identify Visual Indicators of an Improvised Explosive Device (UNCLASSIFIED//FOR OFFICIAL USE ONLY) (U//FOUO)	INST	SA	1
071-326-0512	Estimate Range	INST	SA	1
061-283-1002	Locate a Target by Grid Coordinates	INST	SA	1
<b>Legend:</b> AN – annually, INST – institutional, Int Tng Loc – initial training location, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
171-138-0028	Identify Combat Vehicles and Aircraft	OP	SA	1-4
071-060-0001	Construct a Fighting Position for a Javelin	OP	SA	1
171-300-0037	Establish a Listening Post/Observation Post	INST	QT	1
171-300-0014	Conduct Surveillance from an Observation Post	INST	QT	1
061-283-1011	Conduct an Immediate Smoke Fire Mission	OP	SA	1
061-COM-1000	Adjust Indirect Fire	INST	SA	1
171-300-0048	Apply the Detect, Identify, Decide, Engage, and Assess Process	INST	AN	1
<b>Subject Area 7 VEHICLE - CREWMEMBER</b>				
071-001-0005	Operate the CBRN System on an M2A3/M3A3 Bradley Fighting Vehicle	OP	AN	1
071-324-6025	Start a Bradley Fighting Vehicle Using Auxiliary Power	INST	SA	1
071-324-6001	Drive a Bradley Fighting Vehicle	INST	SA	1
071-329-1300	Operate the Driver's Compass Display on an M2A3/M3A3 Bradley Fighting Vehicle	OP	SA	1
071-216-0023	Maintain the Hull on a Bradley Fighting Vehicle	INST	SA	1
171-132-1018	Stow Ammunition on an M2A3 or M3A3 Bradley Fighting Vehicle	OP	SA	1
171-132-1019	Stow Ammunition on an M2A2 or M3A2 Bradley Fighting Vehicle	OP	SA	1
071-034-0005	Load the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle	OP	AN	1
071-034-0006	Unload the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle	OP	AN	1
071-034-0008	Maintain an M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle	OP	AN	1
071-324-6027	Extinguish a Fire on a Bradley Fighting Vehicle	OP	SA	1
071-056-0001	Load the Tow Missile Launcher on a Bradley Fighting Vehicle	INST	SA	1
071-056-0002	Unload TOW Missile Launcher on a Bradley Fighting Vehicle	INST	AN	1
071-316-3015	Remove a Misfired TOW Missile from a Bradley Fighting Vehicle	OP	SA	1
171-300-0061	Drive an Up-Armored High-Mobility Multipurpose Wheeled Vehicle	INST	SA	1
071-025-0011	Mount an M240B or M240L Machine Gun on a Vehicle	OP	SA	1-2
551-88M-1361	Operate Vehicle Under Adverse Conditions	OP	SA	1
071-217-0001	Drive a Stryker Vehicle	INST	SA	1
071-217-0005	Operate the Video Display Terminal on a Stryker Vehicle	INST	SA	1
071-217-0044	Operate Video Display Electronic Terminal on a Stryker	OP	SA	1
171-156-0035	Load the M6 Smoke Grenade Launcher on the Mobile Gun System	OP	AN	1
<b>Legend:</b> AN – annually, INST – institutional, Int Tng Loc – initial training location, QT – quarterly, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level, TOW – tube launched, optically tracked, wire guided				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng Sl</i>
171-156-0050	Unload the M6 Smoke Grenade Launcher on the Mobile Gun System	OP	AN	1
171-156-0043	Prepare the Mobile Gun System for Operation after Transport	OP	SA	1
171-159-0010	Operate the Chemical Defense System on the Mobile Gun System	OP	SA	1
071-217-0011	Remove a Caliber .50 M2 Machine Gun from a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0009	Install a Caliber.50 M2 Series Machine Gun on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0017	Engage Targets with a Machine Gun Mounted on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0010	Load an M2 .50 Caliber Machine Gun on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0016	Zero the Primary Weapon on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0058	Unload an M2. 50 Caliber Machine Gun mount on the Stryker Remote Weapon Station	OP	SA	1
071-217-0060	Unload an MK19 Grenade Machine Gun on the Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0069	Load the M6 Smoke Grenade Launchers on a Stryker Remote Weapon Station	OP	AN	1
071-217-0012	Install an MK19 Grenade Machine Gun on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0013	Load an MK19 Grenade Machine Gun on a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0007	Operate the Remote Weapon Station on a Stryker Vehicle	OP	SA	1
071-217-0014	Remove an MK19 Grenade Machine Gun from a Stryker Vehicle Remote Weapon Station	OP	SA	1
071-217-0018	Fire the M6 Smoke Grenade Launcher on a Stryker Vehicle Remote Weapons Station	OP	AN	1
171-157-0012	Unload an M6 Smoke Grenade Launcher on a Stryker Reconnaissance Vehicle	OP	AN	1
071-217-0025	Operate the Ramp from the Drivers Station on a Stryker Vehicle	OP	SA	1
071-217-0061	Operate the Fuel Distribution Assembly on a Stryker Vehicle	OP	SA	1
071-217-0063	Slave Start a Stryker Vehicle	OP	SA	1
171-157-0010	Load an M6 Smoke Grenade Launcher on a Stryker Reconnaissance Vehicle	OP	SA	1
171-157-0004	Operate the Cupola on a Reconnaissance Vehicle	INST	SA	1
171-157-0005	Install a Primary Weapon on a Reconnaissance Vehicle or Fire Support Vehicle	OP	SA	1

**Legend:** AN – annually, INST – institutional, Int Tng Loc – initial training location, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng Sl – sustainment training skill level

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
071-217-0026	Operate the Ramp from the Troop Station on a Stryker Vehicle	OP	SA	1
071-217-0062	Operate the Personnel and Engine Coolant Circulation Heater on a Stryker Vehicle	OP	SA	1
071-217-0027	Operate the Driver's Vision Enhancer and the Rear-View Sensor System on a Stryker Vehicle	INST	SA	1
071-217-0031	Perform Operator Preventive Maintenance Checks and Services on a Stryker Vehicle	INST	SA	1
171-136-0007	Mount the Joint Combat Identification Marking System on a Stryker	OP	AN	1
171-157-0006	Remove a Primary Weapon from Reconnaissance Vehic	OP	SA	1
171-159-0019	Operate the Chemical Defense System on the Command Vehicle and Reconnaissance Vehic	OP	SA	1
<b>Subject Area 8 VEHICLE GUNNER</b>				
071-216-0025	Maintain the Turret on a Bradley Fighting Vehicle	INST	SA	1-2
071-024-0005	Maintain the 25-millimeter Gun on a Bradley Fighting Vehicle	INST	SA	1-2
071-001-0001	Boresight the Weapon Systems on an M2A3/M3A3 or M2A2/M3A2 Operation Desert Storm-Situational Awareness Bradley Fighting Vehicle	OP	SA	1-2
071-001-0002	Zero the Weapon Systems on an M2A3/M3A3 or M2A2/M3A2 Operation Desert Storm-Situational Awareness Bradley Fighting Vehicle	OP	SA	1-2
071-001-0006	Engage Targets using the Weapon Systems on a Bradley Fighting Vehicle	OP	SA	1-4
071-024-0006	Perform a Function Check on the 25-millimeter Gun on a Bradley Fighting Vehicle	INST	SA	1-2
071-314-0012	Fire the 25-millimeter Gun on a Bradley Fighting Vehicle M2A2/M3A2 Operation Desert Storm	OP	SA	1-4
071-024-0007	Load the 25- millimeter Gun Feeder on a Bradley Fighting Vehicle	OP	AN	1-2
071-024-0008	Unload the 25-millimeter Gun Feeder on a Bradley Fighting Vehicle	OP	SA	1-2
071-024-0004	Unload the 25-millimeter Armor-Piercing Discarding Sabot Tracer Ammunition Can on a Bradley Fighting Vehicle	INST	SA	1
071-024-0003	Unload the 25-millimeter High-Explosive Incendiary Tracer Ammunition Can on a Bradley Fighting Vehicle	INST	SA	1
071-026-0010	Install an M240C Coaxial Machine Gun on a Bradley Fighting Vehicle	INST	SA	1-2
071-026-0004	Perform a Function Check on the M240C Coaxial Machine Gun on a Bradley Fighting Vehicle	INST	SA	1-2
<b>Legend:</b> AN – annually, INST – institutional, Int Tng Loc – initial training location, mm – millimeter, ODS – Operation Desert Storm, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SL</i>
071-313-4007	Fire the M240C Coaxial Machine Gun on a Bradley Fighting Vehicle	OP	SA	1-4
071-026-0011	Remove an M240C Coaxial Machine Gun on a Bradley Fighting Vehicle	INST	SA	1-2
071-217-0019	Correct Malfunctions of the Primary Weapon on a Stryker Vehicle Remote Weapon Station	OP	SA	1-2
071-316-3006	Fire the TOW Missile on a Bradley Fighting Vehicle M2A2/M3A2 Operation Desert Storm	OP	SA	1-2
071-056-0067	Perform Immediate-Action Procedures on the TOW System on a Bradley Fighting Vehicle	OP	AN	1-2
071-324-4003	Fire the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle	OP	AN	1-2
071-324-4004	Perform Misfire Procedures on the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle	OP	AN	1-2
171-157-0013	Engage Targets with Primary Weapon on a Reconnaissance Vehicle	OP	SA	1-2
071-000-0008	Prepare a Range Card	INST	SA	1-2
<b>Subject Area 9 WEAPONS</b>				
071-004-0007	Maintain an M17 or M18 Pistol	OP	SA	1-4
071-004-0008	Perform a Function Check on an M17 or M18 Pistol	OP	SA	1-4
071-004-0009	Load an M1 or /M18 Pistol	OP	SA	1-4
071-004-0010	Engage Targets with an M17 or M18 Pistol	OP	SA	1-4
071-004-0011	Correct Malfunctions of an M17 or M18 Pistol	OP	SA	1-4
071-004-0012	Unload an M17/M18 Pistol	OP	SA	1-4
071-022-0001	Maintain a Caliber .50 M2-Series Machine Gun	INST	SA	1
071-022-0012	Mount a Caliber .50 M2-Series Machine Gun on a Vehicle	OP	SA	1
071-022-0013	Dismount a Caliber .50 M2-Series Machine Gun from a Vehicle	OP	SA	1
071-022-0003	Load a Caliber .50 M2-Series Machine Gun	INST	SA	1
071-022-0004	Unload a Caliber .50 M2-Series Machine Gun	INST	SA	1
071-313-3454	Engage Targets with a Caliber .50 M2-Series Machine Gun	INST	SA	1-2
071-022-0005	Correct Malfunctions of a Caliber .50 M2-Series Machine Gun	INST	SA	1
071-030-0009	Mount an MK19 Grenade Machine Gun on a Vehicle	OP	SA	1
071-030-0010	Dismount an MK19 Grenade Machine Gun from a Vehicle	OP	SA	1
071-030-0001	Maintain an MK19 Grenade Machine Gun	INST	SA	1
071-030-0008	Correct Malfunctions of an MK19 Grenade Machine Gun	INST	SA	1
071-030-0007	Perform a Function Check on an MK19 Grenade Machine Gun	INST	SA	1
<b>Legend:</b> AN – annually, INST – institutional, Int Tng Loc – initial training location, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SL – sustainment training skill level, TOW – tube launched, optically tracked, wire guided				

**Table 2-4. 19D, skill level 1, critical task list (continued)**

<b>Task Number</b>	<b>Task Title</b>	<i>Int Tng Loc</i>	<i>Sust Tng Freq</i>	<i>Sust Tng SI</i>
071-030-0005	Load an MK19 Grenade Machine Gun	INST	SA	1
071-030-0006	Unload an MK19 Grenade Machine Gun	INST	SA	1
071-030-0004	Engage Targets with an MK19 Grenade Machine Gun	INST	SA	1
071-031-0004	Maintain an M320 Grenade Launcher	INST	SA	1
071-031-0005	Zero an M320 Grenade Launcher	INST	SA	1
071-031-0002	Load an M320 Grenade Launcher	INST	SA	1
071-031-0003	Unload an M320 Grenade Launcher	INST	SA	1
071-031-0001	Engage Targets with an M320 Grenade Launcher	INST	SA	1
071-056-1120	Load an M41 Improved Target Acquisition System while in the Mounted Configuration on an M1167 TOW Carrier	OP	SA	1-2
071-056-1121	Unload an M41 Improved Target Acquisition System while in the Mounted Configuration on an M1167 TOW Carrier	OP	SA	1-2
071-060-0003	Maintain a Javelin	INST	SA	1
071-060-0004	Prepare an M98 Javelin for Firing	INST	SA	1
071-060-0005	Engage Targets with a Javelin	INST	SA	1
071-060-0006	React to Javelin that Fails to Fire	INST	SA	1
071-318-2250	Perform Preventive Maintenance Checks and Services on an 84-millimeter Recoilless, M3 Rifle	OP	SA	1-2
071-318-2251	Maintain an 84-millimeter Recoilless, M3 Rifle	OP	SA	1-2
071-318-2253	Boresight an 84-millimeter Recoilless M3 Rifle	OP	SA	1-2
071-318-2257	Load an 84-millimeter Recoilless, M3 Rifle	OP	SA	1-2
071-318-2258	Unload an 84-millimeter Recoilless, M3 Rifle	OP	SA	1-2
071-318-2254	Engage Targets with an 84-millimeter Recoilless M3 Rifle	OP	SA	1-2
071-318-2255	Perform Misfire Procedures on an 84-millimeter Recoilless M3 Rifle	OP	SA	1-2
071-025-0001	Maintain an M240-Series Machine Gun	INST	SA	1-2
071-025-0006	Zero an M240B or M240L Machine Gun	OP	SA	1-2
071-025-0003	Load an M240B or M240L Machine Gun	INST	SA	1-2
071-025-0004	Unload an M240B or M240L Machine Gun	INST	SA	1-2
071-025-0002	Perform a Function Check on an M240B or M240L Machine Gun	INST	SA	1-2
071-025-0007	Engage Targets with an M240B or M240L Machine Gun	INST	SA	1-2
071-025-0005	Correct Malfunctions of an M240B or M240L Machine Gun	INST	SA	1-2
071-025-0008	Construct a Fighting Position for an M240B or M240L Machine Gun	OP	SA	1-2
071-025-0009	Lay an M240B or M240L Machine Gun Using Field Expedients	OP	SA	1-2
071-025-0012	Dismount an M240B or M240L Machine Gun from a Vehicle	OP	SA	1-2

**Legend:** AN – annually, INST – institutional, Int Tng Loc – initial training location, OP – operational, SA – semi-annually, Sust Tng Freq – sustainment training frequency, Sust Tng SI – sustainment training skill level, TOW – tube launched, optically tracked, wire guided

## Chapter 3

# MOS/Skill Level Tasks

### Task Summary Format

3-1. Task summaries outline the performance requirements of each critical task in soldier training publications. They provide the Soldier and trainer with the information necessary to prepare, conduct, and evaluate critical task training.

3-2. Each task will provide the Soldier and trainer with the information necessary to prepare, conduct, and evaluate critical task training. (See table 3-1 for the format components included in each task.)

**Table 3-1. Task summary format**

<b>Component</b>	<b>Description</b>
Task Title	Describes the required action to be performed.
Task Number	Identifies each individual task with a unique, permanent identification number.
Condition	Describes the operating conditions under which the task is performed. The condition expands on the information in the task title by identifying when, where and why the Soldier performs the task and what materials, personnel, and equipment the Soldier needs to perform the task.
Standard	Describes the acceptable level of performance. It notes how well the Soldier should perform the task to be considered competent. The standard includes the performance and criteria.
Training and Evaluation Guide	Contains two sections: (a) Task performance steps, which provide details required to perform the task. (b) Performance evaluation guide that contains: (1) Evaluation preparation. Provides special setup procedures and instructions for evaluating task performance (if required). (2) Performance measures with GO/NO-GO criteria. (3) Evaluation guidance. Indicates requirements for receiving a GO and other special guidance (if required).
References	Identifies required and related references.
Integrated Safety Statements and Environmental Considerations	Provides special safety requirements and environmental considerations identified during task analysis. Safety and environmental factors and considerations are included in the task steps as identified during task analysis.

Subject Area 1: CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES DEVICE

**031-74D-1019**

**Detect Chemical Warfare Agents Vapors Using the Joint Chemical Agent Detector**

**WARNINGS**

Following detection, the detector gives an audible alarm of at least 85 decibels (dB)(a) at 1 meter. It also provides an audible alert in instances of faulty operation or if the battery or sieve pack needs replacement. The operator's hearing could be affected if subjected to long periods of exposure to the audible indicators, especially when an earpiece is being worn. Audible indicators must be muted as quickly as possible to minimize the risk of hearing damage.

Sieve packs contain a molecular sieve material that reacts vigorously with water and releases heat. Do not allow a sieve pack to become immersed in water. Particular care must be taken if fording, swimming, or cleaning/decontaminating the equipment.

The confidence sample contains the simulants dipropylene glycol methyl ether (known as DPM) and methyl salicylate (known as MS) that are generally not harmful unless misused; however, inhalation or ingestion may result in poisoning. DPM and MS are considered nonhazardous because of the limited volume of each simulant used in the sample. Do not inhale or ingest simulants. If a confidence sample is wet, avoid prolonged contact with skin. Dispose of the confidence sample in accordance with (IAW) local regulations.

Do not return the confidence sample to the charcoal bag and storage location without the end caps in place. Failure to install the end caps could result in contamination of the storage location and continual alarms.

Although there is a diffuser over the light-emitting diodes (LEDs) on the display panel, staring at the LEDs, particularly in dark conditions, could result in the loss of night vision (dark adaptation) or eyesight damage. Do not stare at the LEDs for long periods of time.

If the rain cap becomes contaminated, the detector could give incorrect responses. To avoid contamination interfering with detection, use care when handling the detector, and ensure hands/gloves are free from contamination prior to handling the detector.

If the nozzle or nozzle extension becomes contaminated, the detector could give incorrect responses.

Batteries may contain hazardous substances. Dispose of batteries IAW local regulations.

## WARNINGS

**In the event that a battery within the detector is shorted or starts to heat up, it should be removed from the battery tray and taken to a well-ventilated area to cool down. Once the temperature has dropped the battery can be disposed of IAW TB 43-0134. Suitable protective clothing should be worn when handling suspect batteries. If the skin or eyes come into contact with the electrolyte, wash thoroughly with water and seek medical attention.**

**The sieve pack is designed to release very small quantities of ammonia vapor as a doping source for the detector. This is an inhalation hazard and may cause chemical burns to skin and eyes. Do not swallow, inhale, or otherwise come into contact with the ammonia vapor.**

**Conditions:** You are in a tactical environment with suspected chemical contamination and are given a requirement to monitor the unit's perimeter or to verify if personnel or equipment is contaminated. You also have a group of Soldiers, joint chemical agent detector (known as JCAD) with accessories, and TM 3-6665-456-10.

**Standards:** Detect chemical agent vapors using the JCAD. Perform before, during, and after startup and shutdown procedures. Conduct point monitoring by holding the probe  $\frac{1}{2}$  inch from the surface and moving slowly in a zig-zag pattern. Perform continuous monitoring.

### Performance Steps

1. Start the JCAD IAW the technical manual.
2. Conduct a confidence test IAW the technical manual.
3. Conduct monitoring based on mission.
  - a. Conduct point monitoring for chemical agent vapors (for example, checking personnel, equipment, supplies, liquid droplets, puddles, and fluid containers) by attaching the nozzle and nozzle extension IAW the technical manual.
    - (1) Hold the nozzle inlet  $\frac{1}{2}$  inch from the item being monitored without touching the surface or any source of liquid contamination.
    - (2) Check the Soldier from top to bottom and front to back in a zig-zag pattern.
  - b. Conduct continuous monitoring (for example, monitoring a unit's defensive perimeter) by installing a detector in the communications adapter IAW the technical manual.

**Note:** Refer to task 031-74D-1017, Emplace Chemical-Agent Alarms.

4. Remove the JCAD from operation.
  - a. If conducting point monitoring, remove the nozzle and nozzle extension IAW the technical manual.

- b. If conducting continuous monitoring, remove the detector from the communication adapter IAW the technical manual.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Start the JCAD IAW the technical manual.	_____	_____
2. Conduct a confidence test IAW the technical manual.	_____	_____
3. Conduct monitoring based on mission.	_____	_____
4. Remove the JCAD from operation.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 3-6665-355-10/TO 11H2-25-1/TM 11568A-OR/NAVSEA S9437-B2-OPI-010 Operator's Manual Detector, Chemical Agent, Automatic: JCAD, M4 NSN: 6665-01-552-2704	TM 3-6665-456-10/TO 11H2-26-1/TM 11568B-OR Operator's Manual Detector, Chemical Agent, Automatic: JCAD, M4A1 NSN 6665-01-586-8286
TB 43-0134 Battery Disposition and Disposal	

**031-74D-1026****Detect Neutron/Gamma Radiation Dose and Gamma Radiation Dose Rate with an AN/UDR-13/14 Radiac Set**

**Conditions:** You are in a tactical environment as a member of a reconnaissance, survey, or sampling team given an order to monitor an area or point of interest to determine the radiation dose of neutron and/or gamma radiation or the radiation dose rate of gamma radiation. You are given an AN/UDR-13 or AN/UDR-14 Radiac Set with accessories, TM 11-6665-364-12 or TM 11-6665-375-13, and the requirement to operate the Radiac Set under normal conditions.

**Standards:** Detect neutron and/or gamma radiation or gamma radiation dose rate using the AN/UDR-13 or AN/UDR-14 Radiac Set. Perform pre-operation, operation, and post-operation procedures without error in accordance with (IAW) TM 11-6665-364-12 or TM 11-6665-375-13 while following all safety notes without causing injury to self or others.

**Performance Steps**

1. Perform pre-operation procedures IAW the operator's manual.
  - a. Read and adhere to all safety notes and requirements.
  - b. Inventory equipment for completeness.
  - c. Ensure sufficient number of batteries are on-hand to complete the mission.
  - d. Perform all before-operation checks, services, and tests.
2. Perform operation procedures IAW the operator's manual.
  - a. Read and adhere to all safety notes and requirements.
  - b. Perform start-up procedures.
  - c. Employ the equipment to perform the desired operational procedure (for example, monitor dose and/or dose rates).
  - d. Perform during operation checks, services, and tests.
3. Perform post-operation procedures IAW the operator's manual.
  - a. Read and adhere to all safety notes and requirements.
  - b. Perform shut-down procedures.
  - c. Perform after-operation checks, services, and tests.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed pre-operation procedures IAW the operator manual.	_____	_____
2. Performed operation procedures IAW the operator manual.	_____	_____
3. Performed post-operation procedures IAW the operator manual.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 11-6665-364-12 Operator's and Unit Maintenance Manual for Radiac Set AN/UDR-13 (NSN 6665-01-407-1237) (EIC: KYH)	TM 11-6665-375-13 Operator and Field Maintenance Manual Radiac Set AD/UDR-14 (NSN 6665-01-507-0420) (EIC:N/A)	

## Subject Area 2: COMMUNICATIONS AND COMPUTERS

**113-COM-7046****Navigate using the Defense Advanced Global Positioning System Receiver**

**Conditions:** You are given a requirement to navigate to waypoints on the ground. Soldiers will have an AN/PSN-13 Defense Advanced Global Positioning System Receiver (known as DAGR), TO 31R4-2PSN13-1/TM 11-5820-1172-13&P/EE174-AD-OMI-010/NAVAIR 16-30PSN13-1/PCN 184 098802 00/TM 09880-OI, and predetermined waypoints 10-digit grid coordinates. The student will be aware that operational environment factors, such as extreme temperature differences, unstable political state, and hostile locals are critical to maintaining vital communications.

**Standards:** Navigates using a DAGR to locate five out of seven waypoints within 1 hour.

**Performance Steps**

1. Acquire DAGR information.
  - a. Acquire current position.
  - b. Identify the sections on the POS page set.
    - (1) Present Position page.
      - (a) Present position coordinates.
      - (b) Coordinate and grid system.
      - (c) Datum identifier.
      - (d) Current operating mode.
      - (e) Estimated horizontal error.
      - (f) Figure of merit.
      - (g) Elevation.
      - (h) Elevation reference.
      - (i) Ground speed.
      - (j) Track.
      - (k) Estimated time error.
      - (l) Time figure of merit.
      - (m) Time and date.
    - (2) Identify the relationships between sections on the Situational Awareness page.
      - (a) Present position.

- (b) Track.
  - (c) Waypoints.
  - (d) Routes.
  - (e) Alerts.
  - (f) North reference indicator.
  - (g) Ground speed.
  - (h) Track.
  - (i) Position error data.
  - (j) Range scale.
- (3) Identify the sections on the NAV Pointer page.
- (a) Current navigation method.
  - (b) Destination waypoint number and name.
  - (c) Azimuth.
  - (d) Range information.
- (4) Identify the sections on the Image Viewer page.
- (a) Current position.
  - (b) Landmarks.
  - (c) Map objects.
  - (d) Selected waypoints.
- (5) Identify the sections on the Sky View page.
- (a) Tracked satellites (current operating status shown at the top of the display).
  - (b) Numbers inside black circles (indicate satellites in use by the DAGR, with corresponding number at left side of display).
  - (c) A bar graph of each satellite.

**Note:** Indicates signal strength and code status. A long black bar indicates good signal strength and ephemeris data. A thick black bar indicates receiving Y or P code. If the DAGR is unable to display satellite information, no bars appear at all.

2. Input waypoints into DAGR.

- a. Mark present position waypoint.

- (1) From any display, push and hold the WP ENTER key.
  - (2) Select MARK a WP, then push the WP ENTER key. The “MARK PRESENT POSITION” message is displayed.
  - (3) Push the WP ENTER key to store the marked waypoint. A waypoint stored message is briefly displayed.
  - (4) Push the WP ENTER key to acknowledge, or just let display time out. Display returns to previously viewed display.
- b. Create a new waypoint.
    - (1) Push and hold the WP ENTER key.
    - (2) Highlight CREATE NEW WP, and then push the WP ENTER key.
    - (3) The Waypoint Editor page is shown. The first unused waypoint is populated with current position information (if tracking satellites).
    - (4) Revise information in all fields as necessary.
    - (5) Push the MENU key.
    - (6) Highlight Save and Exit, then push the WP ENTER key. After the waypoint is stored, a waypoint stored message is briefly displayed.
    - (7) Push the WP ENTER key to acknowledge, or just let display time out. Display returns to the Waypoints page with the new waypoint information saved and highlighted.
3. Navigate to waypoints using the DAGR.
    - a. Waypoint go-to navigation.
      - (1) From any display except a message pop-up, push and hold the POS PAGE key, the Present Position page is displayed.
      - (2) Push and hold the WP ENTER key.
      - (3) Highlight GOTO a WP, then push the WP ENTER key.
      - (4) Scroll through the waypoint name list using the UP, DOWN, LEFT, or RIGHT Arrow Keys to select the desired destination waypoint.

**Note:** For waypoint selection sorting options, push the MENU key. Select desired option, and then push the WP ENTER key.

- (5) After waypoint selection, push the WP ENTER key. The DAGR automatically displays the NAV Pointer page. The top of the rotating compass dial indicates the current ground track.

- b. Alerts.

**Note:** Alerts are made up of one or more waypoints, and are used to notify whether the operator is approaching or leaving a point, line, or area of significance (for example, radius distance from a waypoint, defining a line not to be crossed, or mine field area). The following alerts must be identified:

- (1) Anchor—Circular area defined by a radius from a waypoint. This activates when outside a defined radius.
- (2) Hazard—Circular area defined by a radius from a waypoint. This activates when inside a defined radius.
- (3) Buffer Zone—Rectangular area defined by two waypoints. This prevents the user from entering a defined area.
- (4) Corridor—Rectangular area defined by two waypoints. This prevents the user from exiting a defined area.
- (5) Other alerts include—area, boundary line/phase line, position error, and time/date.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Acquired DAGR information.	_____	_____
2. Inputs waypoints into DAGR.	_____	_____
3. Navigated to waypoints using the DAGR.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TC 3-25.26 Map Reading and Land Navigation	TO 31R4-2PSN13-1/TM 11-5820-1172-13&P/EE174-AD-OMI-010/NAVAIR 16-30PSN13-1/PCN 184 098802 00/TM 09880-OI Operator and Maintenance Manual Defense Advanced GPS Receiver (DAGR) Satellite Signals Navigation Set AN/PSN-13 (NSN 5825-01-516-8038), AN/PSN-13A (NSN 5825-01-526-4783), AN/PSN-13B (NSN 5825-01-590-9534)	

## 113-COM-1016

### Operate Simple Key Loader AN/PYQ-10

**Conditions:** You are given a loaded simple key loader (known as SKL) AN/PYQ-10, operational tactical radio, cut sheet, signal operating instructions (SOIs), communications security (COMSEC) training keys, and required references in an operational environment.

**Standards:** Operate SKL AN/PYQ-10 by completing seven of nine performance measures within 50 minutes. Perform installation procedures, power-up procedures, user application software procedures, manage the database, and load an operational radio with COMSEC keys.

#### Performance Steps

1. Perform installation procedures (if not required, go to step 2).
  - a. Conduct inventory.

**Note:** Verify the following components are present: SKL, stylus, battery pack, high-capacity lithium ion battery or standard lithium ion battery, battery charger assembly, crypto ignition key (known as CIK) and a universal serial bus adapter.

- b. Assemble the battery charger.
- c. Installation and removal of the CIK.

**Note:** If the CIK is not already installed in the SKL, locate the CIK that came with your SKL and follow the instructions below to install it.

- (1) Open the CIK access door with the SKL facing you. Insert the CIK into the CIK slot.

**Note:** Ensure the CIK is firmly seated in the CIK slot.

- (2) Close and secure the CIK access door.
2. Power up the SKL.
3. Perform presets.
  - a. Calibrate stylus (if required).
  - b. Set Auto Power shutdown and Backlight.
  - c. Reset KOV-21 card.
  - d. Create NEW special security officer password (if not required, proceed to step i).
  - e. Set and/or verify KOV-21 card time and date.
  - f. View the Audit Log.

**Note:** If there's too many entries in it, the KOV-21 may NOT initialize and the user CANNOT log on.

- g. Verify Audit Trail free space to ensure there's enough to load additional COMSEC.

- h. Clear Audit Trail.
  - i. Launch the SKL unmanned aircraft system (UAS) software.
  - j. Create SKL User.
  - k. Change User Password.
  - l. Activate Night Vision mode.
  - m. Disable Four-way button.
  - n. Display Summary Status.
  - o. Set Key view option.
  - p. Set Profile Mode.
  - q. Set Keys Prompt.
  - r. Set Tree Sort view.
  - s. Set Keys Load.
  - t. Enable Audit Warning message.
4. Manage database.
- a. Add/load platform.
    - (1) Select the desired platform to load from the Plats Tab.
    - (2) Select File→Transmit→Load.
    - (3) Execute each Profile step and then tap on the Send button.
  - b. Add/load equipment.
    - (1) Select the equipment you want to load from the expanded platform from the Plats Tab.
    - (2) Select File→Transmit→Load.
    - (3) Execute each Profile step and then tap on the Send button.

**Note:** The subsequent windows that open will vary depending on the equipment that you are trying to load.

- c. Create Key Tag(s).
- d. Assign Key Tag attributes.
- e. Assign equipment to platform.
- f. Set Date and load filter.
- g. Change key source (if required).

5. Transmit/transfer database.
  - a. Transfer preselected database to the SKL; Select File→Transmit→Database from the SKL Main Menu.
  - b. Select the individual database you wish to transmit from this window. Then tap on the Next>> button.
  - c. After Transfer Mode window opens. Select the target device that is the intended destination of the database. Then tap on the Next>> button.
  - d. Tap on the OK button to close it. The Transmit Database operation is now complete.

**Note:** When the transfer is complete, an "Operation Successful" window will open.

- e. Transfer dat file from the jump drive to SKL.
  - f. Transfer a predetermined database SKL to SKL.
  - g. Transmit/receive using single-channel ground and airborne radio system broadcast mode (only if radio is available).
6. Receive Key procedures.

- a. Receive Key from KOK-22 (DS-101); Select File→Receive→Key.
- b. Select the key source from the Key Source List. Tap on the Next>> button and follow the Profile and tap on the Finish button.
- c. Tap on the OK button. (You should see an "Operation Successful" indication).

**Note:** The key should show up on the Keys Tab unless you have set a Date Load Filter that precludes the key from being shown in the Keys Tab. The Receive Key function is complete at this time.

7. View SOI MENU.
  - a. Select a single SOI edition and tap on the OK button from the Edition window.
- Note:** To start the edition activation process, make sure that the SKL UAS SOI Tab is open.
- b. View SOI information; You should be able to expand the SOI Tab and view the Group, Pyro, and Smoke information. If you have added anything to the Quick Reference, you will be able to see that as well.
8. Load Assigned Key (Radio).
  - a. Load predetermined Radio; from the Plats tab, expand the Platform, Equipment, Fill Location, Short Title, and Edition so that you can see the key assigned to the Fill Location.
  - b. Load selected location on predetermined radio; Select File→Transmit→Load.
  - c. Verify the assigned key is loaded in the radio.
9. Power down from the SKL UAS Program.
  - a. Select File→Exit from the SKL UAS Main Menu.

- b. Select Session→Logout when the Core Library Desktop opens.
- c. After the KOV-21 LED goes out, depress and hold the Power Push button until you see the power-down sequence begin.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed installation procedures (if not required, go to step 2).	_____	_____
2. Powered up the SKL.	_____	_____
3. Performed presets.	_____	_____
4. Managed database.	_____	_____
5. Transmitted and/or transferred database.	_____	_____
6. Received Key procedures.	_____	_____
7. Viewed SOI menu.	_____	_____
8. Loaded assigned key(s)(radio).	_____	_____
9. Powered down from the SKL UAS PROGRAM.	_____	_____

<b>References Required</b>	<b>Primary</b>
STP 11-25C13-SM-TG Soldier's Manual and Trainer's Guide, MOS 25C, Radio Operator-Maintainer Skill Levels 1, 2, and 3	TM 11-5810-410-13&P-V12.0/TM 11866A-12&P/2 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Transfer Unit, Cryptographic Key Simple Key Loader (SKL) User Application Software (UAS), Version 12.0 AN/PYQ-10(C) (NSN 5810-01-517-3587) (EIC: KFV) AN/PYQ-10A(C) (NSN 5810-01-644-4375) (EIC: 2BR)

**113-589-2001****Input Program Data in the Tactical Satellite Radio Set AN/PRC-117()**

**Conditions:** As a radio operator-maintainer in a field environment, you are given an AN/CYZ10(\*) Automated Net Control Device radio set AN/PRC-117, antenna, battery box, two BA-5590/U batteries, fill cable, STP 11-25C13-SM-TG, TM 11-5820-1407-13&P, and TM 11-5810-394-13&P. The Soldier will be aware that operational environment factors, such as extreme temperature differences, unstable political state, and hostile locals are critical to maintaining vital communications.

**Standards:** The standard is met when the Soldier correctly programs the radio to respond to a NET CALL by the net control stations on the SATCMD net and DAMACMD net, while observing the operational environment.

**Performance Steps**

1. Prepare radio set for operation.
  - a. Install two batteries (BA-5590/U or BB-390A) into the battery case.
  - b. Connect battery case to radio set.
  - c. Connect handset H-250()U to AUDIO connector.
  - d. Install antenna.
  - e. Remote keyboard display unit.
  - f. Turn radio on by placing FUNCTION switch to PT.
2. Load electronic fill.
  - a. Place FUNCTION switch in LD position.
  - b. Connect fill device.
  - c. Select KYK-13. Press ENT.
  - d. Select VINSON. Press ENT.
  - e. Select the appropriate TEK.
  - f. Turn fill device on and select key position and press ENT.
  - g. When FILL DONE displays, press any key.
  - h. Select YES when prompted.
  - i. Select SATELLITE and press ENT.
  - j. Select appropriate TSK01.
  - k. Turn fill device on and select key position and press ENT.

- l. When FILL DONE displays, press any key.
- m. Select NO when prompted.
- n. Turn off and disconnect fill device.
- o. Rotate function switch to desired operating position.

**Notes:** If programming 25 kilohertz (kHz) DAMA UHF SATCOM, perform steps 3 and 4.

If programming 5 kHz DAMA UHF SATCOM, perform steps 5 and 6.

3. Program 25 kHz DAMA UHF SATCOM preset.
  - a. Press PGM button.
  - b. Select DAMA and press ENT.
  - c. Select PRESETS and press ENT.
  - d. Select NETS and press ENT.
  - e. NET TO MODIFY displays, type net preset number and press ENT.
  - f. NET PRESET SUBMENU displays, select CHANNEL and press ENT.
  - g. CHANNEL NUMBER display, type in channel number and press ENT.
  - h. TRANSMIT CAPABILITY displays, scroll via up/down arrow keys to FULL and press ENT.
  - i. CONSTANT KEY PORT? displays, select NO press ENT.
  - j. DEFAULT CONFIG displays, type 0 and press ENT.
  - k. NET PRESET SUBMENU displays, select RANGING, press ENT.
  - l. RANGING METHOD displays, select ACTIVE, press ENT.
  - m. NET PRESET SUBMENU displays, select ADDR, press ENT.
  - n. Select BASE\_ADDRESS and press ENT.
  - o. BASE ADDRESS displays, type TBA (terminal base address) assigned and press ENT.
  - p. ENCRYPTION KEY displays, select TEK 01, press ENT.
  - q. TRAINING FRAME displays, select 20, press ENT.
  - r. VOICE AUTOSWITCH displays, select DISABLED, press ENT.
  - s. PORT CONFIG SUBMENU displays, select DATA/VOICE and press ENT.
  - t. VOICE MODE displays, select MELP, press ENT.
  - u. SYNC/ASYNC SELECT displays, select SYNC and press ENT.

- v. BUAD RATE screen will display. Select baud rate and press ENT.
- w. Select GUARD\_LIST by using the left/right arrow keys and press ENT.
- x. DAMA PARAMETER PRESENT SCREEN will display. Select CONFIG CODE, press ENT.
- y. ADDRESS TO ADD displays, type in GUARD LIST assigned and press ENT.
- z. Press CLR twice. NET PRESET SUBMENU displays, select TRANSEC, press ENT.
  - aa. DAMA PARAMETER PRESET SCREEN will display. Select NAME, press ENT.
  - ab. CHANGE NAME screen will display. Type 25KHZDAMACFG, press ENT.
  - ac. DAMA PARAMETER PRESET SCREEN will display. Press CLR once.
  - ad. DAMA PARAMETER PRESET SCREEN will display. Select DESTINATIONS, press ENT.
  - ae. TRANSPower POWER displays, select 1 WATT by using the up/down arrow keys and press ENT.
  - af. NET PRESET SUBMENU displays, select NAME, press ENT.
  - ag. CHANGE NAME displays, type 25KHZDAMA and press ENT.
  - ah. NET PRESET SUBMENU displays, press CLR once.
  - ai. DAMA PARAMETER PRESET displays, select PORT CONFIGS, press ENT.
  - aj. SELECT PORT CONFIG displays, type in 0 and press ENT.
  - ak. PORT CONFIG SUBMENU displays, select COMSEC and press ENT.
  - al. CRYPTO MODE displays, select ANDVT, press ENT.
  - am. DESTINATION PRESET SUBMENU screen will display. Use the left/right arrow keys to select 25K\_AC, press ENT.
  - an. Select ADD, press ENT.
  - ao. DESTINATION TO ADD screen will display. Type in 11111, press ENT.
  - ap. Press CLR. ADD-REVIEW-DELETE screen will display. Press CLR once.
  - aq. Use the left/right arrow keys to select NAME, press ENT.
  - ar. CHANGE NAME screen will display. Type NCS, press ENT.
  - as. 5KHZ-25K\_AC-25K\_DC screen will display. Press CLR.
  - at. SELECT DESTINATION screen will display. Select 01, press ENT.
  - au. DESTINATION PRESET SUBMENU screen will display. Select 25K\_AC, press ENT.
  - av. Select ADD, press ENT.

- aw. DESTINATION TO ADD screen will display. Type in 51000, press ENT.
  - ax. ADD-REVIEW-DELETE screen will display. Press CLR once.
  - ay. Select NAME, press ENT.
  - az. CHANGE NAME screen will display. Type NET, press ENT.
  - ba. 5KHZ-25K\_AC-25K\_DC screen will display. Press CLR.
  - bb. SELECT DESTINATION screen will display. Select 02, press ENT.
4. Operate radio set on the 25 kHz DAMA UHF SATCOM. Establish communications by receiving a NET CALL by NCS on the DAMACMD net.
5. Program 5 kHz UHF DAMA preset.
- a. Press PGM button on KDU.
  - b. Select DAMA, press ENT.
  - c. Select PRESETS, press ENT.
  - d. Select NETS, press ENT.
  - e. NET TO MODIFY screen displays, type net preset number and press ENT.
  - f. NET PRESET SUBMENU displays, select CHANNEL and press ENT.
  - g. CHANNEL NUMBER screen displays, type in channel number and press ENT.
  - h. TRANSMIT CAPABILITY screen displays. Scroll via up/down key to FULL, press ENT.
  - i. LOGIN TYPE screen displays, select OVER THE AIR, press ENT.
  - j. DEFAULT CONFIG screen displays, select 1 and press ENT twice.
  - k. NET PRESET SUBMENU screen displays, select RANGING, press ENT.
  - l. RANGING METHOD screen displays, select ACTIVE and press ENT.
  - m. NET PRESET SUBMENU screen displays, select ADDR and press ENT.
  - n. Select BASE\_ADDRESS and press ENT.
  - o. BASE ADDRESS screen displays, type in terminal base address assigned and press ENT.
  - p. CRYPTO MODE screen displays, select ANDVT and press ENT.
  - q. ENCRYPTION KEY screen displays, select TEK 01 and press ENT.
  - r. TRAINING FRAME screen displays, select 20, press ENT.
  - s. VOICE AUTOSWITCH screen displays, select DISABLED and press ENT.

- t. PORT CONFIG SUBMENU screen displays, select DATA/VOICE and press ENT.
  - u. VOICE MODE screen displays, select MELP and press ENT.
  - v. SYNC/ASYNC SELECT screen displays, select SYNC and press ENT.
  - w. Select GUARD\_LIST by using the left/right arrow keys and press ENT.
  - x. DASA OPTION NUM screen displays, select 010 and press ENT.
  - y. ADDRESS TO ADD screen displays, type in GUARD LIST assigned and press ENT.
  - z. Press CLR twice, NET PRESET SUBMENU screen displays.
    - aa. Select TRANSEC, press ENT.
    - ab. DAMA PARAMETER PRESET screen displays, select NAME and press ENT.
    - ac. KEY LOCATION 0 screen displays, select TSK 01, press ENT.
    - ad. DAMA PARAMETER PRESET screen displays, press CLR once.
    - ae. NET PRESET SUBMENU screen displays, select POWER and press ENT.
  - af. TX POWER LEVEL screen displays, select 1 WATT by using the up/down arrow keys and press ENT.
  - ag. NET PRESET SUBMENU screen displays, select NAME and press ENT.
  - ah. CHANGE NAME screen displays, type in 5KHZDAMA and press ENT.
  - ai. NET PRESET SUBMENU screen displays, press CLR once.
  - aj. DAMA PARAMETER PRESET screen displays, select PORT\_CONFIGS and press ENT.
  - ak. SELECT PORT CONFIG screen displays, type in 1 and press ENT.
  - al. PORT CONFIG SUBMENU screen displays, select COMSEC and press ENT.
  - am. SELECT DESTINATION screen displays, select 01 and press ENT.
  - an. DESTINATION PRESET SUBMENU screen displays, select 5 kHz by using the left/right arrow keys and press ENT.
  - ao. DESTINATION screen displays, type 52000 and press ENT.
  - ap. Press CLR four times to return to NORMAL OPERATING screen.
6. Operate radio set on the 5 kHz DAMA UHF SATCOM.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared radio set for operation.	_____	_____
2. Loaded electronic fill.	_____	_____
3. Programmed 25 kHz DAMA UHF SATCOM preset.	_____	_____
4. Operated radio set on the 25 kHz DAMA UHF SATCOM.	_____	_____
5. Programmed 5 kHz UHF DAMA preset.	_____	_____
6. Operated radio set on the 5 kHz DAMA UHF SATCOM.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5810-394-13&P Operator and Field Maintenance Manual (Including Repair Parts & Special Tools List [RPSTL]) for AN/CYZ-10 V3 (NSN 5810-01-393-1973) Data Transfer Device Using CT3 (v3.2) User Application Software and NSA Fill 5.7 Application Software	STP 11-25C13-SM-TG Soldier's Manual and Trainer's Guide, MOS 25C, Radio Operator-Maintainer
TM 11-5820-1407-13&P Technical Manual Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Radio Sets AN/PRC-117F(V)2(C) (NSN 5820-01-580-2575) (EIC 6HP) AN/VRC-103(V)3 (NSN 5820-01-579-0420) (EIC 6HS) AN/TRC-223(C) (NSN 5820-01-579-0476) (EIC 6HU)	

**113-589-1009**  
**Program Radio Set AN/PRC-117() Tactical Satellite Radio**

**WARNING**

**HIGH VOLTAGE** is used in the operation of this equipment.  
**DEATH ON CONTACT** may result if personnel fail to observe safety precautions.

Two lithium-sulfur dioxide batteries are used with the AN/PRC-117F. They contain pressurized sulfur dioxide gas, which is toxic. Batteries MUST NOT be abused in a manner that may cause the battery to rupture. DO NOT charge lithium batteries.

Satellite communication antennas concentrate the transmitter signals into beams of high-energy electromagnetic radiation. Do not stand in front of the satellite antenna or touch it at any time when transmitting.

**Conditions:** Given a radio set AN/PRC-117, simple key loader (known as SKL), data cable, unit signal operating instructions, unit standard operating procedures, and TM 11-5820-1407-13&P.

**Standards:** Program the AN/PRC-117 and perform an operational check in accordance with (IAW) associated references.

**Note:** In addition to the specified safety requirements of this lesson plan, safety standards established in the technical manuals will be reinforced.

**Performance Steps**

1. Inventory equipment IAW TM 11-5820-1407-13&P.
2. Verify preventive maintenance checks and services (PMCS) IAW TM 11-5820-1407-13&P.
3. Program radio.
  - a. Refer to cut sheet provided by network planner.
  - b. Load communications security (COMSEC) fills with the SKL.
4. Load the frequencies IAW TM 11-5820-1407-13&P.
5. Verify the frequencies and COMSEC are loaded in the proper channel and refer to the unit's letter of instruction (LOI).
6. Perform an operational check.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inventoried equipment IAW TM 11-5820-1407-13&P.	_____	_____
2. Verified PMCS IAW TM 11-5820-1407-13&P.	_____	_____
3. Programmed radio.	_____	_____
4. Loaded the frequencies and referred to applicable references.	_____	_____
5. Verified the frequencies and COMSEC are loaded in the proper channel and referred to the unit's LOI.	_____	_____
6. Performed an operational check.	_____	_____

<b>References Required</b>	<b>Primary</b>
Unit SOI Unit/Unit's Signal Operation Instructions (SOI)	TM 11-5820-1407-13&P Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Radio Sets AN/PRC-117F(V)2(C) (NSN 5820-01-580-2575) (EIC 6HP) AN/VRC-103(V)3 (NSN 5820-01-579-0420) (EIC 6HS) AN/TRC-223(C) (NSN 5820-01-579-0476) (EIC 6HU)
TM 11-5810-410-13&P-V12.0/TM 11866A-12&P/2 Operators and Field Maintenance Manual Including Repair Parts And Special Tools List for Transfer Unit, Cryptographic Key AN/PYQ-10(C) Simple Key Loader (SKL) SKL User Application Software (UAS) Version 12.0 AN/PYQ -10(C) (NSN 5810-01-517-3587) (EIC: KFV) AN.PYQ-10A(C) (NSN 5810-01-644-4375) (EIC: 2BR)	
Unit's SOP	

**113-589-2004****Operate Tactical Satellite Radio Set AN/PRC-117() in All Modes of operation**

**Conditions:** You are given an AN/CYZ-10(\*) Automated Net Control Device, radio set AN/PRC-117F, antenna, battery box, two BA-5590/U batteries, and fill cable. The operator will be aware that operational environment factors, such as extreme temperature differences, unstable political state, and hostile locals are critical to maintaining vital communications.

**Standards:** The standard is met when the Soldier establishes communications to the distant end, while observing the operational environment.

**Performance Steps**

1. Prepare radio set for operation.
  - a. Install two batteries (BA-5590/U or BB-390A) into the battery case.
  - b. Connect battery case to radio set.
  - c. Connect handset H-250()U to AUDIO connector.
  - d. Install antenna.
  - e. Remote keyboard display unit (known as KDU).
  - f. Turn radio on by placing FUNCTION switch to PT.
2. Load electronic fill.
  - a. Place FUNCTION switch in LD position.
  - b. Connect fill device.
  - c. Select KYK-13. Press ENT.
  - d. Select VINSON. Press ENT.
  - e. Select the appropriate TEK. (PRESS ENTER TO INITIATE display; DO NOT press ENT yet.)
  - f. Turn fill device on and select key position and press ENT.
  - g. PRESS ENTER TO INITIATE displays on KDU; press ENT.
  - h. FILL IN PROGRESS displays. When FILL DONE displays, press any key.
  - i. At prompt MORE FILL DATA, select YES.
  - j. Select ANDVT; press ENT.
  - k. Select appropriate TEK. (PRESS ENTER TO INITIATE displays; DO NOT press ENT yet.)
  - l. If fill device is not on, turn on at this time and select key position and press ENT.
  - m. PRESS ENTER TO INITIATE displays on KDU; press ENT.

- n. FILL IN PROGRESS displays. When FILL DONE displays, press any key.
- o. At prompt MORE FILL DATA, select NO.
- p. Turn off fill device and disconnect.
- q. Rotate FUNCTION switch from LD to desired operating position.

**Note:** When performing steps for dedicated UHF SATCOM mode of operation, perform steps 3 and 5. When performing steps for DAMA UHF SATCOM mode of operation, perform steps 4 and 5a thru 5g.

3. Operate radio set in dedicated UHF mode.
  - a. Program dedicated UHF SATCOM Wideband net preset.
  - b. Program dedicated UHF SATCOM Narrowband net preset.
  - c. Set FUNCTION switch to CT.
  - d. Select SATCMD (UHF SATCOM Frequency net) by pressing the PRE +/- switch on the KDU.
4. Operate radio set in DAMA UHF SATCOM Mode.
  - a. Set FUNCTION switch to CT.
  - b. Once radio finishes initializing, press MODE.
  - c. OPERATIONAL MODE screen displays. Select DAMA and press ENT.

**Note:** If 25 kilohertz net preset automatically comes up, step d is not required.

- d. Select the desired DAMA NET PRESET on the KDU and scroll to the net preset number (use the KDU numeral keys to enter the desired net preset).
5. Establish communications with the distant end.

**Note:** In order to establish communications for DAMA UHF SATCOM Mode, you must PLACE A CALL using the following procedures:

- a. Press CALL key on KDU.
- b. SELECT REQUEST TYPE screen displays, select PLACE A CALL and press ENT.
- c. SELECT DESTINATION screen displays, select the destination NET ID and press ENT.
- d. PRECEDENCE screen displays. Select the precedence of the call and press ENT.
- e. DURATION screen displays. Select duration time and press ENT.
- f. MAIN OPERATING screen will display. Press 0 button twice. SERVICE STATE screen will display PENDING. When SERVICE STATE screen displays ACTIVE (WAIT for request to be sent to channel controller before keying handset.)
- g. When ACTIVE is displayed, establish communications with distant end.

**Note:** Upon completion of the call, you must terminate the call.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared radio set for operation.	_____	_____
2. Loaded electronic fill.	_____	_____
3. Operated radio set in dedicated UHF mode.	_____	_____
4. Operated radio set in DAMA UHF SATCOM mode.	_____	_____
5. Established communications with distant end.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5820-1407-13&P Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Radio Sets AN/PRC-117F(V)2(C) (NSN 5820-01-580-2575) (EIC 6HP) AN/VRC-103(V)3 (NSN 5820-01-579-0420) (EIC 6HS) AN/TRC-223(C) (NSN 5820-01-579-0476) (EIC 6HU)	

**171-300-0063**

## **Operate the SINCGARS Advanced System Improvement Program Radio**

**Conditions:** You are a member of a platoon conducting operations. You have an antenna, handset, and a fully operational single-channel ground and airborne radio system (SINCGARS) Advanced System Improvement Program radio properly filled with communications security (COMSEC), frequency hopping (known as FH) data, and synchronize (known as SYNC) time. You must place the radio in operation and establish communications with higher headquarters.

**Standards:** Set up radio, load frequencies, and perform passive late net entry (known as LNE) to establish communications with higher headquarters.

### **Performance Steps**

1. Set up the radio.
  - a. Set the volume.
    - (1) Press the MENU button until VOL LEVEL shows in the display.
    - (2) Press number key 1–9 to set the volume level or 0 for whisper mode.
  - b. Set the channel.
    - (1) Press the MENU button until CHAN shows in the display.
    - (2) Press number key 1–6 until the desired channel shows in the display.
    - (3) Press 0 for manual (MAN) or 7 for CUE.
  - c. Set the receiver-transmitter (known as RT) power.
    - (1) Press the MENU button until PWR shows in the display.
    - (2) Press the CHG button until the desired PWR setting shows in the display.

**Note:** Power settings are low (LO), medium (M), high (H), and power amplifier (known as PA).

- d. Set the RT mode.
  - (1) Press the MENU button until MODE shows in the display.
  - (2) Press the CHG button until the desired mode shows in the display.

**Note:** Mode settings are single channel (known as SC), FH and frequency hopping-master (known as FHM).

- e. Set COMSEC.
  - (1) Press the MENU button until CMSC shows in the display.
  - (2) Press the CHG button until the desired CMSC setting shows in the display.

**Note:** Setting are plain text (PT), cipher text (CT), time delay (TD), and receive variable.

- f. Set the display backlight.
  - (1) Place the RT in SQ ON.
  - (2) Press the FREQ backlight button.
  - (3) Press the CHG button until the desired setting shows in the display.

**Note:** Backlight settings are low to high, then OFF.

2. Load the SC frequency.
  - a. Turn the FCTN knob to LD.
  - b. Set the RT mode to SC.
  - c. Set the CMSC to the desired mode.
  - d. Set PWR to the desired mode.

**Note:** If PWR is set to PA, you must have a PA configuration on your radio set.

- e. Set the RT to the desired channel.

**Note:** Operators normally do not load a CUE frequency; only net control stations (NCSs) and alternate NCSs need to receive CUE messages. The manual frequency must be loaded if the Cold Start net opening procedure is to be used. Channels 1 through 6 are loaded with SC frequencies only when SC communications are to be used. In a typical FH net, which uses the Hot Start net opening procedure, it is not necessary to load any SC frequencies, unless a specific need arises.

- f. Press the FREQ button until the display shows [00000] or [30000].
- g. Press the CLR button until the display shows [ \_ \_ \_ \_ ].
- h. Enter the desired frequency.

**Note:** The display will show the frequency entered.

- i. Press STO.

**Note:** The display will blink showing the entered frequency.

- j. Turn the FCTN to SQ ON.

**Note:** Loading of the SC frequency is complete at this point.

- k. Repeat process of step 2 to load additional channels.

3. Change Net ID.

- a. Turn the FCTN knob to LD.
- b. Set the RT mode to FH or FHM.
- c. Set the CMSC to the desired mode (PT, CT, TD, RV).

- d. Set the PWR to the desired mode (LO, M, HI, PA).

**Note:** To use the PA setting, you must have a PA attached to your radio set.

- e. Set the RT to the desired channel.
- f. Press the FREQ button until the display shows [F000] or [F300].
- g. Press the CLR button until the display shows [ F \_\_\_ ].
- h. Enter the desired frequency.

**Note:** Display will show the frequency entered.

- i. Press the STO button.

**Note:** Display will blink showing the entered frequency.

- j. Turn FCTN to SQ ON.

**Note:** Loading of the FH/FHM frequency is complete at this point.

- k. Repeat process of step 3 to load additional channels.

**4. Perform passive LNE.**

- a. Press FREQ on keypad until [F XXX] is displayed.
- b. Press SYNC on keypad until [LF XXX] is displayed
- c. Wait until radio traffic to be heard, RT will show [F XXX].

**Note:** DO NOT press PTT while RT is in this mode.

- d. Conduct a radio check once traffic is heard and the display shows [F XXX].

**Note:** The “L” is dropped when the radio is in sync, and the passive LNE will be complete.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Set up the radio.	_____	_____
2. Loaded the SC frequency.	_____	_____
3. Changed net ID.	_____	_____
4. Performed passive LNE.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5820-890-13&P-2 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for SINCGARS Ground ICOM Combat NET Radio: AN/PRC-119 (NSN: 5820-01-267-9482)(EIC: L2Q) AN/PRC-119D (NSN: 5820-01-421-0801)(EIC: GC9) AN/PRC-119F (NSN: 5820-01-451-8252)(EIC: GA4) AN/VRC-87A (NSN: 5820-01-267-9480)(EIC: L22) AN/VRC-87C (NSN: 5820-01-304-2045)(EIC: GDC) AN/VRC-87D (NSN: 5820-01-351-5259)(EIC: GAR) AN/VRC-87F (NSN: 5820-01-451-8248)(EIC: GA5) AN/VRC-88A (NSN: 5820-01-267-9481)(EIC: L23) AN/VRC-88D (NSN: 5820-01-352-1694)(EIC: GAS) AN/VRC-88F (NSN: 5820-01-452-8435)(EIC: GA3) AN/VRC-89A (NSN: 5820-01-267-9479)(EIC: L24) AN/VRC-89D (NSN: 5820-01-420-6619)(EIC: GD8) AN/VRC-89F (NSN: 5820-01-451-8247)(EIC: GAY) AN/PRC-90A (NSN: 5820-01-267-5105)(EIC: L25) AN/VRC-90D (NSN: 5820-01-420-6618)(EIC: GD9) AN/VRC-90F (NSN: 5820-01-451-8246)(EIC: GA2) AN/VRC-91A (NSN: 5820-01-267-9478)(EIC: L26) AN/VRC-91D (NSN: 5820-01-420-6621)(EIC: GDG) AN/VRC-91F (NSN: 5820-01-451-8249)(EIC: GA8) AN/VRC-92A (NSN: 5820-01-267-9477)(EIC: L27) AN/VRC-92D (NSN: 5820-01-421-2605)(EIC: GDH) AN/VRC-92F (NSN: 5820-01-451-8250)(EIC: GM2)	

**113-589-2028**

**Operate Secure Single-Channel Tactical Satellite Radio Set in Satellite Communications Mode**

**Conditions:** You are given a data transfer device, tactical satellite (TACSAT) terminal AN/PSC-5 or similar TACSAT radio set, satellite antenna AS-4326/P, battery box, two BB-590/U batteries, fill cable, and TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A.

**Standards:** Established communications using satellite communications (SATCOM) mode of operation.

**Performance Steps**

1. Prepare radio set for operation.
  - a. Install two batteries (BA-5590/U or BB-390A) into the battery case.
  - b. Connect battery case to radio set.
  - c. Connect handset H-250()U to AUDIO connector.
  - d. Install antenna.

**WARNING**

**Physical contact with any nearby metallic objects may cause a radio frequency (RF) shock or burn. Do not use the antenna if the sheath covering is damaged or removed because contact with the internal metallic parts of the antenna can cause an RF shock or burn.**

- (1) Line of sight (LOS) antenna.

- (a) Loosen friction ring on LOS antenna.
  - (b) Connect LOS antenna to ANTENNA connector of R/T by turning fully clockwise.
  - (c) Position LOS antenna as desired and tighten friction ring.

**WARNING**

**SATCOM antennas concentrate transmitter signals into beams of high energy electromagnetic radiation. Do not stand in front of the satellite antenna or touch it any time when transmitting.**

- (2) Satellite antenna.

- (a) Remove antenna from carrying case.

- (b) Release leg strap holding tripod legs around antennas assembly. Slide leg strap off leg and stow in carrying case.
  - (c) Pull out and swing tripod legs to receptacles and set up on ground.
  - (d) Press down on locking ring and release found dipole elements.
  - (e) Open eight telescoping ground plan arms by pulling down and out on the conductive chain attached to each arm.
  - (f) Loosen "T" screw. Adjust antenna for desired elevation angle and hand-tighten "T" screw.
  - (g) Loosen "T" screw. Position dipole elements over a tripod leg. Hand-tighten "T" screw.
  - (h) Using your compass, position antenna to desired azimuth according to operational requirements.
  - (i) Unfold radials; then, connect two radials together as an array.
  - (j) Insert long end of array into the driven assembly. Ensure the array elements align with dipole elements.
  - (k) Connect P2 of antenna cable W6 to satellite antenna connector. Connect P1 of W6 to ANT connector on R/T.
2. Power-up procedure.
- a. Set MODE switch to PT or CT position. The radio set displays "AN/PSC-5 Initializing Radio" for approximately 2 seconds. Then the message "AN/PSC-5 Initializing Modules" will appear for 1 second or less.

**Note:** Selecting CT will not run the built-in test (known as BIT).

- b. Observe that radio set initiates power-up BIT. Power-up BIT will be completed after approximately 30 seconds. The display will show the last active CURRENT MODE menu.

**Note:** If power-up BIT fails, refer to TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A, Table 5-3.

- 3. Load communications security. (Refer to TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A, para 4.13.)
- 4. Load SATCOM presets. (Refer to TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A, para 4.23.2 for procedures.)
- 5. Send/receive communications using SATCOM mode of operation.
  - a. Set SQUELCH and VOLUME controls to midrange.
  - b. Verify SATCOM is selected on CURRENT MODE menu. If not selected, press NEXT/PREV keys to move cursor to mode field. Press arrow keys until SATCOM is displayed. Then press ENT key.

**Note:** Whenever the ENT key is pressed while in the CURRENT MODE menu, the menu title will alternate with the message "CONFIGURING: WAIT" while the parameters are being processed. Wait until the "CONFIGURING:WAIT" message is no longer displayed before proceeding with operation.

- c. Select desired operating preset. Press ENT key.
- d. If in CT, proceed to next step. If in PT, proceed to step (4).
  - (1) While observing field strength indication on display (Sq- 040), position satellite antenna for maximum field strength indication.
  - (2) To transmit, press and hold push to talk (known as PTT) switch on handset while talking in the mouthpiece (wait for single beep in handset before transmitting). Observe that transmit indication (Tx-CT-130) and signal strength (Tx-CT-130) are shown on display during transmission.
  - (3) To receive, release PTT switch and listen to the handset ear piece. Observe that receive indication (Rx-CT-170) and signal strength (Rx-CT-170) are shown on display during reception.
  - (4) Connect a data device. (If using KL-43C/KL-43F, refer to TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A, para 4.8.1; if using Digital Communications Terminal AN/PSC-2, refer to para 4.8.2; if using Digital Message Device Group OA-8990, refer to para 4.8.3.)
    - (a) Send message by keying data device. Observe transmit indication on radio set.
    - (b) Receive message on data device. Observe receive indication on radio set.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared radio set for operation.	_____	_____
2. Performed power-up procedures.	_____	_____
3. Loaded keys into the radio set.	_____	_____
4. Loaded SATCOM presets.	_____	_____
5. Sent/received communications using SATCOM mode of operation.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 11-5820-1130-12&P/TO 31R2-RPSC5-1/EE125-WU-OMI-010/PSC-5/TM 1019A-12&P/1A  
Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Radio Set AN/PSC-5 (NSN 5820-01-366-412 (EIC: N/A)

**171-170-0072****Perform Startup Procedures for FBCB2/Blue Force Tracking with Joint Capabilities Release**

**Conditions:** You are a crewmember of a vehicle preparing to conduct an operation that requires the use of Force XXI Battle Command, brigade and below (FBCB2)-blue force tracking (BFT) (Joint Capabilities Release [known as JCR]). The KBV-72 platform encryption device operational black keys and unit task organization have been preloaded. All before-operation preventive maintenance checks and services have been completed. TM 11-7010-326-10/TO 31S5-2UYK128-1/TM 11180A-OR is on hand. Some iterations of this task should be performed in mission-oriented protective posture 4.

**Standards:** Perform startup procedures in sequence for the FBCB2-BFT (JCR) system in accordance with TM 11-7010-326-10/TO 31S5-2UYK128-1/TM 11180A-OR.

**Performance Steps**

1. Start up the Defense Advanced Global Positioning System Receiver (known as DAGR).

- a. Push the PWR/Quit key to turn the DAGR on.
  - b. Verify POWER-ON status message.

**Note:** The POWER-ON status screen displays, followed by the Sky View page, then the Present Position page.

- c. Acquire current position.
  - d. Adjust the keypad/display lighting.
  - e. Perform manual initialization.
  - f. Select operating mode.

2. Start up the satellite transceiver.

**Note:** For satellite transceiver startup, the switches are located on the power module assembly (known as PMA) switchbox.

- a. Toggle the system circuit breaker switch on the PMA to on position.
  - b. Check that the satellite transceiver initializes.
3. Perform AN/UYK-128(V)3 system startup/login.
  - a. Set the circuit breaker switch CB1 on the processor unit (known as PU) to ON.
  - b. Press the display unit (known as DU) PWR button for up to 4 seconds and release after the green PWR light-emitting diode (LED) illuminates.

**Note:** The computer begins to boot, and the PWR, display, and central processing unit green status LEDs are on.

- c. Wait until Session Manager screen is displayed on the DU.

**Note:** It will take approximately 2 to 3 minutes for the screen to display.

- d. Select START/LOGIN.

**Note:** The password is case sensitive. Asterisks display as the password is typed, followed by a blinking cursor in the password text box. If an incorrect password is entered, the bad password dialog box opens. Select OK and re-enter the password. After three unsuccessful login attempts, the system displays a warning notice that the maximum login attempts have been exceeded. If the system aborts the login process, contact the unit signal staff officer.

- e. Enter the password.

**Note:** If Virus Scan dialog box is displayed, select NO to continue logging in.

- f. Select OPS.
- g. Start up KGV-72 PED.
  - (1) Turn Mode switch on KGV-72 programmable encryption device (known as PED) from OFF to RUN.

**Note:** PED Status Change dialog box opens on DU and displays the message: "Mode changed to Run!"

- (2) Select OK on DU.

**Note:** PED Status Change dialog box closes.

- (3) Turn Mode switch on KGV-72 from RUN to ADMIN.

**Note:** When authentication is complete, KGV-72 PED LED will be flashing green only.

- (4) Turn Mode switch on KGV-72 PED from ADMIN to RUN.
- (5) Verify unit icons (your unit and others) are displayed on map.

**Note:** This step may take up to 5 minutes. If other unit icons are displayed, the PU is receiving and processing position data via the satellite.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Started up the DAGR.	_____	_____
2. Started up Satellite Transceiver.	_____	_____
3. Performed AN/UYK-128(V)3 system startup/login	_____	_____

<b>References Required</b>	<b>Primary</b>
TO 31R4-2PSN13-1/TM 11-5820-1172-13&P/EE174-AD-OMI-010/NAVAIR 16-30PSN13-1/PCN 184 098802 00/TM 09880-OI Operator and Maintenance Manual Defense Advanced GPS Receiver (DAGR) Satellite Signals Navigation Set AN/PSN-13 (NSN 5825-01-516-8038), AN/PSN-13A (NSN 5825-01-526-4783), AN/PSN-13B (NSN 5825-01-590-9534)	TM 11-7010-326-10/TO 31S5-2UYK128-1/TM 11180A-OR Operator's Manual FOR Force XXI Battle Command Brigade-and-Below (FBCB2)-Blue Force Tracking Computer Set, Digital AN/UYK-128(V) AN/UYK-128(V)1 (EIC: K2S) AN/UYK-128(V)3 (EIC: K2U) AN/UYK-128A(V)3 (EIC: K4U)

### 171-170-0073

## Perform Shutdown Procedures for FBCB2/Blue Force Tracking with Joint Capabilities Release

**Conditions:** You are a member of a squad, team, or crew that has just completed a mission and you have been directed to shut down the Force XXI Battle Command, brigade and below (FBCB2)/blue force tracking (BFT) Joint Capabilities Release (known as JCR) system.

**Standards:** Shutdown the FBCB2/BFT JCR components in correct sequence.

### Performance Steps

1. Shut down the AN/UYK-128(V)3.

- a. Select Start > Shut Down > Shut Down.

**Note:** Shutdown confirmation dialog box displays message: "Do you really want to SHUT DOWN the system?"

- b. Select Yes.

**Note:** System closes all applications and shuts down. System is shut down when screen goes blank.

- c. Press and hold display (known as DU) POWER for up to 4 seconds and release when DU light-emitting diodes shut off.

- d. Set circuit breaker/toggle power switch on processor unit to OFF position.

2. Toggle power module assembly (known as PMA)/S1 to TRANSCEIVER OFF.

3. Shut down Defense Advanced Global Positioning System Receiver (known as DAGR).

- a. Select PWR/QUIT.

**Note:** The 30-second shutdown warning is displayed. If Auto-On, Automark, or Off Mode Display Heater functions are enabled, DAGR notifies the operator and requires acknowledgment prior to displaying the 30-second shutdown warning.

- b. Select ENTER to key to immediately power off the DAGR.

**Note:** Emergency Zeroize Passed message appears when process is completed.

- c. Select ENTER to acknowledge message.

**Note:** No CV keys loaded message closes.

- d. Select and hold PWR/QUIT.

- e. Select ENTER to immediately power off DAGR.

4. Shut down the KGV-72 PED.

**Note:** The KGV-72 programmable encryption device (known as PED) in an UNKEYED state is a controlled cryptographic item and must be handled, stored, transported and reported in accordance with AR 380-40. There

must be physical safeguards for the KGV-72 PED. The hard drive is considered SECRET classification even after the hard drive is pulled.

- a. Zeroize the KGV-72, if required, by lifting up and turn mode switch to Z position.

**Note:** The KGV-72 will immediately begin to zeroize all operational keys.

- b. Turn Mode Switch to OFF on KGV-72 PED.

Performance Measures	GO	NO-GO
1. Shut down the AN/UYK-128(V)3.	_____	_____
2. Toggled PMA/S1 to TRANSCEIVER OFF.	_____	_____
3. Shut down the DAGR.	_____	_____
4. Shut down the KGV-72 PED.	_____	_____

References Required	Primary
AR 380-40 Safeguarding and Controlling Communications Security Material (FOUO)	TM 11-7010-326-10 Operator's Manual for Force XXI Battle Command Brigade-and-Below (FBCB2)-Blue Force Tracking Computer Set, Digital AN/UYK-128(V) AN/UYK-128(V)1 (EIC: K2S) AN/UYK-128(V)3 (EIC: K2U) AN/UYK-128A(V)3 (EIC: K4U)
TO 31R4-2PSN13-1/TM 11-5820-1172-13&P/EE174-AD-OMI-010/NAVAIR 16-30PSN13-1/PCN 184 098802 00/TM 09880-OI Operator and Maintenance Manual Defense Advanced GPS Receiver (DAGR) Satellite Signals Navigation Set AN/PSN-13 (NSN 5825-01-516-8038), AN/PSN-13A (NSN 5825-01-526-4783), AN/PSN-13B (NSN 5825-01-590-9534)	

**171-000-0099**

**Perform Startup Procedures with Joint Battle Command-Platform Vehicle System AN/UYK-128B(V)3**

**Conditions:** As an operator of a Joint Battle Command-Platform (known as JBC-P) vehicle system with associated hardware mounted in a tactical vehicle, you are given applicable references. The hardware is configured and powered off, and crypto variable (known as CV)/key encryption key (known as KEK)/traffic encryption key (known as TEK) keys have been loaded on a simple key loader (known as SKL).

**Standards:** Perform start up procedures in sequence in accordance with applicable references and ensure the JBC-P vehicle system is fully operational.

**Performance Steps**

1. Start up Defense Advanced Global Positioning System Receiver (known as DAGR).

- a. Press PWR QUIT.

**Note:** If there is no crypto key installed, the DAGR will display “WARNING! NO CVs LOADED” and will require you to acknowledge the warning by pressing WP ENTER before the DAGR will display the Sky View page.

- b. Press WP ENTER.
  - c. Press BRIGHTNESS (light bulb)/MENU as applicable.
  - d. Press MENU twice.
  - e. Select Receiver Setup.
  - f. Press WP ENTER.
  - g. Select GPS Setup.
  - h. Press WP ENTER.
  - i. Verify:
    - (1) OPERATING MODE: Continuous.
    - (2) POWER-ON OPERATING MODE: Default.
    - (3) FREQUENCY: L1 Primary.
    - (4) SV CODE: All-Y.
    - (5) ELEVATION HOLD: Automatic.
    - (6) RAIM MODE: Enabled.
    - (7) REHEARSAL ROUTE: - - (two dashes).
    - (8) REHEARSAL GROUND SPEED – 7 kilometers per hour.

- (9) ANTI-JAM ACCESSORY MODE: Disabled.
- j. Press POS PAGE.
  - k. Verify that the DAGR has returned to the Present Position page.
2. Start Up Satellite Transceiver.
- a. Ensure Satellite Transceiver is connected prior to powering up the AN/UYK-128B(V)3.
  - b. Set Power Module Assembly power switch to TRANSCEIVER ON.
3. Start Up/login to AN/UYK-128B(V)3 with UTO Loaded.
- a. Ensure startup and initialization of DAGR and Satellite Transceiver peripheral components are complete.
  - b. Set circuit breaker/toggle switch (CB-1) on the processor unit to ON.
  - c. Press and hold display unit (known as DU) PWR for up to 4 seconds and release after Green PWR light-emitting diode (LED) illuminates.
    - (1) Green LEDs for PWR, DISP, and CPU cycle in sequence.
    - (2) Startup begins and displays Secure Data at Rest password prompt.
    - (3) Type password.
    - (4) Press Enter.
  - d. Type appropriate password in Password text box.
- Note:** The password is case-sensitive. Dots are displayed as the password is typed followed by a flashing cursor in the Password text box. If an incorrect password is entered, the Bad Password dialog box displays. Select OK and retype the password. After three unsuccessful login attempts, the system displays a warning notice: “Number of login attempts exceeded. Please contact the Security Officer. Security Officer has been notified.” Contact your security officer/signal staff officer (S-6) to resolve the situation.
- e. Select OK.
  - f. Select SECRET.
  - g. Select OK.
  - h. Select NO.
4. Start up KGV-72 PED.
- a. Lift and turn Mode Switch on KGV-72 programmable encryption device (known as PED) from OFF to RUN.

**Note:** KGV-72 PED Status LED Indicator should be solid red, start flashing red, and then alternately flash green/amber. Flashing green/amber indicates KGV-72 PED has not authenticated to the hard drive. If it is not authenticated on initial startup, the PED Status Change dialog box displays on the DU with the message, “Communicator Authentication failure!” Select OK to close.

- b. Select OK on DU.
5. Load DAGR CV Keys Using SKL.
  - a. Press MENU twice on DAGR.
  - b. Select Receiver Setup.
  - c. Press WP ENTER.
  - d. Select Crypto Fill.
  - e. Press WP ENTER to access the CV Loading Interface field.
  - f. Press WP ENTER to open CV Loading Interface submenu.
  - g. Select DS-102 as CV LOADING INTERFACE.
  - h. Press WP ENTER.
  - i. Connect the serial cable end of the DAGR Crypto keyfill cable to J1 on the DAGR.
  - j. Connect SKL Fill cable to SKL Fill.
  - k. Connect DAGR Crypto keyfill cable and SKL Fill cable at connector ends.
  - l. Press and hold (approximately 4 seconds) SKL Power Push Button (upper right).
  - m. Press screen brightness on SKL (bottom left and right buttons) to adjust backlighting.
  - n. Type appropriate user ID in User ID text box.
  - o. Type appropriate password in Password text box.
  - p. Select OK on Logon dialog box.
  - q. Select OK on Startup Information dialog box.
  - r. Select Keys tab.

**Note:** DAGR keys are provided by the communications security custodian without profile. Two keys are provided and each key must be loaded individually. Verify with your S-6 personnel the correct sequence to load the two keys.

- s. Expand appropriate key folder.
- t. Select key to be loaded.
- u. Select LOAD (upper right-hand corner of menu/toolbar).
- v. Select DS-102 as Protocol option.
- w. Select DS-102 as Activate Mode option.
- x. Verify Send Tag option is NOT selected.

- y. Select Fill as Mode option.
- z. Select OK on Key Load Settings dialog box.
  - aa. Select OK on Ready to Send Key dialog box.
  - ab. Select OK on the SKL.
  - ac. Select Done.
- ad. Press WP ENTER to acknowledge DAGR message(s).

**Note:** After the second key is loaded, the CV Status on Crypto Fill page indicates “Have Today’s CV Key.”

- ae. Press WP ENTER.

**Note:** Repeat steps s. though ad. for the second key.

- af. Select X in upper right corner of SKL UAS screen.

**CAUTION**

The green LED must turn off before powering down the SKL to prevent possible database corruption.

- ag. Select Session > Logout.
- ah. Disconnect DAGR Crypto keyfill cables from SKL and DAGR J1 Fill.
  - ai. Press SKL Power Push Button to power off the SKL
  - aj. Disconnect SKL J1/DAGR fill cables from J13.
  - ak. Disconnect DAGR Crypto keyfill cable from SKL keyfill cable.
6. Load KGV-72 PED Operational Black Keys (KEK/TEK) with profile.
  - a. The profile is the KEK and TEK packaged together so that they will be loaded as one function.

**CAUTION**

When the KGV-72 PED is connected to a different platform or a different hard drive is inserted, any previously loaded operational keys (KEK or TEK) will be lost when the KGV-72 PED mode switch is changed to ADMIN.

- b. Ensure KGV-72 PED is set to RUN and Status LED Indicator is flashing green.

**Note:** Status LED Indicator will go from a flashing green/amber to a flashing green to indicate that the KGV-72 PED has successfully authenticated with the hard drive when the Mode Switch is changed to ADMIN. The flashing green status LED Indicator indicates that the KGV-72 PED requires operational keys to be loaded.

- c. If the Status LED Indicator is not flashing green, turn Mode Switch on KGV-72 PED from RUN to ADMIN.
- d. Select OK on DU.
- e. Verify LED is flashing Green.
- f. Turn Mode Switch on KGV-72 PED to FILL.
- g. Select OK on DU.
- h. Connect SKL keyfill cable to SKL Fill.
- i. Connect SKL keyfill cable to KGV-72 PED J1 Fill.
- j. Press and hold (approximately 4 seconds) SKL Power Push Button.
- k. Press screen brightness on SKL (bottom left and right buttons) to adjust backlighting to desired brightness.
- l. Enter appropriate user ID in User ID text box.
- m. Enter appropriate password in Password text box.
- n. Select OK on SKL.
- o. Select OK on Startup Information screen.
- p. Select Keys tab.
- q. Select plus (+) sign to expand the folder.
- r. Verify correct KEK short title.
- s. Select plus (+) sign to expand the folder.
- t. Verify correct TEK short title.
- u. Select Eqs tab.
- v. Select equipment KGV-72 Prime on SKL.
- w. Select LOAD (upper right-hand corner) on SKL.
- x. Select Next on SKL.
- y. Verify SKL cable is connected to KGV-72 PED J1 Fill.
- z. Verify Mode Switch on KGV-72 PED is set to FILL mode.
- aa. Select Send on SKL.

**Note:** When Send is selected, observe the KGV-72 PED Status LED Indicator. A flickering green will indicate the Key Load was successful, whereas a flickering red/green will indicate a key mismatch and the Key Load was unsuccessful.

- ab. Select OK on SKL.
- ac. Turn Mode Switch on the KGV-72 PED from FILL to RUN.
- ad. Select OK on DU.
- ae. Select No on SKL.
- af. Select OK on SKL.
- ag. Select Done on SKL.
- ah. Disconnect SKL cable from KGV-72 PED J1 Fill.
- ai. Select File > Exit.
- aj. Select X on SKL UAS screen.

**CAUTION**

The Green LED on the SKL must turn off before powering down the SKL to prevent possible database corruption.

- ak. Press and hold SKL Power Push Button to power off the SKL.

**Note:** Once the operational keys have been loaded into all of the KGV-72 PEDs, the KEK must be deleted from the SKL when directed and the key destruction recorded on DA Form 5251-R (*CONAUTH Key Management Worksheet*). To delete operational keys from the SKL, refer to WP titled “REMOVE OPERATIONAL KEYS FROM SKL/DTD” listed in TM 11-5810-268-13/TM 12391A-12/1/PCN 184 123910 00/NAVAIR 16-30KGV72-1/PCN 184 129141 00.

**CAUTION**

Changing the role in a system will result in a loss of all data for the previous operator.

7. Change role after Initial Startup.

- a. If logged into the system:
  - (1) Select Expand Hemisphere > Tools.
  - (2) Select System Actions > Logout from the Tools Ribbon menu.
  - (3) Select OK.
- b. Type appropriate password in Password text box.

- c. Select Current Role dropdown.

**Note:** After changing roles, all user-created data associated with former role, including saved messages and overlays, will be lost.

- d. Select Yes.
- e. Select appropriate criteria:
  - (1) Corps.
  - (2) Division.
  - (3) Brigade.
  - (4) Battalion.
  - (5) Company.
  - (6) Platoon.
- f. Select appropriate role from list of roles displayed in Matches text box.
- g. Select OK on Select Role dialog box.
- h. Select OK on Select Classification dialog box.
- i. Select Secret.
- j. Select OK.
- k. Select No.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Started up DAGR.	_____	_____
2. Started up Satellite Transceiver.	_____	_____
3. Started up/logged into AN/UYK-128B(V)3 with UTO Loaded.	_____	_____
4. Started up KGV-72 PED.	_____	_____
5. Loaded DAGR CV keys using SKL.	_____	_____
6. Loaded KGV-72 PED operational Black keys (KEK/TEK) with profile	_____	_____
7. Changed role after initial startup.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5810-268-13/TM 12391A-12/1/PCN 184 123910 00/NAVAIR 16-30KGV72-1/PCN 184 129141 00 Operator and Field Maintenance for Platform Encryption Device (PED) KGV-72 (NSN 5810-01-564-3364) (EIC GPT)	TM 11-7010-498-10 Operator's Manual for Joint Battle Command Platform (JBC-P) Computer set, Digital AN/UYK-128B(V)3 (NSN 7010-01-618- 5798) (EIC K5V)

**171-170-0100****Perform Shutdown Procedures with Joint Battle Command-Platform Vehicle System AN/UYK-128B (V) 3**

**Conditions:** As an operator of the Joint Battle Command-Platform (known as JBC-P) vehicle system with associated hardware mounted in a tactical vehicle, you are given applicable references. The hardware is configured and powered on, and the Soldier is logged into JBC-P.

**Standards:** Perform shutdown procedures in sequence in accordance with (IAW) applicable references and ensure the JBC-P Vehicle system is completely powered off.

**Performance Steps****CAUTION**

DO NOT zeroize the KGV-72 programmable encryption device (known as PED) as part of normal shutdown unless directed by your unit standard operating procedure. Zeroizing the KGV-72 PED will eliminate the operational keys; the system will be rendered inoperable on the SECRET network. You will be required to reload the appropriate operational keys, of which the key encryption key may have been deleted from your unit simple key loader.

Do not shut off power to the processor unit (known as PU) without first following the software shutdown procedure. Failure to comply may cause loss of program data or damage to the PU.

Leaving the PU circuit breaker/toggle switch (known as CB-1) set to ON will enable the PU to continue to pull power from the vehicle battery as long as external direct current power is available. This could possibly result in a dead vehicle battery if left in this condition over an extended time period.

1. Lift up and turn Mode Switch on the KGV-72 PED to OFF.

**Note:** Separating the authenticated hard drive from a keyed KGV-72 PED returns the PED to a controlled cryptographic item state, and it should be handled and secured according to AR 380-5, AR 190-13, and AR 380-40. When removing the hard drive from a SECRET system, you must mark the hard drive as SECRET and mark the KGV-72 PED to which it has been authenticated. If the hard drive is connected to a different KGV-72 PED, it will require a new authentication and you will lose operational keys, rendering the system unable to communicate over the SECRET network.

2. Shut down AN/UYK-128B(V)3:
  - a. Select Expand Hemisphere > Tools.
  - b. Select System Actions > Shut Down from the Tools Ribbon menu.
  - c. Select OK.
  - d. Once software shuts down, set CB-1 on PU to OFF.
3. Set PMA power switch on the Satellite Transceiver to TRANSCEIVER OFF.

4. Shut down DAGR:
  - a. Press and hold PWR QUIT.

**Note:** A 30-second power down warning is displayed. If the Auto-On, Automark, or OFF Mode Display Heater functions are enabled, DAGR notifies the operator and requires acknowledgement prior to displaying the 30-second power down warning.

- b. Press WP ENTER to immediately power off DAGR.

Performance Measures	GO	NO-GO
1. Lifted up and turned Mode Switch on the KGV-72 PED to OFF.	_____	_____
2. Shut down AN/UYK-128B(V).	_____	_____
3. Set PMA power switch on the satellite transceiver to TRANSCEIVER OFF.	_____	_____
4. Shut down DAGR.	_____	_____

References Required	Primary
AR 380-5 Army Information Security Program	TM 11-7010-498-10 Operator's Manual for Joint Battle Command Platform (JBC-P) Computer set, Digital AN/UYK-128B(V)3 (NSN 7010-01-618-5798) (EIC K5V)
AR 190-13 The Army Physical Security Program	
AR 380-40 Safeguarding and Controlling Communications Security Material (U)	

071-217-0068

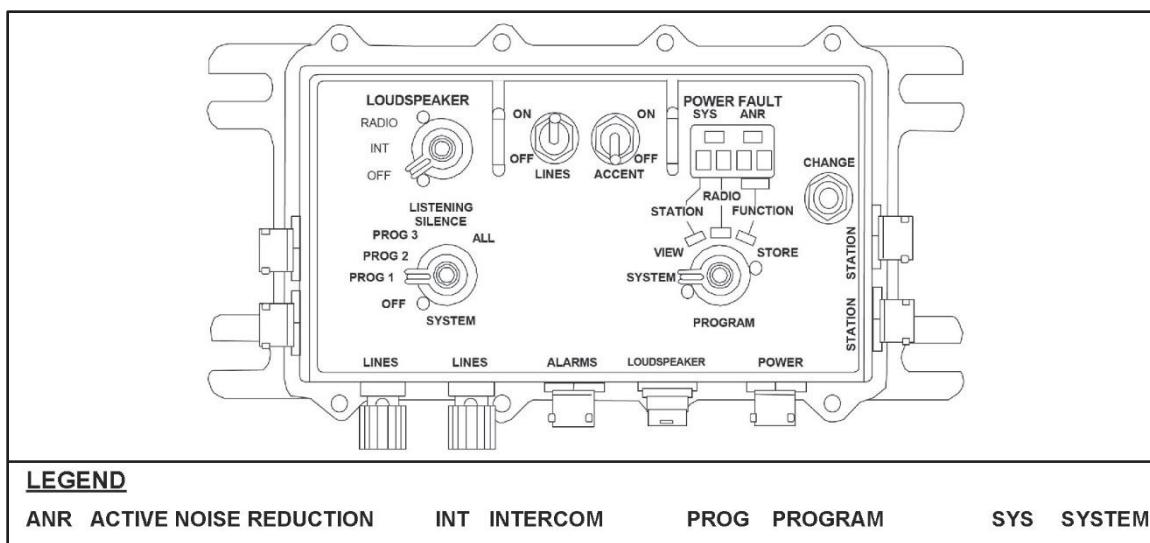
**Operate Vehicular Intercommunication Set AN-VIC-3(V) on the Stryker Vehicle**

**Conditions:** You are a crewmember on a Stryker vehicle preparing for a tactical operations and you must operate the AN-VIC-3(V) vehicular intercommunication set on the vehicle. You and other crewmembers have combat vehicle crewman (known as CVC) helmets. The master control station (known as MCS) has already been programmed.

**Standards:** Prepare the MCS for operation, operate the loudspeaker, connect the CVC helmet to the full function crew station (known as FFCS), set up the FFCS for operation, and establish voice communications. Once operations are complete power down the MCS and disconnect the CVC helmet.

**Performance Steps**

1. Prepare the MCS for operation. (See figure 3-1.)

**Figure 3-1. Master control station**

- a. Move the vehicle's AUX MASTER switch on the power distribution panel to the ON position.
- b. Move the SYSTEM switch to the desired position.

**Notes:** The SYSTEM switch is used to select one of five MCS operating modes:

- OFF position removes DC power, making the intercom system inoperable.
- PROG 1, PROG 2, and PROG 3 positions define the level of access of each crew station to the radios. The level of access is programmed into the MCS by the vehicle commander and/or crewmember.
- LISTENING SILENCE position allows all connected crew stations to have receive only access to all radios.
- ALL position allows connected crew stations to receive and transmit on all radios.

The system will initialize and go through the built-in-test (known as BIT) when PROG 1, PROG 2, PROG 3, LISTENING SILENCE, or ALL is selected.

- c. Verify the system passes the BIT test.

**Notes:** Display will show PASS followed by the system mode (example: P1) if there are no configuration discrepancies or errors. The system is ready for normal communications.

If there are configuration discrepancies or errors, the display will show FAIL followed by an error code(s). Refer to TM 11-5830-263-10 for troubleshooting procedures.

- d. Set the PROGRAM switch to SYSTEM.

**Note:** The SYSTEM position is the normal operation setting. On the alphanumeric display the selected setting of the SYSTEM switch (example: PROG1) is shown as well as any error messages caused by problems in the system.

- e. Turn the LOUDSPEAKER switch to desired position.

**Notes:** In the INT position, the speaker will outputs audio received from the intercom channel.

In the RADIO position, the loudspeaker will outputs audio received from all radios.

In OFF position there will be no audio output to the speaker.

- f. Turn the ACCENT switch on or off, as required.

**Notes:** The ACCENT switch in the ON position reduces the volume of the radio signals by 20 decibels (dB) and the vehicle's alarm signal by 6 dB with respect to the intercom signal in order that the intercom is emphasized above all other signals, but only when an override condition occurs.

In the OFF position all intercom, radio signals, and vehicle alarms remain at the same level.

- g. Turn the MCS LINES switch to desired position.

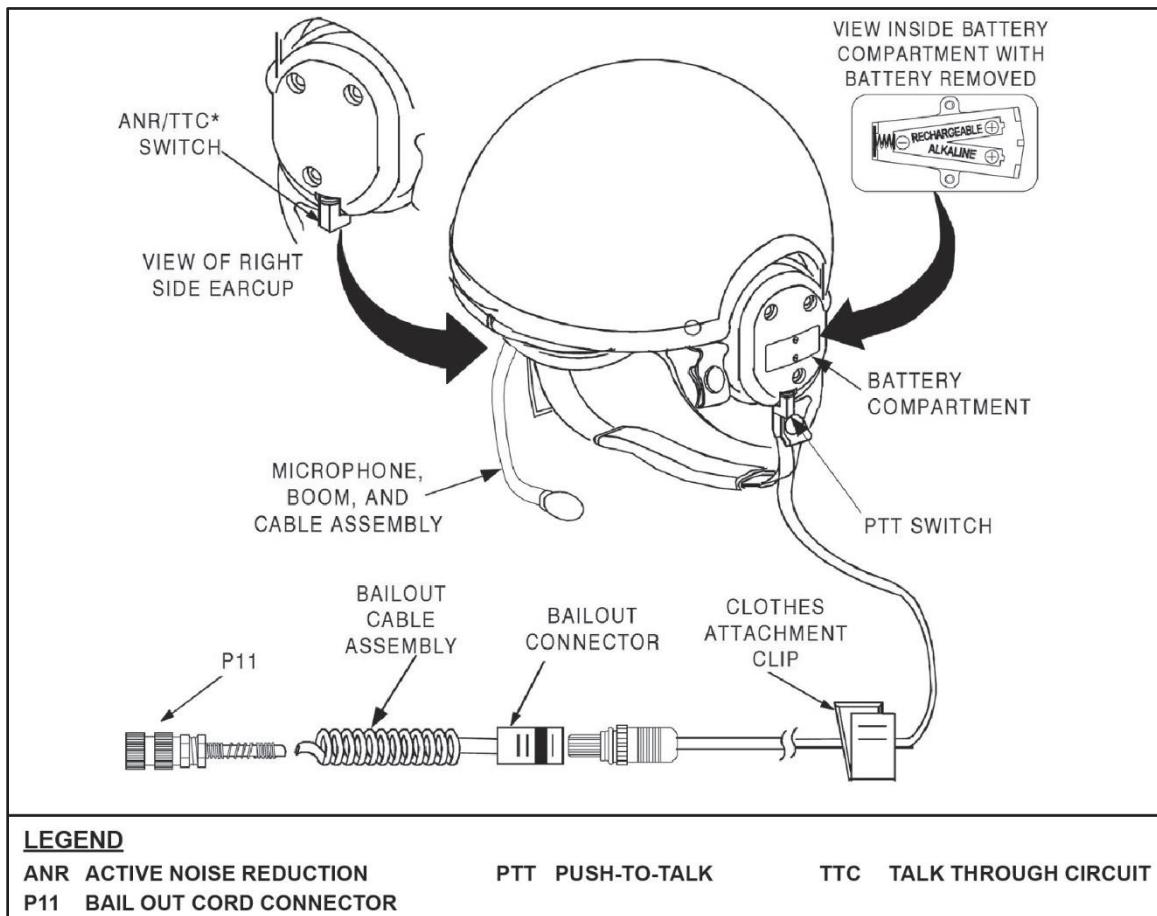
**Note:** The LINES switch in the OFF position disables the field wire transmit capability from the MCS, but still allows reception. The LINES switch in the ON position permits field wire transmission and reception.

2. Turn the loudspeaker on or off, as required.

**Note:** The ON/OFF switch is also used to control the volume.

3. Connect the CVC helmet to the FFCS. (See figure 3-2, page 3-50.)

**Note:** The CVC helmet push-to-talk (known as PTT) switch is a three-position switch. The switch works as follows: when the switch is set momentarily to the forward position, it allows access to communications on radios; when the switch is set to the center position, it allows listening only on radios and intercom; when the switch is set to the rear position, it allows access to communications on the intercom. The right ear cup has an active noise reduction (known as ANR) switch, which defeats the ANR circuitry.



**Figure 3-2. Combat vehicle crewman helmet and bailout cable**

- a. Connect the CVC helmet connector into the bailout cable connector.
  - b. Connect the bailout cord connector (P11) to the headset connector on the FFCS.
4. Prepare the FFCS for operation. (See figure 3-3.)

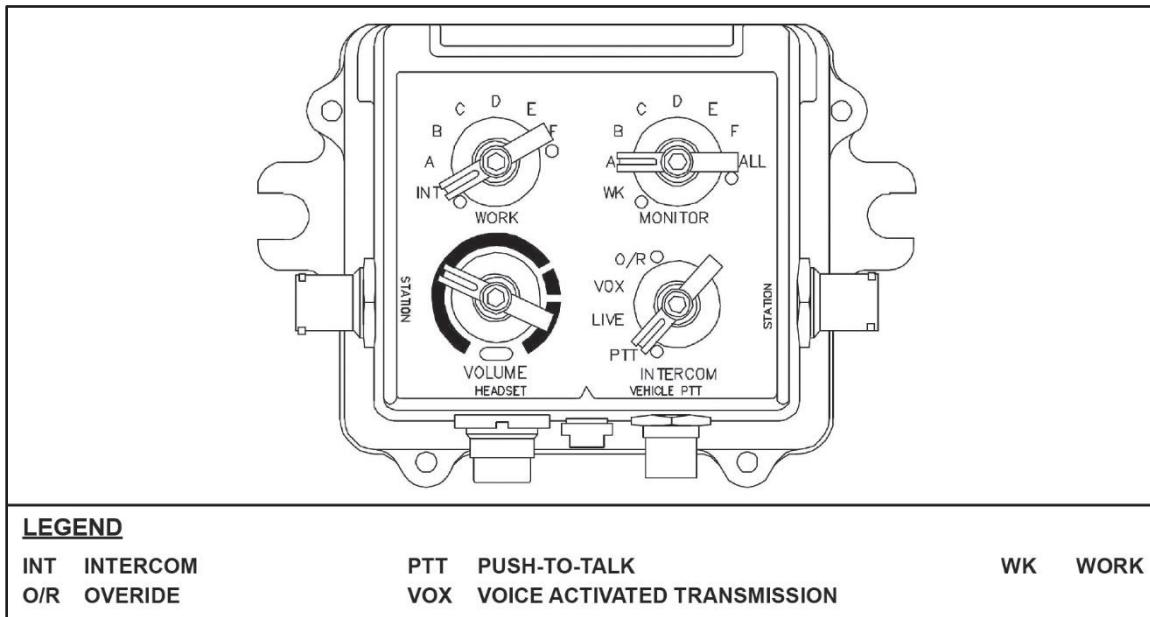


Figure 3-3. Full function crew station

### WARNING

**Operating the system with volume-control pointer in the red zone  
for an extended period of time may cause hearing damage.**

- Adjust volume using the VOLUME HEADSET switch.

**Note:** Color bands indicate level; end of green range is 85 dB, end of yellow range is 95 dB, end of red range is 110 dB. There are detents for each range to prevent inadvertent adjustment.

- Set the WORK switch to appropriate position.

**Note:** The WORK switch, when placed in the INT position, permits the operator to transmit and receive intercom channel. In positions A, B, C, D, E, and F, if access is permitted, the operator can communicate over the selected radio.

- Set MONITOR switch to appropriate position.

**Note:** The WK position, permits the operator has access to the functions selected on the WORK switch. In positions A, B, C, D, E, and F the operator can monitor one radio (MONITOR switch) while transmitting and receiving on another radio (WORK switch). In the ALL position the operator can receive all radio channels as defined by the programming of the MCS.

- Set the INTERCOM switch to the appropriate position.

**Note:** The INTERCOM switch allows two-way communication over the radios only (subject to the access levels defined in PROG 1, PROG 2, and PROG 3), intercom only, or radios and intercom. PTT position - the crewmember must activate the headset PTT switch in order to engage in two-way intercom communication. LIVE position - the crewmember can communicate over the intercom hands free regardless of the position of the work switch. In voice-operated switch (known as VOX) position, the crewmember can communicate on the

intercom hands free but without introducing vehicle noise as long as the volume of the signal is sufficient to overcome the threshold level setting of the VOX. The override (known as O/R) position - allows crewmember's communication to take priority over any traffic on the intercom channel no matter what other crew station FFCSs are set on. The O/R position is a momentary position; therefore, the INTERCOM switch must be held in this position for the duration of the communication. When the switch is released, it returns to the VOX position.

5. Establish voice communications, as required.
6. Power down the MCS.
  - a. Adjust the FFCS VOLUME control counterclockwise to the lowest volume level.
  - b. Move the ACCENT switch to the OFF position.
  - c. Move the LOUDSPEAKER switch to the OFF position.
  - d. Move the LINES switch to the OFF position.
  - e. Move the MCS SYSTEM switch to the OFF position.
  - f. Set the AUX MASTER switch on the PDP to the OFF position.
7. Disconnect the CVC helmet, if required.
  - a. Disconnect the bailout cable from the headset connector on the FFCS.
  - b. Disconnect the CVC helmet connector from the bailout cable.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the MCS for operation.	_____	_____
2. Turned the loudspeaker on or off, as required.	_____	_____
3. Connected the CVC helmet to the FFCS.	_____	_____
4. Set up the FFCS for operation.	_____	_____
5. Established voice-communication.	_____	_____
6. Powered down the MCS.	_____	_____
7. Disconnected the CVC helmet.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4 Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF) Stryker	TM 11-5830-263-10 Operator's Manual Vehicular Intercommunication Set AN/VIC-3(V), Including: Control, Indicator CD-82/VRC (NSN 5895-01-382-3221) (EIC: NA) Control, Intercommunication Set C-12357/VRC (NSN 5820-01-382-3218) (EIC: NA) Control, Intercommunication Set C-12358/VRC (NSN 5830-01-382-3209) (EIC: NA) Interface Unit, Communication Equipment C-12359/VRC (NSN 5895-01-382-3220) (EIC: NA) Loudspeaker, Permanent Magnet, LS-688/VRC (NSN 5965-01-382-3222) (EIC: NA)

**071-810-0010**  
**Maintain Intercommunication Set, AN/VIC-Series on a Tactical Vehicle**

**Conditions:** You are a crewmember on a tracked vehicle and have been directed to perform operator-level maintenance on the AN/VIC-3 Intercommunications Set. You have TM 11-5830-340-12 or TM 11-5830-263-10, an equipment inspection and maintenance worksheet (DA Form 2404 [*Equipment Inspection and Maintenance Worksheet*] or DA Form 5988-E [*Equipment Maintenance and Inspection Worksheet*]), and cleaning equipment.

**Standards:** Conduct operator level preventive maintenance checks and services (PMCS) and clean the AN/VIC-3 Intercommunications Set in accordance with the appropriate technical manual. Conduct operator troubleshooting, if required, in accordance with the appropriate technical manual. Record and report any uncorrectable faults.

**Note:** Preventive maintenance is the systematic care, service, and inspection of equipment to prevent the occurrence of trouble and to reduce downtime by detecting and correcting problems as they occur. These checks and services are performed to maintain the equipment in mission-ready condition.

**Performance Steps**

1. Conduct operator PMCS in accordance with the appropriate technical manual.
2. Clean equipment in accordance with the appropriate technical manual.
3. Conduct operator troubleshooting procedures using the appropriate technical manual, if required.
4. Record results of PMCS on DA Form 2404 or DA Form 5988-E.
5. Report uncorrected faults to immediate supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Conducted operator PMCS in accordance with the appropriate technical manual.	_____	_____
2. Cleaned equipment in accordance with the appropriate technical manual.	_____	_____
3. Conducted operator troubleshooting procedures using the appropriate technical manual, if required.	_____	_____
4. Recorded results of PMCS on DA Form 2404 or DA Form 5988-E.	_____	_____
5. Reported uncorrected faults to immediate supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 11-5830-340-12 Operator's and Organizational Maintenance Manual Intercommunication Set, AN/VIC-1(V) (NSN 5830-00-856-3273) Control, Intercommunication Sets, C-10456/VRC (5830-01-

<b>References Required</b>	<b>Primary</b>
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	082-0804) and C-10680/VRC and Amplifier, Audio Frequency AM-7046/VRC
TM 11-5830-263-10 Operator's Manual Vehicular Intercommunication Set AN/VIC-3(V), Including: Control, Indicator CD-82/VRC (NSN 5895-01-382-3221) (EIC: NA) Control, Intercommunication Set C-12357/VRC (NSN 5820-01-382-3218) (EIC: NA) Control, Intercommunication Set C-12358/VRC (NSN 5830-01-382-3209) (EIC: NA) Interface Unit, Communication Equipment C-12359/VRC (NSN 5895-01-382-3220) (EIC: NA) Loudspeaker, Permanent Magnet, LS-688/VRC (NSN 5965-01-382-3222) (EIC: NA).	

**Subject Area 3: MAINTENANCE/ACCOUNTABILITY**

**171-123-1023**  
**Maintain Operator's Part of Equipment Record Folder**

**Conditions:** You are the operator of a motorized vehicle (either wheeled or tracked) and are required to maintain the equipment record folder. The following forms are located in the equipment record folder: SF 91 (*Motor Vehicle Accident [Crash] Report*), DD Form 518 (*Accident-Identification Card*), DA Form 2408-4 (*Weapon Record Data*), DA Form 2408-14 (*Uncorrected Fault Record*), DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), and DD Form 1970 (*Motor Equipment Utilization Record*) or DA Form 5987-E (*Motor Equipment Dispatch*).

**Standards:** Ensure folder contains all required forms and complete forms as required.

**Performance Steps**

1. Obtain the equipment record folder from unit dispatcher.
2. Inventory the forms in the equipment record folder by ensuring the following forms are present:
  - a. SF 91.
  - b. DD Form 518.
  - c. DA Form 2408-4.
  - d. DA Form 2408-14.
  - e. DA Form 2404 or DA Form 5988-E.
  - f. DD Form 1970 or DA Form 5987-E.
3. Prepare DA Form 2404 or DA Form 5988-E, as required.

**Note:** Units with automatic data processing equipment support will use DA Form 5988-E instead of DA Form 2404.

4. Maintain entries on DD Form 1970 or DA Form 5987-E.

**Note:** Units with automatic data processing equipment support will use DA Form 5987-E instead of DD Form 1970. The dispatcher initiates this form and gives it to the operator at the time of the dispatch. The dispatcher enters the following information prior to the dispatch: date, type of equipment, registration number or serial number, administration number, organization, fuel and oil, operator's name, and the name of the person to whom the operator will report. The dispatcher also enters the appropriate information in the TIME OUT, MILES OUT, and HOURS OUT columns and signs the form in the space provided.

- a. Sign the OPERATOR'S SIGNATURE block immediately upon receipt of the equipment.
- b. Indicate the locations at which a trip begins and ends in the DESTINATION column.
- c. Enter the departure time from the motor pool and each succeeding location in the DEPART column.
- d. Enter the arrival time at each destination in the ARRIVE column.

- e. Make sure the person in charge of the equipment or senior person present (officer in charge, noncommissioned officer in charge, and so forth) signs the RELEASED BY column upon release at the last destination or end of equipment usage.
- f. Use the REMARKS column to record fuel and oil added, unusual operation, abnormal occurrences during operation, or other information as directed by the local command.

**Note:** When the equipment is not operated for more than one day in a row, you may use one line to cover the combined time. Print "DID NOT OPERATE" in the REMARKS column.

- g. Enter the time equipment was returned from dispatch or use in the TIME IN column.
- h. Enter the difference between the TIME OUT and TIME IN columns in the TIME TOTAL column.
- i. Enter the mileage reading when equipment is returned in the MILES IN column.
- j. Enter the estimated mileage if the odometer is inoperative.
- k. Enter the difference between the MILES OUT and MILES IN columns in the MILES TOTAL column.
- l. Enter the hour reading upon completion of equipment usage in the HOURS IN column.
- m. Enter the estimated hours of operation if the hour meter is inoperative or on equipment without an hour meter.

**Note:** Record hours to the nearest whole hour. Vehicles without hour meters are not required to annotate hours.

- n. Enter the total hours operated in the HOURS TOTAL column.
- o. Ensure that supervisor has signed the Released By column.
- p. Turn the form and equipment record folder in to the dispatcher upon completion of the form.

Performance Measures	GO	NO-GO
1. Obtained the equipment record folder from the unit dispatcher.	_____	_____
2. Inventoried the forms in the equipment record folder.	_____	_____
3. Prepared DA Form 2404 or DA Form 5988-E.	_____	_____
4. Maintained entries on DD Form 1970 or DA Form 5987-E.	_____	_____

References Required	Primary
DA Form 2404 Equipment Inspection and Maintenance Worksheet	DA Pam 750-3 Soldiers' Guide for Field Maintenance Operations
DA Form 2408-14 Uncorrected Fault Record	

<b>References Required</b>	<b>Primary</b>
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DA Form 2408-4 Weapon Record Data

DA Form 5987-E Motor Equipment Dispatch

DA Form 5988-E Equipment Maintenance and  
Inspection Worksheet

DD Form 1970 Motor Equipment Utilization Record

DD Form 518 Accident-Identification Card

SF 91 Motor Vehicle Accident (Crash) Report

**171-123-1090**  
**Perform Preventive Maintenance on Basic Issue Items**

**CAUTION**

Use basic issue items (known as BII) for the purpose described in the operator's manual. For example, a staff section for the 105-millimeter bore brush is made of light aluminum and is used only to clean the main gun tube. It will be damaged if used as a lever. A crowbar is included in the BII for this purpose. Use the right tool for the job.

Cleaner, lubricant, and preservative (known as CLP) can be used instead of lubrication, small arms; rifle bore cleaner; or preservative, lubricating oil-special. Do not use gasoline or diesel fuel.

**Conditions:** You are a vehicle crewmember and have been directed to do preventive maintenance on the vehicle's BII. You have TO 32-1-101/TM 9-243/M6290-AJ-MAN-1010/TM 10209-10/1, vehicle operator's manual and/or vehicle load plan, rags, cleaning solvent, linseed oil, and general purpose lubrication oil or CLP.

**Standards:** Clean all BII so they are free of dirt, grease, and debris. Inspect each item for serviceability. Protect BII from rust, drying, or cracking. Account for all BII on the vehicle. Report any damaged or missing BII to the vehicle commander. Store all BII in the place designated by the operator's manual and/or the vehicle loading plan.

**Performance Steps**

1. Remove dirt, grease, and debris from BII.
2. Inspect BII for serviceability.
3. Protect BII from rust by applying a thin film of oil or CLP to all metal surfaces.
4. Protect the wooden parts of BII from drying and cracking.
  - a. Store BII away from direct sunlight and heat sources.
  - b. Apply a thin film of linseed oil to keep moisture in the wood.
5. Account for all BII by comparing the BII on the vehicle against the BII listed in the operator's manual.
6. Report any damaged or missing BII to the vehicle commander.
7. Stow all BII in the place designated by the operator's manual and the vehicle loading plan.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Removed all dirt, grease and debris from BII.	_____	_____
2. Inspected BII for serviceability.	_____	_____
3. Protected BII from rust by applying a thin film of oil or CLP to all metal surfaces.	_____	_____
4. Protected the wooden parts of BII from drying and cracking by applying a thin film of linseed oil.	_____	_____
5. Accounted for all BII.	_____	_____
6. Reported any damaged or missing BII to the vehicle commander.	_____	_____
7. Stowed all BII in the place designated by the operator's manual and/or the vehicle load plan.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TO 32-1-101/TM 9-243/M6290-AJ-MAN-1010/  
TM 10209-10/1 Use and Care of Hand Tools and  
Measuring Tools

**551-88M-1352**  
**Perform Preventive Maintenance Checks**

**DANGER**

**Soldiers must be aware of the inherent dangers of working in and around tactical wheeled vehicles. Hot surfaces and sharp, moving objects, such as fan blades, slippery surfaces, and excessively loud noises, are all dangers. Each Soldier should take every precaution not to become a victim of these dangers by wearing the proper uniform, protective devices.**

**WARNING**

**Soldiers must adhere to all WARNINGs published in the applicable publication for the vehicle or equipment as well as instruction from local standard operating procedure (SOP) and leadership.**

**CAUTION**

**Soldiers must adhere to all CAUTION notices published in the applicable publication for the vehicle or equipment as well as instruction from local SOP and leadership.**

**Conditions:** In an operational environment, your unit is preparing to move to another tactical location and orders are given to conduct maintenance checks on all vehicles. Given a chocked tactical wheeled vehicle, trailer, basic issue items (BII), DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*) or DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*), rags and lubricants as necessary, level ground to work, replacement parts as available, -10, -12, or -13 series technical manual for the vehicle, trailer or equipment, DA Form 5987-E (*Motor Equipment Dispatch*) or DD Form 1970 (*Motor Equipment Utilization Record*) as applicable, hearing protection, eye protection, gloves, advanced combat helmet in accordance with (IAW) local SOP and guidance on disposition of completed maintenance worksheets.

**Standards:** Perform preventive maintenance checks to analyze the applicable technical manual and related forms. Inspect the vehicle, trailer, or equipment according to the preventive maintenance checks and services (PMCS) tables of the appropriate technical manual. Distinguish between before-, during-, and after-operation maintenance checks. Regarding faults detected, correct all faults, when possible, within operator level. Record all uncorrectable faults on DA Form 5988-E or DA Form 2404 completely, accurately, and legibly. Replace available parts within operator-level of authority. Troubleshoot faults as necessary according to the technical manual. All preventive maintenance checks are to be completed without injury to personnel or damage to equipment.

**Special Conditions:** Supervisory personnel are present to perform those actions required for proper disposition of vehicle status and vehicle dispatching for mission according to the unit SOP.

**Installed components:** The operator is responsible for performing maintenance of all installed components of the vehicle to include communications equipment and weapons mounts. In such cases, the successful completion of this task will include the inspection of these items in accordance with the appropriate technical manual.

**Notes:** Use the reference publication that supports the vehicle being used for this task.

**Cleanliness**—Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Use dry cleaning solvent on metal surfaces where directed.

**Bolts, nuts, and screws**—Check bolts, nuts, and screws for obvious looseness and missing, bent, or broken conditions. Look for chipped paint and bare metal or rust around bolt heads. If any part seems to be loose, tighten it or notify unit maintenance.

**Welds**—Look for loose or chipped paint, rust, or gaps where parts are welded together. If a bad weld is found, notify unit maintenance.

**Electrical wires and connections**—Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure wires are in good shape. If a bad wire or connector is found, notify unit maintenance.

**Hydraulic lines and fittings**—Look for wear, damage, and leaks; make sure clamps and fittings are tight. Wet spots show leaks. A stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, notify unit maintenance.

### **Performance Steps**

1. Prepare for inspection.
  - a. Gather the following items needed for the inspection.
    - (1) Replacement parts (indicated by DA Form 5988-E or DA Form 2404, under "parts requested").
    - (2) Oil and lubricants IAW the technical manual, as needed.
    - (3) BII, rags, and other tools as required (authorized for operator-level maintenance only).
    - (4) On DA Form 5988-E, check for correct preprinted information in header area. On DA Form 2404, ensure header information is filled in.
    - (5) Flashlight, work gloves, eye protection and hearing protection as needed.
    - (6) Applicable vehicle technical manual (-10, -12, or -13 series).
  - b. Review documentation and ensure that driver information is shown on all required forms.
2. Perform before-operation inspection as listed in appropriate vehicle operator's technical manual (-10 series). If deficiencies are noted, ensure that they are annotated on DA Form 5988-E or DA Form 2404.
  - a. Isolate the malfunction by applying step-by-step troubleshooting procedures.
  - b. Determine classification of any fluid seepage/leakage by the following criteria:
    - (1) Class I—Seepage of fluid (indicated by wetness or discoloration) not great enough to form drops.
    - (2) Class II—Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being inspected.
    - (3) Class III—Leakage of fluid great enough to cause drops to drip from item being checked.
  - c. Correct all deficiencies (faults) within the operator's level of maintenance.

- d. Record all vehicle deficiencies correctly by replacing parts under corrective action of DA Form 5988-E or DA Form 2404.
  - e. Record all deficiencies under fault description of DA Form 5988-E or in block 10c, Deficiencies and Shortcomings, of DA Form 2404.
  - f. When a deficiency or shortcoming is found using DA Form 5988-E, the operator or supervisor enters a signature and time. For DA Form 2404, the operator or supervisor signs and enters the rank.
3. Perform during-operation inspection as listed in the appropriate vehicle operator's technical manual (-10 series).
- a. If no deficiencies are noted, make no entries.
  - b. If deficiencies are noted, follow step 2 above.
4. Perform after operation-inspection as listed in the appropriate vehicle operator's technical manual (-10 series).
- a. If no deficiencies are noted on DA Form 5988-E, place the first letter of the type of inspection performed under the corrective action column. For DA Form 2404, put initials in the initials column.
  - b. If deficiencies are noted, follow step 2 above.
5. Turn in DA Form 5988-E or DA Form 2404 to the maintenance supervisor.
6. Retain DA Form 5988-E or DA Form 2404 in equipment records folder if no faults are recorded.
7. Perform PMCS on installed components (as applicable, IAW the appropriate technical manual).

Performance Measures	GO	NO-GO
1. Prepared for inspection.	_____	_____
2. Performed before-operation inspection as listed in appropriate vehicle operator's technical manual (-10 series) if deficiencies are noted ensure that they are annotated on DA Form 5988-E or DA Form 2404.	_____	_____
3. Performed during-operation inspection as listed in the appropriate vehicle operator's technical manual (-10 series).	_____	_____
4. Performed after operation-inspection as listed in the appropriate vehicle operator's technical manual (-10 series).	_____	_____
5. Turns in DA Form 5988-E or DA Form 2404 to the maintenance supervisor.	_____	_____
6. Retained DA Form 5988-E or DA Form 2404 in equipment records folder if no faults are recorded.	_____	_____
7. Performed preventive maintenance checks on installed components (as applicable, IAW the appropriate technical manual).	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 5987-E Motor Equipment Dispatch	TC 21-305-20/AFMAN 24-306(I) Manual for the Wheeled Vehicle Operator
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	
DA Pam 750-8 The Army Maintenance Management System (TAMMS) Users Manual	
TM 9-2320-345-10 Operators Manual for Truck, Load Handling System (LHS) 8X8 M1120A4 NSN 2320-01-534-1872 (EIC BG7)	
TM 9-2320-366-10-1/T.O. 36A12-1C-1091-1 Operator's Instructions Manual M1083 Series, 5-TON, 6X6, Medium Tactical Vehicles (MTV) Volume NO. 1 OF 2 TRK, CAR., MTV, M1083 W/WN (NSN 2320-01-360-1895) (EIC: BT3) W/O WN (NSN 2320-01-354-3386) (EIC: BR2) TRK, CAR., MTV, W/MATL HDLG EQPT (MHE) M1084 (NSN 2320-01-354-3387) (EIC: BR3) TRK, CAR., MTV, LWB, M1085 W/WN (NSN 2320-01-360-1897) (EIC: BT5) W/O WN (NSN 2320-01-354-4530) (EIC: BR7) TRK, CAR., MTV, LWB, W/MATL HDLG EQPT (MHE) M1086 (NSN 2320-01-354-4531) (EIC: BR8) TRK, TRACTO MTV, M1088 W/WN (NSN 2320-01-360-1892) (EIC: BTY) W/O WN (NSN 2320-01-355-4332) (EIC: BTJ) TRK, WKR, MTV, M1089 (NSN 2320-01-354-4528) (EIC: BR4) TRK, DUMP, MTV, M1090 W/WN (NSN: 2320-01-360-1893) (EIC: BTZ) W/O WN (NSN 2320-01-354-4529) (EIC: BR5) TRK, CHAS, MTV, M1092 (NSN 2320-01-354-3382) (EIC: BRZ) TRK, CAR., MTV, AIR DROP, M1093 W/WN (NSN: 2320-01-360-1894) (EIC: BT4) W/O WN (NSN 2320-01-355-3063) (EIC: BR9) TRK, DUMP, MTV, AIR DROP, M1094 W/WN (NSN 2320-01-360-1894) (BT2) W/O WN (NSN 2320-01-355-3062) (EIC: BTK) TRK, CHAS, MTV, LWB, M1096 (NSN 2320-01-354-4527) (EIC: BR6)	

## Subject Area 4: MINES/DEMOLITIONS

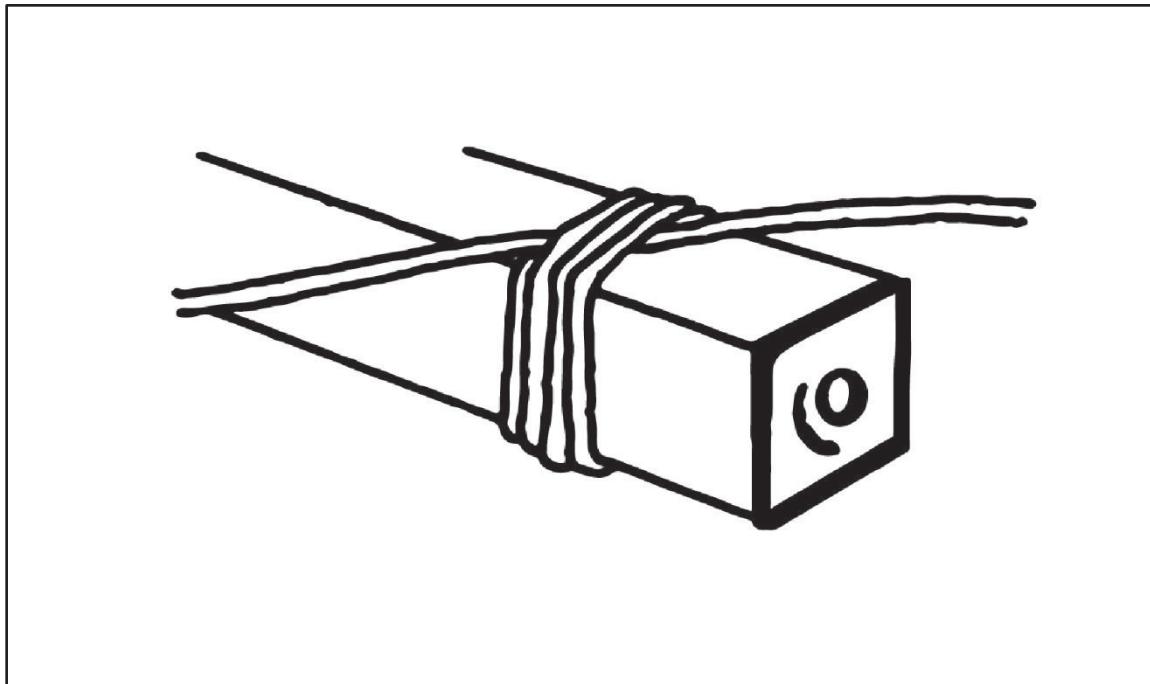
**052-193-1311**  
**Prime Military Explosives**

**Conditions:** You are in a field environment with obstacles to reduce or create. You are given various types of military explosives, detonating cord, modernized demolition initiators (known as MDIs) with high-strength blasting caps, a demolition knife, an M2 crimper, string, tape, and sandbags.

**Standards:** Prime military explosives with 100-percent accuracy in accordance with TM 3-34.82/MCRP 3-17-7L using MDIs, detonating cord, and M112 blocks depending on the charge.

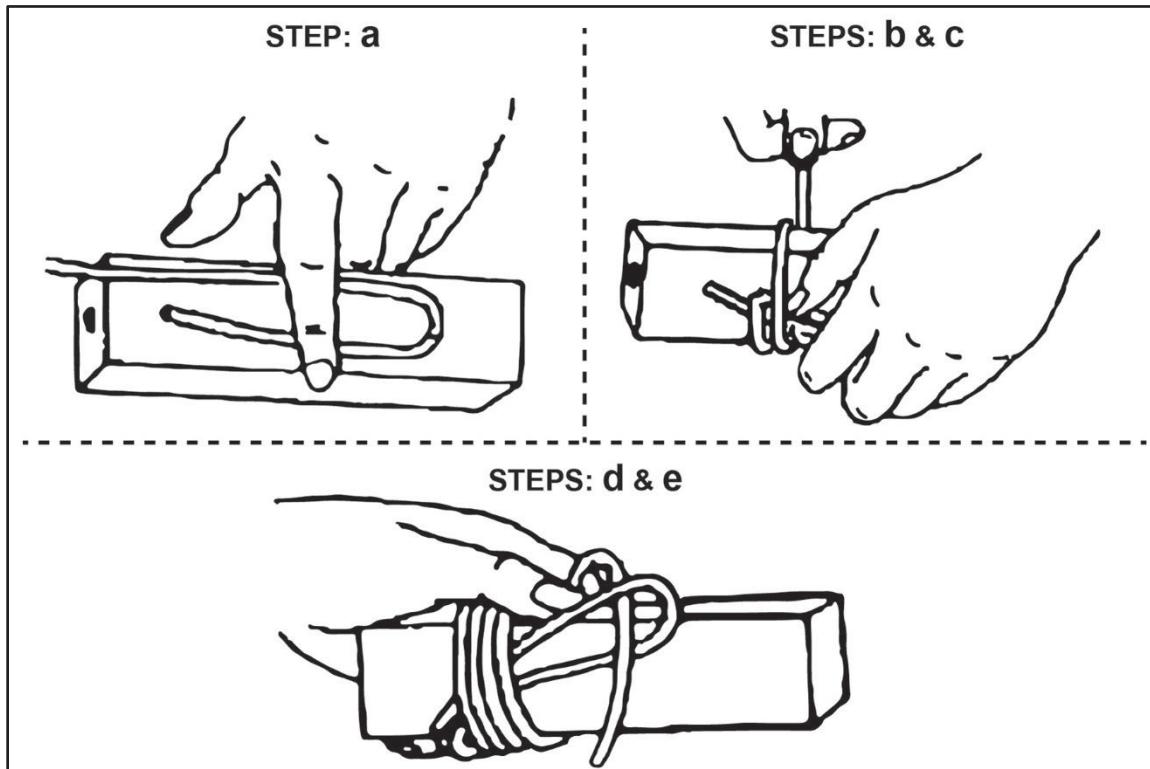
**Performance Steps**

1. Prime TNT.
  - a. Prime a TNT block with detonating cord.
    - (1) Use the common method to prime a TNT block (see figure 3-4).



**Figure 3-4. Priming a TNT block using the common method**

- (a) Lay one end (1-foot length) of detonating cord at an angle across the explosive.
  - (b) Wrap the running end around the block three turns, laying the wraps over the standing end.
  - (c) Slip the running end under all of the wraps, parallel to the standing end, and draw the wraps tight to form a clove hitch with two extra turns on the fourth wrap.
- (2) Use the alternate method to prime a TNT block (see figure 3-5, page 3-66).



**Figure 3-5. Priming a TNT block using the alternate method**

- (a) Make a bight of detonating cord on the explosive, leaving enough length on the end to make four turns around the block.
- (b) Cross the first wrap over the standing end of the bight.
- (c) Make a total of four wraps around the block and the standing end, working toward the closed end of the bight.
- (d) Pass the running end of the detonating cord between the TNT block and through the bight, bottom to top.
- (e) Pull the bight closed by pulling on the standing end.

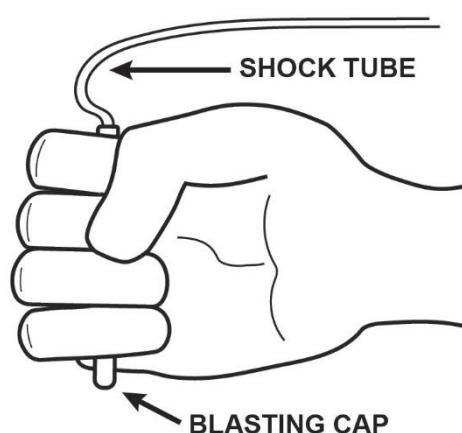
**WARNING**

Handle military and commercial blasting caps carefully; both are extremely sensitive and may explode if handled improperly. Do not tamper with blasting caps. Protect them from shock and extreme heat. Failure to comply could result in immediate personal injury or damage to equipment.

**CAUTION**

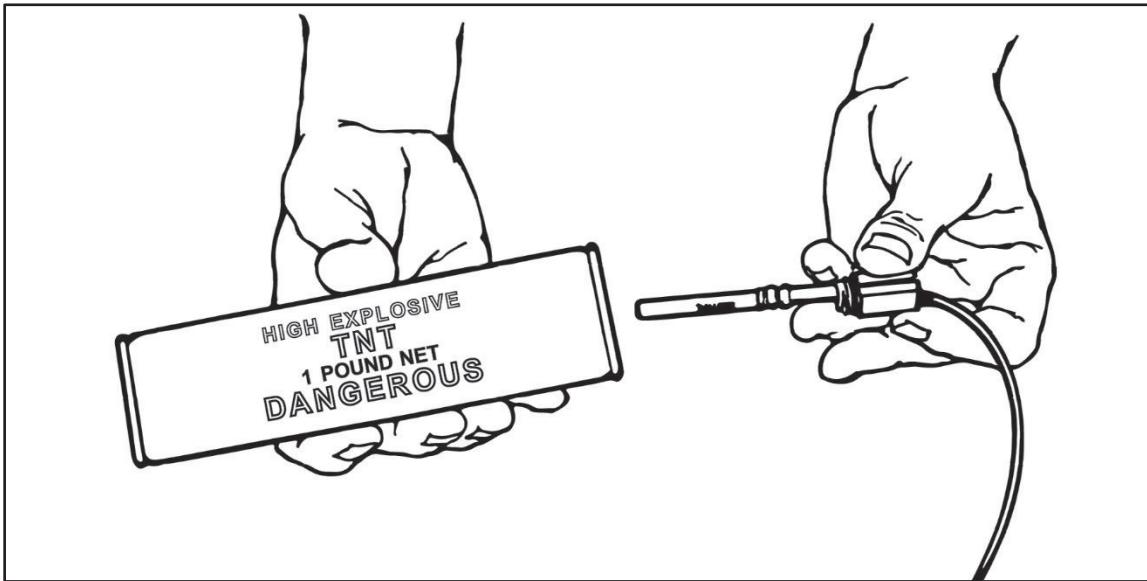
Foam cylinders should be installed onto the high-strength blasting cap or booster of an MDI component after removal from original packaging. The protector cushions the blasting cap or booster if inadvertently struck by a hard object during handling. If foam cylinders are not available, blasting cap or booster must be placed in a secured and protected place (underneath a sandbag, for example).

- b. Prime a TNT block with MDIs.
    - (1) Prime a TNT block with an MDI, high-strength blasting cap and an M1A4 priming adapter.
      - (a) Punch a hole in the paper covering the cap well of the TNT block using the pointed end of the M2 crimper.
      - (b) Inspect the cap well to ensure that nothing is preventing the blasting cap from being fully seated in the cap well of the explosive.
      - (c) Attach the priming adapter.
- Note:** The M1A4 priming adapter must be slid down the full length of the shock tube to the blasting cap.
- \_1\_ Cut the desired amount of shock tube, or cut the sealed end of the shock tube and remove the J hook, when attached.
  - \_2\_ Slide the priming adapter onto the shock tube, threaded end first, down to the blasting cap.
  - \_3\_ Replace the J hook, when used.
- (d) Secure the blasting cap to the TNT block.
    - \_1\_ Secure the blasting cap in one hand. Ensure that the cap is completely enclosed in the hand, face down, and away from the thumb (see figure 3-6).



**Figure 3-6. Holding the blast cap**

\_2\_ Rotate your hand and insert the blasting cap end into the threaded cap well of the TNT block (see figure 3-7).



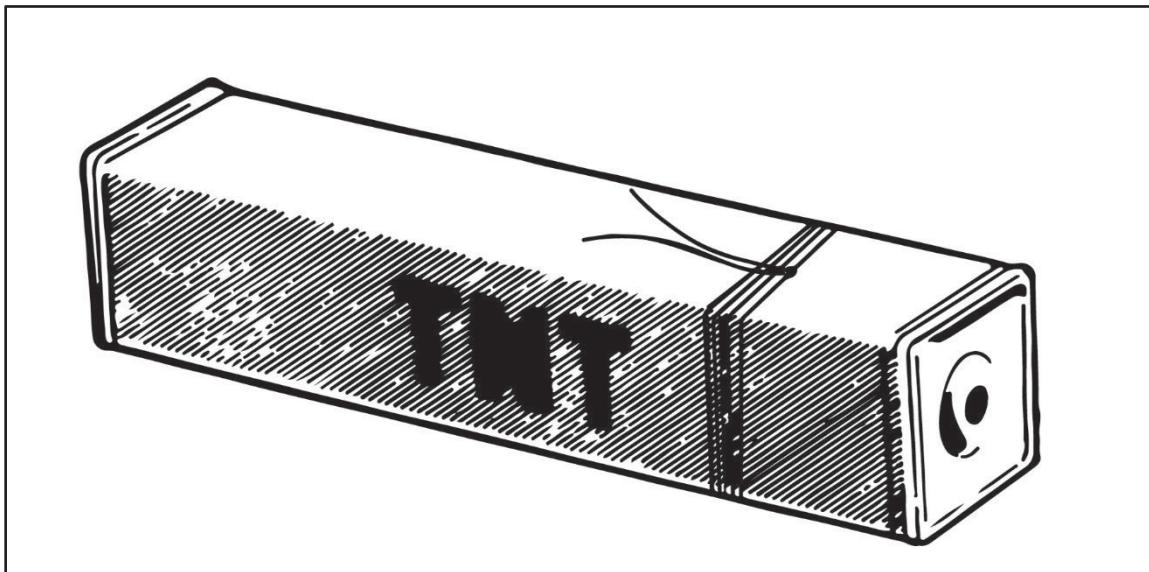
**Figure 3-7. Inserting the blasting cap into the TNT block**

\_3\_ Tighten the priming adapter by screwing it into the threaded cap well.

(2) Prime a TNT block with an MDI, high-strength blasting cap without a priming adapter.

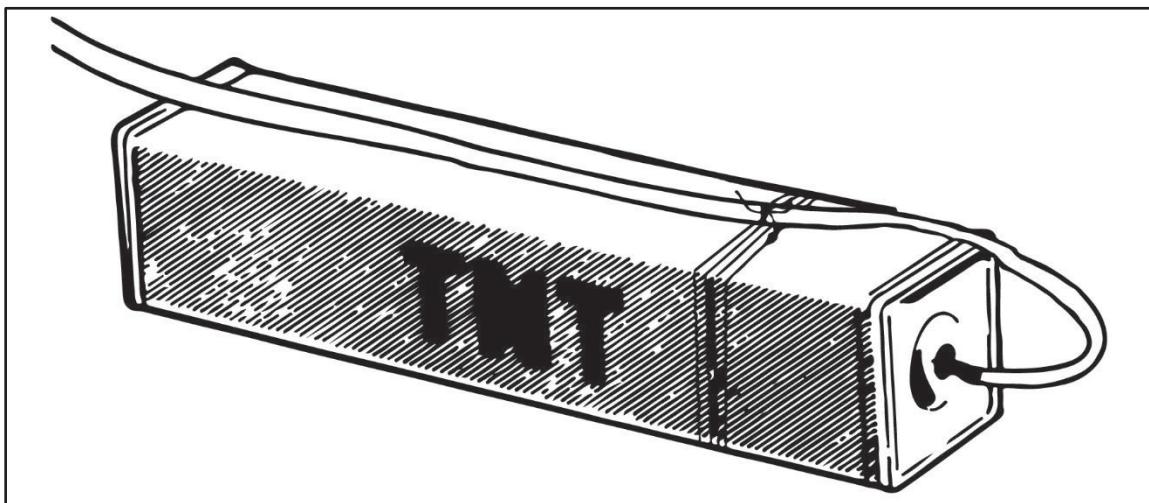
- (a) Punch a hole in the paper that covers the threaded cap well of the TNT block using the pointed end of the M2 crimper.
- (b) Inspect the threaded cap well to ensure that nothing is preventing the blasting cap from being fully seated in the threaded cap well of the explosive.
- (c) Secure the blasting cap using the string method.

\_1\_ Wrap the string around the block four times. Ensure that the tails are the same length, and secure the wraps with a nonslip knot (see figure 3-8).



**Figure 3-8. Tying string around a TNT block**

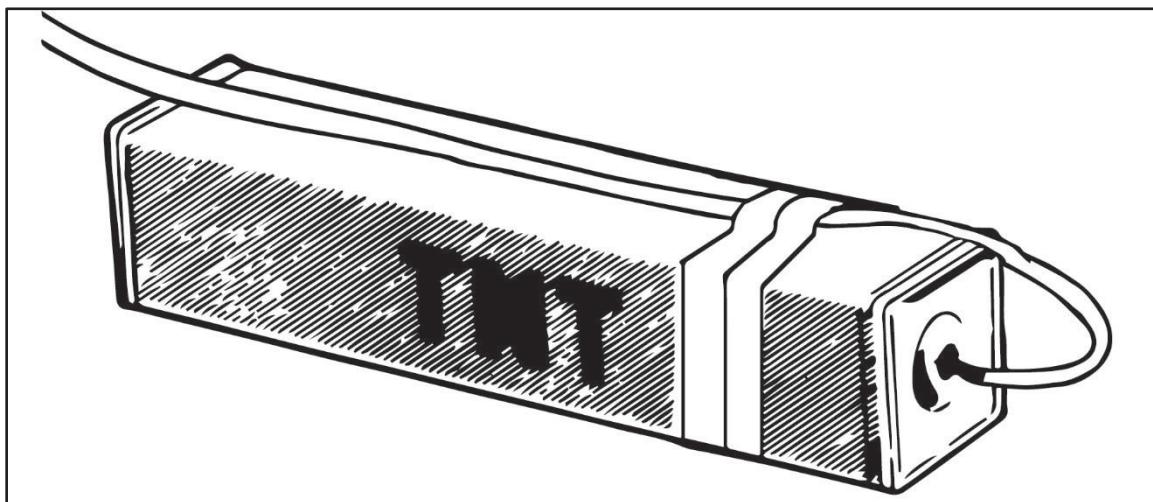
- \_2\_Secure the blasting cap in one hand. Ensure that the cap is completely enclosed in the hand, face down, and away from the thumb.
- \_3\_Insert the blasting cap end into the threaded cap well of the TNT block.
- \_4\_Bend the shock tube over the nonslip knot.
- \_5\_Secure the shock tube with the string tails using two half hitches (see figure 3-9).



**Figure 3-9. Securing a shock tube with string tails using two half hitches**

- (d) Secure the blasting cap using the tape method.
  - \_1\_Secure the blasting cap in one hand. Ensure that the cap is completely enclosed in the hand, face down, and away from the thumb.
  - \_2\_Insert the blasting cap end into the threaded cap well of the TNT block.

- \_3\_ Bend the shock tube over the block.
- \_4\_ Secure the shock tube with tape (see figure 3-10).



**Figure 3-10. Securing a shock tube with electrical tape**

2. Prime composition C4.
  - a. Prime an M112 C4 demolition block with detonating cord.
    - (1) Form a uli, a double overhand, or a triple roll knot (see figure 3-11).

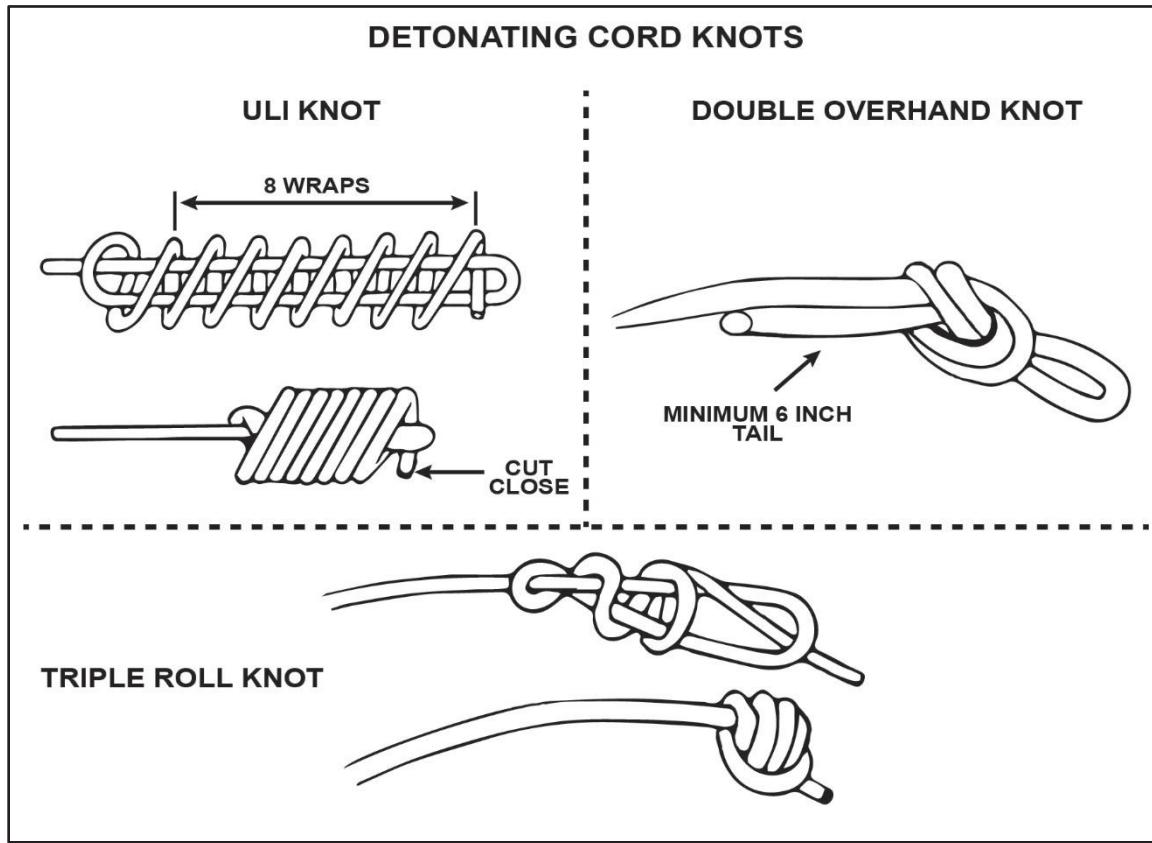
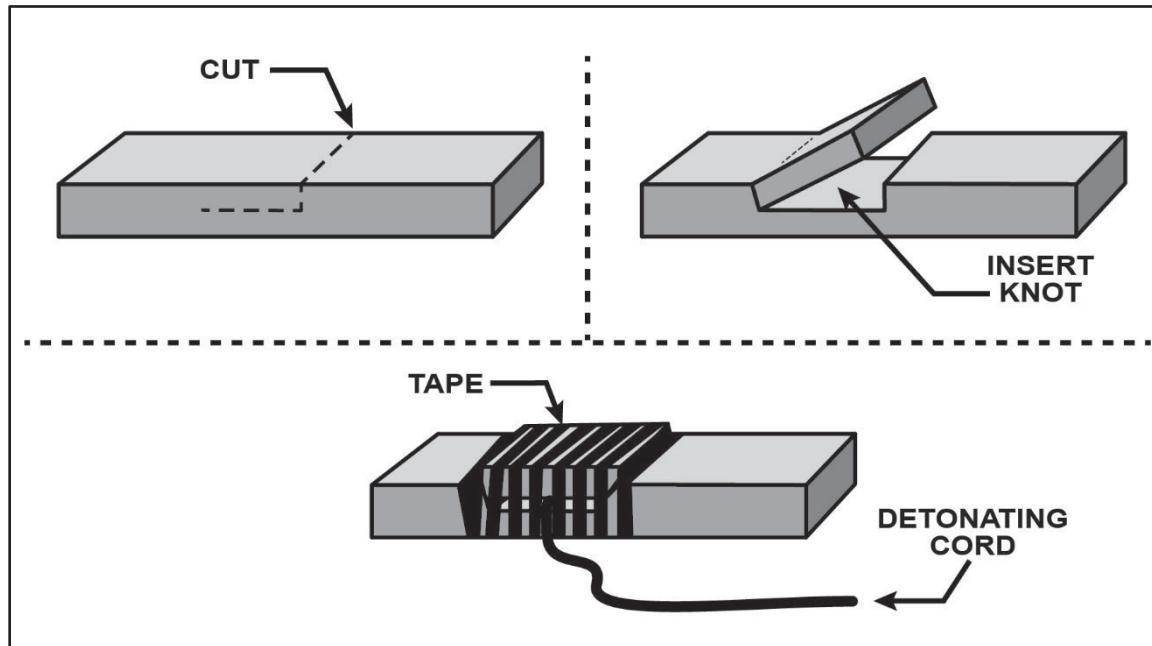


Figure 3-11. Forming detonating cord knots

**CAUTION**

Use a sharp, nonsparking knife on a nonsparking surface to cut the explosive. Long-term failure to comply may result in personal injury or damage to equipment.

- (2) Cut an L-shaped portion of the explosive, but leave it connected to the explosive. Ensure that the space is large enough to insert the knot you formed (see figure 3-12, page 3-72).



**Figure 3-12. Cutting an L-Shape on an explosive**

- (3) Insert the knot into the L-shaped cut.
- (4) Push the cut explosive over the knot. Ensure that there is at least  $\frac{1}{2}$  inch of explosive on all sides of the knot.
- (5) Strengthen the primed area by wrapping it with tape.

#### **WARNING**

**Handle military and commercial blasting caps carefully; both are extremely sensitive and may explode if handled improperly. Do not tamper with blasting caps. Protect them from shock and extreme heat. Failure to comply could result in immediate personal injury or damage to equipment.**

#### **CAUTION**

Foam cylinders should be installed onto the high-strength blasting cap or booster of an MDI component after removal from original packaging. The protector cushions the blasting cap or booster if inadvertently struck by a hard object during handling. If foam cylinders are not available, blasting cap or booster must be placed in a secured and protected place (underneath a sandbag, for example).

- b. Prime an M112 C4 demolition block with an MDI, high-strength blasting cap.

- (1) Make a hole in one end or in the side (at midpoint) of the demolition block using the M2 crimper or another nonsparking tool.

**Note:** The hole must be large enough to hold a blasting cap.

### **WARNING**

**Do not force the blasting cap. If the blasting cap does not fit, enlarge the hole. Failure to comply may cause immediate personal injury or damage to equipment.**

- (2) Insert the blasting cap into the hole of the demolition block, handling the blasting cap as directed above.
- (3) Anchor the blasting cap into the block by gently squeezing the C4 plastic explosive around the cap.
- (4) Use tape to secure the cap in the charge.

### **WARNING**

**Handle military and commercial blasting caps carefully; both are extremely sensitive and may explode if handled improperly. Do not tamper with blasting caps. Protect them from shock and extreme heat. Failure to comply could result in immediate personal injury or damage to equipment.**

### **CAUTION**

Do not prime the charge until it is placed on the target.

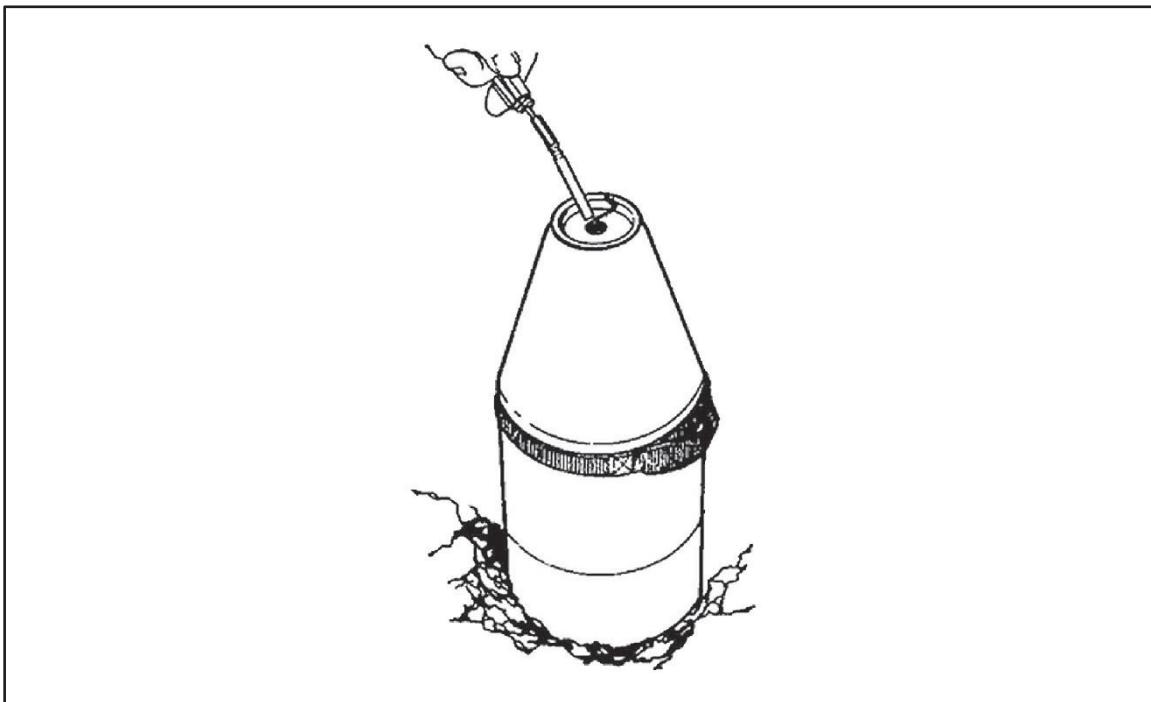
Foam cylinders should be installed onto the high-strength blasting cap or booster of an MDI component after removal from original packaging. The protector cushions the blasting cap or booster if inadvertently struck by a hard object during handling. If foam cylinders are not available, blasting cap or booster must be placed in a secured and protected place (underneath a sandbag, for example).

3. Prime an M2A4- or M3A1-shaped charge with an MDI, high-strength blasting cap and an M1A4 priming adapter.

**Note:** Use adhesive tape to secure the blasting cap in the threaded cap well when a priming adapter is not used.

- a. Position the charge.
- b. Cut the desired amount of shock tube, or cut the sealed end of the shock tube and remove the J hook, when attached.
- c. Slide the priming adapter onto the shock tube, threaded end first, down to the blasting cap.

- d. Replace the J hook, if used.
- e. Secure the blasting cap in one hand. Ensure that the cap is completely enclosed in the hand, face down, and away from the thumb.
- f. Insert the blasting cap into the threaded cap well of the shaped charge. Secure the blasting cap by tightening the priming adapter into the threaded cap well (see figure 3-13).

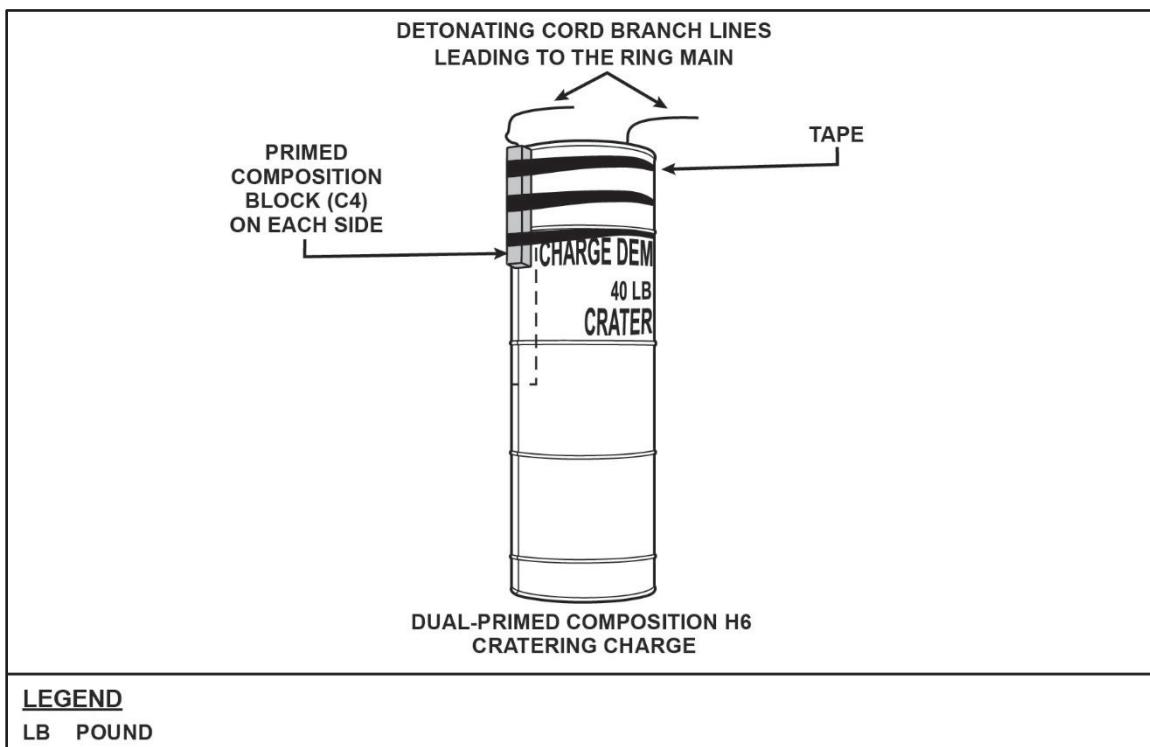


**Figure 3-13. Priming a shaped charge with a modernized demolition initiator**

4. Prime 40-pound cratering charges.

**Note:** Because the cratering charge is primarily an underground charge, prime it only with C4 that is primed with detonating cord or MDI booster (M151/M152). Dual-prime the charge to protect against misfires.

- a. Prime a 40-pound composition H6 cratering charge (see figure 3-14).



**Figure 3-14. Priming an H6 cratering charge**

**CAUTION**

If priming the C4 using MDI either M151 or M152 boosters must be used. Do not prime the C4 with blasting caps.

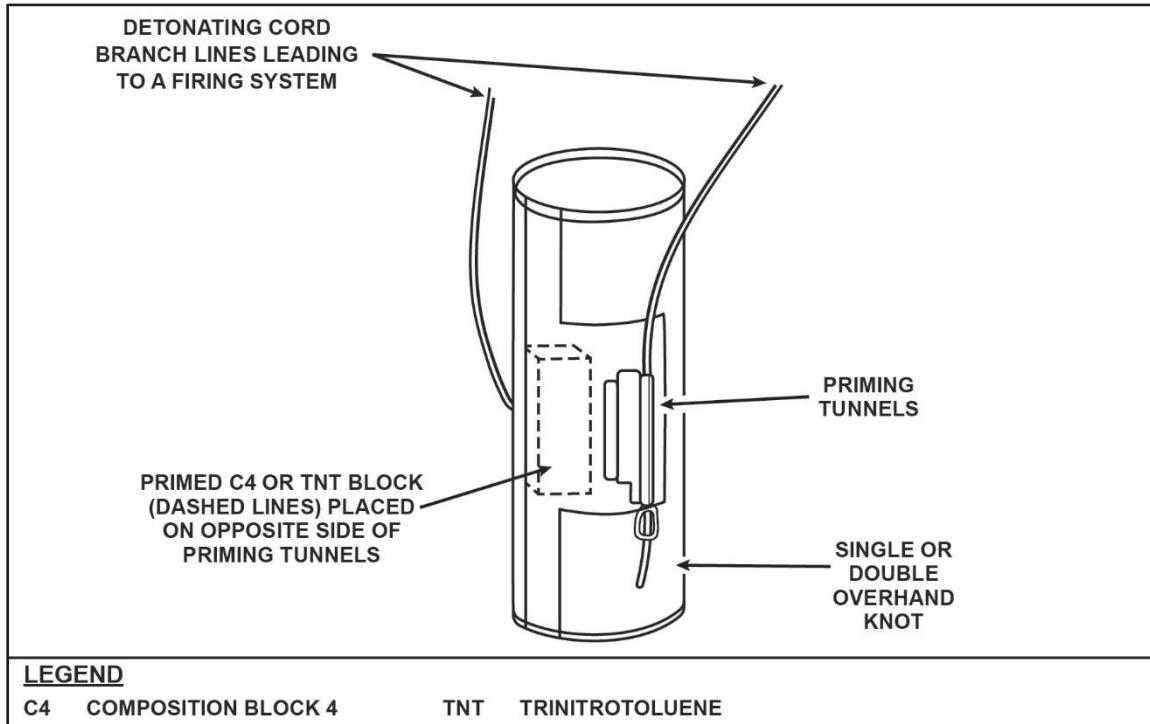
- (1) Prime two packages of C4 as described in step 2.
- (2) Place the primed C4 packages parallel to the cratering charge, on opposite sides of it, and flush with the top.
- (3) Attach the packages firmly in place with adhesive tape.

**Note:** Instructions and markings on the canister indicate the exact placement of the primed C4. Ensure that the detonating cord branchlines (from the C4) are long enough to reach the detonating cord line main or ring main. Place adhesive tape on the detonating cord from the cratering charge 1-foot up to aid in clearing possible misfires.

**DANGER**

Ammonium nitrate is hygroscopic and ineffective when wet; therefore, inspect the metal container for damage or rust. Do not use damaged or rusty charges. Failure to comply may result in immediate death or permanent injury.

- b. Prime a 40-pound ammonium nitrate cratering charge (see figure 3-15).



**Figure 3-15. Priming an ammonium nitrate cratering charge**

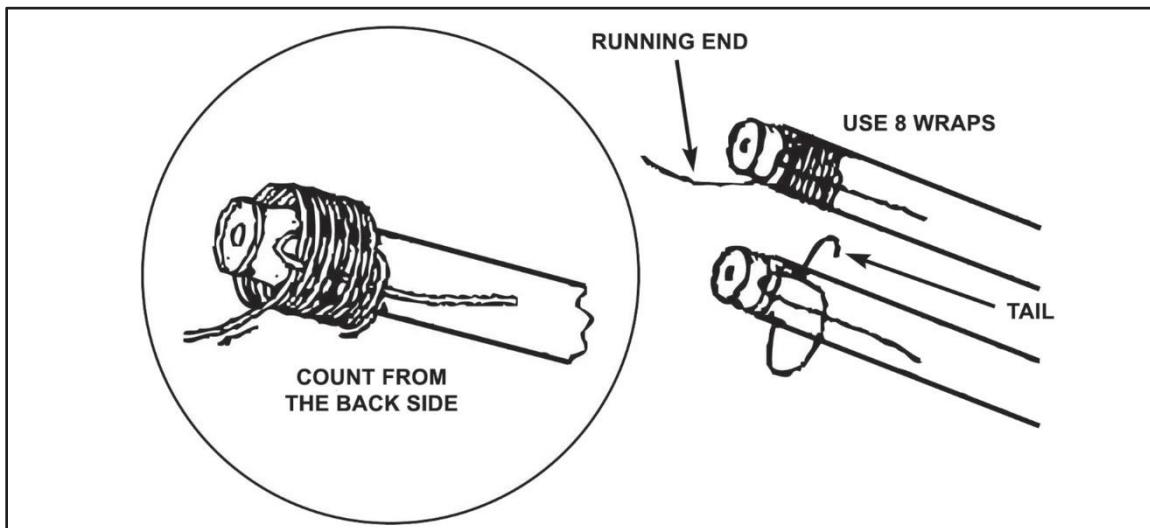
- (1) Pass the end of the detonating cord through the tunnel on the side of the ammonium nitrate cratering charge.
- (2) Tie an overhand knot with a 6-inch tail at the lower end of the length of the detonating cord.
- (3) Attach a primed 1-pound block of explosive (C4 or TNT) along the center of the ammonium nitrate cratering charge.

5. Prime a Bangalore torpedo.

**CAUTION**

Use exactly eight wraps to prime the torpedo. Too many wraps will extend the detonating cord past the booster charge housing, possibly causing the torpedo to be cut without detonation. Too few wraps may cause the torpedo to only be creased without detonation.

- c. Prime a Bangalore torpedo with detonating cord (see figure 3-16).



**Figure 3-16. Priming a Bangalore torpedo with detonating cord**

- (1) Make a bight of detonating cord on the end of the Bangalore torpedo, leaving enough length on the end to make eight turns around the Bangalore.
- (2) Cross the first wrap over the standing end of the bight.
- (3) Wrap the detonating cord eight times around the end of the section, just below the bevel, working towards the closed end of the bight.
- (4) Pass the running end between the Bangalore and through the bight, bottom to top.
- (5) Pull the bight closed by pulling on the standing end.

**CAUTION**

Never use the short end (tail) of the detonating cord to initiate the torpedo. Initiation must come from the running end of the detonating cord connected to the line main or ring main. Failure to comply may cause personal injury or damage to equipment.

- (6) Insert the short end of the detonating cord into the cap well, and secure it with adhesive tape, when needed.

### **WARNING**

**Handle military and commercial blasting caps carefully; both are extremely sensitive and may explode if handled improperly. Do not tamper with blasting caps. Protect them from shock and extreme heat. Failure to comply could result in immediate personal injury or damage to equipment.**

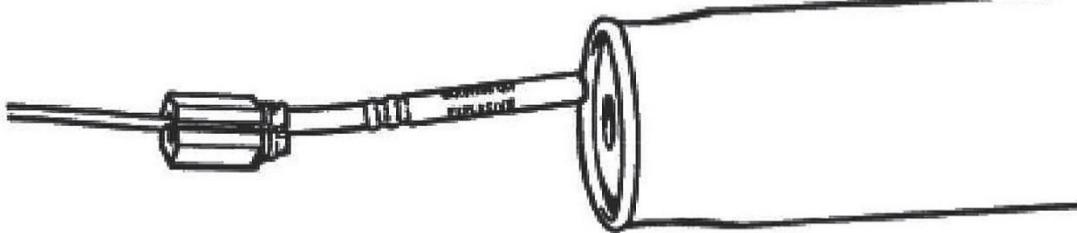
### **CAUTION**

Do not prime the charge until it is placed on the target.

Foam cylinders should be installed onto the high-strength blasting cap or booster of an MDI component after removal from original packaging. The protector cushions the blasting cap or booster if inadvertently struck by a hard object during handling. If foam cylinders are not available, blasting cap or booster must be placed in a secured and protected place (underneath a sandbag, for example).

- d. Prime a Bangalore torpedo with an MDI, high-strength blasting cap and an M1A4 priming adapter (see figure 3-17).

**Note:** Secure the blasting cap in the threaded cap well by using adhesive tape when a priming adapter is not used.



**Figure 3-17. Priming a Bangalore with a modernized demolition initiator**

- (1) Position the charge.
- (2) Cut the desired amount of shock tube, or cut the sealed end of the shock tube, and remove the J hook, when attached.
- (3) Slide the priming adapter onto the shock tube, threaded end first, down to the blasting cap.
- (4) Replace the J hook, when used.

- (5) Secure the blasting cap in one hand. Ensure that the cap is completely enclosed in the hand, face down, and away from the thumb.
- (6) Insert the blasting cap into the threaded cap well of the Bangalore torpedo. Secure the blasting cap by tightening the priming adapter into the threaded cap well.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Primed TNT.	_____	_____
2. Primed C4.	_____	_____
3. Primed an M2A1 or M3A1 shaped charge with an MDI, high-strength blasting cap and an M1A4 priming adapter.	_____	_____
4. Primed 40-pound cratering charges.	_____	_____
5. Prime a banglore torpedo.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1375-213-12 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List): Demolition Materials	TM 3-34.82/MCRP 3-17-7L Explosives and Demolitions

**052-193-1312**  
**Construct Demolition Initiating Systems**

**WARNING**

**Never attach an M81 until ready to attach the system. Failure to comply could result in immediate personal injury or damage to equipment.**

**CAUTION**

A firing system should be dual-initiated. The blasting cap that will detonate first should be placed closest to the charges. Doing this ensures the integrity of the backup system if the first cap detonates and fails to initiate the firing system.

**Conditions:** In an operational environment, you are given a constructed demolition firing system with placed and primed explosives, modernized demolition initiator (known as MDI) branchlines and transmission lines, an M14 time-delay fuse, M81 fuse igniters, M9 holders, adhesive tape, a demolition knife, and sandbags.

**Standards:** Construct a command-and-delay demolition initiating system by attaching the correct initiating components to the transmission lines 100 percent of the time without causing premature detonation.

**Notes:** All MDI blasting caps can be used to initiate a shock tube. Only use M11, M14, M15, M21, M23 high-strength blasting caps and boosters to detonate the detonating cord line main or ring main.

Use MDI initiating systems to initiate transmission lines instantaneously or an M14 delay fuse for delay initiation up to 5 minutes.

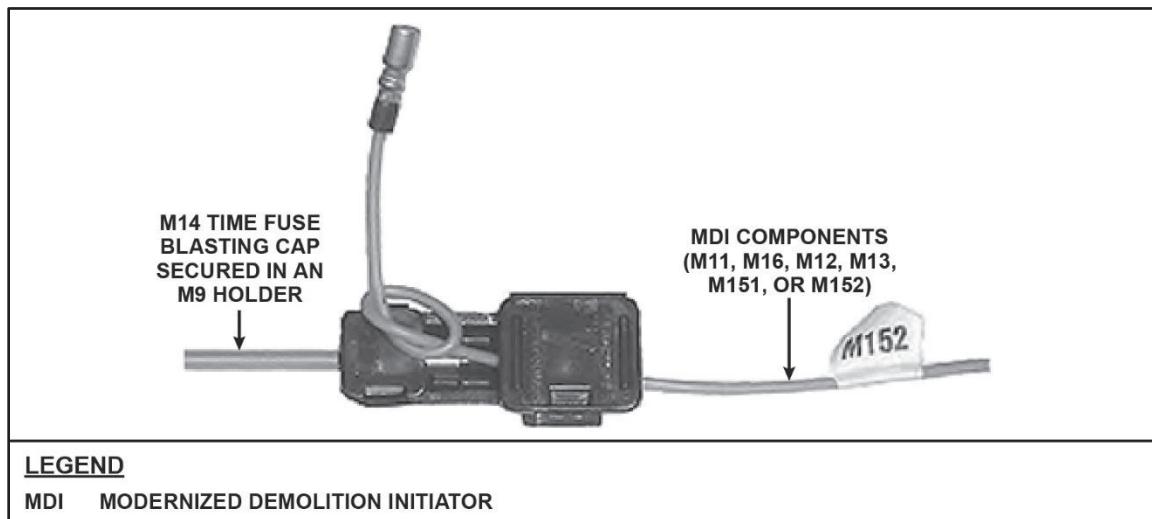
When using combination command-and-delay demolition initiating systems on demolition firing systems, the command initiation system will be the primary and the delay-initiation system will be the secondary. Place a sandbag on the secondary initiation system blasting cap to reduce the fragmentation hazard of the cap when detonated from the firing system.

**Performance Steps**

**DANGER**

**When using a time or safety fuse, uncoil it and lay it out in a straight line. The time fuse should be placed so that the fuse will not curl up and prematurely detonate the blasting cap crimped to it. Failure to comply may cause death or permanent injury.**

1. Construct the delay initiation system (see figure 3-18).

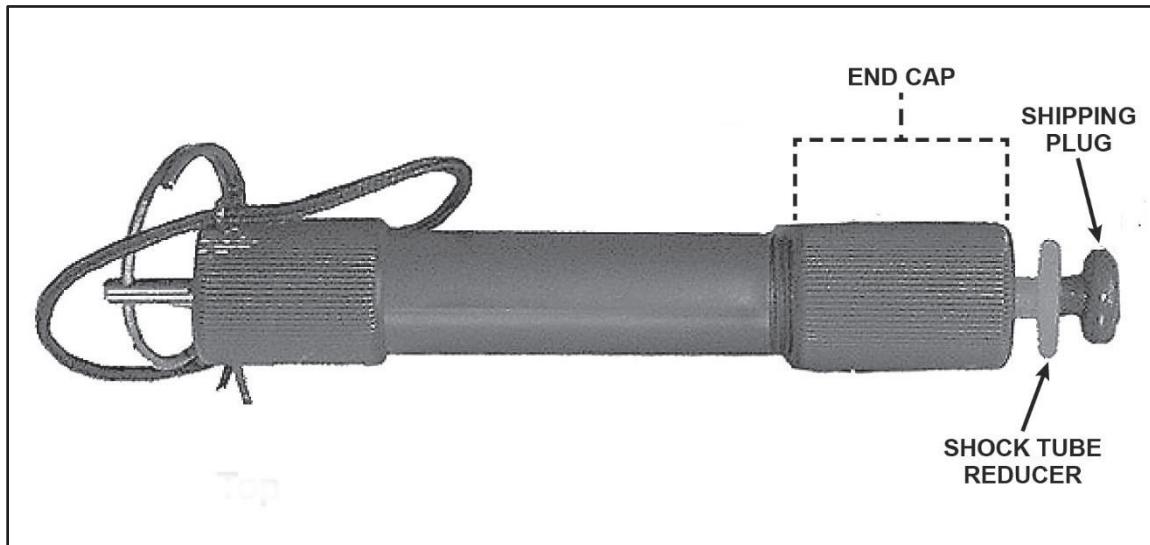


**Figure 3-18. M9 blasting cap holder in a delay initiation**

- a. Open an M9 blasting cap holder.
- b. Insert the M14 blasting cap into the M9.
- c. Shut the smaller hinged flap to secure the M14.
- d. Connect the M9 to the firing system, leaving enough room on the end transmission line to connect the primary initiator.
- e. Cut  $\frac{1}{4}$  inch of the time fuse and the metal seal from the free end of the M14 with a sharp demolition knife.

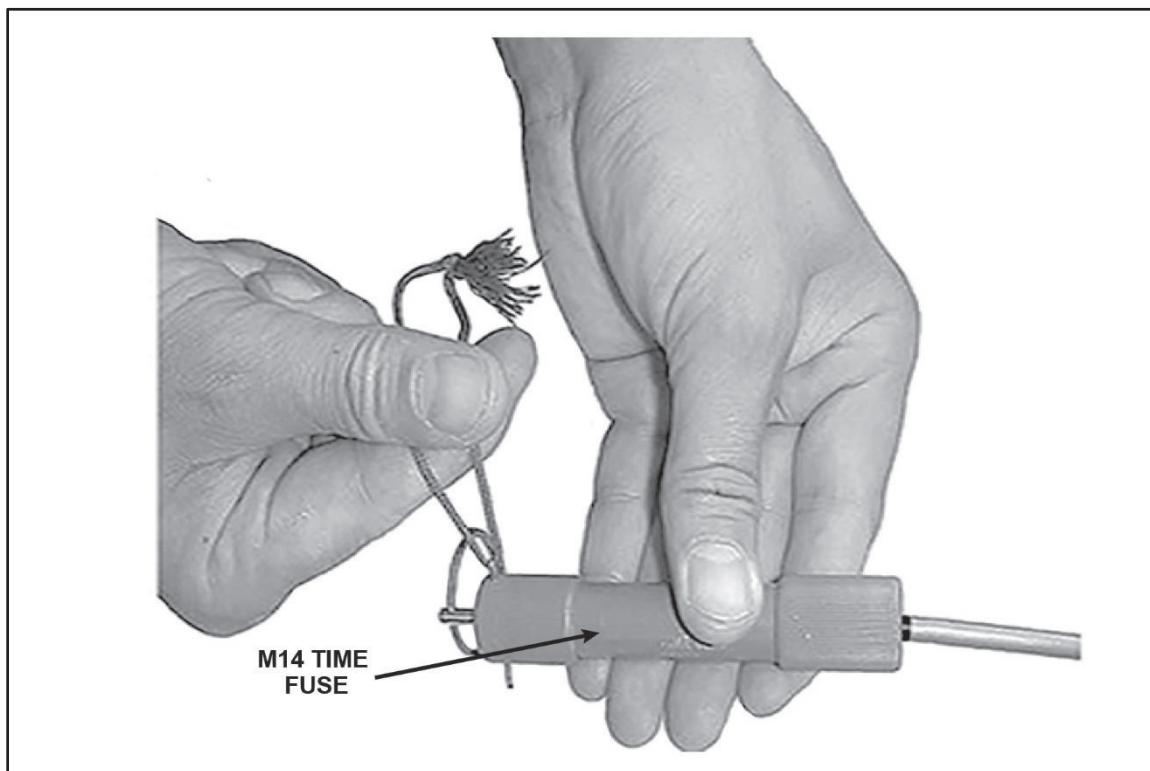
**Note:** If less than the maximum 5-minute delay is desired, cut the timed fuse at the marked bands. Each band represents 1-minute of timed delay.

- f. Loosen the M81 fuse igniter end cap three to four turns counterclockwise (see figure 3-19, page 3-82).



**Figure 3-19. M81 fuse igniter**

- g. Pull the shipping plug and shock tube reducer out of the igniter.
- h. Secure the M81 to the freshly cut end of the M14 (see figure 3-20).



**Figure 3-20. M81 igniter with M14 time fuse**

2. Construct the command initiation system.

**Note:** If using an M21 or M23, the M81 fuse igniter is factory installed to an in-line initiator on the mini-tube, and steps 2.d. through 2.h. can be skipped.

- a. Attach the initiating system blasting cap to the firing system.
- b. Unreel the transmission line towards the initiation point.
- c. Inspect the initiation system for possible misfire problems.
- d. Loosen the M81 fuse igniter end cap three to four turns counterclockwise.
- e. Pull the shipping plug out of the M81 without removing the shock tube reducer. (See figure 3-21).

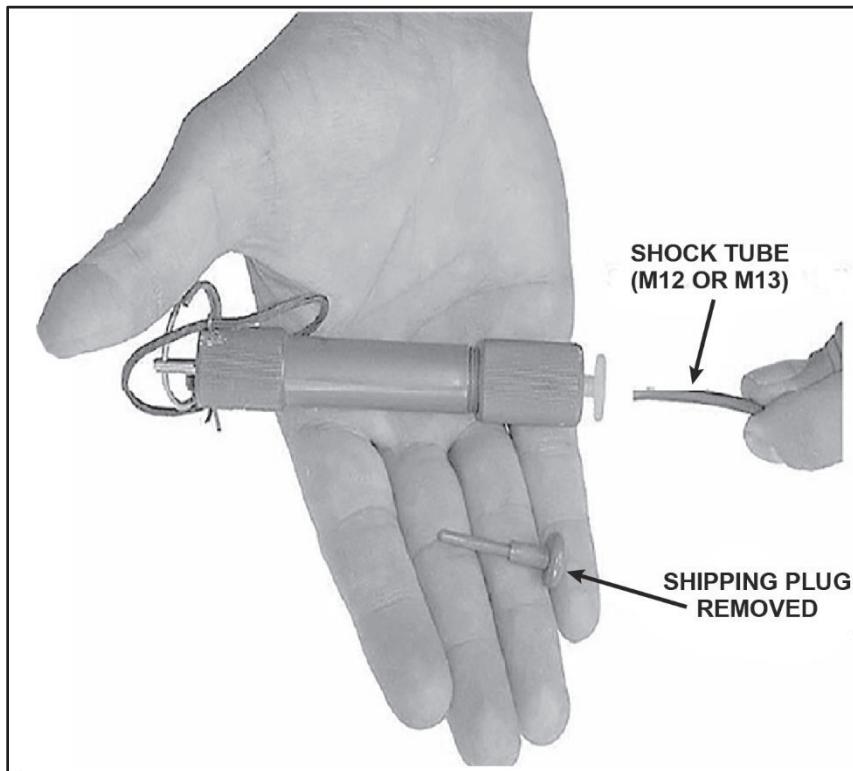


Figure 3-21. M81 fuse igniter ready for shock tube

#### WARNING

**Crimpers will not make a smooth enough cut to ensure that the M81 will initiate the shock tube. Failure to properly cut shock tube may cause immediate personal injury or damage to equipment.**

- f. Cut off the crimped end of the shock tube at the desired length of the transmission line using a sharp demolition knife.
- g. Push the shock tube into the M81, through the shock tube reducer, as far as it will go.
- h. Turn the igniter end cap clockwise until finger-tight.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Constructed the delay initiation system.	_____	_____
2. Constructed the command initiation system.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 3-34.82/MCRP 3-17-7L Explosives and Demolitions		

**052-193-1310**  
**Construct Demolition Firing Systems**

**WARNING**

**Do not dispose of used shock tubes by burning them. The shock tubes give off potentially toxic fumes from the burning plastic. Failure to comply may result in immediate personal injury.**

**Never attach an M60 or M81 igniter to the M151, M152, or detonating cord. Failure to comply could result in immediate personal injury or damage to equipment.**

**CAUTION**

See the safety procedures in TM 3-34.82/MCRP 3-17-7L before undertaking any demolition mission. Personal injury or damage to equipment may result from long-term failure to follow correct procedures.

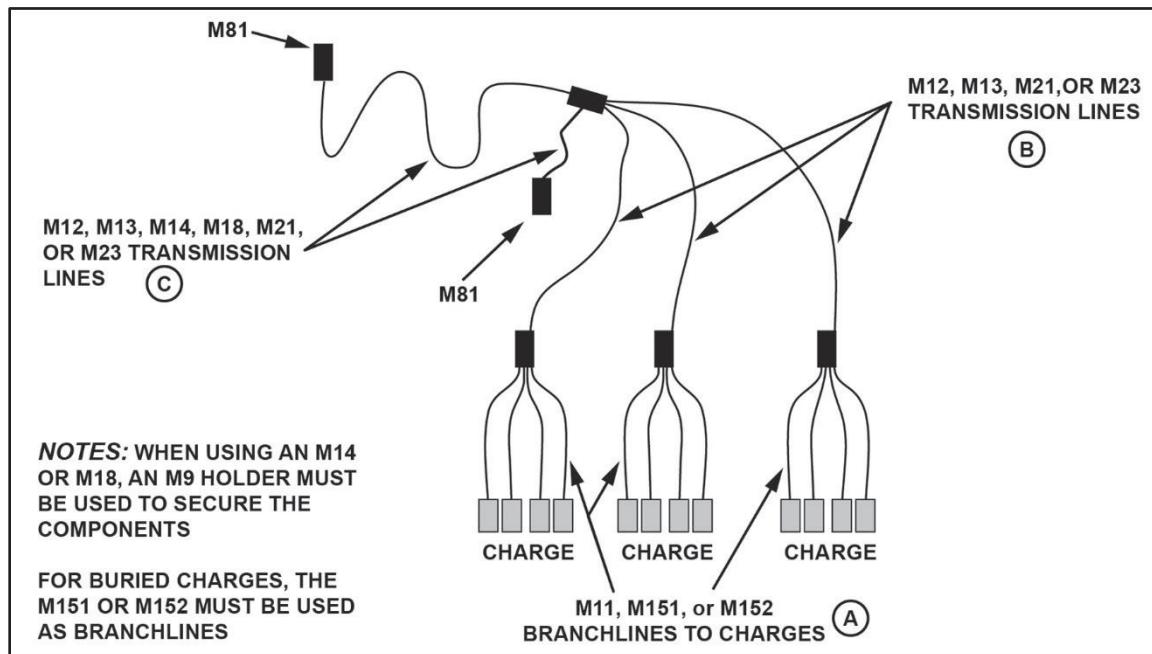
**Conditions:** In an operational environment, you are given primed and placed military explosives requiring a firing system, detonating cord, modernized demolition initiator (known as MDI) branchlines and transmission lines, M9 holders, detonating cord clips, MDI detonating cord clips, an M2 crimper, a demolition knife, adhesive tape, and sandbags.

**Standards:** Construct a stand-alone and a combination demolition firing system, in sequence, without causing premature detonation.

**Note:** There are two types of demolition firing systems: a stand-alone and a combination. On a stand-alone firing system, the initiation set(s), transmission line(s), and branch line(s) are MDI components, and explosives are primed with MDI blasting caps. It is important that the firing system is balanced. All charges must have the same distance in the shock tube from the firing point to the charge. A combination firing system consists of the MDI initiation system; either a detonating cord line or ring main; and branchlines that can be either MDI, detonating cord, or a mix of both. The combination firing system is the preferred firing system for reserved demolition targets.

**Performance Steps**

1. Construct a stand-alone demolition firing system. (See figure 3-22, page 3-86.)



**Figure 3-22. Modernized demolition initiator stand-alone firing system (single-primed, dual-initiated)**

- Identify the firing point.
- Identify the location of all explosive charges placed on the target.

### WARNING

Ensure that the firing system is balanced. The shock wave in the shock tube must travel the same distance to all charges to effectively prevent a misfire. Failure to comply may cause immediate personal injury or damage to equipment.

When making multishock tube installations, ensure that the shock tubes are protected from the effects of the nearby relay caps and charges. The shrapnel produced by a cap or charge could easily cause a misfire (partial or complete). When there are many shock tubes involved in a shot, they should be carefully placed away from the junction. Failure to comply could result in immediate personal injury or damage to equipment.

- Lay out branchlines from the primed explosive charges to the transmission line. (See figure 3-22.)

**Note:** Type of transmission line is determined by the distance needed. Use an M151 transmission line (booster) if the distance is less than 10 feet, an M152 transmission line (booster) or M11 when the distance is less than 30 feet. However, use the same combination of transmission lines for all charges, regardless of distance, see warning above.

- Place a sandbag, or other easily identifiable marker, over the transmission line blasting cap.

- e. Repeat steps 1.c. to 1.d. if number of charges requires multiple transmission lines. (One transmission line can connect up to five charges.)
- f. Unreel all transmission lines used to connect the branchlines towards the firing point. (See figure 3-22[B].)
- g. Unreel the firing point transmission line to the firing point from the point where all transmission lines intersected. (See figure 3-22[C].)

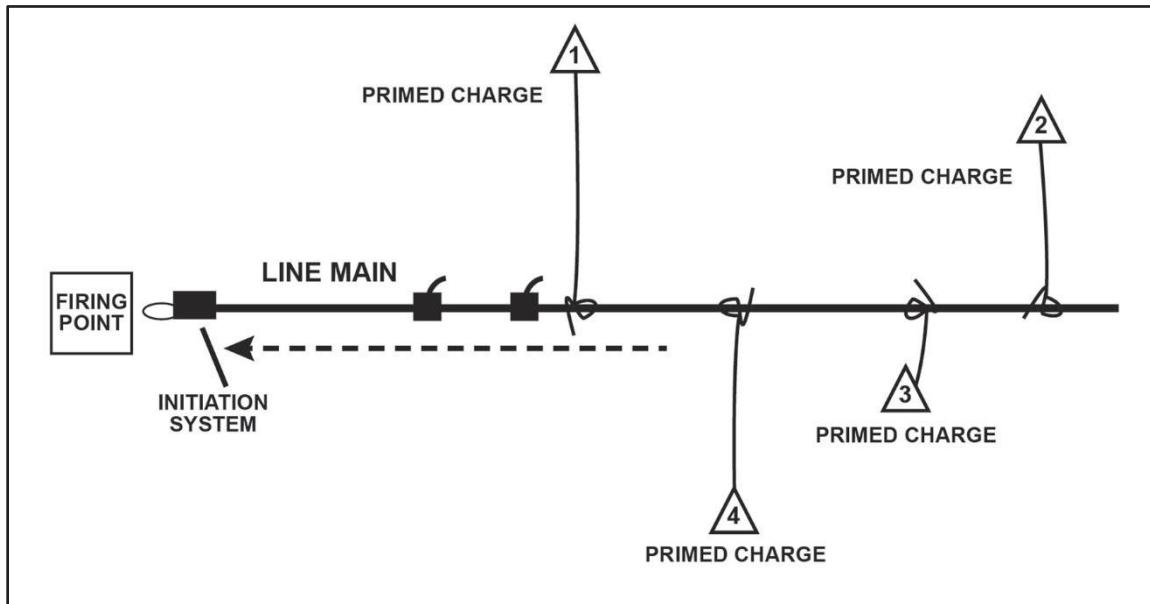
**Note:** Achieve the necessary safe distance by using several M12s, M13s, M21s, or M23s if needed. Use an M14 or M18 as an ignition element of a transmission line to provide time to reach a safe distance without the need to lay and connect multiple M12s, M13s, M21s, and M23s spooled components as transmission lines.

- h. Connect and secure all transmission and branchlines using an M9 and taping all the holders closed, starting from the branch line furthest from the firing point.
  - i. Perform visual inspection of the firing system for possible misfire indicators while en route to the firing point.
2. Construct a combination demolition firing system.
    - a. Identify the firing point.
    - b. Identify the location of all explosive charges placed on the target.

**CAUTION**

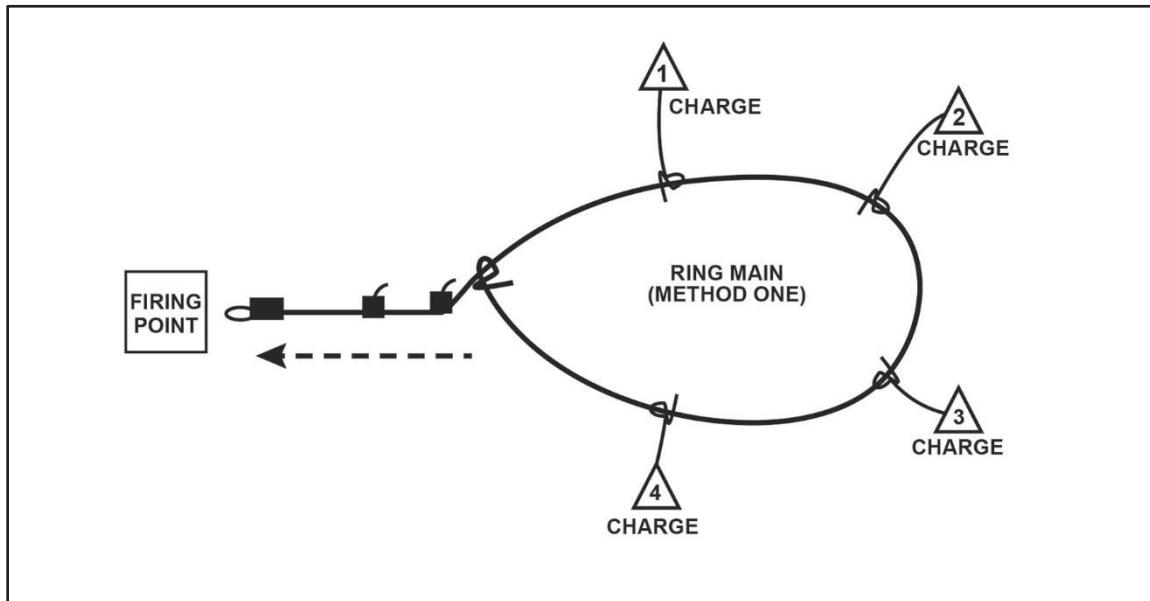
Do not use M151 low-strength detonating cord as a line or ring main. The M151 is only used as a branch line and cannot be substituted for a standard detonating cord. Personal injury or damage to equipment may result from long-term failure to follow correct procedures.

- c. Construct the detonating cord line main or ring main.
  - (1) Construct a line main. (See figure 3-23, page 3-88.)



**Figure 3-23. Construction of a line main**

- (a) Start the line main between the charges furthest from the firing point.
  - (b) Lay the detonating cord in a straight line between charges towards the firing point until line main reaches all charges.
- (2) Construct a ring main.
- (a) Use method one. (See figure 3-24.)

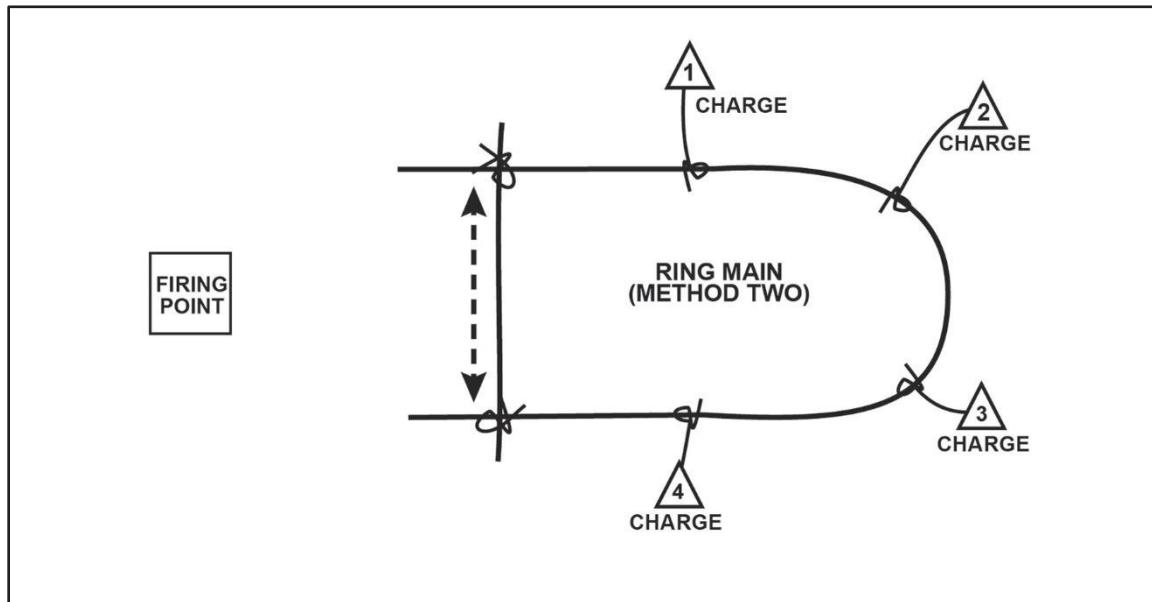


**Figure 3-24. Construction of a ring main (method one)**

\_1\_ Lay out the desired amount of detonating cord and form a loop.

\_2\_ Attach the loop to itself with a girth hitch and an extra turn.

- (b) Use method two. (See figure 3-25.)



**Figure 3-25. Construction of a ring main (method two)**

- \_1\_ Lay out the desired amount of detonating cord and form a U shape.
- \_2\_ Lay another piece of detonating cord across the open end of the U shape.
- \_3\_ Attach the crossover ends to the U shape with a girth hitch and an extra turn.
- d. Place the transmission line blasting caps underneath a sandbag or another easily identifiable marker at the connection point to the detonating cord line or ring main.
- e. Unreel the transmission line to the firing point.
- f. Connect the branchlines.

**Note:** Branchlines must be connected perpendicular to the line main or ring main. Avoid kinks and crossing lines. Curves and angles should not be sharp. Any number of branchlines may be connected to a line main or ring main. Ensure that there is at least 1 foot of space between each branch line connection. Do not connect the branchlines at the point where the ring main is connected.

- (1) Connect the branchline from the explosives primed with detonating cord to the line or ring main with a girth hitch and an extra turn or an M1 detonating cord clip. (See figures 3-26 and 3-27, page 3-90.)

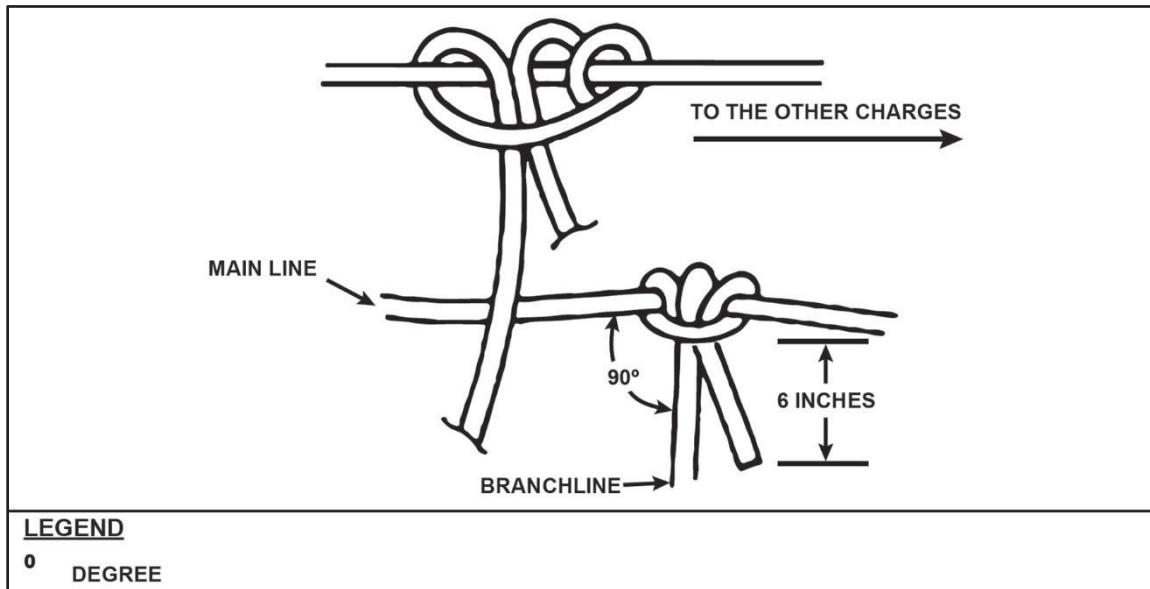


Figure 3-26. Branchlines connected using a girth hitch with an extra turn

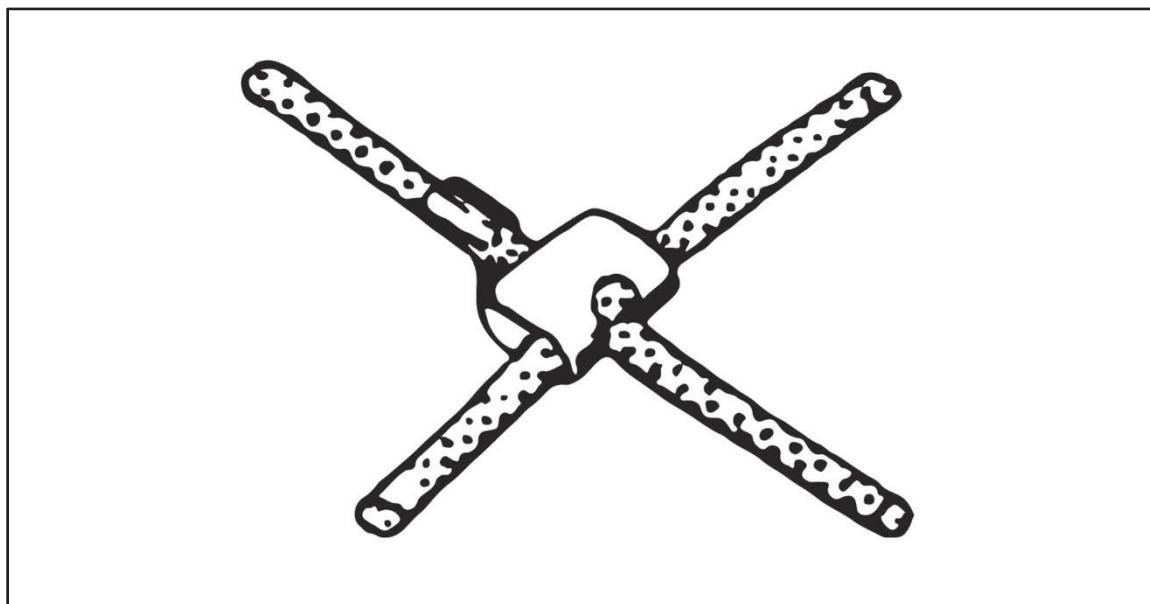
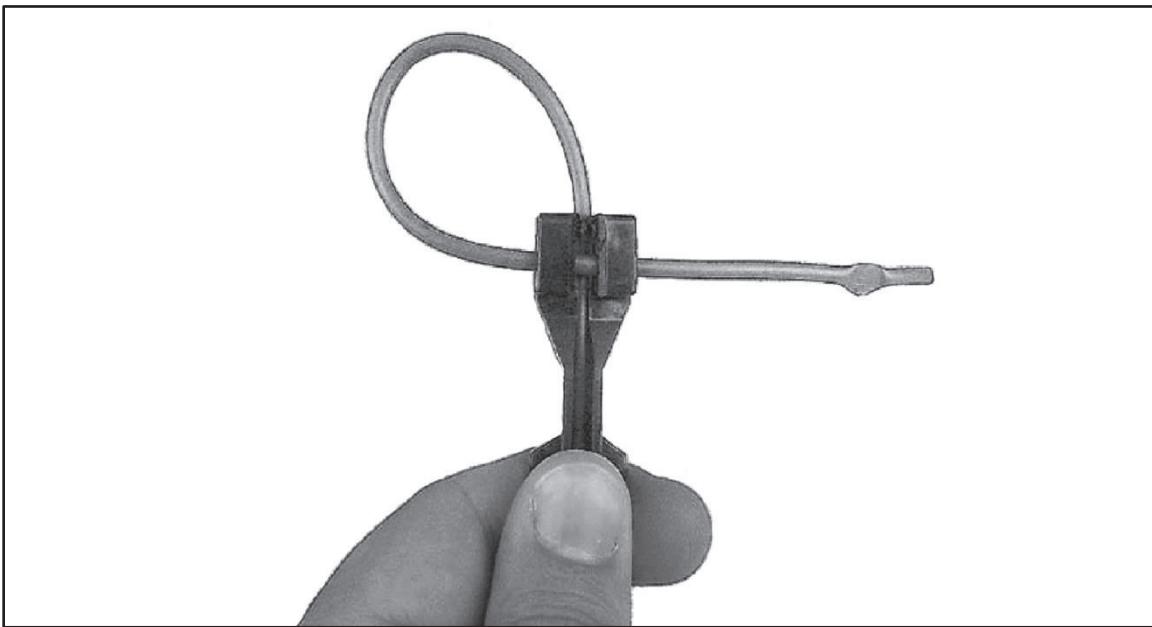


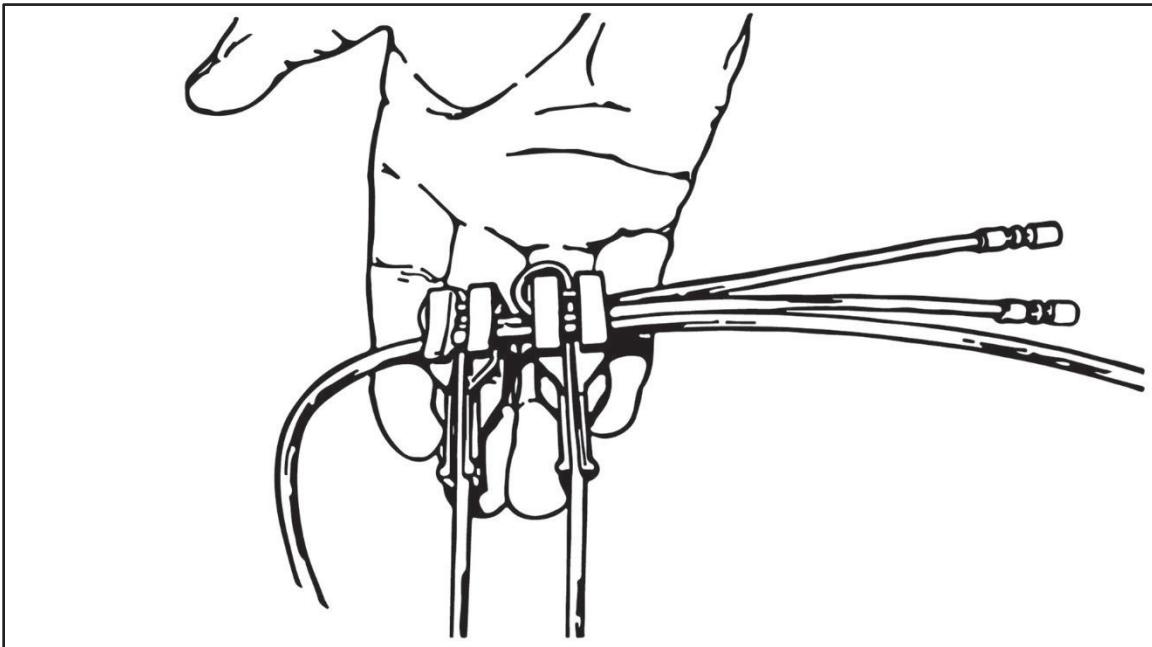
Figure 3-27. Branchlines connected using an M1 detonating cord clip

- (2) Connect MDI branchlines using the MDI detonating cord clip (J Hook) to the detonating cord.
  - (a) Loop the shock tube around and through the J hook. (See figure 3-28.)



**Figure 3-28. Looping shock tube in a modernized demolition initiator detonating cord clip**

- (b) Pull the shock tube tight to prevent the detonating cord clip from slipping (see figure 3-29).



**Figure 3-29. Modernized demolition initiator branchlines connected to detonating cord using a modernized demolition initiator detonating cord clip**

- (c) Clip the detonating cord line or ring main into the detonating cord clip.  
g. Connect the line or ring main to the transmission line.  
(1) Remove the transmission line blasting cap from underneath the sandbag.

- (2) Insert the blasting cap into an M9 connector, and secure the connection with adhesive tape.
  - (3) Place the ring or line main detonating cord into the M9 holder, tying an overhand knot in the detonating cord, and secure the large flap with tape.
- h. Perform visual inspection of the firing system for possible misfire indicators while en route to the firing point.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Constructed a stand-alone demolition firing system.	_____	_____
2. Constructed a combination demolition firing system.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 3-34.82/MCRP 3-17-7L Explosives and Demolitions	

## 052-193-3554

### Clear Demolition Misfires

**Conditions:** In an operational environment, you are given a demolition mission and a misfire has occurred on a charge. You are also given an initiation system, detonating cord, time fuse, a fuse igniter, or modernized demolition initiator (known as MDI) equivalents, a demolition set, hand tools, and TM 3-34.82/MCRP 3-17-7L. Some iterations of this task should be performed in mission-oriented protective posture 4.

**Standards:** Clear misfires, after waiting the required amount of time after a misfire occurs, without causing harm to personnel or equipment, in accordance with (IAW) TM 3-34.82/MCRP 3-17-7L.

#### Performance Steps

1. Clear a nonelectric misfire.

**Note:** 1: Ensure that all personnel wait 30 minutes following a misfire before investigating detonation problems. 2: The Soldier who placed the charges should investigate any misfires and correct any problems with the demolition. 3: Each misfired charge or charge separated from the firing circuit that contains a blasting cap requires a 1-pound charge for detonation.

- a. Investigate above-ground misfires of charges primed with blasting caps.
  - (1) Place a primed 1-pound charge next to the misfired charge.
  - (2) Detonate the new charge.

#### **CAUTION**

Scattered charges that contain blasting caps should not be touched; they must be destroyed in place.

- b. Investigate misfires of charges primed with detonating cord. Investigate—
    - (1) Above-ground misfires. Reprime and attempt to detonate the charge. Scattered charges that do not contain blasting caps may be collected and detonated together.
    - (2) Below ground/buried misfires. Dig near underground charges to within 1 foot of the charge. Place a primed 2-pound charge on top or to the side of the charge and detonate the new charge.
  - c. Investigate detonating cord misfires. If the detonating cord fails to function properly, attach a new blasting cap to the remaining detonating cord, taking care to fasten it properly, and detonate the new blasting cap. Treat the branchlines in the same manner.
2. Clear an electric misfire.
    - a. Make another attempt to fire.
    - b. Use the secondary firing system (when present).
    - c. Check the wire connections to the blasting machine, or the power source terminals.

- d. Disconnect the blasting machine or the power source prior to checking the continuity of the firing system using a circuit tester.
- e. Use another blasting machine or power source and attempt to fire the demolition again.
- f. Disconnect the blasting machine.
  - (1) Shunt the wires.
  - (2) Investigate immediately when employing only one electrical initiation system.

**WARNING**

**Wait 30 minutes when employing more than one electrical initiation system.**

- g. Inspect the entire circuit for wire breaks or short circuits.

**CAUTION**

Do not attempt to remove or handle an electric blasting cap suspected of causing the misfire.

- h. Place a primed 1-pound charge next to the misfired charge, and detonate the new charge.
3. Clear an MDI misfire.
- a. Step 1. If the igniter appears to have functioned properly, but the charge did not fire—
    - (1) Cut off the first 6 inches of shock tube and discard.
    - (2) Cut off a 1-foot section from the shock tube, hold the 1-foot piece so that one end is over the palm of your hand, then blow through the other end.
    - (3) If no powder is present, proceed to step 2. If a gray or silver powder is blown from the shock tube, it has not fired. Install a new igniter on the freshly cut end of the shock tube, and repeat the firing procedure. If detonation does not occur, proceed to step 3.
  - b. Step 2. If the igniter or initiating element functioned properly and no powder was blown from the shock tube, or its flash was seen, observe the burn time plus 30 minutes before going downrange.
  - c. Step 3. After waiting the burn time plus 30 minutes, proceed downrange to check all the components in the firing system.
    - (1) Check for the incorrect placement of the shock tube in the blasting cap holders.
    - (2) Check that the shock tube was not initiated by the up-line blasting cap.
    - (3) Check if the shock tube has fired at a particular point; if so, perform step 1 with a 1-foot section of shock tube cut from the suspect area.

- d. Step 4. If the shock tube still contains the explosive dust—
  - (1) Attach a new component by cutting the shock tube down line from the defective shock tube 1-foot past the blasting cap holder.
  - (2) Seal the shock tube by bending it 2 inches from the cut and taping it.
  - (3) On the defective tube, move down and cut it 10 feet from the blasting cap. Remove and dispose of the defective shock tube and cap according to local misfire policies.
  - (4) Lay out the shock tube of the replacement component back to the firing point and repeat the firing sequence when it is safe to do so.
- e. Step 5. If the shock tube contains no explosive dust because it has been fired, the problem is probably with the blasting cap:
  - (1) The shock tube is cut down line from the defective cap 1-foot past the blasting cap holder.
  - (2) Seal the shock tube by bending it 2 inches from the cut and taping it.
  - (3) On the shock tube of the defective blasting cap, move down and cut it 10 feet from the blasting cap. Remove and dispose of the defective shock tube and cap according to local misfire policies.
  - (4) Lay out the shock tube of the replacement component back to the firing point and repeat the firing sequence when it is safe to do so.

**DANGER**

**Never yank or pull hard on the shock tube. This may actuate the blasting cap. Failure to comply may cause death or permanent injury.**

- f. Step 6. If the first component of the firing train was not the one that failed, check out each succeeding component until the failed one is found. Then, replace the failed or fired relay components back to the initiating site as in steps 4 and 5.
- g. Step 7. If the failed component appears to be the final high-strength blasting cap or booster, replace it if easily accessible. If it is used to prime an explosive charge, do not disturb it. Then, place a new 1-pound explosive charge next to the misfired charge and detonate it when it is safe to do so.
- h. Step 8. If the charges were primed with MDI M151 or MDI M152 components and buried, follow the above misfire procedures to the low-strength detonating cord of an MDI M151 or MDI M152.
  - (1) If the transmission line blasting cap has failed to function, use a nonsparking tool to cut the low-strength detonating cord 1-foot past the failed transmission-line blasting cap.
  - (2) Remove the defective shock tube, failed cap, and the length of low-strength detonating cord and dispose of them according to local misfire procedures.
  - (3) Lay out a replacement transmission line to the firing point and then connect the remaining low-strength detonating cord to the transmission line holder.

- (4) Repeat the firing sequence to detonate the charge. If the buried charge has failed to detonate, but the booster cord has functioned to the surface of the buried charge, follow the procedures for nonelectric misfires.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared a nonelectric misfire.	_____	_____
2. Cleared an electric misfire.	_____	_____
3. Cleared an MDI misfire.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 3-34.82/MCRP 3-17-7L Explosives and Demolitions	

## Subject Area 5: SIGHTS, SENSORS, AND OPTICS

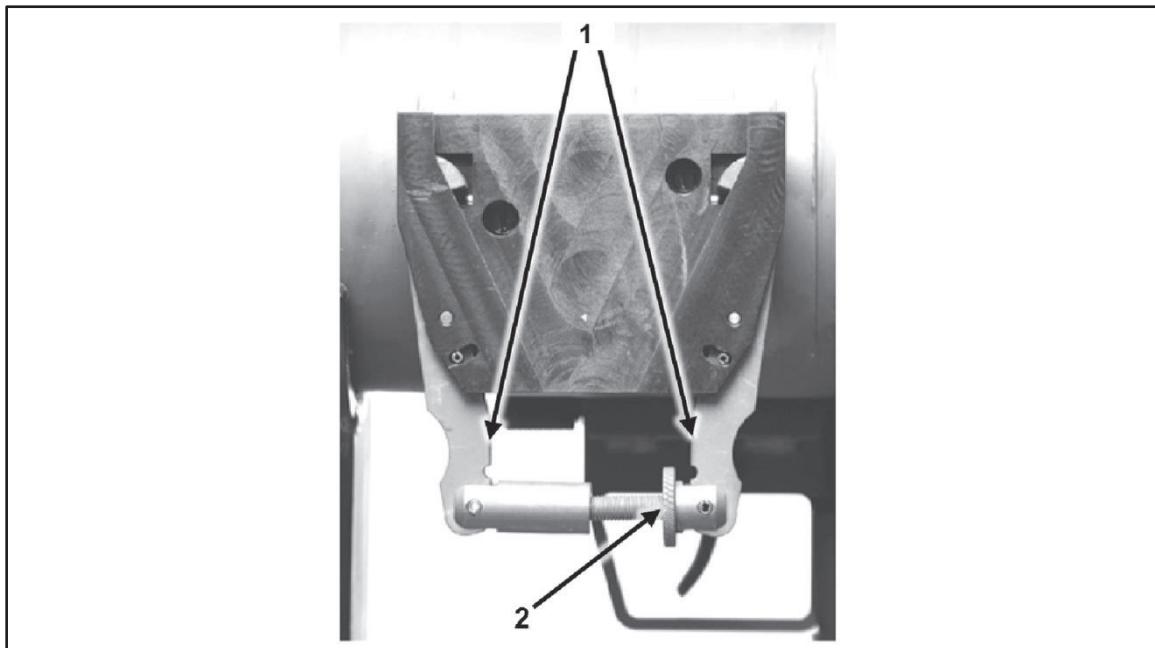
**071-318-2252****Mount the Telescopic Sight on an 84-millimeter Recoilless M3 Rifle**

**Conditions:** You are assigned as a gunner for an 84-millimeter recoilless M3 rifle and must mount a telescopic sight onto the rifle in preparation for use. The rifle is not loaded.

**Standards:** Mount the telescopic sight on the M3 rifle.

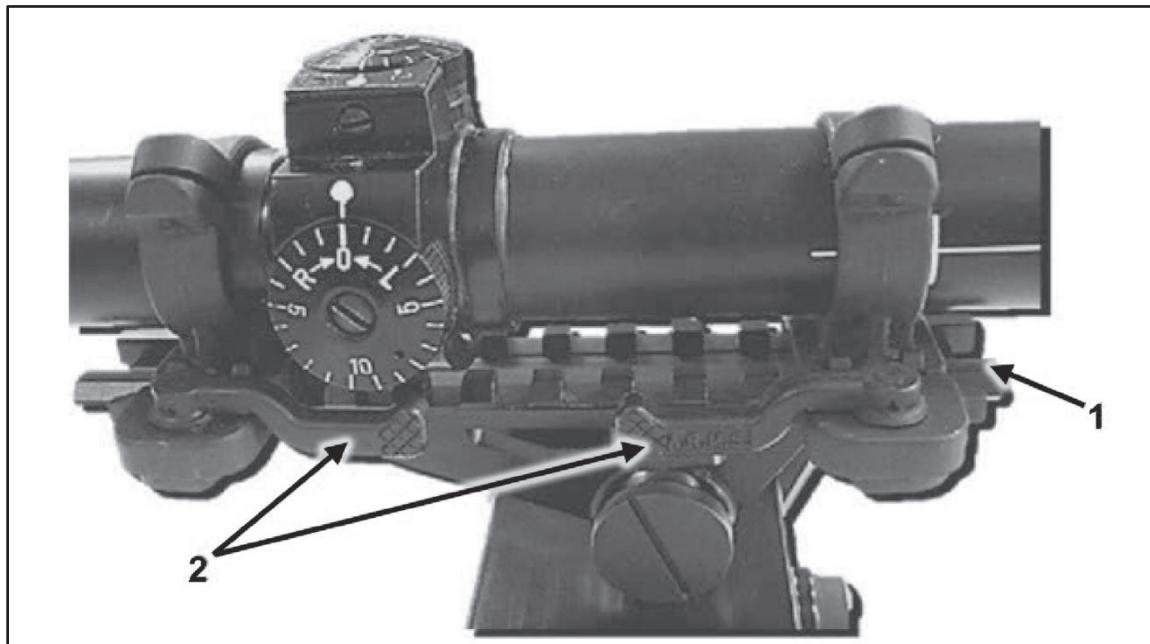
## Performance Steps

1. Install the telescopic sight assembly (see figure 3-30).



**Figure 3-30. Telescope sight assembly installation**

- a. Loosen spreader bar nut (see figure 3-30, item 2) fully.
  - b. Squeeze lever arms (see figure 3-30, item 1) on V-slide mounting bracket and insert picatinny fire control device (known as PFCD) V slide block into V-slide mounting bracket.
  - c. Ensure lever arms on the V-slide mounting bracket engage indentations on PFCD V-slide block.
  - d. Finger-tighten spreader bar nut.
2. Install the telescopic sight (see figure 3-31, item 1, page 3-98).



**Figure 3-31. Telescope installation**

- a. Rotate scope mounting bracket throw levers (see figure 3-31, item 2) 180 degrees to point away from telescope.
- b. Rotate telescope onto PFCD rail (see figure 3-30, item 1, page 3-97) in the desired location, starting with the throw lever side.
- c. Rotate the scope mounting bracket throw levers 180 degrees towards PFCD rail to secure the telescope.

Performance Measures	GO	NO-GO
1. Installed the telescopic sight assembly.	_____	_____
2. Installed the telescopic sight.	_____	_____

References Required	Primary
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

**071-704-0001****Operate a Mini Eyesafe Laser Infrared Observation Set AN/PVS-6****WARNING**

**The AN/PVS-6 mini eyesafe laser infrared observation set (known as MELIOS) rangefinder incorporates a restricted eyesafe laser. Do not stare into the laser exit port.**

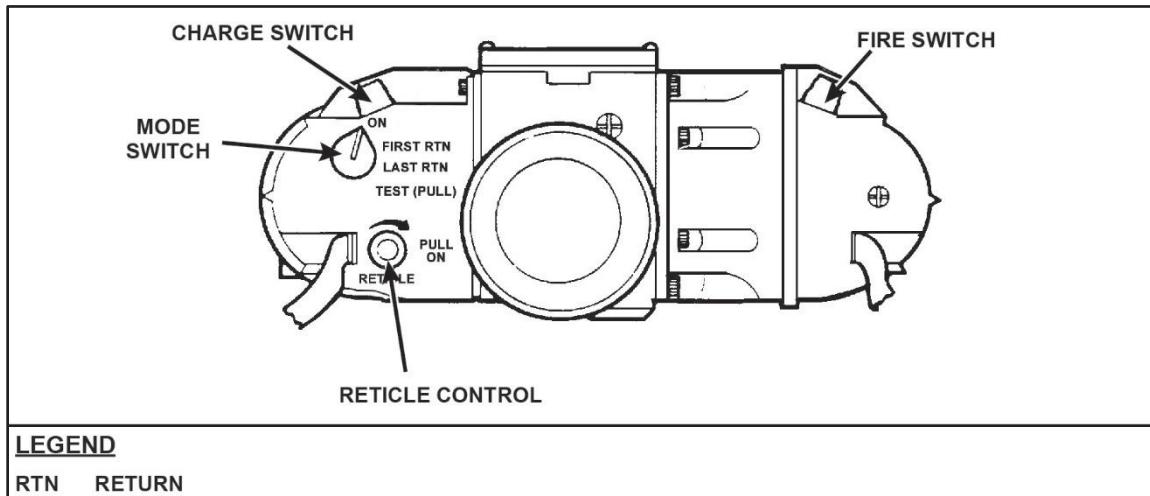
**Conditions:** You are a member of a squad or team and must place the AN/PVS-6 MELIOS into operation to support the current mission. You have all the components and accessories for the MELIOS and two BA-6516/U (nonrechargeable) or two BB-516/U (rechargeable) batteries.

**Standards:** Prepare the AN/PVS-6 for operation. Conduct an operation test and, if necessary, zero the AN/PVS-6. Employ the AN/PVS-6 under normal conditions or operate under unusual conditions, if required. Power down the AN/PVS-6 when no longer needed.

**Note:** The AN/PVS-6 MELIOS is a lightweight, individually operated, handheld or tripod-mounted laser rangefinder. It can determine ranges from 50 through 9,995 meters in 5-meter increments and displays the range in the eyepiece. Compass/vertical angle measurement (known as C/VAM) allows for an azimuth measurement and vertical angle measurement.

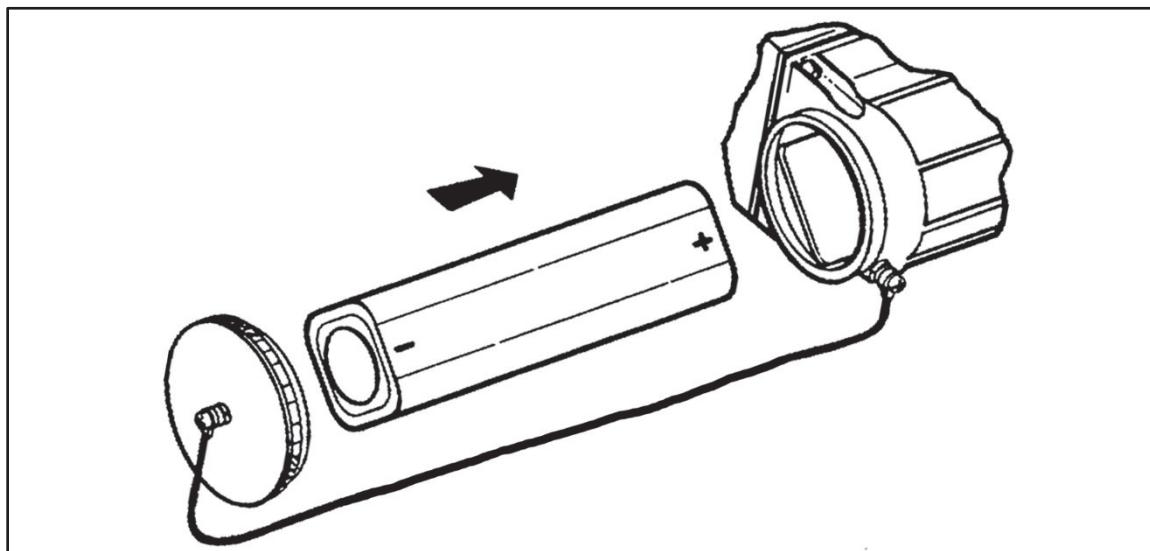
**Performance Steps**

1. Prepare the MELIOS for operation.
  - a. Remove the MELIOS from the carrying case.
  - b. Secure the MELIOS.
    - (1) Place the carrying strap around neck.
    - (2) Mount to tripod.
      - (a) Remove the tripod from the carrying case.
      - (b) Open the tripod legs and secure tripod at the desired height.
      - (c) Place the tripod on a stable surface.
      - (d) Mount the MELIOS securely on the tripod by aligning the mounting hole over the tripod screw and pad.
      - (e) Tighten the screw until the MELIOS is secure on the tripod pad.
    - c. Install the battery.
      - (1) Ensure the mode switch is in the OFF position (see figure 3-32, page 3-100).



**Figure 3-32. Mini eyesafe laser infrared observation set controls**

- (2) Open the battery compartment door by turning the screw bail counterclockwise.
- (3) Insert the battery with the small raised contact first (see figure 3-33).

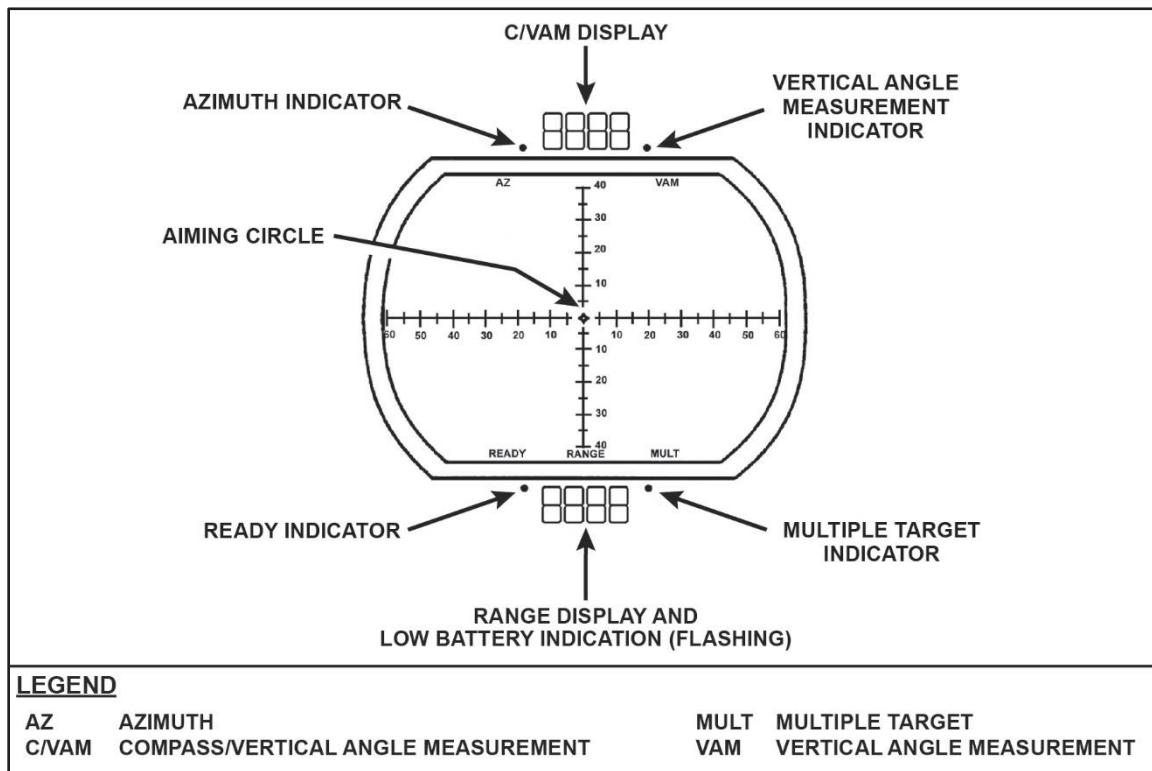


**Figure 3-33. Battery replacement**

- (4) Close the battery compartment door by turning the screw clockwise.
2. Conduct an operation test of the MELIOS.
  - a. Rotate the front lens cap away from the objective lens and laser window.
  - b. Pull the eyeshield plug out of the eyeshield.
  - c. Adjust the diopter setting for clear focus.
  - d. Turn the mode switch to TEST.

- e. Press the charge switch.
- f. Observe the display through eyepiece lens for all elements and indicators to be lit.
- g. Press the fire switch.
- h. Turn the mode switch to FIRST RTN or LAST RTN.
- i. Press the charge switch.
- j. Observe the display for ready indicator (see figure 3-34).

**Note:** If the ready indicator light does not come on 3 seconds after the charge switch is pressed, a possible malfunction has occurred.



**Figure 3-34. Eyepiece display**

- k. Aim at a target at a distance of 50 meters or greater.
- l. Press the fire switch.
- m. Observe the display for range value.

**Note:** If there is no range value displayed 1 second after fire switch is pressed, a possible malfunction has occurred.

- n. Adjust the reticle brightness.

**Note:** If reticle does not illuminate or the target cannot be seen clearly, a possible malfunction has occurred.

- o. Set the mode switch to C/VAM to place the C/VAM in standby mode.
- p. Press the charge switch.
- q. Observe the upper C/VAM standby display (four dashes).

**Note:** If a banking display appears, reposition the MELIOS to a more level position. The display will go out after 10 seconds.

- r. Press the charge switch again to reactivate the charge switch.

**Note:** If FAIL appears in the display, go to troubleshooting procedures.

- s. Press the fire switch.
- t. Observe the upper C/VAM display for alternating AZ and VAM indications.

**Note:** The display will alternately display the target azimuth and elevation angles in mils or degrees for two times each.

3. Zero the MELIOS, if required.

**Note:** Conduct zero procedures if the C/VAM if the MELIOS has been relocated more than 100 miles from the last location it was zeroed and whenever a battery has been removed or replaced. Zeroing is accomplished by firing the laser twelve times with the MELIOS in three different positions at each of the four main compass azimuth positions. The compass azimuth positions are not critical and may be within + 20 degrees ( $\pm 355$  mils) of the C/VAM azimuth display indication.

- a. Rotate the front lens cap away from the objective lens and laser window.
- b. Pull the eyeshield plug out of eyeshield.
- c. Adjust the diopter setting for clear focus.
- d. Turn the MELIOS mode switch to FIRST RTN.
- e. Press the charge switch.
- f. Observe the READY indicator lights.
- g. Press the fire switch.
- h. Repeat steps e, f, and g three times.
- i. Turn the C/VAM mode switch to ZERO.
- j. Press the charge switch.
- k. Observe the READY indicator and C/VAM standby display (four dashes) lights.
- l. Acquire the 12 zeroing measurements by firing the MELIOS 12 times from each of the four cardinal directions using the listed tilt and bank positions (see figure 3-35).

#	AZIMUTH	TILT	BANK
1	NORTH	LEVEL	LEVEL
2	NORTH	UP	LEFT
3	NORTH	DOWN	RIGHT
4	EAST	LEVEL	LEVEL
5	EAST	UP	LEFT
6	EAST	DOWN	RIGHT
7	SOUTH	LEVEL	LEVEL
8	SOUTH	UP	LEFT
9	SOUTH	DOWN	RIGHT
10	WEST	LEVEL	LEVEL
11	WEST	UP	LEFT
12	WEST	DOWN	RIGHT

**Figure 3-35. Zero measuring positions**

- (1) Point MELIOS in the indicated direction with the appropriate tilt and bank.
- (2) Press Fire Switch while holding the MELIOS as steady as possible until C/VAM display lights.
- (3) Observe C/VAM display.

**Note:** If "ERO#" is displayed, then repeat measurement of that firing position.

- (4) Proceed to the next zeroing measurement position.
- m. Observe C/VAM display; dashes move back and forth across display after twelfth successful measurement.

**Note:** Display continues flashing dashes for up to 5 minutes while compensation constant is calculated.

- n. Observe blank display to indicate calculation is complete.
- o. Press charge switch.
- p. Observe C/VAM display for results.

**Note:** Display of "ql'(good) - Accuracy better than 10 mils. Display of "Ac15" . . . "AC95" - Accuracy f15. 95 mils, repeat zeroing procedure. Display of "Ac-" - Calculation procedure failed, repeat zeroing procedure. Display of "FAIL" - C/VAM malfunction, return to unit maintenance.

- q. Move C/VAM mode switch to C/VAM position, if displayed accuracy is acceptable.
4. Employ the MELIOS.
  - a. Turn MELIOS mode switch to the proper ON POSN based on target visibility.
    - (1) Turn MELIOS mode switch to FIRST RTN for a clearly visible target.
    - (2) Turn MELIOS mode switch to LAST RTN POSN for a partially obscured target (trees, smoke, and so forth).

- b. Set the C/VAM mode switch to C/VAM to place in standby mode.
- c. Place reticle aiming circle on target.
- d. Press the charge switch.

**Note:** If you do not range a target in 8 seconds after the Charge Switch is pressed, the MELIOS will shut down and you will have to press the Charge Switch again.

- e. Observe the C/VAM standby display (four dashes).

**Note:** Reposition the MELIOS to a more level position if a banking display appears.

- f. Hold aiming circle steady on target.
- g. Fire the laser by pressing and holding the fire switch.
- h. Read "Range" at bottom of display.
- i. Release Fire Switch.
- j. Observe the results.
  - (1) Observe upper C/VAM display for alternating AZ and VAM indications.
  - (2) Display the same indications by pressing and holding the fire switch again.
  - (3) Display the same indications continuously by pressing and holding the fire switch continuously.
- k. Continue mission.
  - (1) Press charge switch to begin a new measurement cycle.
  - (2) Conduct power-down procedure if ranging operations are complete.

5. Operate under unusual conditions, as required.

**Note:** Operating the MELIOS during adverse weather or battlefield conditions may adversely impact ranging distance but should not affect C/VAM accuracy as long as the target is visible in the field of view. Adverse conditions are defined as smoke, dust, fog, heavy rain, snow, and degraded visibility.

- a. Operate under extreme cold conditions.

**Note:** Extreme cold will shorten battery life. The BA-6516/U is the preferred battery for extreme low-temperature operation.

- (1) Keep spare batteries in your inner pockets to keep them warm.
  - (2) Wipe off condensation after the AN/PVS-6 has warmed up when brought from cold to warm.
- b. Operate under chemical, biological, radiological, and nuclear conditions.

**Note:** Do not use Decontamination Solution 2 for decontaminating the MELIOS.

- (1) Decontaminate AN/PVS-6 using a 5-percent sodium hypochlorite solution.

- (2) Rinse by wiping with hot soapy water.
  - (3) Dry metal parts.
  - (4) Wipe metal parts with oil.
6. Power down the MELIOS.
- a. Turn mode switch OFF.
  - b. Press reticle control in.
  - c. Turn C/VAM mode switch OFF.
  - d. Rotate lens cap over objective lens and laser window.
  - e. Place eyeshield plug in eyeshield.
  - f. Remove the MELIOS from around the neck, or
  - g. Remove MELIOS from tripod.
- (1) Release tripod height adjustment lock.
  - (2) Withdraw shaft and lanyard from leg mount.
- h. Remove battery.
  - i. Return all equipment to the carrying case.

Performance Measures	GO	NO-GO
1. Prepared the MELIOS for operations.	_____	_____
2. Conducted an operation test of the MELIOS, if required.	_____	_____
3. Zeroed the MELIOS if required.	_____	_____
4. Employed the MELIOS.	_____	_____
5. Operated under unusual conditions, as required.	_____	_____
6. Powered down the MELIOS.	_____	_____

References Required	Primary
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TM 11-5860-202-10 Operator's Manual for Mini Eyesafe Laser Infrared Observation Set (MELIOS)  
AN/PVS-6 (NSN 5860-01-350-8551) (EIC: N/A)

**071-704-0005**  
**Operate the Laser Target Locator Module AN/PED-5**

**WARNING**

**Allow at least 5 seconds between turning the laser target locator module (known as LTLM) off, then back on. Failure to do so may cause damage to the LTLM.**

**Never use old or depleted batteries or batteries of unknown strength in the LTLM. If battery condition is unknown, dispose of batteries in accordance with unit standard operating procedure and replace with fresh L91 lithium batteries.**

**Conditions:** You are a member of a team or squad conducting operations and you have been given an AN/PED-5 LTLM with components and batteries and a requirement to operate the LTLM.

**Standards:** Install batteries and power up the LTLM. Perform a boresight check, run a built-in test (known as BIT), acquire self-location (known as SLF), perform a compass calibration (known as Cal), and place the LTLM in thermal recon mode, as required. Use the LTLM to conduct targeting, fall of shot, and distance and bearing between points operations, as necessary.

**Performance Steps**

1. Remove the LTLM from the carrying case.
2. Install batteries in the main battery cassette.
  - a. Press in and rotate the battery cassette latch on the main battery cassette counterclockwise until the battery cassette latch clears the hooks.
  - b. Pull battery cassette out of the LTLM.
  - c. Insert six L91 lithium batteries in the battery cassette oriented as marked on the battery cassette.
  - d. Align orientation ridges with the bottom of the LTLM and slide the battery cassette into the compartment.
  - e. While pressing inward, rotate the battery cassette latch clockwise until it fully engages the hooks.
3. Power up the LTLM by pressing the ON/OFF button for more than 3 seconds.

**Notes:** Shortly after a successful power-on, the system displays the startup screen as shown in figure 3-36.

The LTLM runs a BIT upon startup. If the system is held at an angle greater than 45-degree pitch or roll, the initial BIT will report back a digital magnetic compass (known as DMC) failure on the BIT report screen. If this issue occurs, manually run the BIT being sure to hold the LTLM at a relatively level pitch and roll position.

During this time, you can switch between DAY and THERMAL mode, but all other button functionality is shut off until the initial BIT is complete.

If the initial BIT fails, the system automatically transitions to the BIT page in MAINTENANCE mode.

If the BIT passes, system operations are not disturbed.



Figure 3-36. LTLMU startup screen

**CAUTION**

When turning the diopter adjust, do not attempt to turn further than the end of travel. The diopter may seize and damage can occur.

4. Adjust the diopter.

**Note:** Use the diopter adjust to focus the thermal reticle but not the thermal image. Focusing the thermal imagery is done using the thermal focus adjust.

- a. Look into the eyecup (see figure 3-37, item 2).
- b. Adjust the diopter adjust (see figure 3-37, item 1) until the reticle and display text are focused.

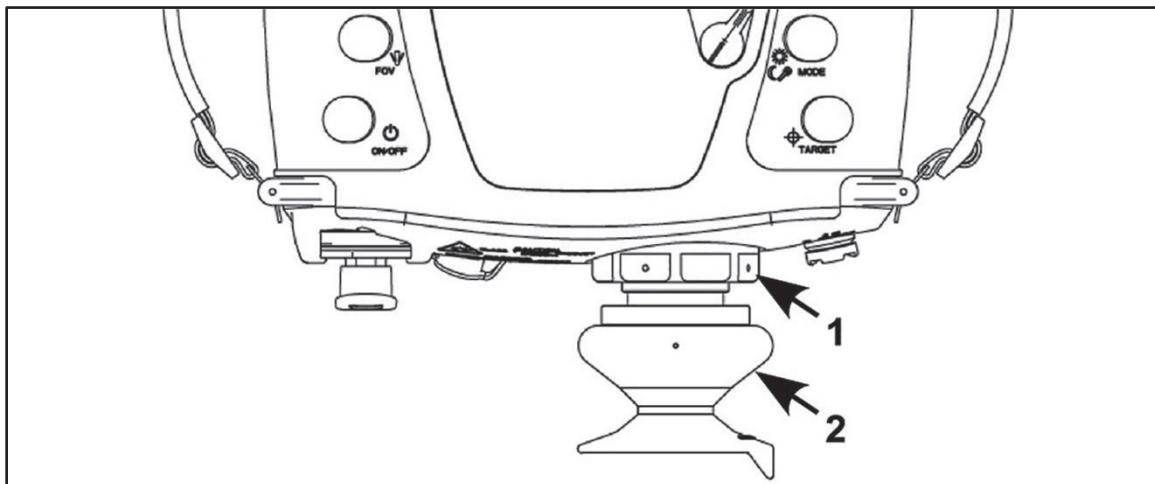


Figure 3-37. Diopter adjust

**DANGER**

**A boresight check must be performed during mission preparation, as well as any time the LTLM's boresight is suspect. Failure to perform a boresight check could result in incorrect target locations.**

5. Perform a boresight check.
  - a. Ensure the LTLM is powered on and has passed the BIT.
  - b. Select a narrow target or a target with straight horizontal or vertical edges in either DAY or THERMAL mode.

**Notes:** It is advised to select a target close to current location for ease of targeting.

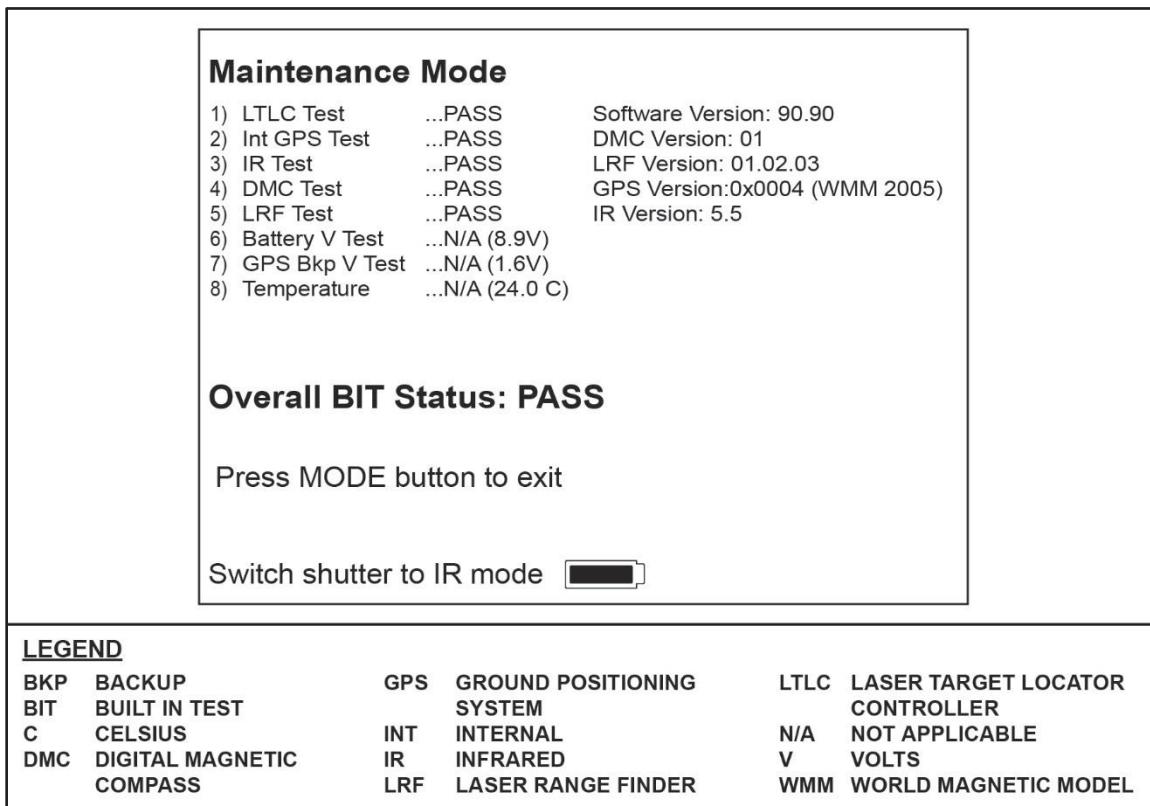
The LTLM laser range finder (LRF) should be fired at 15-second intervals or longer. Firing the LRF too quickly causes a LASER NOT READY message to appear in the Target Location field of the display. If this occurs, wait 15 seconds or longer, then resume targeting.

- c. Perform multiple range measurements across the selected edge of the target, closely watching the range measurements.
  - d. Observe when the measured range suddenly decreases or increases and STOP.
- Note:** Do not move the LTLM as this should be assumed the point where the reticle aimpoint was at the target edge.
- e. Inspect the reticle aimpoint location in reference to the target edge.

**Notes:** In DAY mode, if the target edge is greater than 1/3 the diameter of the aiming circle from its center, the boresight is suspect. Return to next higher-level maintenance.

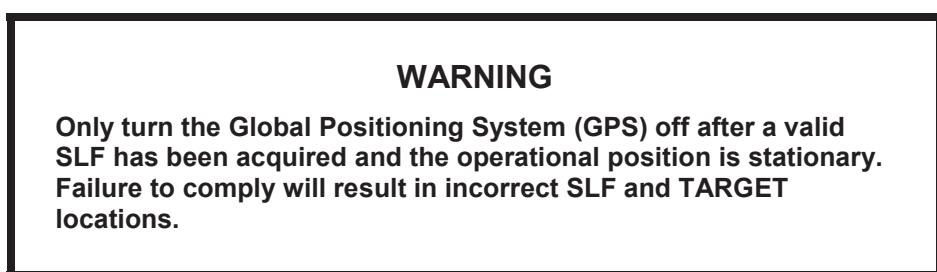
In THERMAL mode, if the target edge is greater than 3/4 artillery mil from the center of the aiming box, the boresight is suspect. Annotate fault on DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*) and return to next higher-level maintenance.

6. Run a BIT, if necessary.
  - a. Press the MODE button for more than 3 seconds to enter MAINTENANCE mode.
  - b. Set SHUTTER to NIGHT to aid in MAINTENANCE mode menu visibility.
  - c. Use the GPS or TARGET button to highlight the Run BIT option.
  - d. Press the MODE button.
- e. Observe that a BIT Status Display is visible upon completion, as illustrated in figure 3-38.



**Figure 3-38. Built-in test status display**

- f. Press the MODE button to exit the BIT Status Display.
- g. Press and hold the MODE button until the LTLM returns to RECON mode to exit MAINTENANCE mode.
7. Acquire SLF.



- a. Ensure that the internal GPS is acquiring satellites and displays ACQUIRING POSITION in the SLF data indicator.

**Note:** If the auto power down feature is activated and the system remains inactive for the set amount of time, the laser target locator module unit (known as LTLMU) will automatically turn off.

- b. Allow the GPS to acquire SLF before performing ranging operations.

**Note:** An initial accurate position fix should take approximately 2 minutes but can take up to 10 minutes. Subsequent fixes may be substantially shorter. If the GPS does not acquire SLF after 10 minutes troubleshoot using TM 9-1240-455-10.

8. Perform Compass Cal.

### **WARNING**

When performing Compass Cal, care should be taken to get the best quality factor possible, Q1 being the best. Poor compass accuracy can lead to incorrect target locations, especially when targeting at long distances.

Close direct view optics (known as DVOs) LRF lens cap prior to performing Compass Cal. Viewing the sun through the DVO can result in permanent eye damage.

### **CAUTION**

Replace the thermal lens cap prior to performing Compass Cal. Viewing the sun through the thermal optics can result in permanent system damage.

Ensure eyecup is properly installed on the LTLM when performing Compass Cal. Failure to comply could result in damage to the display.

- a. Perform a 12-point Compass Cal.

**Note:** The angular reference diagram in figure 3-39 can be used as an aid when performing a 12-point Compass Cal with the tripod.

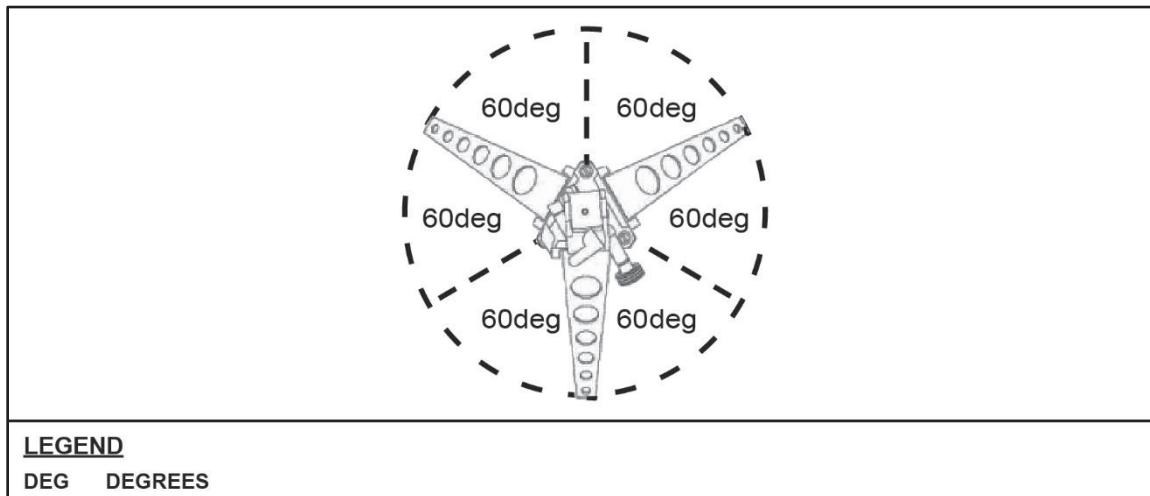


Figure 3-39. Tripod reference for the azimuth and elevation positions

**CAUTION**

Ensure the pan/lock screw is loose when panning with the LTLM mounted to the tripod. Failure to comply will result in tripod mount pad damage.

- (1) Mount the LTLM on the tripod.
- (2) Press the MODE button for more than seconds to enter the MAINTENANCE mode.
- (3) Set SHUTTER to NIGHT to aid in MAINTENANCE mode menu visibility.
- (4) Press the MODE button with the Compass Cal option highlighted.
- (5) Press the MODE button with the Do 12-point Compass Cal option highlighted.
- (6) Move the LTLM to make the bottom AZ, EL, and Roll line match the top AZ, EL, and Roll line.
- (7) Follow on-screen instructions.

**Note:** The LTLMU will display Hold Still and press Mode when properly oriented. See table 3-2 for detailed pointing instructions for the 12-point Compass Cal.

**Table 3-2. 12-point compass calibration**

	AZIMUTH (Az) (deg)	ELEVATION (El) (deg)	ROLL (deg)	OPERATOR INSTRUCTIONS
P1	Start (0 + 10)	Up (+30 + 5)	Level (0 + 5)	Az 0; El +30
P2	Move Right 60 (60 + 10)	Up (+30 + 5)	Level (0 + 5)	Az +60; El +30
P3	Move Right 60 (120 + 10)	Up (+30 + 5)	Level (0 + 5)	Az +120; El +30
P4	Move Right 60 (180 + 10)	Up (+30 + 5)	Level (0 + 5)	Az +180; El +30
P5	Move Right 60 (240 + 10)	Up (+30 + 5)	Level (0 + 5)	Az +240; El +30
P6	Move Right 60 (300 + 10)	Up (+30 + 5)	Level (0 + 5)	Az +300; El +30
P7	Same (300 + 10)	Down (-30 + 5)	Level (0 + 5)	Az +300; El -30
P8	Move Left 60 (240 + 10)	Down (-30 + 5)	Level (0 + 5)	Az +240; El -30
P9	Move Left 60 (180 + 10)	Down (-30 + 5)	Level (0 + 5)	Az +180; El -30
P10	Move Left 60 (120 + 10)	Down (-30 + 5)	Level (0 + 5)	Az +120; El -30
P11	Move Left 60 (60 + 10)	Down (-30 + 5)	Level (0 + 5)	Az +60; El -30
P12	Move Left 60 (0 + 10)	Down (-30 + 5)	Level (0 + 5)	Az 0; El -30

**Legend:** deg – degree

- (8) Adjust the head to +30 degrees by observing the elevation reading on the display.
- (9) Lock the head and perform the six azimuth measurements using the tripod legs as a reference.
- (10) Adjust the head to -30 degrees by again observing the elevation reading on the display.
- (11) Lock the head and perform the reverse 6 azimuth measurements using the tripod legs as reference.

**Note:** Upon 12-point Compass Cal completion, the display states CALCULATING, followed by a countdown timer starting at 40 seconds and decrementing in 2-second intervals. Compass Cal quality and accuracy results will be displayed once calculated, on average taking 4–6 seconds.

- (12) Rectify poor Compass Cal results by performing one or all of the following tasks:

- (a) Reattempt Compass Cal.
- (b) Move to known good environment and recalibrate.
- (c) Remove personal gear that is causing the disturbance and recalibrate.
- b. Perform a 4-point Compass Cal.

**Note:** A 4-point Compass Cal should be performed when time does not permit a 12-point Compass Cal and AFTER EVERY battery change. A 4-point Compass Cal follows the same process as the 12-point Compass Cal, only with 4 pointing orientations. See table 3-3 for detailed pointing instructions.

**Table 3-3. 4-point compass calibration**

	AZIMUTH (Az) (deg)	ELEVATION (El) (deg)	ROLL (deg)	OPERATOR INSTRUCTIONS
P1	North (0+10)	Up (+30 ± 5)	Level (0 ± 5)	Az 0; El +30
P2	East (90 ± 10)	Down (-30 ± 5)	Level (0 ± 5)	Az +90; El -30
P3	South (+180 ± 10)	Up (+30 ± 5)	Level (0 ± 5)	Az +180; El +30
P4	West (270 ± 10)	Down (-30 ± 5)	Level (0 ± 5)	Az +270; El -30

Legend: deg – degree

### WARNING

**Reloading Factory Cal should only be performed when you cannot successfully complete a 4-point or 12-point Compass Cal. Reloading Factory Cal will not compensate the DMC for magnetic disturbances specific to the current location, which may cause incorrect target locations and result in fratricide.**

- c. Reload Factory Cal required.
  - (1) Enter MAINTENANCE mode.
  - (2) Set SHUTTER to NIGHT to aid in MAINTENANCE mode menu visibility.
  - (3) Press the MODE button with the Compass Cal option highlighted.

**Note:** Two options are available: Reload or Cancel. Select Reload to return the Compass Cal back to factory values. Select Cancel to return the Compass Cal back to the previous Compass Cal setting.

- (4) Highlight the desired selection using the GPS button, then press the MODE button to select.
- (5) Press and hold the MODE button until the LTLMU returns to RECON mode to exit MAINTENANCE mode.

9. Place the LTLM in Thermal Recon mode.

**Note:** Without power, the LTLM functions as 7x monocular with no data overlays with the DVO/LRF lens cap opened. When the LTLM is powered on, the LTLM continues to act as a 7x monocular as well as providing data displays. In RECON DAY mode, the SHUTTER must be in the open position allowing visible light to pass to the eyecup. The SLF is only displayed upon initial GPS acquisition and when requested by pressing the GPS button.

- a. Ensure the LTLM is powered on.
- b. Remove the Thermal Lens Cap.
- c. Press the MODE button to enter THERMAL mode.
- d. Set the SHUTTER to NIGHT.
- e. Press the ON/OFF button to perform a thermal camera calibration of the thermal sensor to ensure good image quality once in THERMAL mode.

**Note:** Thermal camera calibrations can be initiated throughout THERMAL mode operation and should be performed periodically to recalibrate the sensor and ensure continuous good image quality. Subsequent presses of the ON/OFF button within 20 seconds of initiating thermal camera calibration will toggle the thermal reticle polarity between WHT HOT and BLK HOT. Otherwise, proceed with reconnaissance operations.

**DANGER**

**When performing Call for Fire you must ensure the LTLM is in TARGET (known as TGT) mode and the coordinates are preceded by TGT before relaying. Failure to comply may result in fratricide.**

10. Conduct targeting operations.

**Note:** The TARGET button is used to initiate a targeting action. Upon firing the LRF, the LTLM will automatically switch from RECON to TARGET mode.

- a. Ensure that the DVO/LRF Lens Cap is open for DAY mode operations.

**Note:** If operating in THERMAL mode, ensure that both lens caps have been opened.

- b. Press and hold the TARGET button once you locate the object of interest, sighting it in the appropriate reticle aimpoint whether in DAY or THERMAL mode.

**Note:** The LRF fires upon release of the TARGET button. You can press the TARGET button as long as required to steady aim on the target. Release the TARGET button SLOWLY to limit aim disruption.

- c. Take careful aim at the target of interest, and slowly release the TARGET button, maintaining the target in the reticle.

**Notes:** The LTLM will display the target location.

When in TARGET mode, compass azimuth and elevation data are static and are specific to the target data being displayed. Return to RECON mode by pressing the MODE button for real-time azimuth and elevation data updates.

If more than one target was located, the LTLM will assign targets as TGT (x/y) where x is the target detail being displayed and y is the total number of targets the LTLM located. Target display order will be as set in the LTLM configuration. When only one target is located the (x/y) indicator is not displayed.

If more than one target was located, press the GPS button for more than 3 seconds to display the next target. The (x/y) indicator will change accordingly. The (x/y) indicator is present in both the target location field and the target range field.

- d. Repeat steps 10b through 10c to acquire another target.

**Note:** Previous target information will be lost upon release of the TARGET button.

- e. Press the MODE button to return to RECON mode.

11. Conduct fall-of-shot operations.

- a. Ensure that the DVO/LRF lens cap is open for DAY mode operations.

**Note:** If operating in THERMAL mode, ensure that both the DVO/LRF lens cap and the thermal lens cap have been opened.

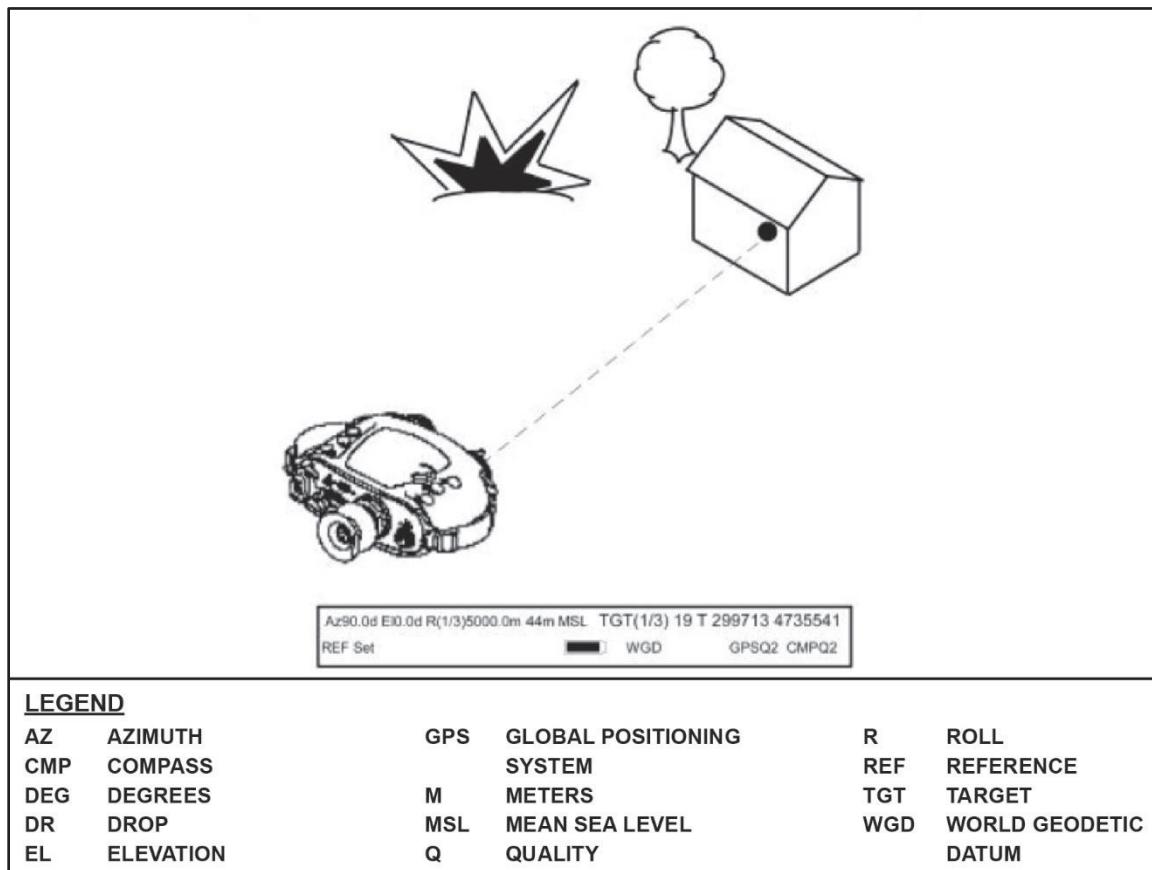
- b. Take careful aim at the target of interest, press and slowly release the TARGET button, maintaining the target in the reticle.

**Note:** The LTLM will display the target location.

- c. Select the desired reference target if more than one target was located.

- d. Press the MODE button for more than 3 seconds to set the selected target as the reference target.

**Note:** Multifunction display will indicate REF set as indicated in figure 3-40.



**Figure 3-40. Example reference target for fall of shot operation**

- e. Take careful aim at the fall of shot, press and slowly release the TARGET button, maintaining the fall of shot in the reticle.

**Note:** The LTLM will display the target location.

- f. Press and release the GPS button until fall-of-shot data is displayed.

**Note:** Fall-of-shot data will be displayed as indicated in figure 3-41, page 3-116. The multifunction field cycles through 4 data sets:

- SLF: Self-location
- Fall of Shot
- Distance and Bearing
- REF: Reference target geolocation

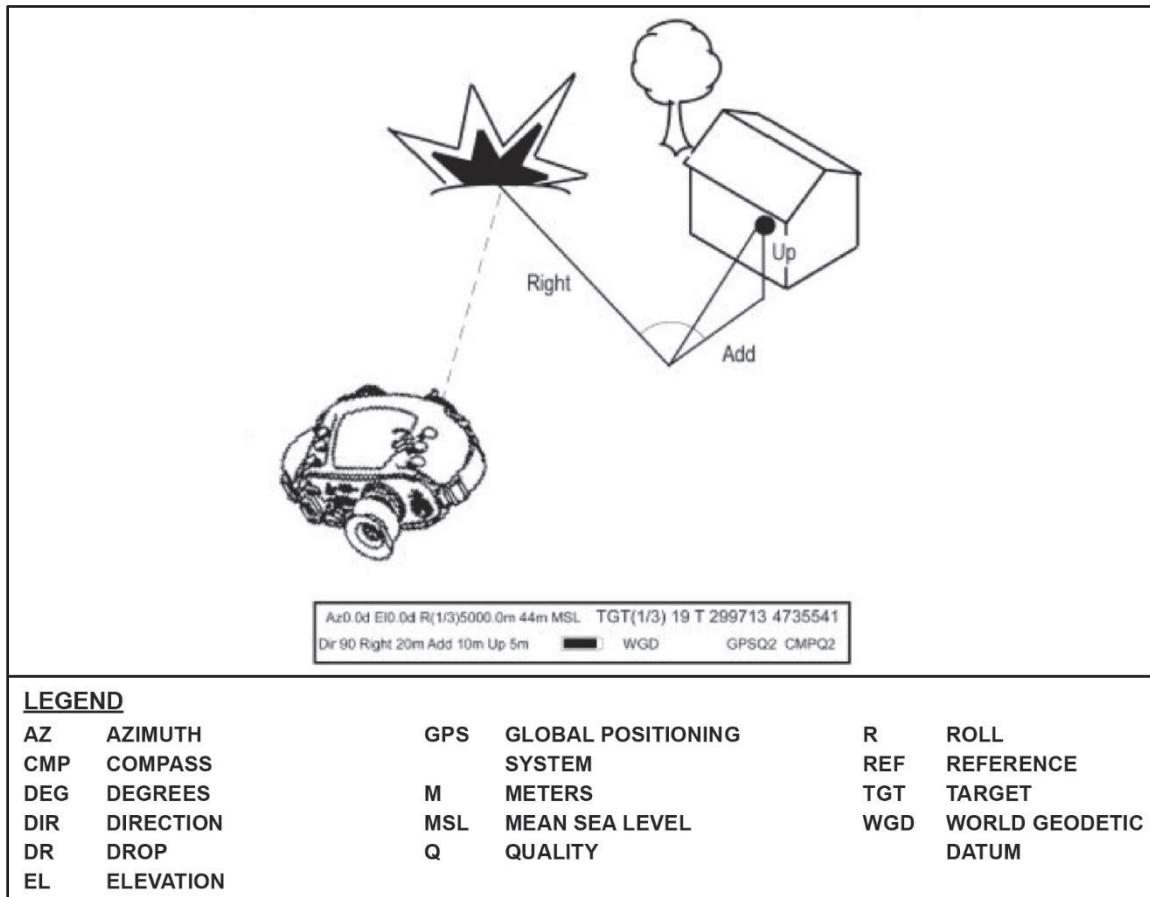
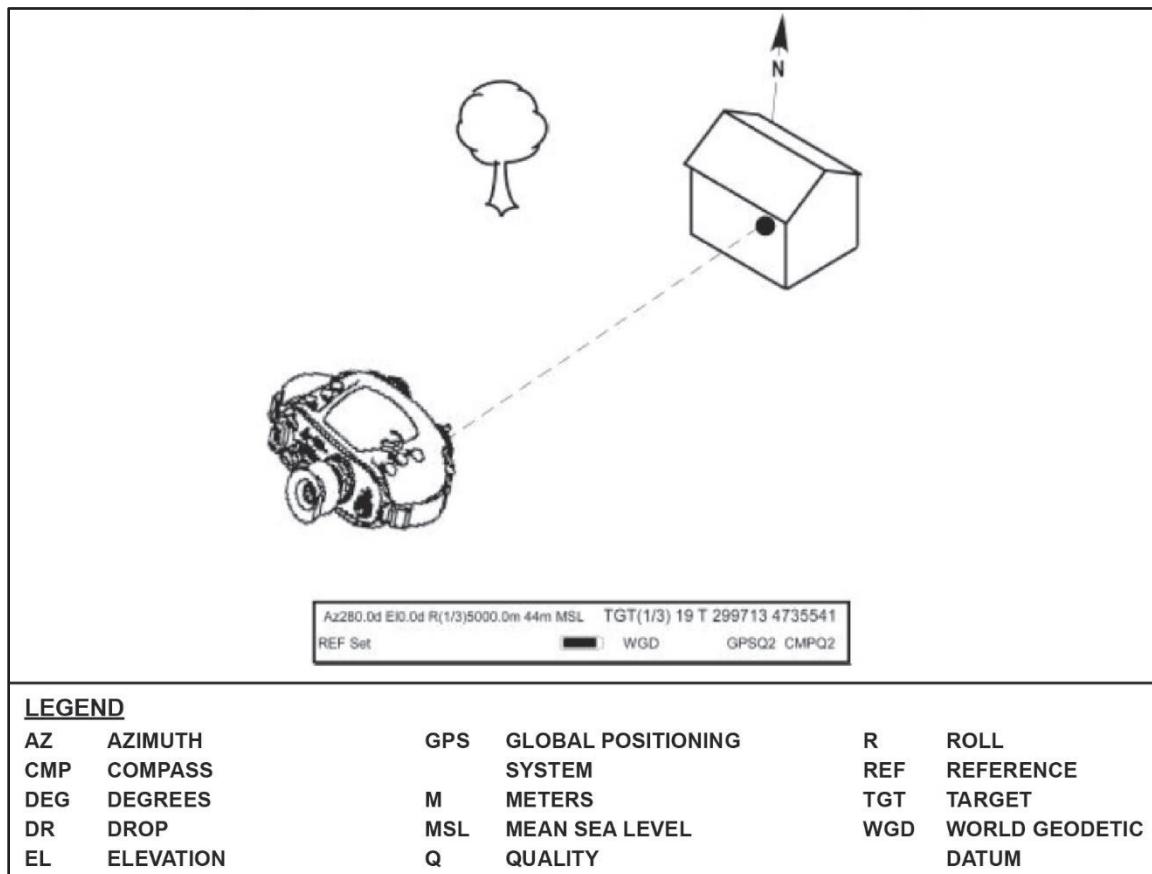


Figure 3-41. Example fall-of-shot data

- g. Repeat step 11e for each additional Fall of Shot.
- h. Set a new reference target by repeating steps 11b through 11d.
- i. Clear the reference target by repeating steps 11b through 11d, but choose a target <50 meters from the LTLM so that the system reports no target.
12. Conduct distance and bearing between points operations.
  - a. Ensure that the DVO/LRF lens cap is open for DAY mode operations.

**Note:** If operating in THERMAL mode, ensure that both the DVO/LRF lens cap and the thermal lens cap have been opened.

- b. Take careful aim at the first point of interest, press and slowly release the TARGET button, maintaining the target in the reticle.
- c. Select the desired reference target if more than one target was located.
- d. Press the MODE button for more than 3 seconds to set the selected target as the reference target. Multifunction display will indicate REF Set as indicated in figure 3-42.

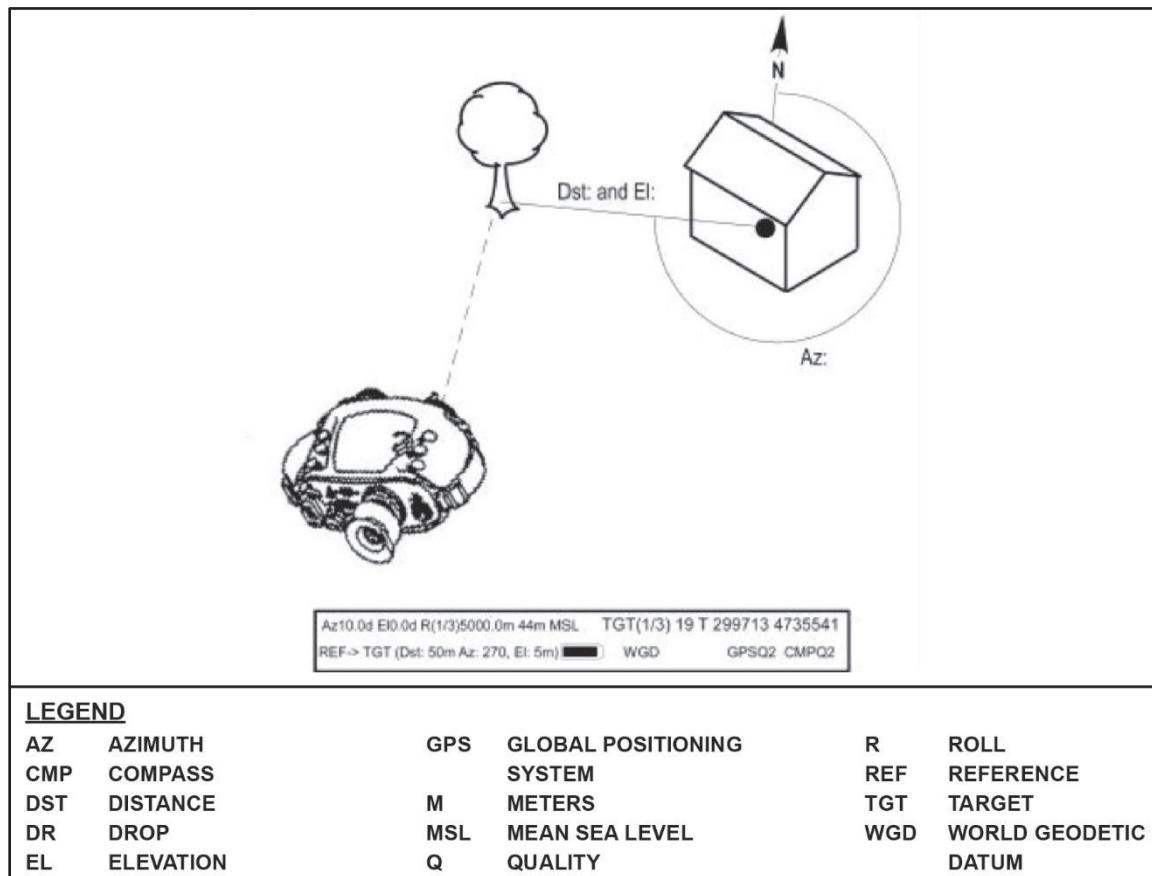


**Figure 3-42. Example reference target for distance and bearing operation**

- e. Take careful aim at the second point of interest, press and slowly release the TARGET button, maintaining the second point of interest in the reticle.
- f. Press and release the GPS button until Distance and Bearing data is displayed.

**Note:** Fall of Shot data will be displayed as indicated in figure 3-43, page 3-118. The multifunction field cycles through 4 data sets:

- SLF: Self location
- Fall of Shot
- Distance and Bearing
- REF: Reference target geolocation



**Figure 3-43. Example data for distance and bearing operation**

- g. Repeat step 13e for each additional distance and bearing from the reference point.
- h. Set a new reference point by repeating steps 13b through 13d.
- i. Clear the reference target by repeating steps 13b through 13d, but choose a target <50 meters from the LTLM so that the system reports no target.

Performance Measures	GO	NO-GO
1. Removed the LTLM from the carrying case.	_____	_____
2. Installed batteries in the main battery cassette.	_____	_____
3. Powered up the LTLM.	_____	_____
4. Adjusted the diopter.	_____	_____
5. Performed a boresight check.	_____	_____
6. Ran a BIT, if necessary.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
7. Acquired SLF.	_____	_____
8. Performed Compass Cal.	_____	_____
9. Placed the LTLM in Thermal Recon mode.	_____	_____
10. Conducted targeting operations.	_____	_____
11. Conducted Fall of Shot operations.	_____	_____
12. Conducted distance and bearing between points operations.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1240-455-10 Operator Manual for Laser Target Locator Module (LTLM) AN/PED-5 NSN 1240-01-590-4552 (EIC: 4XC) (LIN: L05003)	

**071-704-0006**  
**Maintain the Laser Target Locator Module AN/PED-5**

**Conditions:** You are assigned an AN/PED-5 laser target locator module (known as LTLM) and must ensure it is complete and fully operational. You have TM 9-1240-455-10 and DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*).

**Standards:** Conduct preventive maintenance checks and services (PMCS) on the AN/PED-5 in accordance with the technical manual. Record the results of the PMCS on DA Form 2404 or DA Form 5988-E and report system status to immediate supervisor and/or unit maintenance, as required.

**Performance Steps**

1. Conduct PMCS on the AN/PED-5 in accordance with TM 9-1240-455-10.
2. Record results of PMCS on DA Form 5988-E or DA Form 2404.
3. Report operational status of the AN/PED-5 to your immediate supervisor and/or unit maintenance, as required.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Conducted PMCS in accordance with TM 9-1240-455-10.	_____	_____
2. Recorded results of PMCS on DA Form 5988-E or DA Form 2404.	_____	_____
3. Reported operational status of the AN/PED-5 to your immediate supervisor and/or unit maintenance, as required.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-1240-455-10 Operator Manual for Laser Target Locator Module (LTLM) AN/PED-5 NSN 1240-01-590-4552 (EIC: 4XC) (LIN: L05003)
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**171-134-0001**  
**Mount the LRAS3 on an HMMWV**

**Conditions:** You are member of a squad or team mounted on a high mobility multipurpose wheeled vehicle (HMMWV) with vehicle power conditioner-direct current (known as VPC-DC) installed and an AN/TAS-8, long-range advanced scout surveillance system (known as LRAS3). You have been directed to mount the AN/TAS-8, LRAS3 on your vehicle HMMWV.

**Standards:** Mount the LRAS3 yoke on the offset stovepipe, prepare the yoke for mounting the sight sensor, install the sight sensor on the yoke, and connect the mounted power cable.

**Performance Steps**

**WARNING**

**The mounted yoke is heavy. Two people are required to lift and move the mounted yoke. Personnel must exercise care when lifting, mounting, or carrying the mounted yoke to prevent injury.**

**The mounted yoke must be locked in azimuth prior to mounting on the offset stovepipe.**

1. Mount the yoke on the offset stovepipe.
  - a. Unlock the azimuth brake knob by turning it fully counterclockwise.
  - b. Lock the mounted yoke in azimuth by turning the azimuth travel lock ring to release the spring lock.
  - c. Move the mounted yoke slowly in azimuth until the spring lock engages.
  - d. Lock the azimuth brake knob by turning it fully clockwise.
  - e. Lift and place the mounted yoke on the driver's side of the hood.
  - f. Lift the mounted yoke and place it next to the offset stovepipe.
  - g. Release the locking spring.
  - h. Open the coupling clamp handle on the offset stovepipe.
  - i. Remove the weather cap from inside offset stovepipe.
  - j. Route the power cable through the yoke and downward into vehicle.
  - k. Position the yoke over the offset stovepipe.

**CAUTION**

Ensure the detent (notch) in the mounted yoke is mated with the alignment pin inside the offset stovepipe before securing the coupling clamp. Otherwise, the coupling clamp may not properly secure the yoke to the stovepipe and the LRAS3 will not be secured to the vehicle. Injury to personnel or damage to equipment may result.

1. Lower the yoke on the offset stovepipe.
  - m. Position the yoke so that the detent in the yoke aligns with the offset stovepipe.
  - n. Close the offset stovepipe coupling clamp handle to secure the mounted yoke.
  - o. Place the locking spring over the coupling clamp handle.
  - p. Unlock the yoke in azimuth by pulling out and turning the azimuth travel lock ring to the unlocked position.
  - q. Release the azimuth brake knob by turning it fully counterclockwise.
  - r. Ensure the yoke can move smoothly in azimuth in both directions.
  - s. Tighten the azimuth brake knob by turning it fully counterclockwise.
2. Prepare the yoke for mounting the sight sensor.
  - a. Rotate the left-hand elevation trunnions until the elevation trunnion is in the straight up (0 degrees) position.
  - b. Rotate the right-hand elevation trunnions until the elevation trunnions are in the straight up (0 degrees) position.
  - c. Release and rotate elevation trunnion latches to open position.
  - d. Rotate yoke to point toward rear of vehicle and secure using the azimuth brake.

**WARNING**

**The sight sensor is heavy. Two people are required to lift and move the sight sensor. Personnel must exercise care when lifting, mounting, or carrying the sight sensor to prevent injury.**

3. Install the sight sensor on the yoke.
  - a. Press in on the hand release switch on each hand grip.

**CAUTION**

Hand grips can be damaged if they are not rotated in the horizontal detent position prior to lifting, mounting, or carrying the sight sensor.

- b. Rotate the hand grip to the horizontal position.

**CAUTION**

The sight sensor lifting eyes or carrying handle clips may be damaged if the carrying handle clips are not straight up and down when lifting the sight sensor.

- c. Install two carrying handles on the sight sensor.

**WARNING**

**Take care when standing on the hood. The hood can be damaged by standing on an unsupported portion. Make sure you are in a safe and stable position prior to lifting the sight sensor from the hood to the roof to prevent falling or injury.**

- d. Use the carrying handles to carefully lift and place the sight sensor on the driver's side of the hood.
  - e. Use the carrying handles to carefully lift and rotate the sight sensor so the lens is facing the rear of the vehicle.
  - f. Carefully set the sight sensor on the roof of the vehicle next to the yoke.
  - g. Use the carrying handles to carefully position the sight sensor until it is even with the top of the mounted yoke and the lens is pointed toward the rear of the vehicle.
  - h. Align sight sensor v-blocks with yoke elevation trunnions and carefully lower sight sensor on yoke.
  - i. Rotate both elevation trunnions latches to the CLOSED position.
  - j. Secure two carrying handles to the side of the sight sensor with rubber cord shackles by crisscrossing ends and connecting to sight sensor lifting shackles.
  - k. Make sure the sight sensor is securely mounted on the yoke before releasing the sight sensor.
4. Connect the mounted power cable.
- a. Set the sight sensor OFF/STBY/ON switch to OFF.
  - b. Set both of the VPC-DC converter assembly switches to OFF.
  - c. Remove the dust cover from the sight sensor connector 1J1.

- d. Remove the dust cover from the mounted power cable connector.
- e. Connect mounted power cable connector to sight sensor connector 1J1.
- f. Connect mounted power cable connector to sight sensor connector 1J2.
- g. Ensure the power cable plug is securely seated in the yoke.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Mounted the yoke on the offset stovepipe.	_____	_____
2. Prepared the yoke for mounting the sight sensor.	_____	_____
3. Installed the sight sensor on the yoke.	_____	_____
4. Connected the mounted power cable.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	TM 11-5855-310-12&P-1 Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)

TM 9-2320-280-10/TO 36A12-1A-2091-1/TM 2320-10/6B Operator's Manual for Truck, Utility:  
Cargo/Troop Carrier, 1-1/4 TON, 4X4, M998 (NSN 2320-01-107-7155) (EIC: BBD); M998A1 (2320-01-371-9577) (EIC: BBN); Truck, Utility: Cargo/Troop Carrier, 1-1/4 Ton, 4X4, M998A1 NSN 2320-01-371-9577 (EIC: BBN) Truck, Utility: Cargo/Troop Carrier, 1-1/4 ton, 4X4, W/Winch, M1038 NSN 2320-01-107-7156 (EIC: BBE) Truck, Utility: Cargo/Troop Carrier,, 1-1/4 TON, 4X4, W/Winch, M1038A1 NSN 2320-01-371-9578 (EIC: BBP) Truck, Utility: Heavy Variant, 4X4, M1097 NSN 2320-01-346-9317 (EIC: BBM) Truck, Utility: Heavy Variant, 4X4, M1097A1 NSN 2320-01-371-9583 (EIC: BBU) Truck, Utility: Heavy Variant, 4X4, M1097A2, M1097R1 NSN 2320-01-380-8604 (EIC: BB6) Truck, Utility: Heavy Variant, 4X4, M1123 NSN 2320-01-455-9593 (EIC: B6G) Truck, Utility: TOW Carrier, Armored, 1-1/4 TON, 4X4, M966 NSN 2320-01-107-7153 (EIC: BBC) Truck, Utility: TOW Carrier, Armored,, 1-1/4 TON, 4X4, M966A1 NSN 2320-01-372-3932 (EIC: BBX) Truck, Utility: TOW Carrier, Armored,, 1-1/4 TON,

References Required	Primary
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4X4, M1121 NSN 2320-01-456-1282 (EIC: B6H)  
 Truck, Utility: TOW Carrier, W/Supplemental  
 Armor, 1-1/4 TON, 4X4, M1045 NSN 2320-01-146-  
 7191 Truck, Utility: TOW Carrier, W/Supplemental  
 Armor, 1-1/4 TON, 4X4, M1045A1 NSN 2320-01-  
 371-9580 (EIC: BBR) Truck, Utility: TOW Carrier,  
 W/Supplemental Armor,, 1-1/4 TON, 4X4,  
 M1045A2 NSN 2320-01-380-8229 (EIC: BB5)  
 Truck, Utility: TOW Carrier, W/Supplemental  
 Armor, 1-1/4 TON, 4X4, W/Winch, M1046 NSN  
 2320-01-146-7188 Truck, Utility: TOW Carrier,  
 W/Supplemental Armor, 1-1/4 TON, 4X4,  
 W/WINCH, M1046A1 NSN 2320-01-371-9582  
 (EIC: BBT) Truck, Utility: Armament Carrier,  
 Armored, 1-1/4 Ton, 4X4, M1025 NSN 2320-01-  
 128-9551 (EIC: BBF) Truck, Utility: Armament  
 Carrier, Armored, 1-1/4 TON, 4X4, M1025A1 NSN  
 2320-01-371-9584 (EIC: BBV) Truck, Utility:  
 Armament Carrier, Armored, 1-1/4 TON, 4X4,  
 M1025A2, M1025R1 NSN 2320-01-380-8233 (EIC:  
 BB3) Truck, Utility: Armament Carrier, Armored, 1-  
 1/4 TON, 4X4, W/WINCH, M1026 NSN 2320-01-  
 128-9552 (EIC: BBG) Truck, Utility: Armament  
 Carrier, Armored, 1-1/4 Ton, 4X4, W/WINCH,  
 M1026A1 NSN 2320-01-371-9579 (EIC: BBQ)  
 Truck, Utility: Armament Carrier, W/Supplemental  
 Armor, 1-1/4 TON, 4X4, M1043 NSN 2320-01-146-  
 7190 Truck, Utility: Armament Carrier,  
 W/Supplemental Armor, 1-1/4 TON, 4X4, M1043A1  
 NSN 2320-01-372-3933 (EIC: BBY) Truck, Utility:  
 Armament Carrier, W/Supplemental Armor, 1-1/4  
 TON, 4X4, M1043A2 NSN 2320-01-380-8213 (EIC:  
 BB4) Truck, Utility: Armament Carrier,  
 W/Supplemental Armor, 1-1/4 TON, 4X4,  
 W/WINCH, M1044 NSN 2320-01-146-7189 Truck,  
 Utility: Armament Carrier, W/Supplemental Armor,  
 1-1/4 TON, 4X4, W/Winch, M1044A1 NSN 2320-  
 01-371-9581 (EIC: BBS) Truck, Utility: S250  
 Shelter Carrier, 4X4, M1037 NSN 2320-01-146-  
 7193 (EIC: BBK) Truck, Utility: S250 Shelter  
 Carrier,, 4X4, W/Winch, M1042 NSN 2320-01-146-  
 7187 Truck, Ambulance, 2-Litter, Armored, 4X4,  
 M996 NSN 2310-01-111-2275 (EIC: BBB) Truck,  
 Ambulance, 2-Litter, Armored, 4X4, M996A1 NSN  
 2310-01-372-3935 (EIC: BB2) Truck, Ambulance, 4-  
 Litter, Armored, 4X4, M997 NSN 2310-01-111-2274  
 (EIC: BBA) Truck, Ambulance, 4- Litter, Armored,  
 4X4, M997A1 NSN 2310-01-372-3934 (EIC: BBZ)  
 Truck, Ambulance, 4- Litter, Armored, 4X4,  
 M997A2 NSN 2310-01-380-8225 (EIC: BB8) Truck,  
 Ambulance, 2-Litter, Soft Top, 4X4, M1035 NSN  
 2310-01-146-7194 Truck, Ambulance, 2-Litter, Soft  
 Top, 4X4, M1035A1 NSN 2310-01-371-9585 (EIC:

<b>References Required</b>	<b>Primary</b>
	<p>BBW) Truck, Ambulance, 2-Litter, Soft Top, 4X4, M1035A2 NSN 2310-01-380-8290 (EIC: BB9)</p> <p>TM 9-2320-387-10/TO 36A12-1A-3061-1/TM 11033-OR Operator's Manual for Truck, Utility: S250 Shelter Carrier, 4X4, M1113 NSN 2320-01- 412-0143 (EIC B6B) Truck, Utility: Up-Armored Carrier, 4X4, M1114 NSN 2320-01-413-3739 (EIC B6C) Truck, Utility: Expanded Capacity, Armament Carrier, M1151 NSN 2320-01-518-7330 (EIC BA5) Truck, Utility: Expanded Capacity, Armament Carrier, IAP/Armor Ready, M1151A1 NSN 2320-01- 540-2038 (EIC BEG) Truck, Utility: Expanded Capacity, Enhanced, M1152 NSN 2320-01-518-7332 (EIC BA6) Truck, Utility: Expanded Capacity, Enhanced, IAP/Armor Ready, M1152A1 NSN 2320- 01-540-2007 (EIC BEH) Truck, Utility: Command and Control/General Purpose Vehicle, M1165 NSN 2320-01-540-1993 (EIC BEK) Truck, Utility: Command and Control/General Purpose Vehicle, IAP/Armor Ready, M1165A1 NSN 2320-01-540- 2017 (EIC BEJ) Truck, Utility: Expanded Capacity, TOW ITAS Carrier, M1167 NSN 2320-01-544-9638 (EIC BF9) Truck, Ambulance, 4-Litter, 4X4, M997A3 NSN 2310-01-595-3986 Truck, Utility: Expanded Capacity, Armament Carrier, M1151 NSN 2320-01-518-7330 (EIC BA5) Truck, Utility: Expanded Capacity, Armament Carrier, IAP/Armor Ready, M1151A1 NSN 2320-01-540-2038 (EIC BEG) Truck, Utility: Expanded Capacity, Enhanced, M1152 NSN 2320-01-518-7332 (EIC BA6) Truck, Utility: Expanded Capacity, Enhanced, IAP/Armor Ready, M1152A1 NSN 2320-01-540-2007 (EIC BEH) Truck, Utility: Command and Control/General Purpose Vehicle, M1165 NSN 2320-01-540-1993 (EIC BEK) Truck, Utility: Command and Control/General Purpose Vehicle, IAP/Armor Ready, M1165A1 NSN 2320-01-540-2017 (EIC BEJ) Truck, Utility: Expanded Capacity, TOW ITAS Carrier, M1167 NSN 2320-01-544-9638 (EIC BF9) Truck, Ambulance, 4-Litter, 4X4, M997A3 NSN 2310-01- 595-3986, (This Item is Included on EM 0323)</p>

**171-134-0007**  
**Remove the LRAS3 from an HMMWV**

**Conditions:** You are a member of a scout platoon and have been directed to remove the AN-TAS-8, long-range advanced scout surveillance system (known as LRAS3), from a high mobility multipurpose wheeled vehicle (HMMWV) and stow it. You have an assistant and a vehicle load plan or unit standard operating procedures (SOPs).

**Standards:** Remove the LRAS3 from the HMMWV and stow it according to the vehicle load plan or unit SOP. Use the assistant to help lift and carry the LRAS3.

**Performance Steps**

1. Disconnect the mounted power cable, 3W1, from the sight sensor.
  - a. Set the sight sensor OFF-STBY-ON switch to OFF.
  - b. Set the vehicle power conditioner assembly switch to OFF.
  - c. Install the lens cover.
  - d. Disconnect the power cable connector from the sight sensor connector 1J1.
  - e. Install the dust cover on the power cable connector 3W1.
  - f. Install the dust cover from the sight sensor connector 1J1.
  - g. Disconnect mounted power cable connector from sight sensor connector 1J2.
  - h. Install dust cover on power cable connector.
  - i. Install dust cover on sight sensor connector 1J2.
2. Prepare the mounted yoke for dismounting of the sight sensor.
  - a. Unlock the elevation brake knob by turning it fully counterclockwise.
  - b. Rotate the sight sensor until the yoke elevation trunnions are in the straight up (0 degrees) position.
  - c. Move the sight sensor slowly in elevation until the spring lock engages.
  - d. Lock the elevation brake knob by turning it fully clockwise.
  - e. Unlock the yoke in azimuth by pulling out and turning the azimuth travel lock ring to the unlocked position.
  - f. Unlock the brake knob by turning it fully counterclockwise.
  - g. Rotate the yoke so that the azimuth brake knob is pointed toward the front of the vehicle.
  - h. Lock the azimuth brake knob by turning it fully clockwise.
  - i. Release and rotate the elevation trunnion latches to the open position.

**WARNING**

**The sight sensor is heavy and requires two people to lift and move it. Personnel must exercise care when lifting, mounting, or carrying the sight sensor to prevent injury.**

3. Remove the sight sensor from vehicle.

**CAUTION**

The hand grips can be damaged if they are not rotated in the horizontal detent position prior to lifting, mounting, or carrying the sight sensor.

- a. Press in on each hand grip release switch and rotate the hand grip to the horizontal detent position.

**WARNING**

**Do not attempt to lift/carry the sight sensor with the carrying handles secured to the sight sensor with the rubber cord. The rubber cord could break, causing injury to personnel.**

- b. Disconnect two carrying handles rubber cord shackles from the sight sensor lifting shackles.

**WARNING**

**Do not attempt to lift/carry the sight sensor with the carrying handles secured to the sight sensor with the rubber cord. The rubber cord could break, causing injury to personnel.**

- c. Use the carrying handles carefully to lift the sight sensor up and out of the mounting yoke.

**CAUTION**

Stand only on the supported portion of the hood. It can be damaged by standing on an unsupported portion of the hood.

- d. Place the sight sensor on the hood of the vehicle.
- e. Use the carrying handles to carefully lift the sight sensor from the vehicle.
- f. Secure two carrying handles to the side of the sight sensor with rubber cord shackles by crisscrossing the ends and connecting them to the lifting shackles.

4. Stow the LRAS3 according to the vehicle load plan or SOP.

Performance Measures	GO	NO-GO
1. Disconnected the mounted power cable, 3W1, from the sight sensor.	<hr/>	<hr/>
2. Prepared the mounted yoke for dismounting of the sight sensor.	<hr/>	<hr/>
3. Removed the sight sensor from vehicle.	<hr/>	<hr/>
4. Stow the LRAS3 according to the vehicle load plan or SOP.	<hr/>	<hr/>

References Required	Primary
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	TM 11-5855-310-12&P-1 Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)

**171-157-0001**  
**Install LRAS3 on a Reconnaissance Vehicle**

**WARNING**

**The long-range advanced scout surveillance system (known as LRAS3) and the mounted yoke are two-man lifts and should be lifted as individual components.**

**Conditions:** You are a crewmember of a reconnaissance vehicle (known as RV) and you have been directed to install the AN/TAS-8, LRAS3, on the vehicle in preparation for a mission. You have another crewmember to assist. The AUTO and AUX MASTER switches are set to the ON position.

**Standards:** Mount the RV davit, remove the LRAS3 from stowage, install and power up the LRAS3 on the RV.

**Performance Steps**

1. Mount the davit.

a. Power up the cupola.

**WARNING**

**Before traversing the cupola, alert personnel and ensure the area is clear. Moving the cupola can cause injury to personnel and/or damage to equipment.**

b. Traverse the cupola so that the LRAS3 cupola mounting point is at the 9 o'clock position.

c. Engage the cupola lock.

d. Power down the cupola.

e. Set the vehicle power conditioner (known as VPC) power switch on the commander's panel to OFF.

f. Mount the davit.

(1) Mount the single-piece davit.

(a) Remove the retaining pin securing the davit mount in the stowed position.

(b) Lift the davit mount to the upright position.

(c) Secure the davit by inserting the retaining pin into the hole.

(d) Insert the davit pole into the davit mount with the pulley over the left side of the RV.

(e) Crank the winch handle counterclockwise until the cable is slack.

(f) Remove the lifting hook from the stowed position on the davit pole.

- (g) Crank the winch handle clockwise to verify the winch brake is working.

**Note:** If you do not hear a clicking sound, the winch brake is not functioning correctly. Do not use the davit. Notify unit maintenance if the winch brake is not functioning.

- (h) Crank the winch handle counterclockwise until the cable is 3 feet (1 meter) from the ground.
- (i) Install spreader bar on lifting hook on the davit.

**Note:** Spreader bar is stowed in the right side exterior rack.

- (2) Mount the dual-piece davit.
  - (a) Remove mast assembly and boom assembly from stowage.
  - (b) Install mast assembly in mast mounting bracket.

### **WARNING**

**When carrying the boom assembly ensure that the boom assembly arm is pointing toward the center of the vehicle. Failure to do so may result in loss of balance.**

- (c) Install boom assembly in mast assembly.
- (d) Rotate boom assembly over the left side of the vehicle.
- (e) Crank the winch handle counterclockwise until the davit cable is slack.

### **WARNING**

**When winching, ensure that the cable release mechanism is not engaged.**

**If clicking sound is not heard when winching, the automatic brake is not functioning properly. DO NOT use davit.**

**Never place winch in freewheel mode if any potential load exists on cable. Engaging the lockout lever prevents the winch from stopping.**

- (f) Crank winch handle clockwise to verify that the winch brake is functioning correctly.

**Note:** Davit winch is equipped with a lockout lever for freewheeling cable out when there is no load on the winch. To freewheel cable out, turn winch handle counterclockwise until lockout lever can be engaged behind handle hub. In this condition, the cable can be easily pulled from the winch drum. Sufficient load must be applied to the cable to overcome internal resistance and operate the brake properly; otherwise, turning the winch handle counterclockwise will only remove the winch handle from the shaft.

- (g) Crank the winch handle counterclockwise until the davit cable is 3 feet (1 meter) from the ground.

- (h) Install spreader bar on lifting hook on the boom assembly.

**Note:** Spreader bar is stowed in the right-side exterior rack.

- g. Open ramp.

**WARNING**

**Exercise care when lifting, mounting, or carrying the LRAS3 to prevent injury. The LRAS3 is heavy and two people are required to lift and move it.**

2. Prepare LRAS3.

**Note:** It may be necessary to move stowage items to remove the LRAS3 from the RV.

**CAUTION**

Handgrips can be damaged if they are not rotated in the horizontal detent position prior to lifting, mounting, or carrying the LRAS3.

- a. Press in on the hand release switch on each handgrip of the LRAS3 and rotate the handgrip to the horizontal position.
- b. Rotate the elevation trunnion latches to the open position.

**CAUTION**

LRAS3 lifting shackles may be damaged if lifting shackles are not straight up and down when lifting.

- c. Using the carrying handles, carefully lift and place the LRAS3 on the left side of the RV close to the davit cable.
- d. Remove carrying handles from LRAS3 and stow in the vehicle.
- e. Rotate and hold the spring lock and release the marmon clamp on the bottom of the yoke in the RV.

**WARNING**

**Yoke is heavy. Two personnel are required to lift and move yoke. Personnel must exercise care when lifting, mounting or carrying yoke to prevent injury.**

- f. With an assistant, lift the yoke carefully and place in front of the vehicle.

- g. Stow the marmon clamp in the troop seat.
3. Mount the yoke on the RV cupola.
  - a. Unlock the azimuth brake knob by turning it fully counterclockwise.

**Note:** The yoke must be locked in azimuth position prior to mounting on cupola mount.

- b. Lock the yoke in azimuth by turning the azimuth travel lock ring to release the spring lock.
- c. Move the yoke slowly in azimuth until the spring lock engages.
- d. With assistance of a second person, move yoke up to two personnel standing on top of the vehicle nose.
- e. Place yoke on top of the vehicle next to the cupola stovepipe mount.
- f. Release the locking spring and open the coupling clamp handle on the cupola stovepipe.
- g. Remove the power cable and signal cable from cupola stovepipe mount and pass through the center of yoke.
- h. With assistance, position the yoke over the cupola stovepipe mount and carefully lower the yoke so that the azimuth brake knob is facing the cupola interior.

**CAUTION**

Ensure that cables are not crushed as the yoke is lowered onto the cupola stovepipe mount.

- i. Close the coupling clamp handle to secure the yoke.
  - j. Place the locking spring over the coupling clamp handle.
  - k. Unlock the yoke from azimuth by pulling out and turning the azimuth travel lock ring to the unlocked position.
  - l. Release the azimuth brake knob by turning it fully counterclockwise.
  - m. Verify the yoke can move smoothly in azimuth in both directions.
  - n. Position the mounted yoke so the azimuth brake knob is pointed toward the left side of the RV.
4. Install the LRAS3 on the yoke.

**Note:** Figure 3-44, page 3-134, identifies components of the single-piece davit and the dual-piece davit.

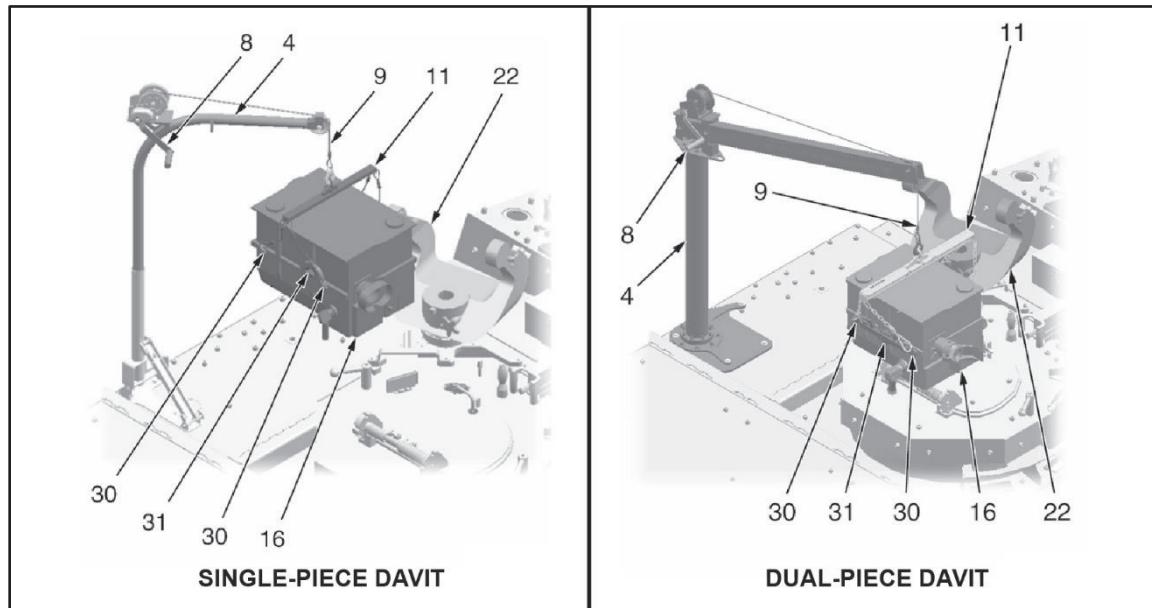


Figure 3-44. Davits

**WARNING**

**Do not stand on or use the cupola or the yoke as a handhold.**

**Davit shall only be used to lift the LRAS3.**

**Ensure personnel stay clear while using the davit.**

- a. Position the davit sling over the LRAS3.
- b. Lower the davit cable.
- c. Position spreader bar (see figure 3-44, item 11), attached to davit cable (see figure 3-44, item 9), over LRAS3 (see figure 3-44, item 16).
- d. Connect chains on spreader bar (see figure 3-44, item 11) to LRAS3 lifting shackles (see figure 3-44, item 30).
- e. Winch LRAS3 (see figure 3-44, item 16) up by cranking the winch handle (see figure 3-44, item 8) clockwise to ensure that V-blocks (see figure 3-44, item 31) on LRAS3 are clear of yoke (see figure 3-44, item 22).
- f. Turn the davit (see figure 3-44, item 4) so that LRAS3 lens cover is facing the right side of the vehicle.
- g. Pull on the spreader bar (see figure 3-44, item 11) until LRAS3 (see figure 3-44, item 16) is over the yoke (see figure 3-44, item 22).
- h. Align the LRAS3 (see figure 3-44, item 16), with cupola and yoke (see figure 3-44, item 22), in order to slide the LRAS3 through the yoke arms.
- i. Open elevation trunnion latches and level the trunnions.

- j. Align V-blocks (see figure 3-44, item 31) on the LRAS3 (see figure 3-44, item 16) with yoke trunnions (see figure 3-44, item 32) and carefully lower the LRAS3 onto the yoke (see figure 3-44, item 22) by cranking the winch handle (see figure 3-44, item 8) counterclockwise.
  - k. Rotate both trunnion latches (see figure 3-44, item 18) counterclockwise to closed position.
  - l. Remove the spreader bar (see figure 3-44, item 11) from the LRAS3 lifting shackles (see figure 3-44, item 30) and the lifting hook (see figure 3-44, item 10) and stow on the vehicle.
5. Stow the davit.
- a. Stow single-piece davit.
    - (1) Crank the winch handle clockwise until 1 to 2 feet (0.3 to 0.6 meters) of winch wire is left.
    - (2) Attach the lifting hook from the davit cable to the davit pole.
    - (3) Crank the winch handle clockwise until the slack is removed.
    - (4) Lift up on the davit pole and remove it from the mounting bracket.
    - (5) Secure the davit pole on top of the RV.
    - (6) Remove the retaining pin securing the davit mount in position.
    - (7) Fold the davit mount down.
    - (8) Insert the retaining pin into the mount.
  - b. Stow dual-piece davit.
    - (1) Crank the winch handle until 3 feet (1 meter) of davit cable is left hanging from the boom assembly.
    - (2) Attach lifting hook to boom assembly and crank winch handle clockwise until davit cable slack is removed.
    - (3) Have an assistant hold the mast assembly.
    - (4) Lift the boom assembly from the mast and stow on top of the vehicle.
    - (5) Remove the mast assembly from the mast mounting bracket and stow mast assembly on top of the vehicle.
6. Connect the mounted power cable and signal cable.
- a. Ensure the VPC power switch is set to OFF on the commander's panel.
  - b. Set the LRAS3 OFF/STBY/ON switch to OFF.
  - c. Remove the dust cover from the LRAS3 connector J1.
  - d. Remove power cable from dummy connector on the cupola stovepipe mount.
  - e. Connect power cable to J1 connector on LRAS3.

- f. Remove signal cable from dummy connector on cupola stovepipe mount.
  - g. Remove dust cover from J2 connector on LRAS3.
  - h. Connect the signal cable to J2 connector on the LRAS3.
  - i. Install dust covers on dummy connectors and on the cupola stovepipe mount.
  - j. Ensure the power cable plug is securely seated in the yoke.
7. Power up the LRAS3.
    - a. Power up the cupola.
    - b. Turn on the 220 volts direct current (vdc) inverter and set it to the POWER SAVE mode.

**Notes:** The 220-vdc inverter provides the necessary power to operate the LRAS3.

Operating the LRAS3 for long periods, without engine on, will drain the RV's auxiliary batteries.

- c. Set the VPC switch on the commander's panel to the ON position.
- d. Set the LRAS3 OFF/STBY/ON switch to the ON position.
- e. Ensure the LRAS3 is powered up.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Mounted the davit.	_____	_____
2. Prepared LRAS3 for mounting.	_____	_____
3. Mounted the yoke on the RV cupola.	_____	_____
4. Installed the LRAS3 on the yoke.	_____	_____
5. Stowed the davit.	_____	_____
6. Connected the power cable and signal cable.	_____	_____
7. Powered up the LRAS3.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-13&P for Stryker Family of Vehicles (this item is included on EM 0269)	TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-2355-01-481-8572) (EIC: AFG) Stryker
TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 (2355-01-481-8572) (EIC: AFG) Stryker	TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-2355-01-481-8572) (EIC: AFG) Stryker

<b>References Required</b>	<b>Primary</b>
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 OF 3 Reconnaissance/Scout Vehicle (RV) M1127 (NSN: 2355-01-481-8572) (EIC: AFG) Stryker	

**171-157-0002**  
**Remove LRAS3 from Reconnaissance Vehicle**

**WARNING**

**Do not lift any objects other than the long-range advanced scout surveillance system (known as LRAS3) with the davit. Injury to personnel or damage to equipment or the reconnaissance vehicle (known as RV) may result.**

**The LRAS3 and yoke are heavy. Each require two personnel to lift and carry.**

**Conditions:** You are a crewmember on a RV and have been directed to remove the AN/TAS-8 LRAS3 from the RV. The AUTO and AUX MASTER switches are set to the ON position and the vehicle's basic issue items are on hand. There is another crewmembers to assist you.

**Standards:** Remove the LRAS3 from the RV using the davit. Stow the LRAS3 on the RV.

**Performance Steps**

1. Mount the davit.
  - a. Power up the cupola.
    - (1) Traverse the cupola so that the LRAS3 cupola mounting point is at the 9 o'clock position.
    - (2) Engage the cupola lock.
    - (3) Power down the cupola.
  - b. Set the LRAS3 OFF/STBY/ON switch to OFF.
  - c. Set the vehicle power conditioner switch to OFF.
  - d. Mount the davit.
    - (1) Mount the single-piece davit.
      - (a) Remove the retaining pin securing the davit mount in the stowed position.
      - (b) Lift the davit mount to the upright position.
      - (c) Secure the davit by inserting the retaining pin into the hole.
      - (d) Insert the davit pole into the davit mount with the pulley over the LRAS3.
      - (e) Crank the winch handle counterclockwise until the cable is slack.
      - (f) Remove the lifting hook from the stowed position on the davit pole.

**WARNING**

**If you do not hear a clicking sound when cranking the winch handle, the winch brake is not functioning correctly. Do not use the davit.**

- (g) Crank the winch handle clockwise and ensure the winch brake is working.

**Note:** If no clicking sound is heard, the winch brake is not functioning correctly. Do not use the davit and notify unit maintenance.

- (h) Crank the winch handle counterclockwise until the cable hook is 1 foot (0.3 meters) from the top of the LRAS3.

**Note:** Spreader bar is stowed in the right side, exterior rack.

- (i) Install spreader bar on lifting hook.
- (2) Mount the dual-piece davit.
  - (a) Remove mast assembly and boom assembly from stowage.
  - (b) Install mast assembly in mast mounting bracket.

**WARNING**

**When carrying the boom assembly, ensure that the boom assembly arm is pointing toward the center of the vehicle. Failure to do so may result in loss of balance.**

- (c) Install boom assembly in mast assembly.
- (d) Rotate boom assembly over the LRAS3.
- (e) Crank winch handle counterclockwise until davit cable is slack.

**WARNING**

**When winching, ensure that the cable release mechanism is not engaged. If clicking sound is not heard when winching, the automatic brake is not functioning properly. Do not use davit.**

**Never place winch in freewheel mode if any potential load exists on cable.**

- (f) Crank winch handle clockwise to verify that the winch brake is functioning correctly.

**Notes:** The davit winch is equipped with a lockout lever for freewheeling cable out when there is no load on the winch. To freewheel cable out, turn winch handle counterclockwise until lockout lever can be engaged behind handle hub. In this condition, the cable can be easily pulled from the winch drum.

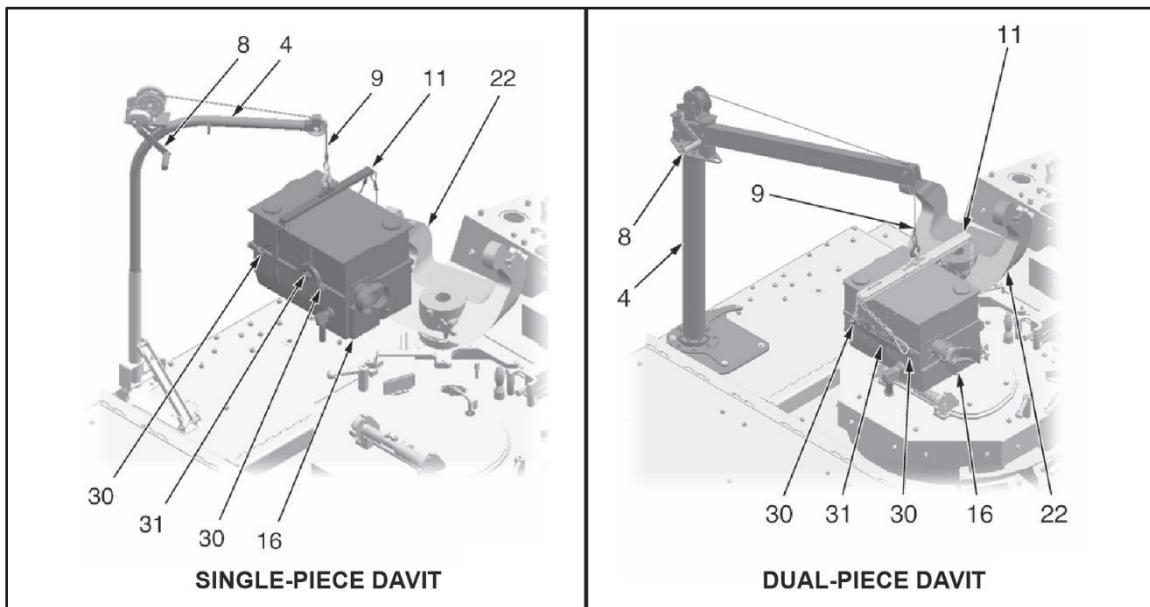
Sufficient load must be applied to the cable to overcome internal resistance and operate the brake properly; otherwise, turning the winch handle counterclockwise will only remove winch handle from shaft.

- (g) Crank winch handle counterclockwise until the cable hook is 1 foot (0.3 meters) from the top of the LRAS3

**Note:** Spreader bar is stowed in the right side exterior rack.

- (h) Install spreader bar on lifting hook.
- e. Open ramp.
  2. Disconnect the power cable and signal cable.
    - a. Disconnect power cable from J1 connector on LRAS3.
    - b. Install the dust cover on the LRAS3 J1 connector.
    - c. Disconnect the signal cable from J2 connector on LRAS3.
    - d. Install dust cover on the LRAS3 J2 connector.
    - e. Install the dust covers on the power and signal cables.
    - f. Install the lens cover.
  3. Prepare the yoke for removal of the LRAS3.
    - a. Unlock yoke in elevation position by pulling out and turning elevation travel lock ring.
    - b. Unlock the elevation trunnion brake knob by turning it fully counterclockwise.
    - c. Rotate the LRAS3 in elevation until trunnion latches are in the UP position and the LRAS3 is level.
    - d. Lock trunnion latches in elevation by turning elevation travel lock ring to release spring lock.
    - e. Move the LRAS3 slowly in elevation until the spring lock engages.
    - f. Lock the elevation brake knob by turning it fully clockwise.
    - g. Unlock the yoke in azimuth by pulling out and turning the azimuth travel lock ring to the unlocked position.
    - h. Unlock the brake knob by turning it fully counterclockwise.
    - i. Rotate the yoke so that the azimuth brake knob faces the 9 o'clock position.
    - j. Lock the azimuth brake knob by turning it fully clockwise.
    - k. Release and rotate trunnion latches to the open position.

4. Remove the LRAS3 from the RV. (See figure 3-45.)



**Figure 3-45. Davits**

**CAUTION**

Handgrips can be damaged if they are not rotated in the horizontal detent position prior to lifting, mounting, or carrying the LRAS3.

- Press in on each handgrip release switch and rotate the handgrip to the horizontal detent position.
- Position spreader bar (see figure 3-45, item 11), attached to davit cable (see figure 3-45, item 9), over LRAS3 (see figure 3-45, item 16).
- Lower the davit cable.

**CAUTION**

The LRAS3 lifting eyes or lifting handle clips may be damaged if the lifting handle clips are not straight up and down when lifting the LRAS3.

- Connect chains on spreader bar (see figure 3-45, item 11) to LRAS3 lifting shackles (see figure 3-45, item 30).

**WARNING**

**Injury to personnel or damage to equipment may result if the winch brake fails and personnel are positioned below the davit.**

**Should the winch brake fail during winching, release the winch handle. Failure to do so may result in injury to personnel.**

- e. Winch LRAS3 (see figure 3-45, item 16, page 3-141) up by cranking winch handle (see figure 3-45, item 8, page 3-141) clockwise to ensure that V-blocks (see figure 3-45, item 31, page 3-141) on the LRAS3 are clear of the yoke (see figure 3-45, item 22, page 3-141).
  - f. Rotate davit (see figure 3-45, item 4), LRAS3 (see figure 3-45, item 16, page 3-141) and yoke (see figure 3-45, item 22, page 3-141) in order to slide LRAS3 (see figure 3-45, item 16, page 3-141) clear of yoke.
  - g. Rotate davit (see figure 3-45, item 4, page 3-141) until the LRAS3 (see figure 3-45, item 16, page 3-141) is over the side of the vehicle with the lens pointing toward the rear.
  - h. Crank winch handle (see figure 3-45, item 8, page 3-141) counterclockwise until LRAS3 (see figure 3-45, item 16, page 3-141) is on ground.
  - i. Remove spreader bar (see figure 3-45, item 11, page 3-141) from lifting shackles (see figure 3-45, item 30) and lifting hook (see figure 3-45, item 10, page 3-141).
  - j. Stow spreader bar (see figure 3-45, item 11, page 3-141).
5. Remove the yoke from the RV.

**WARNING**

**Two personnel are required to lift and move yoke. Exercise care when lifting, mounting, or carrying yoke to prevent injury.**

- a. With assistance of a third person, steady the yoke.
- b. Release the locking spring and open coupling clamp handle on the cupola stovepipe mounting bracket.
- c. While the second person lifts the yoke, pull the power cable and signal cable through center of the yoke, and stow excess cables in cupola stovepipe mounting bracket.
- d. Connect power cable and signal cable to the dummy connectors on the cupola stovepipe mounting bracket.
- e. Close coupling clamp handle on cupola stovepipe mounting bracket and place locking spring over coupling clamp handle.
- f. With assistance of a second person, move the yoke to the nose of the vehicle and lower it down to two personnel on the ground.

6. Stow the LRAS3 in the RV.
  - a. Remove marmon clamp from stowage.
  - b. Rotate spring lock, open coupling clamp handle, release marmon clamp and place on top of interior stovepipe mount in vehicle.
  - c. With assistance of a second person, move yoke into vehicle and place on interior stovepipe mount so azimuth brake knob faces rear of vehicle.
  - d. Slide marmon clamp up onto bottom of yoke, close coupling clamp handle and rotate spring lock to lock marmon clamp.
  - e. Ensure that trunnion latches are in open position.
  - f. Using carrying handles and with assistance of second person, move LRAS3 into vehicle.
  - g. Align v-blocks on LRAS3 and carefully lower LRAS3 onto yoke, ensure the lens is facing front of vehicle.
  - h. Rotate trunnion latches to closed position and secure.
  - i. Remove carrying handles from lifting shackles and handle detents on LRAS3 and stow.
7. Stow the davit.
  - a. Stow single-piece davit.
    - (1) Crank the winch handle clockwise until 1 to 2 feet (0.3 to 0.6 meters) of winch wire is left.
    - (2) Attach the lifting hook from the davit cable to the davit pole.
    - (3) Crank the winch handle clockwise until the slack is removed.
    - (4) Lift up on the davit pole and remove it from the mounting bracket.
    - (5) Secure the davit pole on top of the RV.
    - (6) Remove the retaining pin securing the davit mount in position.
    - (7) Fold the davit mount down.
    - (8) Insert the retaining pin into the mount.
  - b. Stow dual-piece davit.
    - (1) Crank winch handle until 3 feet (1 meter) of davit cable is left hanging from boom assembly.
    - (2) Attach lifting hook to boom assembly and crank winch handle clockwise until davit cable slack is removed.
    - (3) Have assistant hold mast assembly.
    - (4) Lift boom assembly from mast and stow on top of vehicle.

(5) Remove mast assembly from mast mounting bracket and stow mast assembly on top of vehicle.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Mounted the davit.	_____	_____
2. Disconnected the mounted power cable and the signal cable.	_____	_____
3. Prepared the yoke for removal of the LRAS3.	_____	_____
4. Removed the LRAS3 from the RV.	_____	_____
5. Removed the yoke from the RV.	_____	_____
6. Stowed the LRAS3 in the RV.	_____	_____
7. Stowed the davit.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)	TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 (2355-01-481-8572) (EIC: AFG) Stryker
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 OF 3 Reconnaissance/Scout Vehicle (RV) M1127 (NSN: 2355-01-481-8572) (EIC: AFG) Stryker	

**171-134-0002****Prepare the LRAS3 for Operation in Dismounted (Tripod) Configuration**

**Conditions:** You are a crewmember in a field environment with an ANTAS-8, long-range advanced scout surveillance system (known as LRAS3), a tripod and yoke, battery box with 12 batteries, and an assistant. You must prepare the LRAS3 for operation in the dismounted (tripod) configuration.

**Standards:** Set up the LRAS3 in the dismounted tripod configuration so it is ready for operation.

**Notes:** The LRAS3 should be set-up in a position where satellite signal strength will not be lost due to foliage, terrain, or large structures.

Some iterations of this task should be performed using night vision goggles.

**Performance Steps****WARNING**

**Do not set up the tripod-dismounted yoke on a surface with a slope greater than 20 degrees. The LRAS3 can tip over and cause injury or damage to the equipment.**

1. Set up the tripod-dismounted yoke.

**WARNING**

**Make sure that each of the tripod legs are secured in one of the three detent positions by the latch at the top of each leg. Also make sure that the adjustment knobs are fully tightened after proper setup. Failure to do so may cause the sensor and tripod to tip over and cause damage or injury.**

- a. Position the tripod-dismounted yoke for set up so that one leg is pointed in the direction of the area of interest.

**Note:** The tripod legs have three detent positions. In the widest position, the legs are parallel to the ground.

- b. Release the latches and unfold the tripod legs to the desired detent position.
- c. Unsnap the dismounted yoke by folding the arms retaining strap.
- d. Release the latches and unfold the yoke arms until they latch in the upright position.
- e. Loosen the tripod leg locks by turning them counterclockwise.
- f. Extend the tripod legs so that the tripod-dismounted yoke is at the desired height for the sight sensor mounting and viewing.
- g. Secure the tripod legs by turning the knobs fully clockwise.

- h. Put weight on the tripod feet to force extension into the ground.
  - i. Check that the tripod-dismounted yoke is securely positioned and can hold the sight sensor's weight.
2. Prepare the dismounted yoke for sight sensor mounting.
    - a. Unlock the dismounted yoke in azimuth by turning the azimuth brake knob counterclockwise.
    - b. Make sure the dismounted yoke can rotate in azimuth.
    - c. Lock the dismounted yoke in azimuth by turning the azimuth brake knob fully clockwise.
    - d. Unlock the elevation brake lock by turning it fully counterclockwise.
    - e. Rotate both elevation trunnions to the straight up (0 degrees) position.
    - f. Lock the elevation brake knobs by turning them fully clockwise.

**WARNING**

**The sight sensor is heavy. Two people are required to lift and move the sight sensor. Personnel must exercise care when lifting, mounting, or carrying the sight sensor to prevent injury to personnel or damage to equipment.**

3. Mount the sight sensor on the tripod-dismounted yoke.
  - a. On each hand grip, press in on the hand switch and rotate the hand grip to the horizontal position.

**CAUTION**

The sight sensor lifting eyes or lifting strap clips may be damaged if the lifting strap clips are not straight up and down when lifting the sight sensor.

- b. Using the lifting straps, carefully position the sight sensor even with the top of the tripod-dismounted yoke with the window pointed toward the area of interest.

**WARNING**

**Make sure that the sight sensor is securely mounted on the tripod-dismounted yoke before releasing the sight sensor.**

- c. Align the sight sensor yoke mountings with the dismounted yoke elevation trunnions and carefully lower the sight sensor on the dismounted yoke.
- d. Move the rear lifting strap clips to the front lifting shackles.

4. Connect the dismounted power cable W2.
  - a. Position the battery box on the ground near the base of the tripod.
  - b. Set the sight sensor OFF-STBY-ON switch to OFF.
  - c. Set the battery box ON-OFF switch to OFF.
  - d. Remove the dust cover from the battery box connector J1.

**CAUTION**

There are two types of connectors present on the dismounted power cable W2. Use care when removing or installing the cable W2 to avoid damaging connectors.

- e. Remove the dust cover from the dismounted power box cable connector 2W2P2.
- f. Connect the dismounted power cable connector W2P2 to the battery box connector J1.
- g. Feed the dismounted power cable connector W2P1 up through the tripod-dismounted yoke opening.
- h. Remove the dust cover from the sight sensor connector J1.
- i. Remove the dust cover from the dismounted power cable connector W2P1.
- j. Connect the dismounted power cable connector W2P1 to the sight sensor connector.

Performance Measures	GO	NO-GO
1. Set up the tripod-dismounted yoke.	_____	_____
2. Prepared the dismounted yoke for sight sensor mounting.	_____	_____
3. Mounted the sight sensor on the tripod-dismounted yoke.	_____	_____
4. Connected the dismounted power cable W2.	_____	_____

References Required	Primary
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TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)

**171-134-0008**  
**Remove the LRAS3 from the Tripod**

**Conditions:** You are a member of a scout platoon conducting dismounted operations and have been directed to take down and pack the AN/TAS-8, long-range advanced scout surveillance system (known as LRAS3), in a vehicle in preparation for movement. You have a vehicle load plan or standard operating procedures (SOPs) and another Soldier to assist.

**Standards:** Disconnect the dismounted power cable 2W2, dismount the sight sensor from the tripod/dismounted yoke, break down the tripod/dismounted yoke, and stow all equipment used according to the vehicle load plan or SOP.

**Notes:** Some iterations of this task should be performed using night vision goggles.

The LRAS3 major components in the dismounted tripod configuration include the sight sensor, tripod/dismounted yoke, yoke section, leg section, battery box, and the dismounted power cable W2.

**Performance Steps**

1. Disconnect the power cable.
  - a. Set the sight sensor OFF/STBY/ON switch to OFF.
  - b. Set the battery box ON/OFF switch to OFF.
  - c. Install the lens cover.
  - d. Lock the yoke in azimuth by turning the azimuth brake knob fully clockwise.
  - e. Lock the yoke in elevation by turning the elevation brake knob fully clockwise.
  - f. Disconnect the power cable connector 2W2P1 from the sight sensor connector J1.
  - g. Install the dust cover on the power cable connector 2W2P1.
  - h. Install the dust cover on the sight sensor connector J1.
  - i. Pull the dismounted power cable down through the tripod/dismounted yoke opening.
  - j. Disconnect the power cable connector 2W2P2 from the battery box connector J1.
  - k. Install the dust cover on the power cable connector 2W2P2.
  - l. Install the dust cover on the battery box connector J1.
  - m. Move the battery box and power cable clear of the tripod/dismounted yoke.
2. Dismount the sight sensor from the tripod/dismounted yoke.
  - a. Unlock the yoke in elevation by turning the elevation brake knob fully counterclockwise.
  - b. Rotate the sight sensor in elevation until the yoke elevation trunnions are in the straight up (0 degrees) position and lock in place by turning the elevation brake knob fully clockwise.

- c. Press in on the hand grip release switch and rotate the hand grip release switch to horizontal detent position.
- d. Disconnect the two carrying handle rubber cord shackles from sight sensor lifting shackles.

**WARNING**

**Personnel must exercise care when lifting, mounting, or carrying the sight sensor to prevent injury.**

**Two people are required to lift and move the sight sensor.**

- e. Using carrying handles carefully lift up and remove sight sensor from the yoke.
3. Break down the tripod/dismounted yoke.
- Note:** The yoke folding arm with the elevation brake knob must be folded down first.
- a. Release the latches and fold the yoke folding arms down into the carrying position.
  - b. Position the folding arms retaining strap over the folded arms and snap them in place.
  - c. Remove two carrying handles from sight sensor lifting shackles and pins.
  - d. Lift up on the tripod/dismounted yoke until the tripod feet anchors are disengaged from the ground.
  - e. Set the tripod/dismounted yoke on its side on the ground.
  - f. Loosen tripod leg locks by turning knobs counterclockwise.
  - g. Retract the tripod legs to the carrying position.
  - h. Release latches and fold tripod legs to carrying position.
  - i. Ensure that the tripod feet anchors are facing in.
  - j. Tighten the tripod leg locks by turning the knobs fully clockwise.
4. Stow all equipment used according to the vehicle load plan or SOP.

Performance Measures	GO	NO-GO
1. Disconnected the dismounted power cable 2W2.	_____	_____
2. Dismounted the sight sensor from the tripod/dismounted yoke.	_____	_____
3. Broke down the tripod/dismounted yoke.	_____	_____
4. Stowed all equipment used according to the vehicle load plan or SOP.	_____	_____

**References  
Required**

TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)

**Primary**

TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV))

**171-134-0004**  
**Operate the LRAS3**

**WARNING**

**Avoid bringing lithium batteries into contact with water. Lithium reacts with water to produce hydrogen gas. Hydrogen gas may catch fire or explode, causing injury to personnel or damage to equipment.**

**Conditions:** You are a member of a squad or team performing surveillance operations with AN/TAS-8, long-range advanced scout surveillance system (known as LRAS3), in a mounted or dismounted configuration.

**Standards:** Operate the LRAS3 in the DAY TV and forward-looking infrared (FLIR) mode. Determine the range and position of a target.

**Performance Steps**

1. Place the LRAS3 into operation.

**Note:** The LRAS3 must be set up for either vehicle mounted operation or dismounted operation.

- a. Set the LRAS3 OFF/STBY/ON switch to the ON position.

**Note:** When the LRAS3 is turned on, it performs a built-in test (known as BIT) and all settings go to default positions. If the FLIR has cooled down, the system will default to FLIR mode in BOTH EO SENSORS. If the FLIR has not cooled down, the system will default to DAY TV mode in BOTH EO SENSORS.

- b. Turn on the power source.

(1) In mounted configuration, set VPC assembly switch to ON.

(2) In dismounted configuration, set battery box ON/OFF switch to ON.

- c. Push FI if the system is being powered by a battery box. Push POL if the system is not being run off of a battery box.

- d. After initial power-up built-in test is complete, ensure that the BIT indicator does not appear. If BIT indicator appears, cycle power and check display for BIT indicator. If BIT indicator still displays, notify unit maintenance.

- e. Check indicators.

(1) If the DAY TV BORESIGHT REQUIRED indicator appears, boresight the DAY TV.

(2) If the FLIR BORESIGHT REQUIRED indicator appears, boresight the FLIR.

(3) NOT COOL indicator will appear if FLIR has not cooled down.

(4) NO CRYPTO KEY indicator may be flashing.

(5) Wide field of view (known as WFOV) reticle is displayed.

- (6) LOW BATTERY indicator does not appear. If LOW BATTERY indicator appears, perform troubleshooting in accordance with (IAW) the technical manual.
  - (7) LOW GPSIS BATTERY indicator does not appear. If LOW GPSIS BATTERY indicator appears, perform troubleshooting IAW the technical manual.
- f. Select the desired MODE menu option from the main menu.

**Note:** If the DAY TV ONLY was selected, TV ONLY will be displayed. External video operation is disable on the LRAS3.

2. Adjust the DAY TV display.

**Note:** FLIR takes up to 15 minutes to cool down. The sight sensor will automatically go into DAY TV until the FLIR has cooled down.

- a. Remove lens cover.
- b. Using main menu, select MODE and then DAY TV ONLY.
- c. Using the brightness/contrast/focus (known as BCF) menu, adjust the display for the best target scene.
  - (1) Adjust the contrast.
    - (a) Select DISPLAY CON/BRT and then CONTRAST, using the BCF menu.
    - (b) Adjust the display contrast for the best scene.
    - (c) Press the BCF push button on the left hand grip when adjustment is complete.
  - (2) Adjust the brightness.
    - (a) Select BRIGHT, using the BCF menu.
    - (b) Adjust the display brightness for the best scene.
    - (c) Press the BCF push button on the left-hand grip when adjustment is complete.
  - (3) Adjust system brightness.
    - (a) Select SYM BRT, using the BCF menu.
    - (b) Adjust the display symbol brightness for the best symbol display.
    - (c) Press the BCF push button on the left hand grip when adjustment is complete.
  - (4) Adjust reticle brightness.
    - (a) Select RET BRT, using the BCF menu.
    - (b) Adjust the display reticle brightness for the best reticle display.
    - (c) Press the BCF push button on the left-hand grip when adjustment is complete.
  - (5) Select CANCEL, using the BCF menu, once the target scene is acceptable.

- d. Check that both narrow field of view and WFOV reticle can be called up on display by using the FIELD OF VIEW trigger switch on right-hand grip.
3. Adjust the FLIR display.

**Note:** The FLIR sensor takes up to 15 minutes to cool down and be fully operational. Wait until the not COOL indicator has disappeared before continuing operation checkout.

- a. Rotate the sight sensor in EL and AZ to view the target.
- b. Adjust the display for the best target scene.
  - (1) Adjust the focus.
    - (a) Select FOCUS from the BCF menu.
    - (b) Adjust the display focus for the best scene.
    - (c) Press the BCF push button on the left-hand grip when the adjustment is complete.
  - (2) Adjust the contrast.
    - (a) Select FLIR CON/BRT from the BCF menu.
    - (b) Select CONTRAST.
    - (c) Adjust the FLIR display contrast for the best scene.
    - (d) Press the BCF push button on the left-hand grip when the adjustment is complete.
  - (3) Adjust the brightness.
    - (a) Select BRIGHT from the BCF menu.
    - (b) Adjust the FLIR display brightness for the best scene.
    - (c) Press the BCF push button on the left hand grip when the adjustment is complete.
  - (4) Adjust symbol brightness.
    - (a) Select SYM BRT from the BCF menu.
    - (b) Adjust the FLIR display symbol brightness for the best symbol display.
    - (c) Press the BCF push button on the left-hand grip when the adjustment is complete.
  - (5) Adjust the reticle brightness.
    - (a) Select RET BRT from the BCF menu.

- (b) Adjust the FLIR display reticle brightness for the best reticle display.
- (c) Press the BCF push button on the left-hand grip when done.
- (6) Select CANCEL from the BCF menu.
- (7) Adjust the polarity.

**Note:** Changing environmental conditions, time of day, or target temperature may require a change of polarity to optimize the thermal scene.

- (a) Press POL button on the left-hand grip.
- (b) Readjust the FLIR display for best scene.
- c. Select SEARCH or STARE mode using the BCF menus.

**Note:** The system default mode is STARE. The higher the frame integration rate selected (2, 4, 8, or 16), the clearer the display is for stationary targets. However, moving targets will be blurred. If tracking moving targets, SEARCH (60 hertz) provides a better image.

- (1) Use STARE for tracking stationary targets.
- (2) Use SEARCH for tracking moving targets.

### **WARNING**

**The LRAS3 uses a Class 1 laser, which may be safely operated in Force-on-Force training exercises. However, you should always avoid exposure to any type of laser radiation, whenever possible.**

- Do not stare into the laser.**  
**Do not look into the laser through binoculars or telescopes.**  
**Do not point the laser beam at mirror-like surfaces.**  
**Do not point the laser beam at individuals.**

4. Determine the target range and position.
  - a. Select LAST or FIRST using the FIRST/LAST push button on the right-hand grip.

**Note:** LAST is displayed in operational parameter block. This determines the range to the farthest target.

- b. Center reticle aim point on target of interest.
- c. Press and release laser range finder push button on right-hand grip.

**Note:** The range (rounded to the nearest 5 meters) from target is shown in range indicator area.

Performance Measures	GO	NO-GO
1. Placed the LRAS3 into operation.	_____	_____
2. Adjusted the DAY TV display.	_____	_____
3. Adjusted the FLIR display.	_____	_____
4. Determined the target range and position.	_____	_____

References Required	Primary
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)
TO 31R4-2PSN11-1/TM 11-5825-291-13/PCN 60000282000/ EE174-AA-OMI-010/PSN-11 Operations and Maintenance Manual Satellite Signals Navigation Sets AN/PSN-11 NSN 5825-01-374-6643 and AN/PSN-11(V)1 NSN 5825-01-395-3513	

**171-134-0005**

**Boresight the Forward-Looking Infrared and Day Television on the LRAS3**

**Conditions:** You are a crewmember conducting operations in a field environment. You have a fully operational ANTAS-8, long-range advanced scout surveillance system (known as LRAS3), mounted on a vehicle or tripod and a requirement to boresight the forward-looking infrared (FLIR) and DAY television (TV) on the LRAS3.

**Standards:** Boresight the FLIR and DAY TV on the LRAS3.

**Performance Steps**

**1. Boresight the FLIR.**

**Note:** If the FLIR is not ready and the not cool indicator is displayed, FLIR boresighting cannot be selected.

- a. Select MODE and then BOTH EO SENSORS using the main menu.
- b. Select FLIR using the SGT SEL push button on the left-hand grip.

**Note:** FLIR-WH is displayed in the operational parameter block.

- c. Select BORESIGHT using the main menu.
- d. Select BORESIGHT FLIR using the main menu.

**Note:** The ABORT/DONE menu appears with a message displayed in the message area stating FLIR BORESIGHT IN PROGRESS and the boresight reticle will be displayed.

- e. Install the lens cover prior to boresighting.

**Note:** Always install the sight sensor lens cover when boresighting. Installing the cover prevents outside light from obscuring the boresight dot.

- f. Move the boresight reticle off center.
- g. Use the brightness/contrast/focus menu to adjust focus, reticle brightness, display brightness, and contrast if the boresight dot is still hard to see.

**Note:** The boresighting dot will appear on the display.

- h. Select DONE from the ABORT/DONE menu when boresighting is accomplished.

**Note:** A FLIR BORESIGHTING IN PROGRESS message area disappears and the main menu is displayed.

**2. Boresight the DAY TV.**

**Note:** When there is a 20-degree change in the sight sensor operating temperature, a BORESIGHT REQUIRED message will appear.

**Note:** Always install the sight sensor lens cover when boresighting. Installing the cover prevents outside light from obscuring the boresight dot.

- a. Select DAY TV ONLY or BOTH EO SENSORS from the main menu.

**Note:** If you are already in the DAY TV mode, go to step 2c.

- b. Select DAY TV using the SGT SEL push button on the left-hand grip.

**Note:** DAY TV is displayed in the operational parameter block.

- c. Select BORESIGHT from the main menu and then select BORESIGHT DAY TV.

**Notes:** The ABORT/DONE menu appears. A message is stating DAY TV BORESIGHT IN PROGRESS displays in the message area and the boresight reticle is displayed.

If the sight sensor is not far out of boresight, the boresight reticle may already be on top of the boresighting dot making the boresight dot hard to see. The boresight reticle should be moved off center.

- d. Move the reticle aim point on top of the boresighting dot using the boresight adjustment switch on the right handgrip.
- e. Select DONE from the ABORT/DONE menu when boresighting has been accomplished.

**Notes:** The DAY TV BORESIGHTING IN PROGRESS message in the message area and BORESIGHT REQUIRED message disappear and the main menu is displayed. Select ABORT from the ABORT/DONE menu. A BORESIGHT ABORT message will be displayed in the message area until another operator action causes a new message to be displayed.

If DAY TV boresighting cannot be accomplished within 3 minutes, BORESIGHT TIMEOUT will appear in the message area.

Performance Measures	GO	NO-GO
1. Boresighted the FLIR.	____	____
2. Boresighted the DAY TV.	____	____

References Required	Primary
TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)	TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts And Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)

**171-134-0006**  
**Troubleshoot the LRAS3**

**Conditions:** You are a member of a scout platoon conducting operations. You have an AN/TAS-8 long-range advanced scout surveillance system (known as LRAS3) mounted on a vehicle or tripod, TM 11-5855-310-12&P-1 or TM 11-5855-310-12&P-2, and DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*). You have been directed to troubleshoot the LRAS3.

**Standards:** Use TM 11-5855-310-12&P-1 or TM 11-5855-310-12&P-2 to troubleshoot the LRAS3 and conduct all prescribed checks in the troubleshooting guide. Correct all deficiencies that can be corrected at operator level. Submit a completed DA Form 2404 or DA Form 5988-E listing deficiencies that cannot be corrected at operator level per unit standard operating procedure (SOP).

**Note:** Adhere to all safety WARNINGS and CAUTIONS.

**Performance Steps**

1. Troubleshoot the LRAS3 using the steps outlined in TM 11-5855-310-12&P-1 or TM 11-5855-310-12&P-2.
2. Correct deficiencies that can be corrected at operator level.
3. Submit a DA Form 2404 or DA Form 5988-E listing deficiencies that cannot be corrected at operator level per unit SOP.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Troubleshooted the LRAS3 using the steps outlined in TM 11-5855-310-12&P-1 or TM 11-5855-310-12&P-2.	_____	_____
2. Corrected deficiencies that could be corrected at operator level.	_____	_____
3. Submitted a DA Form 2404 or DA Form 5988-E listing deficiencies that could not be corrected at operator level per unit SOP.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)	TM 11-5855-310-12&P-1 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)1 (NSN 5855-01-458-2229) (EIC: LC3) AN/TAS-8A(V)1 (NSN 5855-01-534-3063) (EIC: GMQ) AN/TAS-8B(V)1 (NSN 5855-01-580-6119) (EIC: GMT)
DA Form 2404 Equipment Inspection and Maintenance Worksheet	
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**171-134-0003**  
**Perform Operator Maintenance on the LRAS3**

**Conditions:** You are a member of a scout platoon and have been directed to perform preventive maintenance checks and services (PMCS) on the AN/TAS-8 long-range advanced scout surveillance system (known as LRAS3), in preparation for tactical operations. You have TM 11-5855-310-12&P-1, TM 11-5855-310-12&P-2, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), a clean wiping cloth, detergent, lens cleaning compound, and cotton pads.

**Standards:** Perform PMCS on the AN/TAS-8, LRAS3, in accordance with TM 11-5855-310-12&P-1 and TM 11-5855-310-12&P-2. Record any faults found on DA Form 2404 or DA Form 5988-E. Inform leadership and unit maintenance of all uncorrectable deficiencies.

**Note:** PMCS should be conducted following the steps outlined in TM 11-5855-310-12&P-1 and TM 11-5855-310-12&P-2 ensuring that all WARNINGS and CAUTIONS are observed.

**Performance Steps**

1. Turn the LRAS3 power switch to ON.
2. Perform PMCS on the LRAS3 in accordance with TM 11-5855-310-12&P-1 and TM 11-5855-310-12&P-2.
3. Record any faults on DA Form 2404 or DA Form 5988-E.
4. Correct all operator-level deficiencies.
5. Inform leadership and unit maintenance of all uncorrected deficiencies.

Performance Measures	GO	NO-GO
1. Turned LRAS3 power switch to ON.	_____	_____
2. Performed PMCS on the LRAS3, in accordance with TM 11-5855-310-12&P-1 and TM 11-5855-310-12&P-2.	_____	_____
3. Recorded any faults on DA Form 2404 or DA Form 5988-E.	_____	_____
4. Corrected all operator-level deficiencies.	_____	_____
5. Informed leadership and unit maintenance of all uncorrected deficiencies.	_____	_____

**References  
Required**

TM 11-5855-310-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Surveillance System, Scout, Long Range AN/TAS-8(V)2 (NSN 5855-01-515-9547) (EIC: GMR) AN/TAS-8A(V)2 (NSN 5855-01-534-3724) (EIC: GMS) AN/TAS-8B(V)2 (NSN 5855-01-580-6462) (EIC: GMV)

DA Form 5988-E Equipment Maintenance and Inspection Worksheet

DA Form 2404 Equipment Inspection and Maintenance Worksheet

**Primary**

TM 11-6130-489-13&P Operator's, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Battery Charger PP-8444/U (NSN 6130-01-427-9604) (EIC: N/A) and Battery Charger PP-8444A/U (NSN 6130-01-443-0970) (EIC: N/A)

**809-100-0001**  
**Assemble Small Unmanned Aircraft System**

**Conditions:** As a small unmanned aircraft system (known as SUAS) operator in an operational environment, you have a requirement to conduct an SUAS mission, given a disassembled rotary or fixed wing SUAS, a ground control station (GCS), and remote video transceiver (known as RVT). Appropriate technical manuals and TM 1-1550-695-13&P are available.

**Standards:** Assemble the SUAS, GCS, and RVT, with 100-percent adherence to the technical manual applicable to the SUAS.

**WARNING**

**Remain clear of the propeller at all times. Failure to comply may result in injury to personnel.**

**Performance Steps**

1. Inventory and inspect the SUAS components from the shipping container.
  - a. For fixed wing SUAS.

**WARNING**

**Ensure battery is not connected until assembly is nearly complete; battery power could cause the propeller to spin, causing personal injury or damage to equipment.**

- (1) Remove fixed wing components from travel bag (see figure 3-46).

**Note:** Verify the bag has not been damaged/crushed.



**Figure 3-46. Small unmanned aircraft system travel bag**

- (2) Inspect all eight components for damage or prior repairs (see figure 3-47).

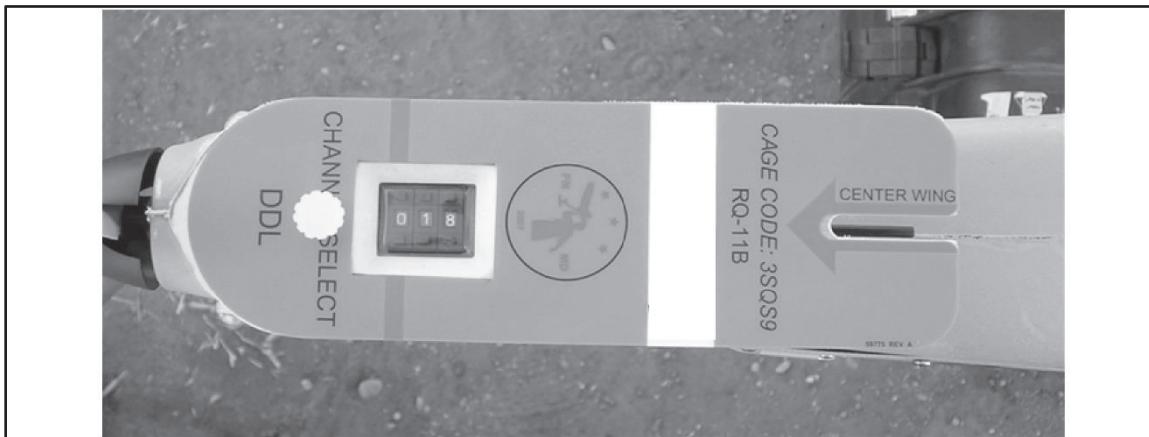


**Figure 3-47. Small unmanned aircraft system individual components**

- b. For rotary wing SUAS.
  - (1) Remove rotary wing components from traveling case.
  - (2) Inspect all components for damage or repairs in accordance with the system's technical manual.
- 2. Assemble the SUAS vehicle.

**Note:** Inspect components for damage during each step of assembly process.

- a. For fixed wing SUAS.
  - (1) Select appropriate precoordinated channel, enter into fuselage channel select (see figure 3-48).

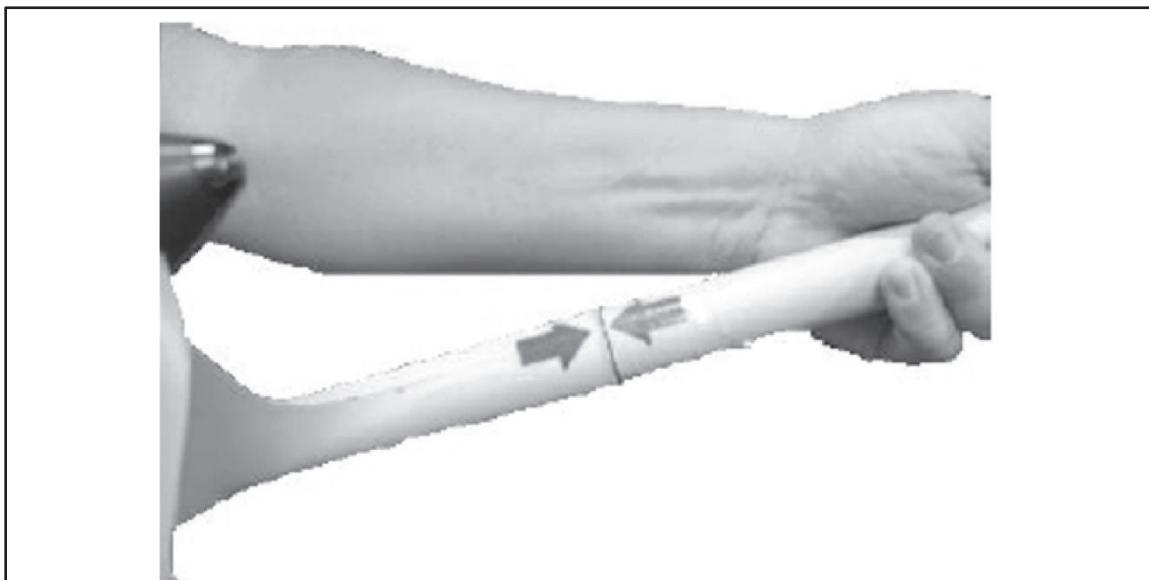


**Figure 3-48. Channel select fixed-wing small unmanned aircraft system**

**CAUTION**

Do not twist the connection between the tailboom and the fuselage when connecting and disconnecting these parts. Twisting will stress the connector and can cause irreparable damage.

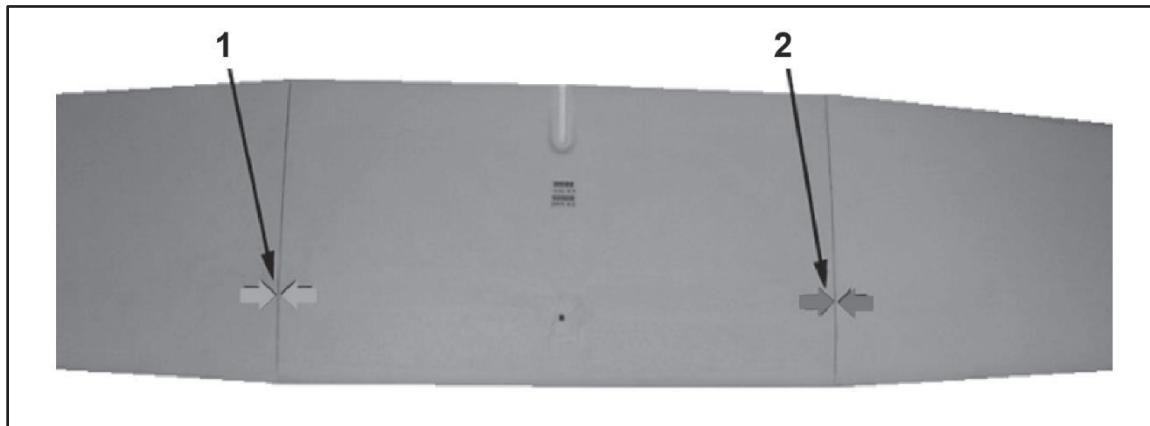
- (2) Connect tail boom to the fuselage, then align red arrows pull together until arrows meet (see figure 3-49).



**Figure 3-49. Tail to fuselage connection**

- (3) Assemble the wing pieces (see figure 3-50, page 3-164).

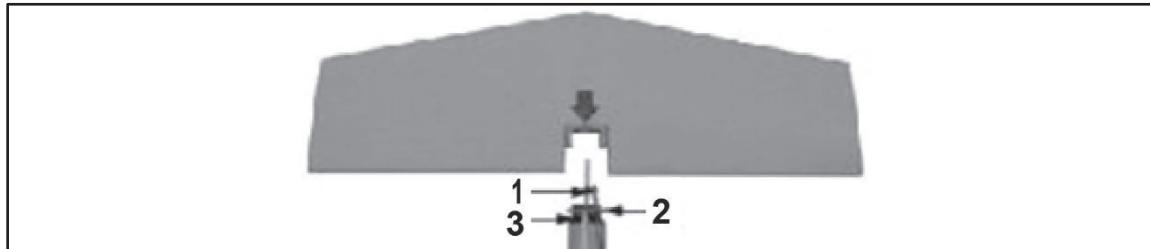
**Note:** Ensure color coordinated arrows match.



**Figure 3-50. Wing assembly complete**

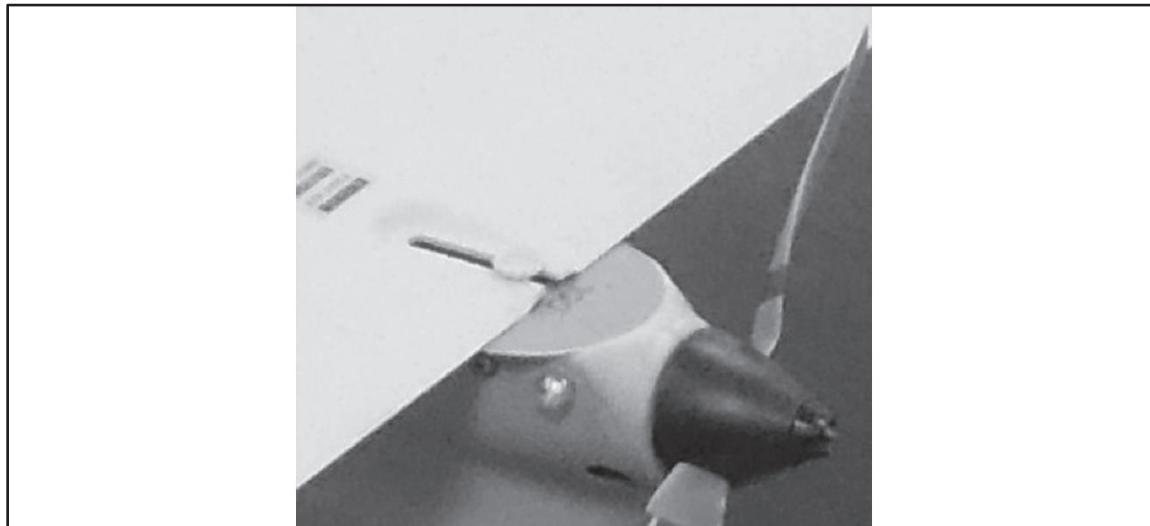
- (4) Install stab onto tail boom (see figure 3-51).

**Note:** Ensure stab has a secured snug fit onto tail boom using the stab assembly clip (see figure 3- 51, item 1).



**Figure 3-51. Stab attachment to tail boom**

- (5) Connect wing assembly onto fuselage, tighten capture screw hand tight (see figure 3-52).



**Figure 3-52. Wing assembly to fuselage**

- (6) Attach appropriate gimbal (payload) (see figure 3-53).



**Figure 3-53. Gimbal (payload) attachment**

- (a) Select the appropriate payload for the mission.
- (b) Align payload hinge, with that of the fuselage.
- (c) Snap into place.
- (7) Install battery.
- (8) Install battery access cover.
- b. For rotary wing SUAS.
  - (1) Select appropriate precoordinated channel, for communication between GCS and SUAS.
  - (2) Assemble rotary wing SUAS in accordance with the operator's manual and approved technical manuals.
    - (a) Ensure radio frequency (RF) antenna is attached and secure.
    - (b) Install fully charged battery; verify it is secure.
3. Inventory and inspect the ground control station with handheld controller from shipping container.
  - a. Remove GCS components from travel bag (see figure 3-54, page 3-166).



**Figure 3-54. Ground control station travel bag**

- b. Inspect all components (see figure 3-55) for damage.

**Note:** Ensure no damage has occurred during transport.



**Figure 3-55. Ground control station equipment layout**

4. Assemble the GCS.

- a. Remove GCS/RVT components from GCS equipment bag (see figure 3-56).

**Note:** GCS bag item 1, GCS/RVT components labeled items 2–9.



**Figure 3-56. Ground control station/remote video transceiver components**

- b. Erect antenna base.
  - (1) Unfold antenna mast (see figure 3-56, item 7).
  - (2) Hang GCS equipment bag (see figure 3-56, item 1) from erect antenna mast (see figure 3-56, item 7).
- c. Attach Omni antenna (see figure 3-56, item 6) to RF unit (see figure 3-56, item 2).
- d. Attach RF unit (see figure 3-56, item 2 with attached OMNI antenna) to the GCS-RVT mast (see figure 3-56, item 7).
- e. Plug RF unit cable (see figure 3-56, item 8) into RF unit (see figure 3-56, item 2) and hub unit (see figure 3-56, item 9).
- f. Plug hand controller (see figure 3-56, item 4) into hub unit (see figure 3-56, item 9).
- g. Attach controller hood (see figure 3-56, item 3) to the hand controller (see figure 3-56, item 4); secure with straps.
- h. Connect ethernet cable (see figure 3-56, item 8) between laptop's ethernet port and the hub's (see figure 3-56, item 9) laptop ethernet port.
- i. Connect hub unit (see figure 3-56, item 9) to ground support battery, via universal battery connectors.

Performance Measures	GO	NO-GO
1. Inventoried and inspected the SUAS components from the shipping container.	<input type="checkbox"/>	<input type="checkbox"/>
2. Assembled the SUAS vehicle.	<input type="checkbox"/>	<input type="checkbox"/>
3. Inventoried and inspected the GCS with handheld controller from shipping container.	<input type="checkbox"/>	<input type="checkbox"/>

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
4. Assembled the GCS.	—	—
<b>References Required</b>	<b>Primary</b>	
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B (NSN 1550-01-538-9256) (EIC: 60C)	

**809-100-0008****Conduct Small Unmanned Aircraft System before Takeoff Checks****WARNING**

**Whenever the battery is mounted in the small unarmed aircraft system (known as SUAS), remain clear of the propeller at all times. Work from the front of the air vehicle whenever possible. Ensure propeller blades are clear of the ground, equipment, and personnel, prior to connecting primary battery.**

**Conditions:** As an SUAS operator in an operational environment, you have a requirement to conduct SUAS before takeoff checks. You have a vehicle, an assembled rotary or fixed wing SUAS, a ground control station (GCS), and remote video transceiver. Appropriate technical manuals and TM 1-1550-695-13&P are available.

**Standards:** Perform 100 percent of the before-takeoff checks correctly, according to the applicable technical manual for the SUAS and TM 1-1550-695-13&P.

**Note:** Max battery temperature prior to launch is 50 degrees Celsius.

**Performance Steps**

1. Perform GCS to SUAS communications check.
  - a. For fixed wing SUAS.
    - (1) Ensure the battery power is on for the air vehicle and the GCS handheld controller.
    - (2) Turn GCS radio transmitter on.
    - (3) Ensure the SUAS and GCS radio channel signal selects match each other.
    - (4) Ensure aircraft vehicle light comes on and off if the tactical situation permits it.
    - (5) Perform pitot sensor test, cover pitot port and verify zero wind speed is viewed on handheld controller screen.
    - (6) Check flight control inputs to verify harmonious movement of flight controls.
  - b. For rotary wing SUAS.
    - (1) Ensure the battery power is on for the air vehicle and the GCS handheld controller.
    - (2) Turn GCS radio transmitter on.
    - (3) Ensure the SUAS and GCS radio channel signal selects match each other.
    - (4) Ensure aircraft vehicle light comes on and off if the tactical situation permits it.
    - (5) Check flight control inputs to verify harmonious movement of flight controls.
2. Perform gyro function checks.

- a. Tilt air vehicle to the left >90 degrees off axis; read coordinated screen display.
- b. Tilt air vehicle to the right >90 degrees off axis; read coordinated screen display.
- c. Tilt air vehicle down >90 degrees off axis; read coordinated screen display.
- d. Tilt air vehicle up > 90 degrees off axis; read coordinated screen display.

**WARNING**

**Preflight verification of infrared payload laser illuminator function shall be done while aiming the beam straight down onto a nonreflective, diffusive surface, such as dirt or grass. Never direct the illuminator upwards or at anyone during this check. The illuminator must be in the “off” state at the end of preflight check, to ensure no risk to the air vehicle launcher. Failure to comply may result in injury to personnel.**

3. Perform payload function checks.
  - a. Move payload full left; view coordinated screen display.
  - b. Move payload full right; view coordinated screen display.
  - c. Move payload full forward; view coordinated screen display.
  - d. Move payload full aft (rearward); view coordinated screen display.
  - e. Zoom payload camera images in/out; view coordinated screen display.
4. Perform throttle function checks.
  - a. Increase throttle to 100 percent; hold for 5–10 seconds.
  - b. Decrease throttle to 50 percent; hold for 5–10 seconds.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed GCS to SUAS communications check.	_____	_____
2. Performed gyro function checks.	_____	_____
3. Performed payload function checks.	_____	_____
4. Performed throttle function checks.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B NSN 1550-01-538-9256 (EIC: 60C)

**809-100-0009**  
**Launch Small Unmanned Aircraft System**

**DANGER**

The medium-range recon small unmanned aircraft system (known as SUAS) fixed side-look infrared payload laser illuminator is classified as a class 1M laser. Acute eye exposure to the laser illuminator can cause retinal burns, color vision degradation, and lens opacity.

**WARNING**

Whenever the battery is mounted, remain clear of the propeller at all times. Prior to connecting the primary battery, ensure all blades are clear of ground, equipment, and personnel. Work from the front of the air vehicle whenever possible.

**CAUTION**

It is critical that the channel selection be coordinated in advance to avoid interference between systems operating in proximity. Failure to do so could cause damage to the system if another ground control station (GCS) takes control of this air vehicle accidentally. Do not select to control an air vehicle when using a GCS as a remote video transceiver (known as RVT). If the RVT operator selects to control the air vehicle without a prearranged handoff, control of the air vehicle is disrupted. Failure to comply can cause loss or damage to the equipment.

**Conditions:** You are an SUAS operator in an operational environment with a requirement to launch an SUAS and are given TM 1-1550-695-13&P and TM 1-1550-695-CL, an assembled fixed wing or rotary wing SUAS with GCS, and an RVT. Launch the SUAS using approved methods.

**Standards:** Launch the SUAS from all launching positions with 100-percent accuracy according to TM 1-1550-695-13&P and TM 1-1550-695-CL, using the task GO/NO-GO checklist. Ensure to complete the task without damaging equipment or causing injury to personnel.

**Note:** The launch procedures for the rotary wing SUAS will always follow the same steps, no matter the position of the individual launching the vehicle. The rotary wing launch allows individuals to remain under concealment, limiting physical exposure to enemy observation or fire.

**Performance Steps**

1. Perform a standing launch of the SUAS.
  - a. For a fixed wing SUAS.

- (1) After selecting a proper launching point and direction facing into the wind, point the SUAS nose into wind.
- (2) Use the HOT KEY button to select MAN mode. Horizontal stabilizer will move from autoland to flight position.
- (3) Vehicle operator states CLEAR PROP.
- (4) Grasp the air vehicle from the bottom aft of the skid pad with the throwing hand.
- (5) Place feet shoulder-width apart, maintaining a solid balance while holding the air vehicle in a ready launch position.
- (6) Press the toggle switch forward and hold until 100-percent throttle is achieved. Hold for a full 3 seconds at 100 percent.
- (7) Launch the air vehicle into the wind in an upward direction (between 25–45 degrees) nose up.

**Note:** Throw the vehicle with complete follow-through. Always maintain a strong, well-balanced stance and throw, while ensuring the prop is always clear. After launching SUAS, it is important for the operator to return quickly to the handheld controller to direct the flight of the vehicle.

- (8) Manipulate joystick to adjust for desired flight paths.

**Note:** If launch appears to be unrecoverable, you must be prepared to command autoland immediately.

- (9) Ensure the SUAS is climbing into the direction of the wind until a height of approximately 200–300 feet above ground level (AGL).
- (10) Select the appropriate flight mode when the SUAS reaches 200–300 feet AGL.
- (11) Immediately drop down into a protected position once the SUAS has established a positive climb.
  - b. For a rotary wing SUAS.
    - (1) Position rotary wing SUAS on a flat surface.

**Note:** Propellers must not be obstructed.

- (2) Power engines on.

**Note:** Move at least 2-meters (6 feet) away from the drone and check that the surroundings of the drone are safe.

- (3) Select the takeoff button on the handheld controller screen.

## WARNING

**Power and communication lines generally run parallel to roads. Wires may be difficult to see, but their supporting poles or towers can provide an indication of their presence and approximate height. Failure to avoid these obstacles could result in damage to equipment or injury to personnel.**

2. Perform a SUAS confined space launch.

**Notes:** A confined area is an area where the flight of the SUAS is limited in some direction by terrain or the presence of obstructions. In this situation, electronic line of sight may be affected, resulting in reduced operating range or intermittent loss of link. Launch direction becomes more critical.

In urban or built-up areas, when any wind is present, expect some turbulence. In wind velocities >10 knots, expect updrafts on the upwind side and downdrafts on the downwind side of obstacles. Confined area launch operations should be planned with this in mind but be ready to alter plans if the wind speed or direction changes.

- a. For fixed wing SUAS.

- (1) Orient the launch vehicle into the wind if possible and on a path clear of obstructions.
- (2) Use the HOT KEY button to select MAN mode. Horizontal stabilizer will move from autoland to flight position.
- (3) Vehicle operator states CLEAR PROP.
- (4) Grasp the air vehicle from the bottom aft of the skid pad with the throwing hand.
- (5) Place feet shoulder-width apart, maintaining a solid balance while holding the air vehicle in a ready launch position.
- (6) Press the toggle switch forward and hold until 100-percent throttle is achieved. Hold for a full 3 seconds at 100 percent.
- (7) Launch the air vehicle, into the wind in an upward direction (between 25–45 degrees) nose up.

**Note:** After launching this SUAS, it is important for the operator to return quickly to the handheld controller to direct the flight of the vehicle.

- (8) Manipulate the joystick to adjust for desired flight paths.

**Note:** If launch appears to be unrecoverable, you must be prepared to command autoland immediately.

- (9) Ensure the SUAS is climbing into the direction of the wind until a height of approximately 200–300 feet AGL.
- (10) Immediately drop down into a protected position once the SUAS has established a positive climb.
- (11) Select the appropriate flight mode when the SUAS reaches 200–300 feet AGL.

- b. For rotary wing SUAS.
  - (1) Position rotary wing SUAS on a flat surface.

**Note:** The propellers must not be obstructed.

- (2) Power engines on.

**Note:** Move at least 2-meters (6 feet) away from the drone and check that the surroundings of the drone are safe.

- (3) Select the takeoff button on the handheld controller screen.

3. Perform a kneeling launch of the SUAS.

**Notes:** Ensure the air vehicle is placed into autoland once the GCS has established link with the air vehicle. This prevents accidental engagement of the propeller.

This is the ideal position to launch an SUAS from should the operator require low-level ground cover. It does, however, reduce the throwing speed, thereby making a successful launch more difficult.

- a. For fixed wing SUAS.
  - (1) Orient the launch vehicle into the wind and position SUAS above, or clear of, obstructions.
  - (2) Use the HOT KEY button to select MAN mode. Horizontal stabilizer will move from autoland to flight position.
  - (3) Orient nonthrowing side toward the intended throwing direction.
  - (4) Bend nonthrowing knee at a 90-degree angle and place that knee on the ground. Extend and lock throwing leg straight, with the side of the boot firmly on the ground.
  - (5) Vehicle operator states CLEAR PROP.
  - (6) Press the toggle switch forward and hold until 100-percent throttle is achieved. Hold for a full 3 seconds at 100 percent.
  - (7) Rock backward, shifting weight to the throwing leg.
  - (8) Push off with the throwing leg and throw the SUAS out and up while keeping the SUAS wings level, releasing the SUAS at an angle between 25–45 degree's nose up.
  - (9) Allow the motion of the throwing arm to continue naturally once the SUAS is released.

**Note:** Ensure the operator quickly gains control of the SUAS through the hand-held controller. A successful launch is predicated on the individual being able to quickly establish a climb rate efficient enough to maintain flight.

- (10) Drop to the prone position, as part of the follow-through, behind cover.
  - (11) Ensure the SUAS is climbing into the direction of the wind until a height of approximately 200–300 feet AGL.
  - (12) Select the appropriate flight mode when the SUAS reaches 200–300 feet AGL.

- b. For rotary wing SUAS.
  - (1) Position rotary wing SUAS on a flat surface.

**Note:** The propellers must not be obstructed.

- (2) Power engines on.

**Note:** Move at least 2-meters (6 feet) away from the drone and check that the surroundings of the drone are safe.

- (3) Select the takeoff button on the handheld controller screen.

**CAUTION**

Ensure the air vehicle is placed into autoland once the GCS has established link with the air vehicle. This prevents accidental engagement of the propeller. Failure to do so could cause personal injury.

4. Perform a modified prone position launch of the SUAS.

**Note:** The modified prone position is useful when launching under fire while behind extremely low-level ground cover.

- a. For fixed wing SUAS.
  - (1) From the standard prone position, roll over onto your back.
  - (2) Use the HOT KEY button to select MAN mode. Horizontal stabilizer will move from autoland to flight position.
  - (3) Orient the nonthrowing side toward the intended throwing direction.
  - (4) Bend throwing knee at a 90-degree angle and place the side of the boot firmly on the ground.
  - (5) Grasp the SUAS from below and behind the skid pad with throwing-side hand and extend arm to the side, pointing the SUAS nose in the intended launch direction.
  - (6) Vehicle operator states CLEAR PROP.
  - (7) Press the toggle switch forward and hold until 100-percent throttle is achieved. Hold for a full 3 seconds at 100 percent.
  - (8) Rock to the side, shifting weight to the throwing leg.
  - (9) Push off with throwing-side foot to give added force and throw the SUAS across the torso. Throw upward at a 25–45-degree angle, while keeping the SUAS wings level.
  - (10) Allow the motion of the throwing-side arm to continue naturally once the SUAS is released.

**Note:** Ensure the operator quickly gains control of the SUAS through the handheld controller. A successful launch is predicated on the operator's ability to quickly establish a climb rate efficient enough to maintain flight.

- (11) Roll to the standard prone position, as part of the follow-through, and move toward cover.
  - (12) Ensure the SUAS is climbing into the direction of the wind until a height of approximately 200–300 feet AGL.
  - (13) Select the appropriate flight mode when the SUAS reaches 200–300 feet AGL.
- b. For rotary wing SUAS.
- (1) Position rotary wing SUAS on a flat surface.

**Note:** The propellers must not be obstructed.

- (2) Power engines on.

**Note:** Move at least 2-meters (6 feet) away from the drone and check that the surroundings of the drone are safe.

- (3) Select the takeoff button on the handheld controller screen.

5. Perform a mobile launch of the SUAS.

- a. For fixed wing SUAS.

- (1) Orient the launch vehicle/vessel into the wind and position the SUAS above, or clear of, obstructions.
- (2) Use the HOT KEY button to select MAN mode. Horizontal stabilizer will move from autoland to flight position.
- (3) Assume a supported stance with weight balanced equally on both feet, (shoulder-width apart).
- (4) Direct vehicle operator to set vehicle speed to 25 miles per hour (mph) (40 kilometers per hour [kph]).

**Note:** Utilize nonthrowing arm to help maintain balance, holding on.

- (5) Vehicle operator states CLEAR PROP.
- (6) Press the toggle switch forward and hold until 100-percent throttle is achieved. Hold for a full 3 seconds at 100 percent.
- (7) When the launch vehicle has reached 25 mph (40 kph), push the SUAS upward, then release, (do not throw).

**Note:** After release of SUAS, grab the handheld controller and establish positive control of the vehicle.

- (8) Immediately drop down into a protected position until the SUAS has established a positive climb.
- (9) Ensure the SUAS is climbing into the direction of the wind until a height of approximately 200–300 feet AGL.

(10) Select the appropriate flight mode when the SUAS reaches 200–300 feet AGL.

b. For rotary wing SUAS.

(1) Position rotary wing SUAS on a flat surface.

**Note:** The propellers must not be obstructed.

(2) Power engines on.

**Note:** Move at least 2-meters (6 feet) away from the drone and check that the surroundings of the drone are safe.

(3) Select the takeoff button on the handheld controller screen.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed a standing launch of the SUAS.	_____	_____
2. Performed a SUAS confined space launch.	_____	_____
3. Performed a kneeling launch of the SUAS.	_____	_____
4. Performed a modified prone position launch of the SUAS.	_____	_____
5. Performed a mobile launch of the SUAS.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B NSN 1550-01-538-9256 (EIC: 60C)

**809-100-0018****Conduct Small Unmanned Aircraft System Preventative Maintenance Checks and Services**

**Conditions:** You are a small unmanned aircraft system (known as SUAS) operator and you must perform operator-level maintenance on your SUAS. You have a fully functioning SUAS, TM 1-1550-695-CL, TM 1-1550-695-13&P, local standard operating procedure, and a field repair kit (known as FRK).

**Standards:** Conduct SUAS preventive maintenance checks and services without error, utilizing the task GO/NO-GO checklist, in accordance with (IAW) TM 1-1550-695-13&P and TM 1-1550-695-CL. Ensure to identify and repair deficiencies or send the SUAS up to the next higher echelon for repairs or replacement.

**Performance Steps**

1. Perform preventative maintenance on the fixed wing SUAS IAW TM 1-1550-695-13&P.

**Note:** Use a charged battery when attempting to identify electrical problems.

The logistics support system includes two echelons of maintenance: operator maintenance and equipment turn-in. The maintenance guidelines and instructions described in this section are for operator maintenance of the SUAS and do not require specialized training or tools. If the repair is not at an operator-maintenance level, the item should be turned in to unit supply.

- a. Inspect battery for any external damage such bulges, cracks, and dents.

**WARNING**

**Do not touch heat sink during operation as it will become very hot. Failure to comply can result in injury to personnel.**

**CAUTION**

Ensure connector is positioned properly. Forcing charge connector in the wrong way will permanently damage charge connector.

- b. Charge batteries.

**Notes:** Placing the universal battery charger (known as UBC) in an upright position provides for faster charging.

Charging rate is reduced to 100 watts when powered from 12-volts direct current (DC) source to prevent blown fuses in automobiles.

Charging rate is reduced when battery temperature is above 40 degrees Celsius.

Normal charging cycle is approximately 90 minutes. However, if two deeply discharged batteries are charged at same time, battery is hot, or battery is severely out of balance, charging times will be increased.

- (1) Open UBC and place in upright position so that heat sink and connectors are to the right.

- (2) Connect either alternating current or DC input cable to power source and battery charger.
- (3) Observe lamp test.

**Note:** If any light-emitting diode (LED) does not light up for 1 second during power-up, refer to next higher level of maintenance.

**CAUTION**

Do not leave adapter plugged in to the ground control station (GCS) batteries when not actively charging as this could cause damage to adapter.

- (4) Connect air vehicle batteries or GCS batteries (using GCS adapter) to output cables on charger.

**Note:** The GCS adapter is designed to sense the chemistry of battery and charge accordingly. Auto-sensing prevents charging of nonrechargeable batteries.

- (5) Observe LEDs for state of charge (known as SOC).

**Note:** The charging LEDs flash to indicate current SOC. As the SOC nears 100 percent, it is normal for the charging current to be reduced dramatically. The charger indicates extended charge times by flashing the charge LED at slower rate than normal when the SOC is 75 percent or below. Charge is complete when the charging LED is off and the SOC indicates 100 percent.

- (6) Disconnect battery when fully charged.

**WARNING**

**Remove battery before performing this corrective action. Failure to comply may result in injury to personnel.**

- c. Inspect payload for debris or damage, clearing debris, if possible.
- d. Inspect wing assembly.
  - (1) Check for dents, cracks, tears, and delamination in skin.
  - (2) Check for buckling in wing spar caps (reinforcing structure in wing that appears as gray shadow along length of center wing and wingtips).
  - (3) Ensure wing cups (molded holes in center wing) where wing pins are inserted are present and secure.
  - (4) Check that wing pins (that hold wingtip to center wing) are not damaged.
  - (5) Ensure O-rings on left- and right-wing pin (these hold wing tip securely to the center wing) are not damaged or missing.
  - (6) Check that leading edge of wing has maintained its shape.

- e. Inspect fuselage.
  - (1) Check for dents, cracks, tears and delamination in skin.
  - (2) Ensure snap screw is not missing, broken, or stripped.
  - (3) Ensure electrical contacts are free of grit or dust.
  - (4) Check that landing pad is secure and not damaged or missing.
  - (5) Check bulkhead and wing mount for fractures.
  - (6) Check pitot tube's alignment, length and washer.
  - (7) Check fuselage screws to ensure they are present and secure.
  - (8) Ensure air vehicle battery and battery fuse are present and serviceable.
- f. Inspect propeller.
  - (1) Check propeller for cracks, nicks and stress fractures.
  - (2) Check that propeller is secure.
  - (3) Ensure propeller spinner and nut are not broken, missing, or stripped.
  - (4) Ensure motor shaft is not bent.
  - (5) Ensure motor temperature indicator is not black.
- g. Inspect tailboom.
  - (1) Check for dents, cracks, tears, and delamination in skin.
  - (2) Check that tailboom fastens securely to fuselage.
  - (3) Check that electrical contacts are free of grit or dust.
  - (4) Ensure antenna detent spring is functional.
  - (5) Check that stabilizer horn pivot housing is not missing or bent, and is firmly seated in end of tailboom.
  - (6) Check that stabilizer pivot pin is centered in housing and housing is secure.
  - (7) Check both servo arms for damage or separation.
  - (8) Check stabilizer horn with ball for damage and play.
- h. Inspect stabilator.
  - (1) Check for dents, cracks, tears and delamination in skin.
  - (2) Check stabilizer clip for damage.

- (a) Check for stripped screws.
- (b) Check for elongated clips.
- i. Inspect soft pack.
  - (1) Check for tears in fabric and crushed foam insert.
  - (2) Check straps for torn or frayed fabric.
  - (3) Check clips for damage and proper function.
2. Perform preventative maintenance on a rotary wing SUAS IAW the appropriate rotary wing technical manual.
  - a. Inspect payload for debris or damage. Clear debris, if possible.
  - b. Inspect propeller(s).
  - c. Inspect battery for any dents, cracks, or bulges.
3. Correct faults on fixed wing SUAS IAW TM 1-1550-695-13&P.
  - a. Perform pitot system troubleshooting if the stabilator does not move during pitot tube preflight check.
    - (1) Remove pitot tube and inspect for debris or damage.
    - (2) Replace with new pitot tube trimmed to no less than  $\frac{1}{2}$  inches.

**Notes:** If indication continues after replacing pitot tube, turn in to supply for replacement.

Use snap screw as measuring device to obtain  $\frac{1}{2}$  length.

**CAUTION**

It is possible to use any combination of the Analog Raven B painted and digital data link (known as DDL) unpainted wing tips and center wing sections with the DDL unpainted fuselage. (Similarly, any combination of wing components may be flown on the analog fuselage.) However, it is very important that both the center wing and fuselage use the gray snap screw (AV part number 64121) and not the milky-white one. Failure to use the gray snap screw can cause, in rare cases, the center wing to detach in flight, causing a catastrophic failure and loss of aircraft. The gray snap screw can be screwed in further than the white one to provide a firmer grip on the wing. In addition, it is very important that the rubber grommets on the wing tips be thoroughly inspected for wear and tear, surface cracking, or changes in surface condition, such as hardening, softening, or tackiness. When installed in its groove, a reasonable portion of the rubber grommet should still be raised above the cylindrical surface of the pin on which it is installed.

- b. Perform vehicle skin and wing leading edge repair.

**Notes:** Tape can be used to repair small holes, dents, and cracks in the air vehicle skin. Use minimal amount of repair material (tape) to avoid shifting air vehicle's center of gravity. When repairing dents along leading edge of wing, use tape and take care to maintain shape of airfoil.

To repair bent wing, place mixing sticks across bent joint and attach with tape to form reinforcing splint.

Replace wing snap screw from FRK.

- (1) Repair small holes, dents, cracks in skin.
  - (a) Place piece of cotton pressure sensitive tape (national stock number 6510-00-663-1729) just large enough to cover damaged area with slight overlap.
  - (b) When repairing dents along leading edge of wing, use tape and do not alter the shape of airfoil.
- (2) Repair bent wing or structural component by placing mixing sticks across bent joint and attach with tape to form reinforcing splint.

c. Replace broken or damaged snap screws.

**CAUTION**

Do not over-tighten the screws into the air vehicle or it may strip the stabilator.

d. Perform stabilator clip replacement.

**Note:** The stab clip is a commonly replaced item. Spare stab clips with attached screws are included in the FRK.

- (1) Unscrew and remove damaged stab clip using crosstip screwdriver provided.
- (2) Attach replacement stab clip using crosstip screwdriver.

**CAUTION**

It is very important that the propeller be installed with the yellow paint facing the motor. The air vehicle could crash upon launch if installed improperly.

e. Perform propeller replacement.

- (1) Grasp broken propeller with one hand and loosen propeller nut by turning it counterclockwise using provided hex key.
- (2) Remove spinner nut, spinner, and old propeller.
- (3) Install propeller with yellow paint/writing facing motor or front of air vehicle.

**Note:** Yellow color in center of the propeller should not be visible after this step. If yellow is visible, propeller is backward and should be reversed.

- (4) Reinstall spinner, reattach and tighten spinner nut using wrench provided. Do not use excessive force when tightening nut.

**CAUTION**

Install backup battery in the correct orientation. If battery is reversed, air vehicle's electronics will be damaged.

- f. Replace Global Positioning System (GPS) battery backup.

**Notes:** The air vehicle GPS backup battery is rechargeable and should not need to be replaced by the user under normal operating conditions. The backup battery recharges while the flight battery is installed in the air vehicle. The backup battery is rated to operate with at least 80 percent of rated capacity after 300 discharge-recharge cycles.

If air vehicle is not being used regularly, recharge backup battery at least once a year. A very long period without recharging can diminish the battery capacity.

Do not replace backup battery unless it is physically damaged, or it fails to recharge while main battery is inserted. If BATT LOW - CHARGING is indicated on GCS GPS screen after backup battery has been charged (by inserting flight battery for at least 80 minutes), battery may need to be replaced.

If replacement battery also fails to charge, or if replaced battery charges in another air vehicle, the charging circuit may have failed.

Until a valid GPS fix is obtained, the hand controller will display 00AAA000000000 (Military Grid Reference System) or 00.00000, 000.00000 (latitude, longitude). If the GPS battery is removed or discharged, fix may be delayed.

- (1) Remove flight battery from air vehicle.
- (2) Remove avionics cover by removing four screws and sliding cover free of fuselage.
- (3) Remove GPS backup battery from bracket. Do not use metallic object to remove battery.
- (4) Ensure battery is positioned correctly.

**Note:** Correct orientation places end with the ring around the case to the right, as marked on circuit board.

- (5) Insert new battery into battery clip.

**CAUTION**

Electronics are subject to hidden damage from electro-static discharge (known as ESD). This procedure requires an ESD safe workplace.

- g. Replace transceiver module.

- (1) Remove the avionics cover by removing the four screws and sliding the cover free of the fuselage.

- (2) Remove the four screws located on top of the transceiver module and remove the module from the avionics bay.

**CAUTION**

To avoid damage to connectors, pull up both ends of module at the same time, straight away from circuit board. Do not pry up.

- (3) Pull and detach coaxial cable connector from the aft end of the module near the heat sink.
  - (4) Seal removed transceiver in ESD safe bag.
  - (5) Put replacement transceiver in place. Press gently to seat transceiver to circuit board. Put a small drop of adhesive liquid onto the threaded end of each screw; install screws to hold transceiver in place.
  - (6) Replace avionics cover with four screws.
- h. Replace battery fuse.

- (1) Orient battery with fuse up.

**CAUTION**

Do not allow screwdriver to touch battery terminals or fuse contacts.

- (2) Insert screwdriver approximately 0.25-inches deep into fuse housing detent.
- (3) Pry 20A fuse upward carefully.

**Note:** Apply pressure to back of fuse body to ensure even removal of component. Do not damage fuse contacts located inside battery.

- (4) Visually inspect fuse receptacle to confirm fuse contacts are not damaged or deformed.
- (5) Position fuse with prongs perpendicular to battery and install component.

**Note:** Do not allow fuse to be inserted at angle to battery.

- (6) Verify fuse is fully seated in housing.
  - i. Replace left and right wing O-ring.
    - (1) Remove left or right wing from wing assembly.
    - (2) Wipe wing tip mating surface, alignment pin, and spar connecting pin with clean cloth.
    - (3) Using a utility knife, remove damaged O-ring from groove on spar connecting pin.

**Note:** Do not score or scratch surface of spar connecting pin.

- (4) Visually inspect O-ring retaining groove on spar connecting pin. Remove any debris from groove and wipe with clean cloth.
  - (5) Position replacement O-ring at bottom beveled edge of spar connecting pin.
  - (6) Roll opposite side of O-ring over top of pin edge and slide into retaining groove.
  - (7) Visually inspect seated O-ring. If not aligned with spar connecting pin or if twisted within groove, repeat steps 2 through 4 above with new O-ring.
- j. Repair rudder, if necessary.
- (1) Rudder linkage replacement.
    - (a) Insert flat blade screwdriver in clevis of rudder linkage assembly and twist screwdriver  $\frac{1}{2}$ -turn to open clevis.
    - (b) Slide clevis steel pins out from rudder horn and top servo horn.
    - (c) Remove pushrod linkage.
    - (d) Verify replacement rudder linkage is the same length as the old rudder linkage, adjust as necessary.
    - (e) Using flat blade screwdriver open clevis at both ends of replacement rudder linkage.
    - (f) Insert steel pin of clevis at one end of rudder linkage through mounting hole in rudder horn.
    - (g) Insert steel pin of clevis at opposite end of rudder linkage through outer most mounting hole in top servo horn.
    - (h) Secure clevis at both ends of rudder linkage to rudder and top servo horns by pressing open end of clevis onto steel pins.
  - (2) Stabilator linkage replacement.
    - (a) Insert flat blade screwdriver in clevis of stabilator linkage and Twist screwdriver  $\frac{1}{2}$ -turn to open clevis.
    - (b) Slide clevis steel pin out from bottom servo horn.
    - (c) Unsnap ball link cup from stabilator horn.
    - (d) Verify replacement stabilator linkage is the same length as the old stabilator linkage, adjust as necessary.
    - (e) Using flat blade screwdriver open clevis at end of replacement stabilator linkage.
    - (f) Insert steel pin of clevis at end of stabilator linkage through outer most mounting hole in bottom servo horn.
    - (g) Secure clevis at end of stabilator linkage to bottom servo horn by pressing open end of clevis onto steel pin.
    - (h) Snap stabilator ball link cup onto stabilizer horn.

## (3) Stabilizer horn replacement.

**Note:** Some system configurations have a stab horn and mount assembly, which does not require removal and installation of pivot pin.

- (a) Remove pivot pin from stabilator mount at end of tailboom with needle nose pliers.
  - (b) Remove stab horn.
  - (c) Position replacement stab horn in stabilator mount and align mounting holes.
  - (d) Install replacement pivot pin and ensure pin is centered.
  - (e) Snap stabilator linkage ball link cup onto stab horn.
  - (f) Attach stabilator to horn and ensure it is secured to the pivot pin.
4. Correct faults on rotary wing SUAS IAW the appropriate rotary wing technical manual.
- a. Replace payload.
  - b. Replace propeller(s).

Performance Measures	GO	NO-GO
1. Performed preventative maintenance on the fixed wing SUAS IAW TM 1-1550-695-13&P.	_____	_____
2. Performed preventative maintenance on a rotary wing SUAS IAW appropriate rotary wing technical manual.	_____	_____
3. Corrected faults on fixed wing SUAS IAW TM 1-1550-695-13&P.	_____	_____
4. Corrected faults on rotary wing SUAS IAW appropriate rotary wing technical manual.	_____	_____

References Required	Primary
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (EIC: 60C)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B (NSN 1550-01-538-9256) (EIC: 60C)
Unit's SOP	

## 809-100-0006

### Conduct Small Unmanned Aircraft System Preflight Checks

**Conditions:** As a small unmanned aircraft system (known as SUAS) operator in an operational environment, you have a requirement to conduct SUAS preflight checks and are given an assembled rotary or fixed wing SUAS. TM 1-1550-695-13&P and TM 1-1550-695-CL are available.

**Standards:** Complete preflight checks with 100-percent accuracy in accordance with (IAW) TM 1-1550-695-13&P and TM 1-1550-695-CL, utilizing the task GO/NO-GO checklist.

#### Performance Steps

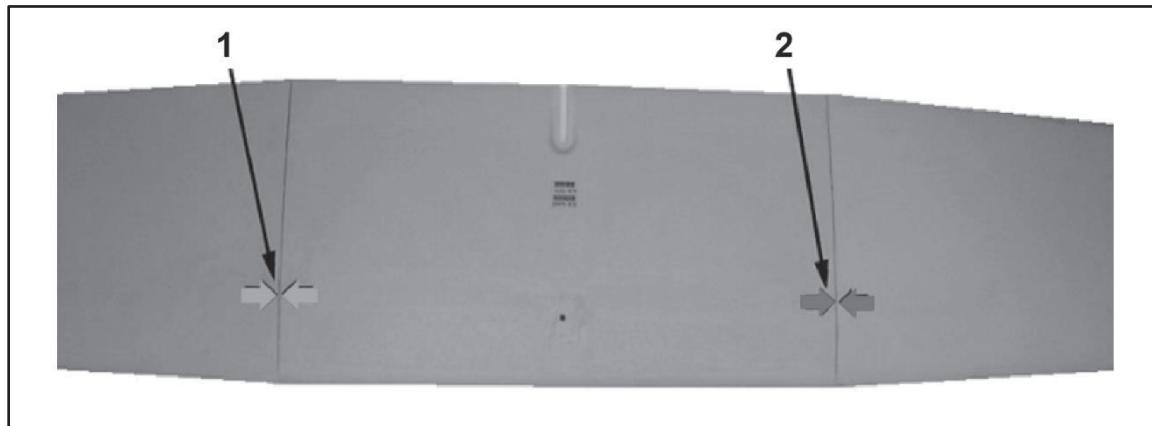
1. Inspect the SUAS for damaged or missing components.
  - a. For fixed wing SUAS.
    - (1) Conduct a visual inspection of the assembled SUAS and its components (see figure 3-57).

**Note:** Wings, rudder, and stabilator construction: The wings, rudder and stabilator are constructed of a relatively soft foam core covered with a thin flexible skin. Excessive force to these components during handling can result in dents. Avoid excessive squeezing or pinching of these parts.



**Figure 3-57. Assembled fixed wing small unmanned aircraft system**

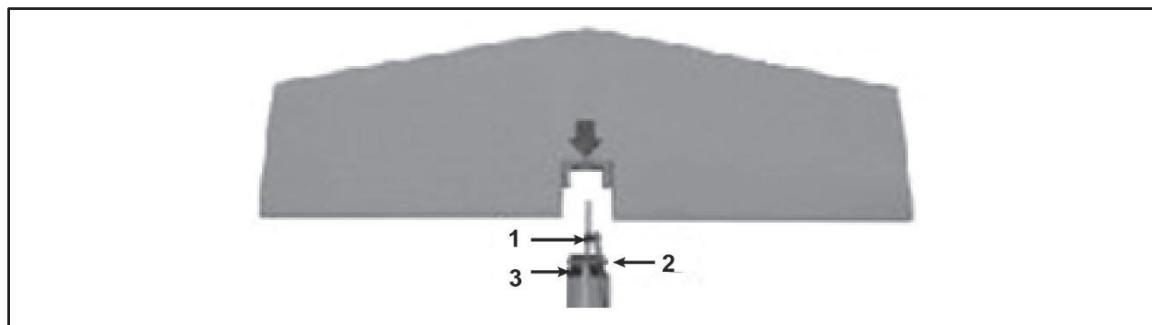
- (a) Inspect wing snap screws for damage.



**Figure 3-58. Preflight wing alignment**

- (b) Ensure the wings are not starting to crack and that the colored arrows match (see figure 3-58).
- (c) Inspect stabilator clip for damage (See figure 3-59, item 1).

**Note:** The stabilator will not clip on securely if the stab clip is damaged or stretched apart this may cause the stab to fall off during launch or in flight.

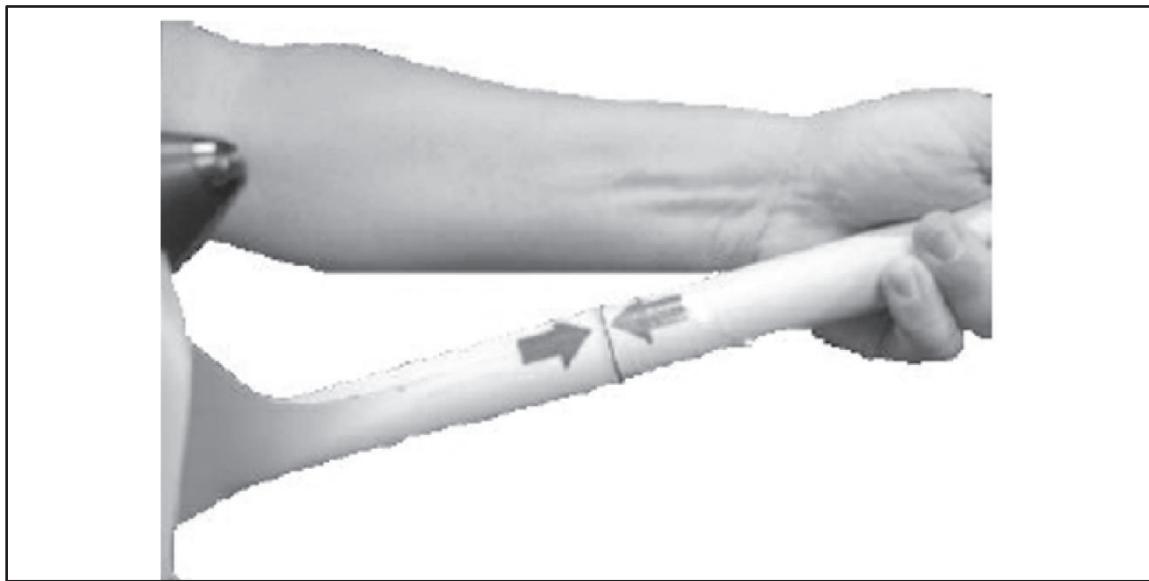


**Figure 3-59. Stab for tailboom**

**CAUTION**

Do not twist the connection between the tailboom and the fuselage when connecting and disconnecting these parts. Twisting will stress the connector and can cause irreparable damage.

- (d) Ensure arrows on the tailboom are aligned and flush with each other (see figure 3-60, page 3-190).



**Figure 3-60. Tail to fuselage connection**

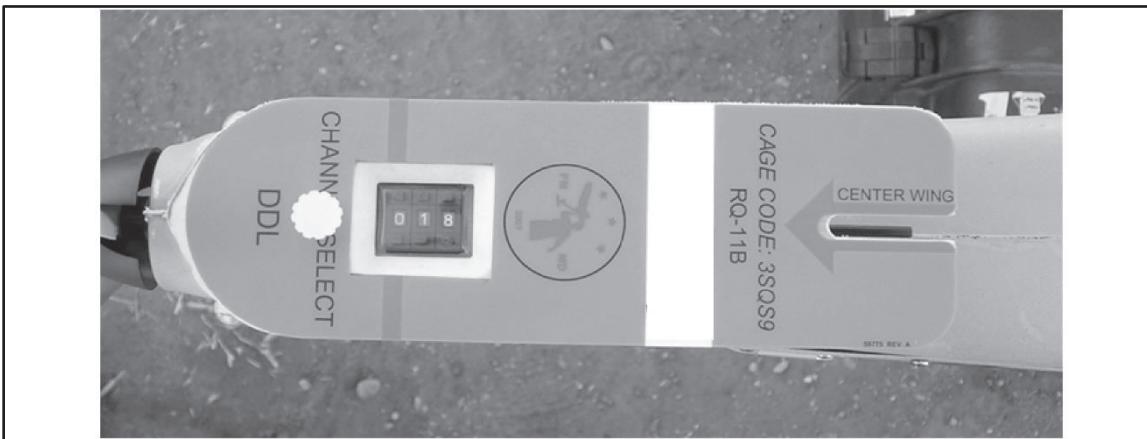
- (2) Make any necessary repairs IAW TM 1-1550-695-13&P.

**Note:** Minimize the amount of tape used for repair to avoid adding excessive weight and/or changing the balance of the air vehicle. Avoid applying tape to tail of aircraft. Excessive weight in the tail will adversely affect flight performance.

- (a) Remove and replace wing snap screws if any cracking appears.
  - (b) If the wings appear excessively loose apply a 2-inch by 2-inch piece of gaffers tape to prevent wings from separating during flight.

**Note:** Painter's tape is an acceptable substitute if gaffers tape is not available.

- b. For rotary wing SUAS.
    - (1) Conduct a visual inspection of the assembled rotary wing SUAS and its components.
      - (a) Ensure rotary wing arms are fully extended and locked in place.
      - (b) Ensure rotor hubs are securely mounted to the rotary engine assemblies.
    - (2) Remove and replace rotor blade(s) if damaged.
  2. Establish communications between the SUAS and the ground control station (GCS).
    - a. Verify channel select on SUAS matches the GCS (see figure 3-61).

**Figure 3-61. Channel selection**

- b. Toggle joystick on GCS to ensure proper communication between the GCS and the SUAS.
3. Ensure the Global Positioning System (GPS) lock has been established.
4. Ensure all waypoints are correct for planned mission.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inspected the SUAS for damaged or missing components.	_____	_____
2. Established communications between the SUAS and the GCS.	_____	_____
3. Ensured GPS lock has been established.	_____	_____
4. Ensured all way points are correct for planned mission.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B NSN 1550-01-538-9256 (EIC: 60C)

**809-100-0013**  
**Conduct Small Unmanned Aircraft System Post-flight Procedures**

**Conditions:** As a small unmanned aircraft system (known as SUAS) operator in an operational environment, you have a requirement to conduct SUAS post-flight procedures. You have an assembled rotary or fixed wing SUAS and TM 1-1550-695-13&P available.

**Standards:** Complete post-flight procedures with 100-percent accuracy in accordance with (IAW) TM 1-1550-695-13&P and utilizing the task GO/NO-GO checklist.

**Performance Steps**

1. Inspect fixed wing SUAS IAW TM 1-1550-695-13&P.

**Note:** Inspect all components for damage. Generally, minor dents or cracks will not require immediate maintenance before launching again. Damage to flight controls may render the SUAS inoperable. Consult the technical manual to determine whether or not the damage to flight controls deadlines the SUAS.

- a. Inspect wing.
  - (1) Check for dents, cracks, tears, and delamination in skin.
  - (2) Check for buckling in wing spar caps (reinforcing structure in wing that appears as gray shadow along length of center wing and wing tips).
  - (3) Ensure wing cups (molded holes in center wing) where wing pins are inserted are present and secure.
  - (4) Check that wing pins (that hold wing tip to center wing) are not damaged.
  - (5) Ensure O-rings on left and right wing pin (these hold wing tip securely to the center wing) are not damaged or missing.
  - (6) Check that leading edge of wing has maintained its shape.
- b. Inspect fuselage.
  - (1) Check for dents, cracks, tears and delamination in skin.
  - (2) Ensure snap screw is not missing, broken, or stripped.
  - (3) Ensure electrical contacts are free of grit or dust.
  - (4) Check that landing pad is secure and not damaged or missing.
  - (5) Check bulkhead and wing mount for fractures.
  - (6) Check the pitot tube's alignment, length and washer.
  - (7) Check fuselage screws to ensure they are present and secure.
  - (8) Ensure air vehicle battery and battery fuse are present and serviceable.
- c. Inspect propeller.

- (1) Check propeller for cracks, nicks and stress fractures.
  - (2) Check that propeller is present and secure.
    - (a) Ensure spinner cap is secure.
    - (b) Ensure retention nut is secure.
  - (3) Ensure motor shaft is not bent.
  - (4) Ensure propeller spinner and nut are not broken, missing, or stripped.
  - (5) Ensure motor temperature indicator is not black.
  - d. Inspect tailboom.
    - (1) Check for dents, cracks, tears, and delamination in skin.
    - (2) Check that tailboom fastens securely to fuselage.
    - (3) Check that electrical contacts are free of grit or dust.
    - (4) Ensure antenna detent spring is functional.
    - (5) Check that stabilizer horn pivot housing is not missing or bent and is firmly seated in end of tailboom.
    - (6) Check that stabilizer pivot pin is centered in housing and housing is secure.
    - (7) Check both servo arms for damage or separation.
    - (8) Check stabilizer horn with ball for damage and play.
  - e. Inspect horizontal stabilizer (stabilator).
    - (1) Check for dents, cracks, tears and delamination in skin.
    - (2) Check stabilizer clip for damage, stripped screws and elongated clips.
2. Inspect rotary wing SUAS IAW the appropriate technical manual.
- a. Inspect payload.
  - b. Inspect propellers.

Performance Measures	GO	NO-GO
1. Inspected fixed wing SUAS IAW TM 1-1550-695-13&P.	_____	_____
2. Inspected rotary wing SUAS IAW the appropriate technical manual.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B NSN 1550-01-538-9256 (EIC: 60C)

**809-100-0017**  
**Disassemble a Small Unmanned Aircraft System**

**Conditions:** As a small unmanned aircraft system (known as SUAS) operator in an operational environment, you have a requirement to disassemble your SUAS and are given an assembled rotary or fixed wing SUAS. The appropriate rotary wing technical manuals and TM 1-1550-695-13&P are available.

**Standards:** Follow 100 percent of the disassembly steps in the correct order for the SUAS in accordance with (IAW) TM 1-1550-695-13&P or the applicable rotary wing SUAS technical manual.

**Note:** Disassembly and storage of the SUAS will vary depending on the platform assigned. Refer to the appropriate technical manual and local standard operating procedures for correct procedures.

**Performance Steps**

**WARNING**

**Always approach the air vehicle from the front to prevent injury from accidental activation of propeller. Failure to comply may result in injury to personnel.**

**Remove battery from the air vehicle before beginning disassembly to prevent injury from accidental activation of propeller. Failure to comply may result in injury to personnel.**

1. Disassemble a fixed wing SUAS IAW TM 1-1550-695-13&P.

- a. Remove payload from fuselage.

**Note:** The payload must be removed first before the battery can be removed.

- (1) Press down on top center of module to release internal catch.
  - (2) Apply downward pressure on module once the internal catch is released and remove module from fuselage.
- b. Remove battery after removing payload by pushing battery out from the nose of the aerial vehicle.

**CAUTION**

Use caution when removing wings. Failure to comply may result in damage to thin trailing edge.

- c. Remove wing assembly from fuselage by loosening the snap screw and pulling the wing forward until it is clear of the snap screw.
  - (1) Remove left wing from center wing after removing Velcro strap under wing.
  - (2) Remove right wing from center wing after removing Velcro strap under wing.
- d. Remove stabilator.

**CAUTION**

Do not twist connection between tailboom and fuselage when connecting and disconnecting these parts. Twisting will stress the connector and can cause irreparable damage.

- e. Remove tailboom by pulling it straight away from fuselage.
2. Disassemble a rotary wing SUAS IAW the appropriate technical manual.
  - a. Remove payload.
  - b. Remove battery.
  - c. Remove propeller(s).

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Disassembled a fixed wing SUAS IAW TM 1-1550-695-13&P.	_____	_____
2. Disassembled a rotary wing SUAS IAW the appropriate technical manual.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 1-1550-695-CL Operator's and Crewmember's Checklist RQ-11B SUAS (NSN 1550-01-538-9256) (EIC: 60C) (NSN 1550-01-587-2765) (EIC: N/A)	TM 1-1550-695-13&P Operator and Field, Maintenance Manual Including Repair Parts and Special Tools List for Small Unmanned Aircraft System (SUAS) RQ-11B NSN 1550-01-538-9256 (EIC: 60C)

**071-705-0010**  
**Maintain the M150 Rifle Combat Optic**

**WARNING**

**Do not handle a damaged unit if you have open skin cuts or abrasions. Use latex or rubber gloves when handling a damaged or crushed rifle combat optic (known as RCO). An inverted clear plastic bag may be used if gloves are not available. Place the damaged or crushed device and gloves in clear double plastic bags and seal it. Label the outside of the sealed clear double plastic bags with "Broken Tritium Devices - Do Not Open" and place it in a secured ventilated storage area. Wash your hands with nonabrasive soap and lukewarm water. Do not eat, drink, smoke, chew, or apply cosmetics in the presence of a damaged or crushed RCO.**

**The RCO scopes are provided with Laser Eye Protection only when used with the included AGF1-ARD Laser Filter/ARD Combo Unit. The AGF1-ARD must be attached to the RCO scope at all times of use. Use of optics without the AGF1-ARD will result in eye damage if exposed to a laser beam. For personnel not issued an AGF1-ARD, SPECS-3 wavelength (Class 4)/ Ballistic Laser Eyewear Protection System (known as BLEPS) goggles will be issued and are to be worn at all times when utilizing the optical scope. Using the optical scope without the BLEPS or AGF1-ARD will result in eye damage if exposed to a laser beam. Personnel are required to utilize BLEPS or AGF1-ARD with this optical scope.**

**Conditions:** You are a member of a squad or team preparing for a mission and must perform maintenance on the M150 RCO to ensure it is operational. You have a DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*) for the RCO.

**Standards:** Clean and perform preventive maintenance checks and services (PMCS) on the RCO. Complete a DA Form 2404 or DA Form 5988-E and turn in the RCO if it is not fully mission capable.

**Performance Steps**

1. Clean the RCO.

**CAUTION**

Be sure to wash the lenses fully before wiping them with a soft cloth. The lenses can be scratched if dirt is pulled along the lens by the cloth.

- a. Clean the lenses.

**Note:** A dry, clean cloth can be used to remove fog from the lenses in cold weather. Anti-fog solutions can also be applied to the exterior of the lenses to help prevent fogging during temperature changes.

- (1) Wash the lenses using fresh water.

- (2) Wipe dry with soft clean cloth.

**CAUTION**

Remove all foreign material from the lenses before cleaning them with the lens pen. This will prevent damage to the lenses.

- b. Clean the RCO utilizing the lens pen.

- (1) Depress and push forward the lens brush slider, exposing the lens brush.
- (2) Use this brush to remove all foreign material from the unit if fresh water is not available.
- (3) Remove the cap from the opposite end of the lens pen to expose the felt lens cleaner.
- (4) Ensure there is no foreign material on the felt surface.
- (5) Starting in the center of the lens, press the felt surface of the lens cleaner against the lens and in a spiral motion, work from the center to the outside edge of the lens.
- (6) Repeat, if necessary.
- (7) When finished, depress lens brush slider and retract the brush into the lens pin.
- (8) Replace the cap over the felt lens cleaner.

**CAUTION**

Treat the laser filter unit (known as LFU)/antireflection device (known as ARD) with the same care you would any optical surface. Never use thread-locking compound when screwing the plastic honeycomb (ARD) housing back onto the modular assembly.

- c. Clean the LFU/ARD.

**Note:** The LFU can be cleaned the same way as the optical lens using the lens pin.

- (1) Clear snow or water from the LFU/ARD when it is mounted by blowing sharply into face of LFU/ARD near one edge.
- (2) Clear LFU/ARD if clogged with dirt or mud.
  - (a) Unscrew the LFU/ARD from the hook/O-ring assembly.
  - (b) Blow clean.

**Note:** If necessary, run water through the honeycomb to clear it and then remove the water by blowing it out.

2. Check the RCO optical surfaces.

- a. Look through the RCO and inspect for visual obstruction of target image, dust, dirt, pits, or moisture on optical surfaces.
- b. Check for loose or broken optical elements.

**Note:** The RCO is not fully mission capable if any of these conditions are present and cannot be corrected by cleaning.

**WARNING**

**Do not handle a damaged unit if you have open skin cuts or abrasions. When a tritium source breaks or is no longer illuminated, the local radiation safety officer must be notified.**

3. Check the tritium lamp.

**Note:** The tritium lamps should be checked for failure; prior to deployment of the optic, twice during any exercise/mission, before placing it back into the storage area, and every 6 months or immediately following any incident which might lead to lamp failure such as the dropping of the RCO onto a hard surface.

- a. Take the RCO into a dark room and look through it.
- b. Verify that the center area between the crosshairs is illuminated by an amber glow.

**Note:** The RCO is not fully mission capable if the tritium lamp does not appear to glow.

4. Check the adjustment cap assembly for missing components (for example, adjustment caps, lanyard, eyepiece bolt).

**Note:** The RCO is not fully mission capable if adjustment cap assembly is missing.

5. Check for missing or damaged flip covers on the objective lens and eye piece lens.

**Note:** If flip covers are missing or damaged, it is a shortcoming but does not make the RCO not fully mission capable.

6. Check the objective lens and eye piece lens for cracks or damage.

**Note:** The RCO is not fully mission capable if lenses are cracked or damaged.

7. Check the LFU/ARD.

- a. Inspect for visual obstruction of target image, dust, dirt, or moisture on the LFU/ARD.
- b. Check for missing, loose, or broken LFU and/or ARD.
- c. Check for missing, loose, or broken retaining band.

**Note:** If the LFU/ARD has damaged or missing parts, it is a shortcoming but does not make the RCO not fully mission capable.

8. Check the windage and elevation adjustment knobs.

- a. Check each knob for an audible click by moving them only one or two clicks.
- b. Return each knob to its original position to retain zero.

**Note:** The RCO is not fully mission capable if no audible click is heard when turning knob.

9. Check the RCO for missing, broken, or loose mounting hardware.

**Note:** The RCO is not fully mission capable if mounting hardware is missing, broken, or loose.

10. Note all deficiencies and shortcomings, if any, on DA Form 2404 or DA Form 5988-E.
11. Turn in the RCO and DA Form 2404 or DA Form 5988-E to maintenance, if equipment is not fully mission capable.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleaned the RCO.	_____	_____
2. Checked the RCO optical surfaces.	_____	_____
3. Checked the tritium lamp.	_____	_____
4. Checked the adjustment cap assembly for missing components.	_____	_____
5. Checked for missing or damaged flip covers on the objective lens and eye piece lens.	_____	_____
6. Checked the objective lens and eye piece lens for cracks or damage.	_____	_____
7. Check the LFU/ARD.	_____	_____
8. Checked the windage and elevation adjustment knobs.	_____	_____
9. Checked the RCO for missing, broken, or loose mounting hardware.	_____	_____
10. Noted deficiencies and shortcomings, if found, on DA Form 2404 or DA Form 5988-E.	_____	_____
11. Turned in the RCO and DA Form 2404 or DA Form 5988-E to maintenance, if equipment was not fully mission capable.	_____	_____

<b>References Required</b>	<b>Primary</b>
----------------------------	----------------

TM 9-1240-416-13&P/TO 11W2-13-10-1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for the M150 Sight, Rifle Combat Optic (RCO) (NSN: 1240-01-557-1897)

**071-705-0002**  
**Operate an M68 Sight Close Combat Optic**

**Conditions:** You are given an M68 close combat optic (known as CCO) mounted on an M16-series rifle or M4-series carbine with components and a requirement to operate the M68 CCO.

**Standards:** Place the M68 CCO into operation without damaging the equipment or injuring personnel.

**Note:** When not in use, the M68 should be stored in its shipping and storage case or carrying case.

**Performance Steps**

**CAUTION**

Before installing battery cap, inspect threads on the battery housing and battery cap to ensure they are free of moisture and dirt and that the O-ring in the battery cap is present. Failure to do so could result in loss of power and shorten battery life.

1. Ensure batteries are installed.
  - a. Ensure the switch knob is set to OFF.
  - b. Unscrew the battery cap by turning counterclockwise.
  - c. Insert battery with positive (+) end into battery cylinder.
  - d. Install cylinder and battery into battery cap.
  - e. Replace the battery cap by turning clockwise until snug.
  - f. Check battery power.
    - (1) Remove rear lens cover.
    - (2) Turn switch knob clockwise to ON position.
    - (3) Look through lens to verify red dot is present (replace battery if no red dot).
    - (4) Turn switch knob counterclockwise to OFF position.
    - (5) Replace rear lens cover.

## WARNING

**At higher intensity settings, the red dot is visible through the front of the sight. For night operations, close the front lens cover before turning the rotary switch to the desired setting. Check light for proper intensity before opening front lens cover. Failure to follow this warning could reveal your position to the enemy.**

2. Activate the M68 CCO using the desired light intensity setting.

**Note:** The M68 CCO is equipped with 10 positions for different dot intensity settings. The OFF position is the number 1 position. Positions 2, 3, and 4 are low intensity for night-vision operations. Positions 5 through 10 are daytime settings. Position 10 is the extra-high intensity setting.

- a. Ensure the front lens cover is closed.
  - b. Turn the switch knob to the desired setting.
  - c. Remove rear lens cover.
  - d. Look through lens to verify the desired intensity of the red dot on the front lens cover.
  - e. Remove the front lens cover.
3. Use the M68 CCO to aim a weapon.
    - a. Obtain proper sight picture.
      - (1) Use the two-eyes-open method (preferred method) by positioning the head so that you can focus one eye on the red dot while scanning downrange with the other eye.
      - (2) Use the one-eye-open method by positioning the head so that you can shut your nonfiring eye while looking through the sight with the firing eye.
    - b. Place the red dot on the center of mass of the target.

**Note:** The same aiming method should be used to both zero and engage targets. The weapon must not be canted during aiming or firing.

4. Operate the M68 CCO under unusual conditions.

- a. Operate in extreme cold conditions.

**Note:** Extreme cold will shorten battery life.

- (1) Keep spare batteries in your inner pockets to keep them warm.
    - (2) Wipe off condensation after the M68 CCO has warmed up when brought from cold to warm.
  - b. Operate under dusty or sandy conditions.
    - (1) Keep front lens covers closed when sight is not being used.

- (2) Keep rear lens covers closed when sight is not being used.
- c. Operate under wet, muddy, and snow conditions.
    - (1) Ensure battery cap is hand-tight before exposing the sight to water, mud, or snow.
    - (2) Ensure both adjustment screw caps are hand-tight before exposing to water, mud, or snow.
    - (3) Close both front and rear lens covers when sight is not being used.
    - (4) Clean lens with lens paper and dry sight with a cloth as soon as possible after being exposed to water, mud, or snow.
  - d. Operate under chemical, biological, radiological, or nuclear conditions.
    - (1) Decontaminate sight with quick release mount and sight mount.
    - (2) Use M258A1 individual Soldier's personal decontamination kit.
5. Power down the M68 CCO.
- a. Turn switch knob to the OFF position.
  - b. Replace front lens cover.
  - c. Replace rear lens cover.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured battery was installed.	_____	_____
2. Activated the M68 CCO using the desired light intensity setting.	_____	_____
3. Used the M68 CCO to aim a weapon.	_____	_____
4. Operated the M68 CCO under unusual conditions.	_____	_____
5. Powered down the M68 CCO.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.9 Rifle and Carbine	TM 9-1240-413-13&P/TO 11W3-5-5-121 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for M68 Sight Reflex, W/Quick Release Mount and Sight Mount (Close Combat Optic (CCO) NSN: 1240-01-411-1265, 1240-01-540-3690, 1240-01-576-6134

## 071-705-0001

### Maintain an M68 Sight Close Combat Optic

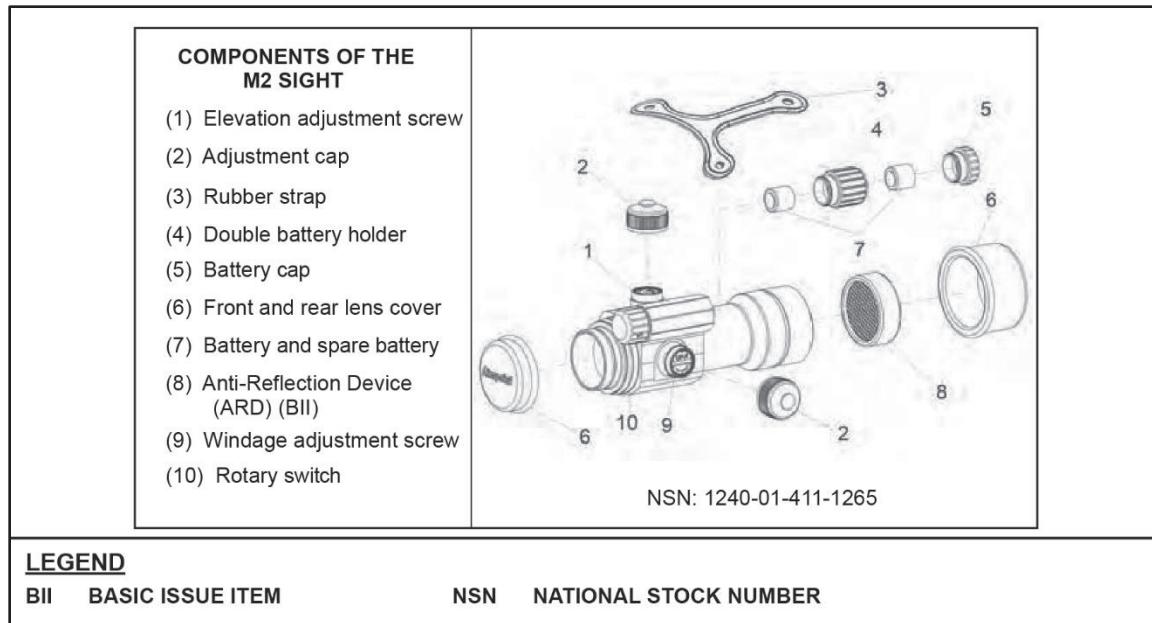
**Conditions:** You are a member of a squad or team preparing for a mission and must perform maintenance on the M68 close combat optic (known as CCO) mounted on your M16-series rifle or M4 carbine to ensure it is operational. You have TM 9-1240-413-13&P/TO 11W3-5-5-121 and DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*) for the sight.

**Standards:** Inventory, clean, and inspect the M68 CCO in accordance with TM 9-1240-413-13&P/TO 11W3-5-5-121, to include all components and accessories. Record deficiencies on DA Form 5988-E or DA Form 2404 and report any deficiencies to your chain of command and/or maintenance personnel, as required.

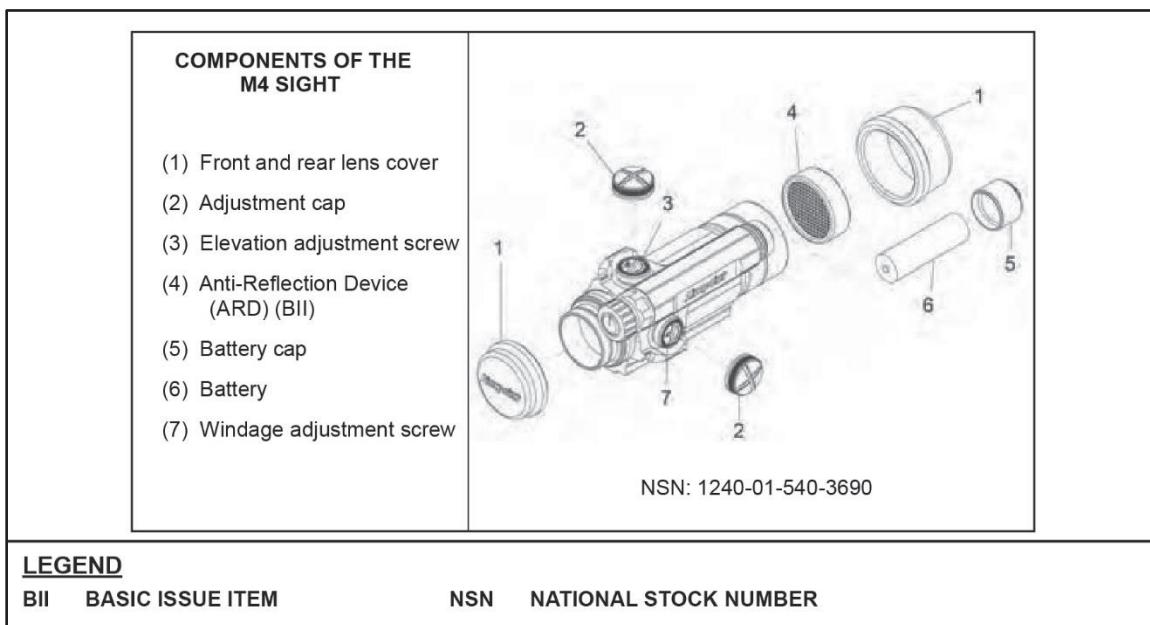
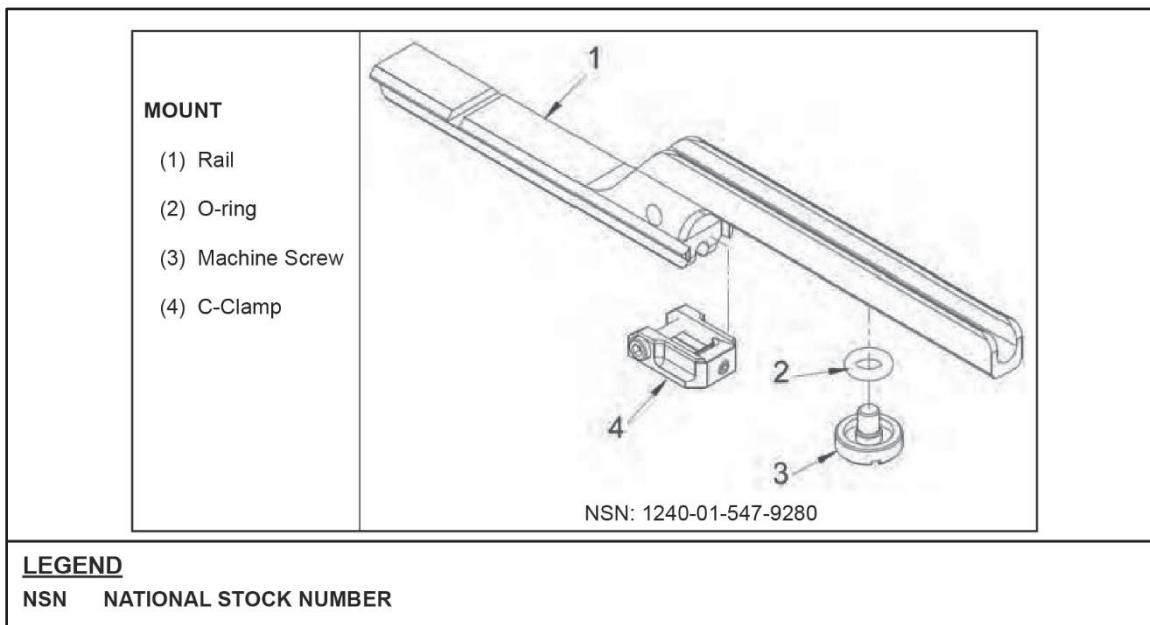
#### Performance Steps

1. Inventory the M68 sight (see figures 3-62, 3-63, and 3-64).

**Note:** Only inventory the components of the appropriate M68 version that will be used.



**Figure 3-62. M68 reflex sight M2 components**

**Figure 3-63. M68 reflex sight M4 components****Figure 3-64. M68 reflex sight mount (used with the M16A2 rifle)**

2. Maintain M68 sight.
  - a. Check the sight for visual obstruction of target image, dust, dirt, pits, or moisture on optical surfaces.
  - b. Check the sight for loose or broken optical elements.
  - c. Check sight battery caps.
    - (1) Ensure that battery cap is present.

- (2) Ensure that battery cap's threads are clean.
  - (3) Ensure that battery cap's threads are undamaged.
  - (4) Inspect O-ring in battery cap.
- d. Ensure that the red dot is visible when switch knob is set to one of the operating positions.
  - e. Check Quick Release Mount base assembly for damage (burrs, bent shaft, loose torque limiting knob) that will prevent sight from being installed.
  - f. Check sight adjustment caps.
    - (1) Ensure that both adjustment caps are present.
    - (2) Ensure that cap's threads are clean.
    - (3) Ensure that cap's threads are undamaged.
  - g. Check sight lens covers.
    - (1) Ensure that front and rear lens covers are present.
    - (2) Ensure lens covers can be snapped in place.
  - h. Check sight mount for damage that will prevent it from being installed on the M16A2 rifle.
  - i. Check quick release mount for damage that would prevent installation of the sight (M16A4 rifle and M4 carbine series only).
  - j. Check quick release mount base.
    - (1) Check base assembly for damage.
    - (2) Ensure torque limiting assembly works.
    - (3) Ensure rail grabbing clamping edge works.
  - k. Check anti-reflection device (known as ARD).
    - (1) Check for damaged threads.
    - (2) Check for damaged honeycomb.
    - (3) Replace ARD if missing or damaged.
  - l. Maintain lens.
    - (1) Remove large particles from exposed lens surfaces by first blowing on the surfaces.
    - (2) Blow as much dust and dirt as possible from the exposed lens surfaces.
    - (3) Gather the center of a sheet of lens paper, and use the edges to brush dust off lens.

- (4) Moisten a piece of lens paper, when all visible particles of dust and dirt have been removed, gently wiping over the lens surfaces.
  - (5) Dry with clean lens paper.
- m. Maintain the ARD.

**Note:** Treat the honeycomb mesh with care as you would any optical surface.

- (1) Clear snow or water from honeycomb when ARD is mounted by blowing sharply into face of ARD near one edge.
  - (2) Remove clogged dirt or mud by removing the shield from the sight and blowing clean.
  - (3) Run water through the honeycomb to clear it blowing through the mesh to remove the water, if necessary.
3. Record any deficiencies found on DA Form 2404 or DA Form 5988-E.
4. Report any deficiencies to chain of command/unit maintenance personnel.

**Note:** The unit's standard operating procedures should provide guidance on reporting equipment status and turn-in procedures for equipment, as required.

Performance Measures	GO	NO-GO
1. Inventoried the M68 sight.	_____	_____
2. Maintained the M68 Sight.	_____	_____
3. Recorded any deficiencies found on DA Form 2404 or DA Form 5988-E.	_____	_____
4. Reported any deficiencies to chain of command/unit maintenance personnel.	_____	_____

References Required	Primary
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-1240-413-13&P/TO 11W3-5-5-121 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for M68 Sight Reflex, W/Quick Release Mount and Sight Mount Close Combat Optic (CCO) NSN: 1240-01-411-1265, 1240-01-540-3690, 1240-01-576-6134
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**071-705-0016**

### **Boresight a Sight System on an M16-Series Rifle or M4-Series Carbine**

**Conditions:** You are a member of a squad or team preparing to conduct a mission. You have just mounted one of the following weapon sights: the M150 rifle combat optic (known as RCO), M68 close combat optic (known as CCO), or back-up iron sight (known as BUIS) to your M16-series rifle or M4-series carbine and have been directed to boresight the sight system to your weapon. You have an AN/PEM-1 laser borelight system, a 10-meter target, a field expedient method of support (sand bags, rucksack, and so forth), and assistant available.

**Standards:** Zero the boresight to the weapon then adjust the sight system to the correct boresight offset mark on a 10-meter target.

#### **WARNING**

**Before using the borelight, ensure that the weapon is clear and on SAFE and that the bolt is locked in the forward position.**

**Do not stare into the visible laser beam.**

**Do not look into the visible laser beam through binoculars or telescopes.**

**Do not point the visible laser beam at mirror-like surfaces.**

**Do not shine the visible laser beam into other individuals' eyes.**

#### **CAUTION**

**When rotating the borelight to zero it, ensure that the mandrel is turning counterclockwise (from the firer's point of view) to avoid loosening the borelight from the mandrel.**

### **Performance Steps**

1. Zero the borelight to the weapon.

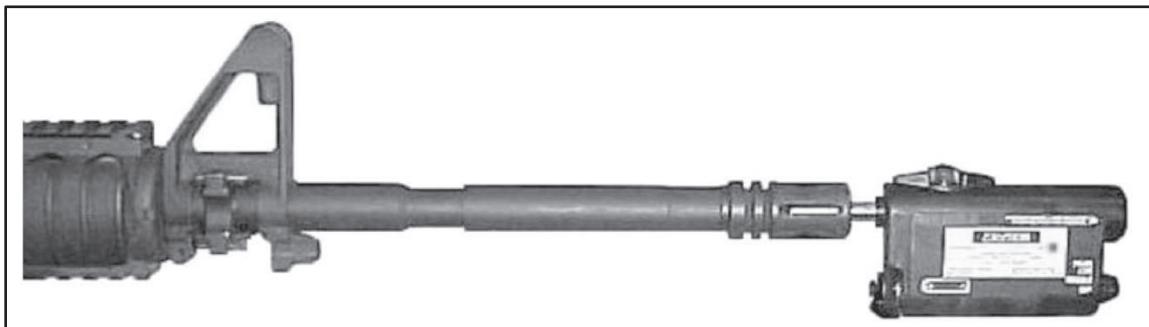
**Note:** Before boresighting the weapon system, the borelight must first be zeroed to the weapon.

- a. Ensure the weapon is clear.
- b. Prepare the weapon.
  - (1) Stabilize the weapon without a cant.

**Note:** Place the weapon in a rifle box rest or lay two rucksacks side by side with another rucksack on top of the weapon. The weapon does not have to be perfectly level with the ground when boresighting.

- (2) Insert the boresight filter to reduce blooming of the laser (optional).
- (3) Attach the 5.56-millimeter mandrel to the borelight.
- (4) Insert the mandrel into the weapon's muzzle (see figure 3-65).

**Note:** The borelight is seated properly when the mandrel cannot be moved any further into the muzzle and the mandrel spins freely.



**Figure 3-65. Borelight inserted properly (battery down)**

c. Prepare the target.

**Note:** It is best to use two Soldiers to boresight. The firer zeros the borelight by making adjustments on the optic or aiming laser being used. The target holder matches the beam and zeroing mark, secures the target straight up and down (aligned with the cant of the weapon) 10 meters from the borelight, and directs the firer to make necessary adjustments. Both Soldiers must clearly communicate their actions.

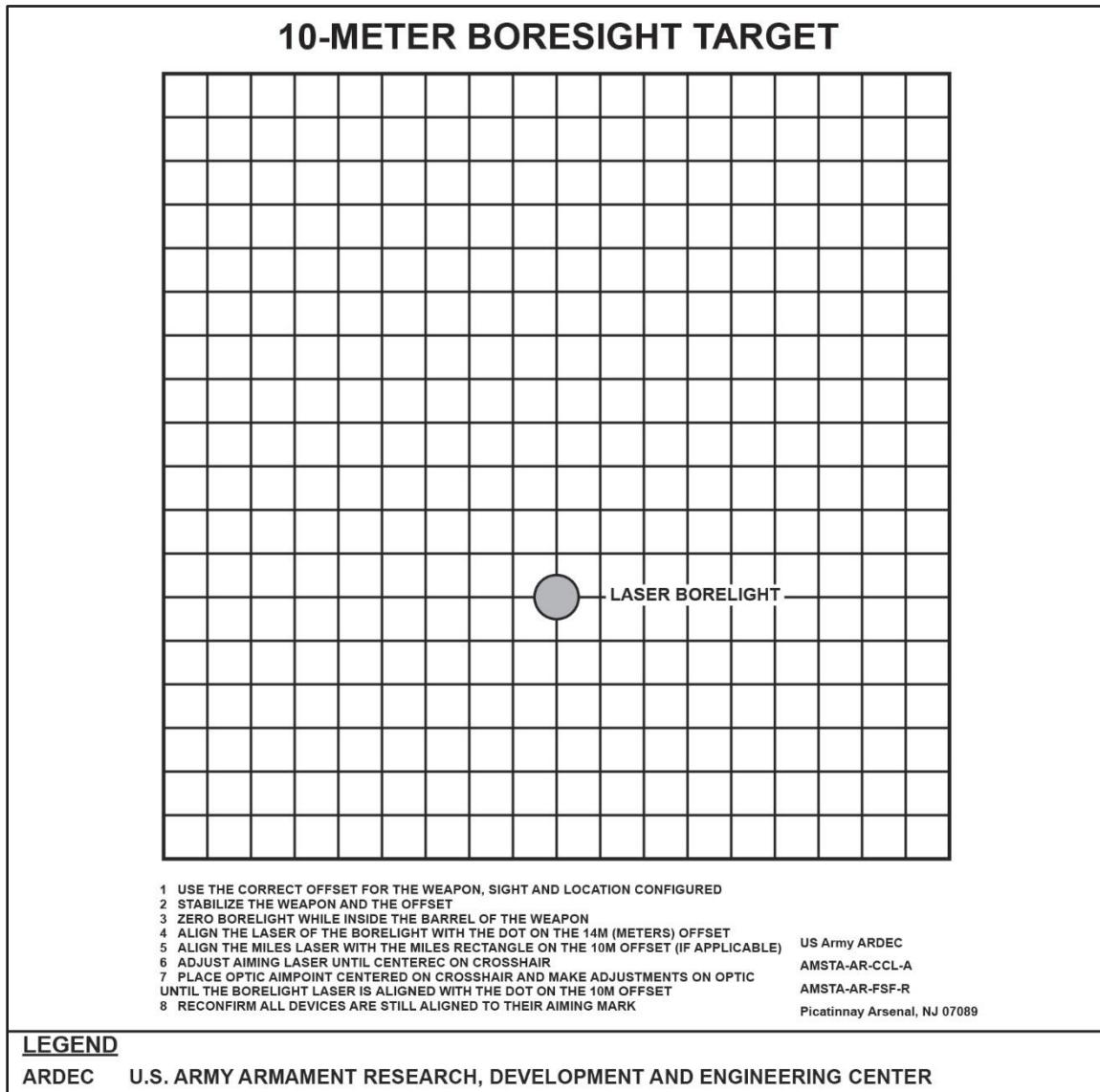
- (1) Secure a target that includes the correct boresight offset (see table 3-4 and figure 3-66, page 3-210).

**Note:** If possible, use the established 10-meter boresighting target found in the AN/PEM-1 technical manual (refer to TM 9-5860-226-13&P). If not available, then ensure the target used is properly marked with a laser borelight zero mark and the correct boresight offset found in table 3-4. Mark the offset by first identifying the correct offset then starting from the center of the borelight zero mark, count the number of squares up (U) or down (D) to the 10-meter borelight offset appropriate to your sight system and mark the spot.

**Table 3-4. Boresight offset**

<b>Weapon</b>	<b>Sight</b>	<b>Zero Offset</b>	
		<b>25m Target</b>	<b>10m Target</b>
M4/M16A4	M150	0.0\1.5D	0.0\4.7U
M4/M16A4	M68	0.0\1.5D	0.0\5.6U
M4/M16A4	BUIS	0.0	0.0\4.0U
M4/M16A4 w M203	M150	0.0\1.5D	0.0\6.7U
M4/M16A4 w M203	M68	0.0\1.5D	0.0\7.5U
M4/M16A4 w M203	BUIS	0.0	0.0\6.0U

**Legend:** BUIS – back-up iron sight, D – down, m – meter, U – up, w – with



**Figure 3-66. Back-up iron sight boresight target**

(2) Measure 10 meters.

**CAUTION**

Do not over-adjust the laser. Do not point the laser at Soldiers or reflective material.

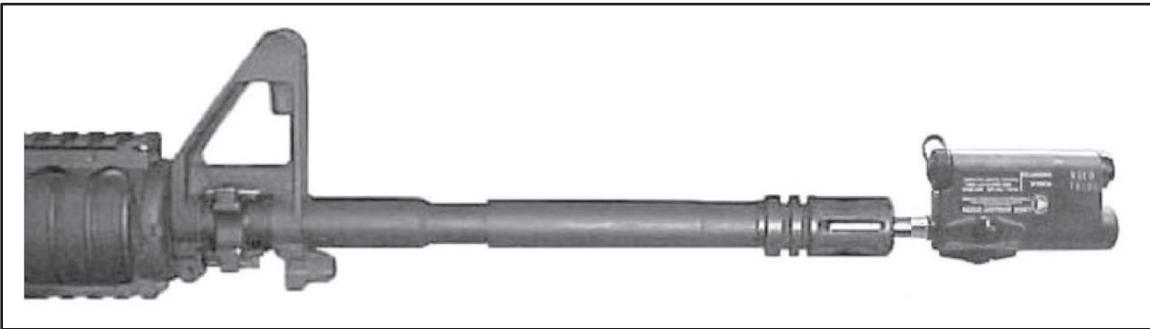
(3) Turn on the borelight.

(4) Ensure the laser strikes the target.

**Note:** If the visible laser cannot be located on the target or does not remain on the target as it is spun, then boresight at 2 meters instead of 10 meters. When the visible laser is zeroed at 2 meters, restart the procedure at 10 meters.

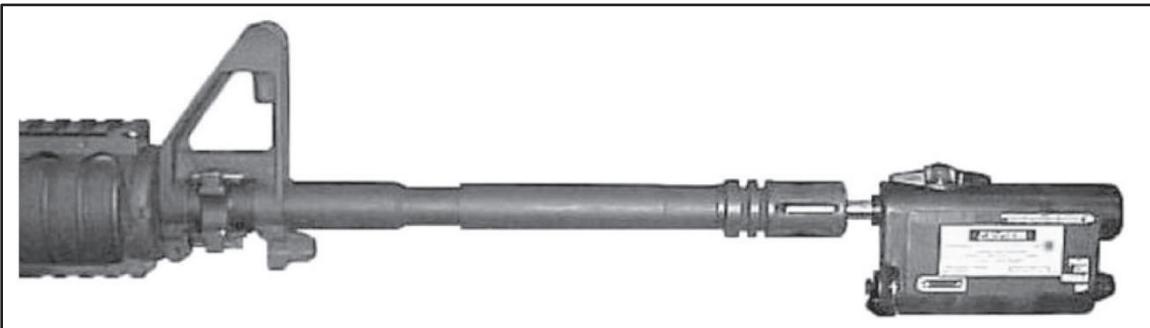
- (5) Place the borelight in the start position by rotating the borelight counterclockwise 180 degrees until the battery compartment is facing upward (see figure 3-67).

**Note:** When rotating the borelight to zero it, ensure that the mandrel is turning counterclockwise (from the firer's point of view) to avoid loosening the borelight from the mandrel.



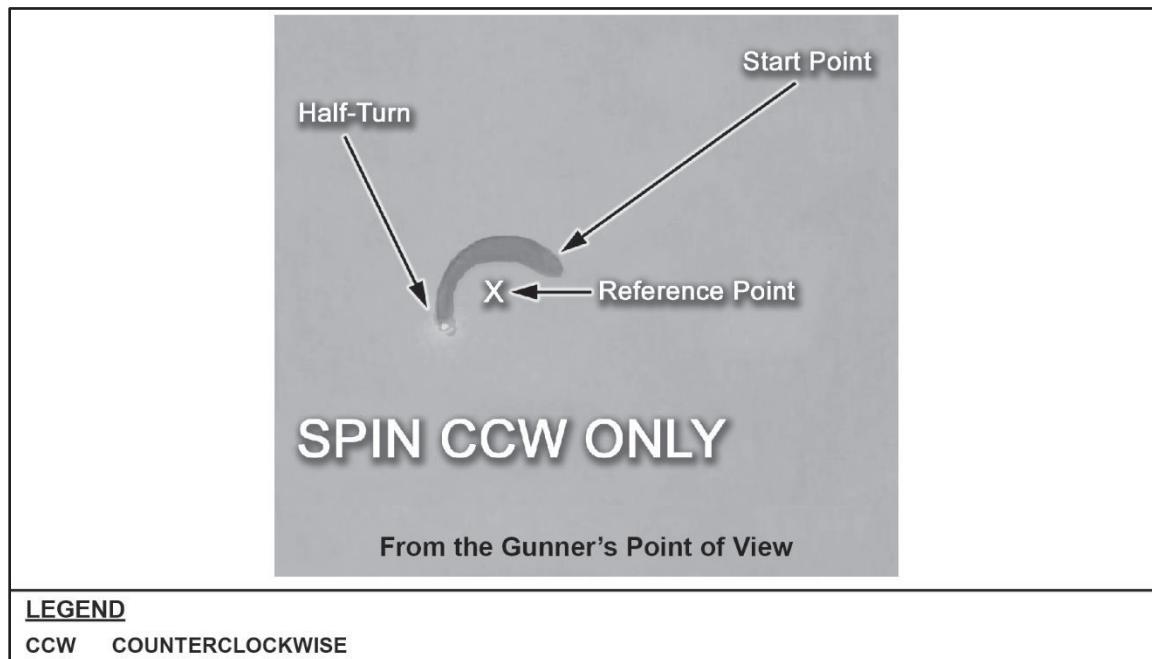
**Figure 3-67. Rotating the borelight (start/battery up position)**

- (6) Secure the boresighting target with the laser striking the zeroing mark or draw a zeroing mark (small dot) on the target, where the laser strikes the target.
  - d. Determine the boresighting reference point.
    - (1) Place the borelight in the half turn position by rotating the borelight counterclockwise 180 degrees until the battery compartment is facing down and the adjusters are on the bottom (see figure 3-68).



**Figure 3-68. Rotating the borelight (half turn/battery down position)**

- (2) Identify the point half way between the start point (battery up) and the half-turn point (battery down) as the reference point (see figure 3-69, page 3-212).



**Figure 3-69. Establishing the reference point**

- e. Determine if the borelight is boresighted (zeroed) to the weapon.

**Note:** A 1 centimeter (cm) or less circle means the borelight has been boresighted to the weapon.

- (1) Determine the size of the laser circle by rotating the borelight counterclockwise.
  - (2) Proceed to step 2, boresight the sight system to the weapon, if the laser dot remains stationary or rotates around the reference point no more than 1 cm.
  - (3) Proceed to step 1f, adjust the borelight, if the laser dot rotates in a circle greater than 1 cm.
- f. Adjust the borelight, as required.
- (1) Turn the windage and the elevation adjusters, as required, to move the visible laser to the reference point.
  - (2) Repeat steps e and f until the visible laser spins a 1 cm or less circle then proceed to step 2, boresight the sight system to the weapon.

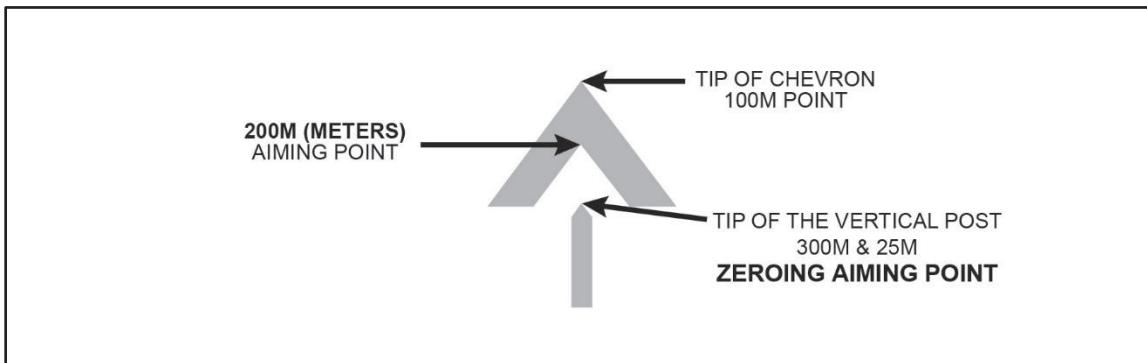
2. Boresight the sight system to the weapon.

- a. Boresight the M150 RCO to the weapon.

**Notes:** A 25-meter zero must be conducted to ensure that the RCO is properly zeroed.

When zeroing the RCO, a 100-meter true zero is preferred. When engaging targets at 200 meters with the RCO, use the 200-meter aiming point tip (tip at the inside of the chevron), if time allows (see figure 3-70).

For the RCO 25-meter zero, Soldiers should use the 300-meter point of aim (tip of the 300-meter post at the target's center of mass) and point of impact (a 4- by 4-cm square drawn 1.5 cm down from the target's center of mass).



**Figure 3-70. M150 rifle combat optic points of aim (100 to 300 meters)**

- (1) Aim the tip of the 300-meter post in the RCO reticle at the 10-meter boresighting target.
  - (2) Make adjustments to the windage and elevation of the RCO until the borelight is centered with the circle on the boresighting target.
  - (3) Turn the borelight off.
  - (4) Move the weapon off of the boresight point of aim.
  - (5) Realign the tip of the 300-meter post on the boresight point of aim.
  - (6) Turn the borelight back on.
  - (7) Verify that the borelight laser is in the borelight circle and that 300-meter post is aligned with the boresight point of aim.
- b. Boresight the M68 CCO to the weapon.
- (1) Rotate switch knob clockwise to desired brightness level.
  - (2) Aim the red dot in the CCO reticle at the 10-meter boresighting target.
  - (3) Make adjustments to the windage and elevation of the CCO until the borelight is centered with the circle on the boresighting target.
  - (4) Turn the borelight off.
  - (5) Move the weapon off of the boresight point of aim.
  - (6) Realign the red dot in the CCO on the boresight point of aim.
  - (7) Turn the borelight back on.
  - (8) Verify that the borelight laser is in the borelight circle and that CCO red dot is aligned with the boresight point of aim.
- c. Boresight the BUIS to the weapon.

- (1) Adjust BUIS elevation to 300-meter mark.
  - (2) Align the BUIS with the offset mark on the 10-meter boresighting target.
  - (3) Make adjustments to the windage of the BUIS and elevation of the front sight post until the borelight is centered with the circle on the boresighting target.
3. Remove the borelight from the weapon.
    - a. Turn the borelight off.
    - b. Carefully remove the borelight and mandrel from the muzzle of the weapon.
    - c. Remove the borelight from the mandrel.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Zeroed the borelight to the weapon.	_____	_____
2. Zeroed the sight system to the weapon.	_____	_____
3. Removed the borelight from the weapon.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1240-416-13&P/TO 11W2-13-10-1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for the M150 Sight, Rifle Combat Optic (RCO) NSN: 1240-01-557-1897	TM 9-5860-226-13&P/TM 10471-OI/1A Operator and Field Maintenance Including Repair Parts and Special Tools List for the Laser Borelight System (LBS), AN/PEM-1 (NSN: 5860-01-471-2091)
TC 3-22.9 Rifle and Carbine	

**071-COM-0031**  
**Zero an M16-Series Rifle/M4-Series Carbine**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
 Treat all weapons as if they are loaded and prepared to fire. Keep  
 finger straight and out of the trigger guard until ready to fire.  
 Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are assigned an M16-series rifle or M4-series carbine and have been directed to zero the weapon. Your weapon has an M68 close combat optic (known as CCO), an M150 rifle combat optic (known as RCO), back-up iron sight (known as BUIS), or carrying handle assembly mounted. You are in a firing position and have 5.56-millimeter ammunition, sandbags for support, GTA 07-01-034, and A8 25-meter zero target at 25 meters.

**Standards:** Prepare the sight system for operation and establish a correct sight picture. Conduct grouping. Initiate zeroing procedure and confirm your zero. Return the rear mechanical sight (carrying handle assembly or BUIS) elevation to the 300-meter setting, if used. Record your zero and confirm the zero at 300 meters.

**Note:** Boresighting of the weapon and any optics is recommended prior to zeroing the weapon system. Although not required, boresighting saves time and requires less rounds for the zeroing process.

**Performance Steps**

1. Prepare the sight system for zeroing.

a. Prepare the CCO.

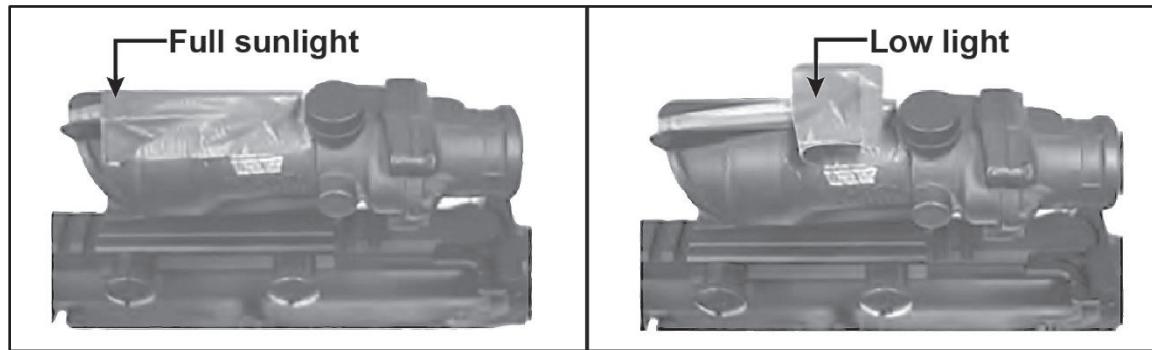
**Note:** The CCO is equipped with 10 positions for different dot intensity settings. The OFF position is the number 1 position. Positions 2, 3, and 4 are low intensity for night-vision operations. Positions 5 through 10 are daytime settings. Position 10 is the extra-high intensity setting.

- (1) Ensure the front lens cover is closed.
- (2) Turn the switch knob to the desired setting.
- (3) Remove rear lens cover.
- (4) Look through lens to verify the desired intensity of the red dot on the front lens cover.
- (5) Remove the front lens cover.

b. Prepare the RCO.

- (1) Open front and rear lens covers.
- (2) Adjust reticle brightness.

**Note:** To adjust reticle illumination during extremely bright conditions, use riggers' tape (see figure 3-71, page 3-216) to shield the fiber optic collector. During bright conditions only about  $\frac{1}{2}$ –1 inch of fiber optic is required to illuminate the reticle. The tape can be peeled back to expose more of the fiber optic when more reticle illumination is needed.



**Figure 3-71. Rifle combat optic field expedient reticle adjustment**

- c. Set the weapon to battlesight zero for mechanical sight (BUIS or carrying handle assembly).

- (1) Set battlesight zero on weapon with carrying handle assembly.

**Note:** No changes are made to the front sight when setting a battlesight zero.

- (a) Adjust rear aperture by positioning the apertures so the unmarked aperture is up and the 0–200 meter aperture is down.
- (b) Adjust windage by turning the windage knob to align the index mark on the 0–200 meter aperture with the long center index line on the rear sight assembly.
- (c) (M16A2/M16A3 only) Adjust elevation.
  - \_1 Turn the elevation knob counterclockwise until the rear sight assembly rests flush with the carrying handle and the 8/3 marking is aligned with the index line on the left side of the carrying handle.
  - \_2 Turn the elevation knob one click clockwise.
- (d) (M16A4 only) Adjust elevation.
  - \_1 Turn the elevation knob counterclockwise until the rear sight assembly rests flush with the carrying handle and the 6/3 marking is aligned with the index line on the left side of the carrying handle.
  - \_2 Turn the elevation knob two more clicks clockwise so the index line on the left side of the detachable carrying handle is aligned with the "Z" on the elevation knob.
- (e) (M4-series only) Adjust elevation by turning the elevation knob counterclockwise until the rear sight assembly rests flush with the detachable carrying handle and the 6/3 marking is aligned with the index line on the left side of the carrying handle.

- (2) Set battlesight zero on weapon with a BUIS.

- (a) (M4/M4A1 Carbine) Align the mark on the left side of the sight cam with the 300-meter mark.
- (b) (M16A4 Rifle) Align the mark on the left side of the sight cam with the line between the 300- and 400-meter mark.

2. Establish a correct sight picture.
  - a. Identify the A8 25-meter zero target.
  - b. Assume a prone supported firing position.
  - c. Obtain a correct sight picture.
    - (1) Obtain a correct sight picture with a CCO.

**Notes:** When zeroing at 25 meters the point of impact (known as POI) of the round should be 1.4 centimeters or (1.5 squares on a 25-meter zero target) below the point of aim (known as POA).

You should focus your eye on the CCO aim point, not the target itself.

- (a) Determine what method to use.
  - \_1\_ Use the two-eyes-open method (preferred method) by positioning your head so that you can focus one eye on the red dot while scanning downrange with the other eye.
  - \_2\_ Use the one-eye-open method by positioning your head so that you can shut your nonfiring eye while looking through the sight with your firing eye.
- (b) Place the red dot on the center of mass of the target.

**Note:** The same aiming method should be used to both zero and engage targets. The weapon must not be canted during aiming or firing.

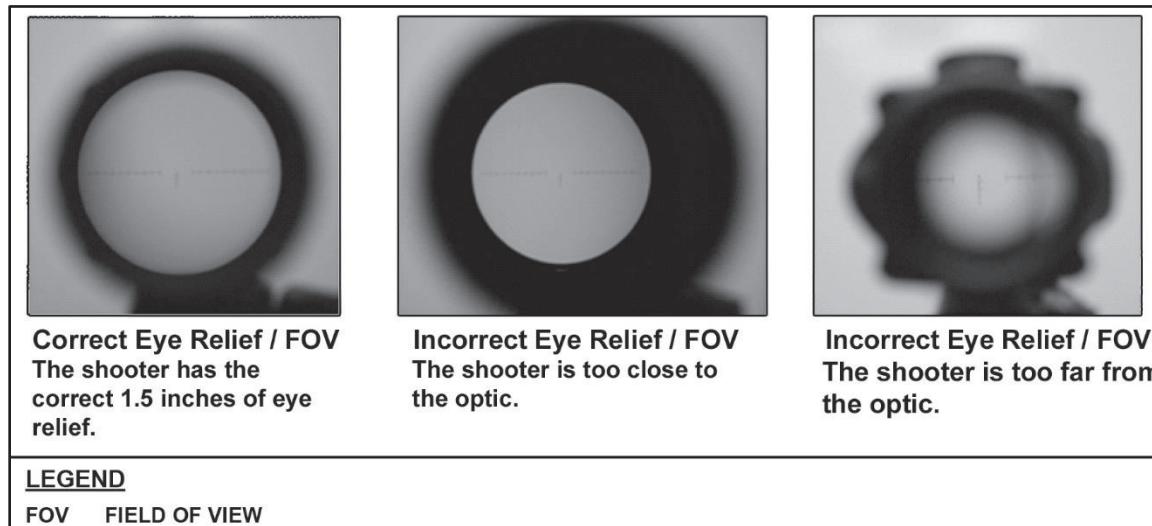
- (2) Obtain a correct sight picture with a RCO.

**Notes:** A 25-meter zero is less precise than a 100-meter zero and should be verified at longer distances once time and a range are available.

You should focus on the correct aim point along the bullet drop compensator, not the target itself.

- (a) Ensure proper eye-relief is obtained (see figure 3-72, page 3-218).

**Note:** Eye relief on the RCO is 1.5 inches.

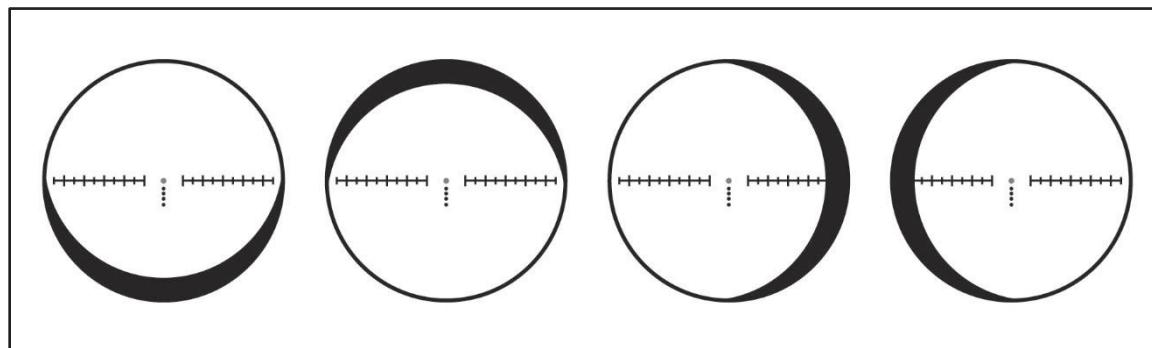
**Figure 3-72. Example of eye relief**

(b) Obtain a proper stock weld.

**Note:** Proper stock weld ensures consistent sight alignment and will improve accuracy. Consistent sight alignment is achieved by resting the full weight of your head on the stock in a manner that allows your dominant eye to look through the center of the RCO.

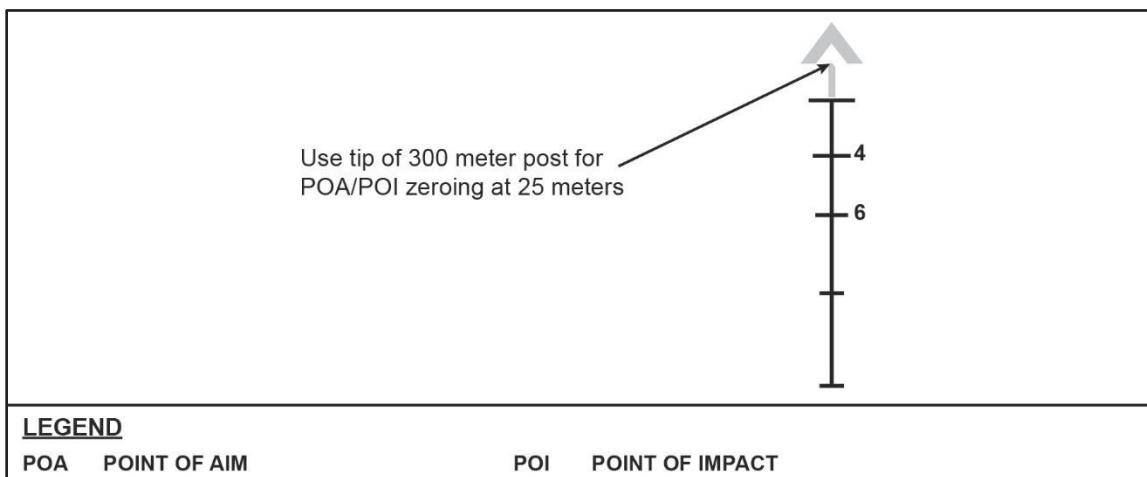
(c) Ensure you have the correct sight alignment (see figure 3-73).

**Note:** "Scope shadow" indicates misalignment of the sights. The outside edge of the sight picture should be crisp.

**Figure 3-73. Example of improper eye relief or scope shadow**

(d) Place the appropriate aiming point within the reticle center of mass of the target.

**Note:** Focus should be on the reticle. The target is a distraction and should not appear clear when the eye is focused properly (see figure 3-74).



**Figure 3-74. Rifle combat optic 25-meter zero point of impact/point of aim**

- (1) Obtain a correct sight picture with a mechanical sight.

**Note:** You should focus on the front sight post, not the target itself.

- (a) Align the sights.

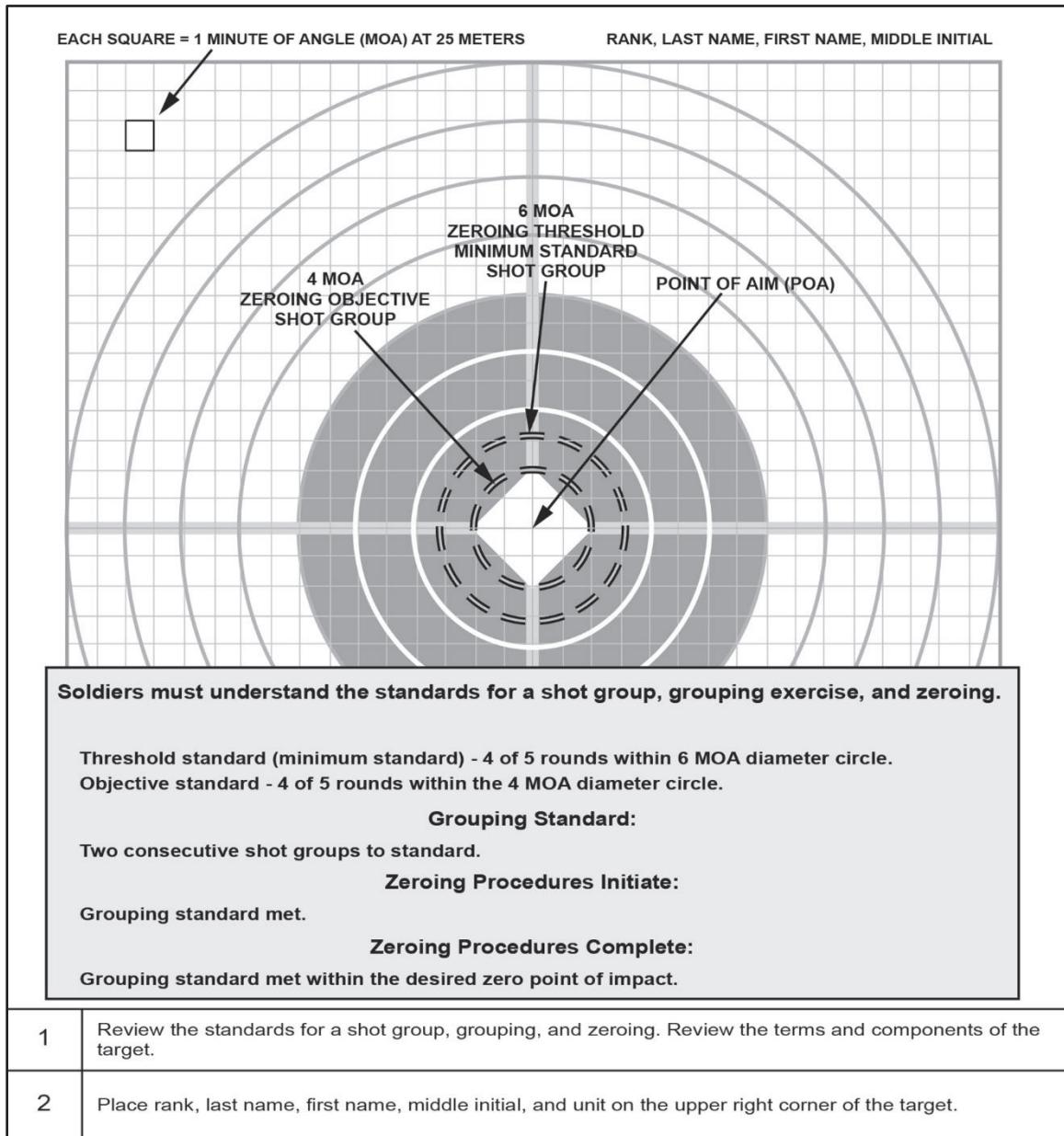
- \_1\_ Center the top of the front sight post in the center of the rear sight.
- \_2\_ Visualize imaginary crosshairs in the center of the rear aperture so that the top of the front sight post touches the imaginary horizontal line and the front sight post bisects imaginary vertical line.
- \_3\_ Verify the sight picture.

- (b) Align the aiming point.

- \_1\_ Aim at target center.
- \_2\_ Position the top of the front sight post center mass of the scaled silhouette target.
- \_3\_ Confirm that an imaginary vertical line drawn through the center of the front sight post splits the target.
- \_4\_ Confirm that an imaginary horizontal line drawn through the top of the front sight post splits the target.

3. Conduct grouping.

**Note:** The objective of grouping is to place four out of five rounds within a 4-minute of angle (known as MOA) diameter circle. However, 6 MOA is accepted as the minimum threshold (see figure 3-75, page 3-220).

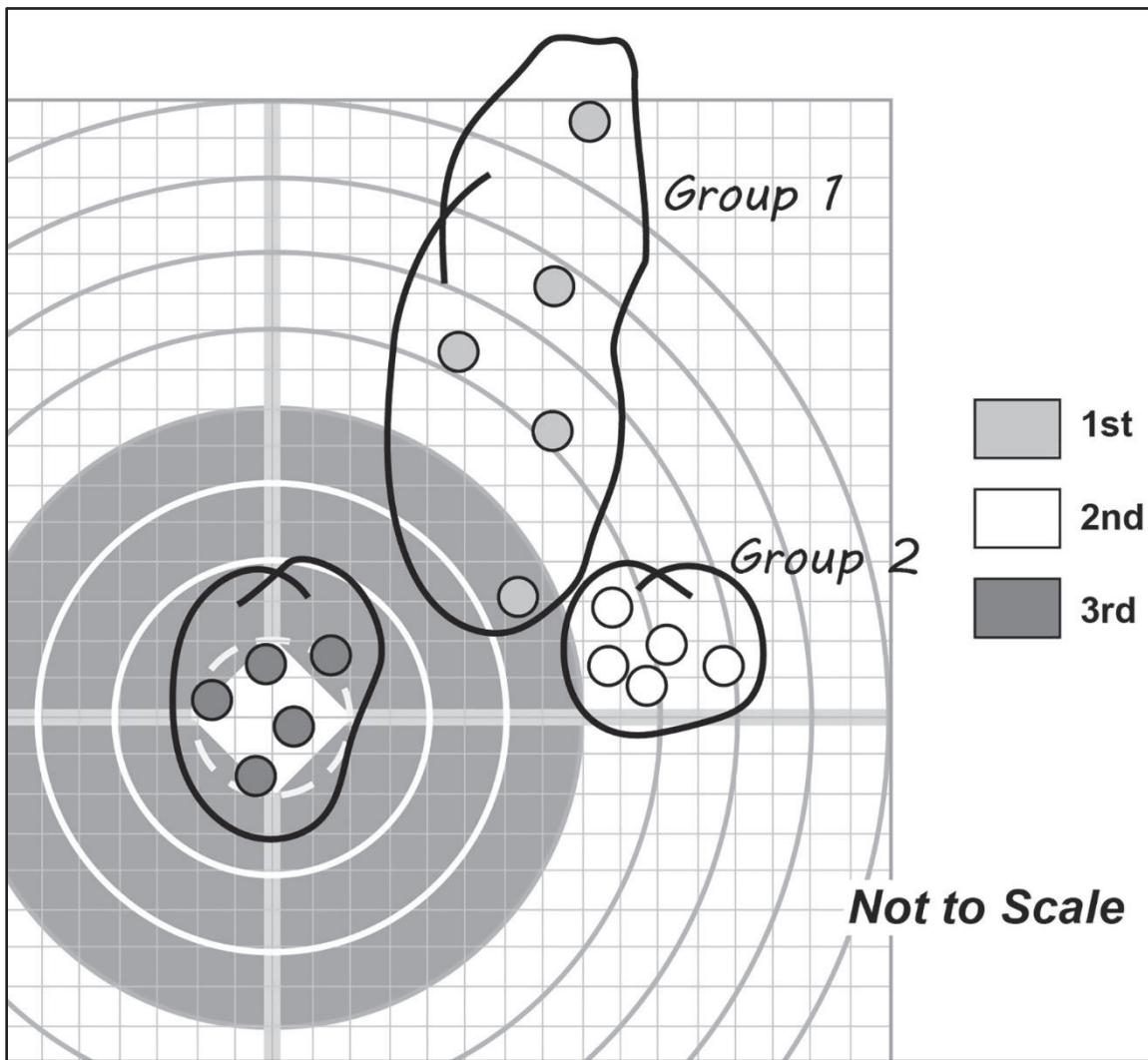
**Figure 3-75. Rifle and carbine, Table IV, standards**

- Fire a five-round shot group at the A8 target.
- Identify the shot group on the target.

**Note:** The shot group must fit within a 6 MOA circle.

- Mark the shot group. (See figure 3-76.)

**Note:** If possible, shot groups should be marked using different colored markers so you can track your progress (see figure 3-76).



**Figure 3-76. Marking shot groups**

- d. Repeat the process until two consecutive shot groups meet the standard of four out of five rounds in a 6 MOA circle.
  
- 4. Initiate zeroing procedure.

**Note:** Prior to starting the zeroing procedure, a new A8 target should be selected.

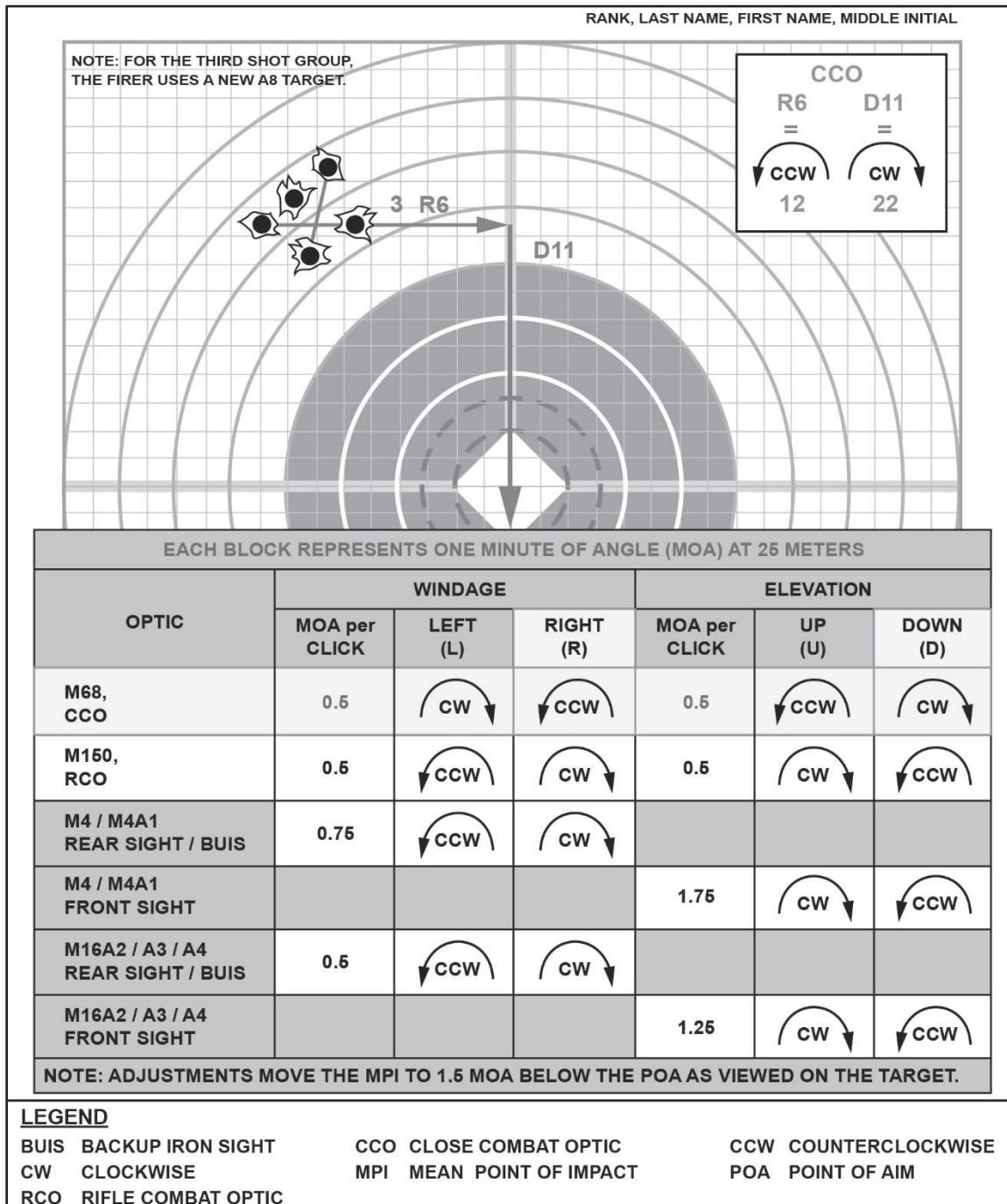
- a. Fire a five-round shot group at the A8 target.
- b. Identify the shot group on the target.
- c. Mark the shot group.
- d. Adjust sights (if required) to obtain a zero.

**Note:** You should not adjust your sights if your shot group meets the standards.

- (1) Determine the necessary sight adjustments.

**Note:** Each square is equal to 1 MOA at 25 meters.

- Identify the center of the last fired shot group.
- Identify the adjustment needed to move the point to the center of the strike zone. (See figure 3-77.)



**Figure 3-77. Rifle and carbine mean point of impact adjustment**

- Adjust sight to bring POI to POA.

- e. Establish a zero.
  - (1) Fire a five-round shot group at the A8 target.
  - (2) Identify the location of the shot group on the target.
    - (a) Return to step 4d, if the group does not strike within the strike zone/zero offset.
    - (b) Proceed to step 5 if the shot group strikes within the strike zone/zero offset.
- 5. Confirm the zero.
  - a. Select a new A8 target.
  - b. Fire a five-round shot group at the A8 target.
  - c. Identify the location of the shot group on the target.
    - (1) Return to step 4e, if the shot group does not strike within the strike zone/zero offset.
    - (2) Proceed to step 5d if the shot group strikes within the strike zone/zero offset.
  - d. Fire a five-round shot group at the A8 target.
    - (1) Cease fire if the shot group strikes within the strike zone/zero offset (your zero is confirmed).
    - (2) If the shot group leans to one side of center or the other (up, down, or left, right), they may make refinement adjustments no greater than one click in any direction.
- 6. (Mechanical sight only) Return the rear sight elevation to the 300-meter setting.
- 7. Record your zero.
- 8. Confirm the zero at 300 meters.

**Note:** The most important step in the zeroing process is to confirm your zero at 300 meters. Having your weapon zeroed at 25 meters does not guarantee a center hit at 300 meters.

Performance Measures	GO	NO-GO
1. Prepared the sight system for zeroing.	_____	_____
2. Established a correct sight picture.	_____	_____
3. Conducted grouping.	_____	_____
4. Initiated zeroing procedure.	_____	_____
5. Confirmed the zero.	_____	_____
6. (Mechanical sight only) Returned the rear sight elevation to the 300-meter setting.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
7. Recorded your zero.	_____	_____
8. Confirmed the zero at 300 meters.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-1005-319-10/T.O. 11W3-5-5-41/SW370-BY-OPI-010 Operator's Manual for Rifle, 5.56 MM, M16A2 (NSN 1005-01-128-9936) (EIC:4GM) Rifle, 5.56 MM, M16A3 (NSN 1005-01-357-5112) Rifle, 5.56 MM, M16A4 (NSN 1005-01-383-2872) (EIC:4F9) Carbine, 5.56 MM, M4 (NSN 1005-01-231-0973)(EIC:4FJ) Carbine, 5.56 MM, M4A1 (NSN 1005-01-382-0953 ) (EIC:4GC)	TC 3-20.40 Training and Qualification - Individual Weapons	GTA 07-01-034 M68 and M150 25-Meter Point of Impact Offsets
TC 3-22.9 Rifle and Carbine		

**071-COM-0030**  
**Engage Targets with an M16-Series Rifle/M4-Series Carbine**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
Treat all weapons as if they are loaded and prepared to fire. Keep  
finger straight and out of the trigger guard until ready to fire.  
Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are a member of a squad or team engaged in active ground combat. You have an M16-series rifle or M4-series carbine and have identified a threat. You have additional loaded rifle magazines in a magazine pouch; you do not have a secondary weapon.

**Standards:** Acquire target(s), assume an appropriate firing position, and engage until target is/targets are destroyed, suppressed, or you receive an order to cease fire. Reload, if necessary.

**Performance Steps**

1. Acquire target(s).
  - a. Detect potential threats.
  - b. Identify threat as friend, foe, or noncombatant.
  - c. Prioritize the threat(s) based on the level of danger they present.

**Note:** The standard prioritization of targets establishes the order of engagement. Similar threats are engaged based on the following guidelines: near before far, frontal before flank, stationary before moving.

2. Assume appropriate firing position.

**Note:** Due to the nature of engagements, you will not always be able to assume a particular firing position. You need to become proficient in firing your weapon from a variety of positions. The variation of supported or unsupported, in the standing, kneeling, seated and prone positions will be determined by threat prioritization, the availability of cover, and the capability of the firer.

- a. Select a suitable firing position.

**Note:** Your environment should affect your physical positioning and firing stance. Your firing position should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire. Your position may vary from a fixed location to a temporary location during movement. You should be able to rapidly change your stance vertically. Like magazine changes, proficiency is achieved through correct repetition and execution. "Fight up" and fight down" drills will aide your ability to quickly change your vertical stance.

- (1) Assume the standing position.

- (a) Place your feet slightly more than shoulder-width apart in an athletic stance with your chest and shoulders squared with your target.

**Note:** Your nonfiring foot should be slightly forward of the other.

- (b) Lean slightly forward.

**Note:** The key is to build a dynamic firing position that provides support, muscle relaxation, natural point of aim, and recoil management.

- (c) Ensure your nonfiring hand is as far forward on the hand guard as possible while maintaining a slight bend in the elbow.
- (d) Apply slight rearward pressure with the nonfiring hand to provide additional recoil management.
- (e) Allow firing arm to fall to a natural position.

**Note:** Do not lift your elbow up or concentrate on keeping it pressed down. This allows for muscle relaxation and aids in support.

- (f) Ensure firing hand is placed high and firmly on the pistol grip.
- (g) Place the butt plate on the highest point of the shoulder to absorb recoil impulse.

**Note:** This will allow your head to be upright, level and free of cant.

(2) Assume the kneeling position.

**Note:** The kneeling position is not as stable as the prone or sitting positions but allows you to move in and out of a relatively stable shooting position quicker.

- (a) Take a step toward your target with your nonfiring foot while simultaneously changing levels down with your firing side knee to the ground.
- (b) Sit back on your firing foot, creating three points of contact with your center of gravity over your firing foot.
- (c) Turn your nonfiring foot 45-degrees inwards towards your body.

**Note:** This action will give you natural skeletal alignment of the nonfiring ankle, tibia, and fibula.

- (d) Place your elbows on your knees without creating bone to bone contact.

**Note:** Align the elbow and thigh to absorb the recoil by placing the elbow on the inside of the firing knee or the nonfiring side tricep resting forward of the knee.

- (e) Ensure firing arm is where it falls naturally.

**Note:** Allow arm to fall to a natural position; do not lift your elbow up or concentrate on keeping it pressed down.

- (f) Ensure firing hand is placed firmly on the pistol grip.
- (g) Place the butt plate into your shoulder where you can achieve an optimum stock weld.

## (3) Assume the seated position.

**Note:** Sitting is the second most stable platform after prone. The position should afford stability and facilitate the aiming process through proper stock weld and butt plate position. There are two common variations of the sitting position: the crossed leg and the open legged. In both variations of the sitting position, proper stock weld will allow the head to be fairly erect. You should look through the rear sight in a manner where the neck and eye are not strained. The rifle butt plate should be high enough to achieve proper stock weld.

## (a) Crossed leg position:

**Note:** Once in this position, if you discover that you need to adjust your natural point of aim, the only part of the position that moves is the buttock. Sliding to the left or right will adjust side to side. Moving closer or further from the legs/ankles will change to elevation. You can also move your nonfiring hand in or out to make a small change to elevation.

- \_1\_ Lower yourself to the ground into a seated position.
- \_2\_ Cross your firing side ankle over your nonfiring side ankle.
- \_3\_ Bend forward at the waste while placing your support elbow on your support leg into the pocket of the knee.
- \_4\_ Lower your firing elbow into the inside of the firing side knee.

## (b) Open leg position:

- \_1\_ Place feet shoulder width apart and face at a 45-degree angle to your target.
- \_2\_ Lower yourself to the ground into a seated position.
- \_3\_ Extend legs into an open position.
- \_4\_ Retract your legs far enough to allow the knees to bend roughly 90 degrees.
- \_5\_ Bend forward at the waste while placing your support elbow on your support leg into the inside of the leg while avoiding bone to bone contact.
- \_6\_ Lower your firing elbow into the inside of the firing side leg.

## (4) Assume the prone position.

**Note:** This technique is commonly referred to as point, post, and/or sprawl.

- (a) Orient yourself and the weapon to the target.
- (b) Post the firing hand on the ground as you do a rear lunge or forward lunge.

**Note:** Posting with the nonfiring hand is ineffective and places too much mass on the shoulder and elbow. By using the firing hand to post, while simultaneously changing level with your hips, you keep the weight over your hips. This will allow you to fight to the prone more efficiently.

- (c) Kick your legs rearward and out so that your body lays naturally on the ground in good firing position.
- b. Stabilize the weapon.

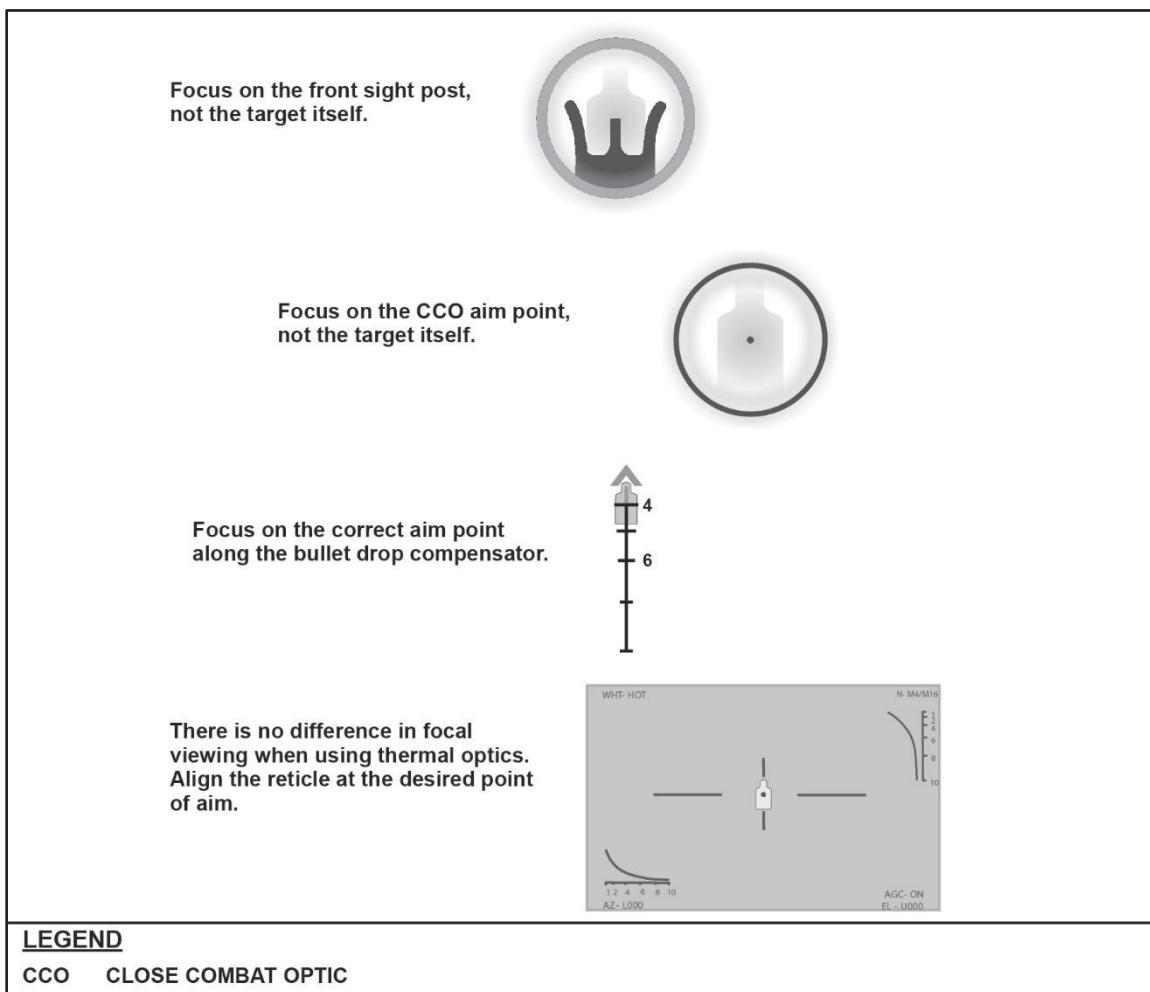
**Note:** A stable firing position provides you with four functions: support for the weapon (natural or artificial), muscle relaxation to maintain the position, natural point of aim to achieve a proper sight picture, and recoil management for rapid subsequent engagements.

- (1) Adequately support the weapon system with natural or artificial support.
- (2) Achieve natural point of aim.

**Note:** The natural point of aim is the point where the barrel naturally orients when your muscles are relaxed and support is achieved.

- (3) Control the arc of movement of the barrel when breathing.
  - c. Reacquire the target.
3. Engage the target(s).
  - a. Disengage the manual safety.
  - b. Ensure sights are aligned on the target (see figure 3-78).

**Note:** The human eye can only focus clearly on one object at a time. To achieve proper and effective aim, focus your eye on the front sight post or reticle.



**Figure 3-78. Front sight post reticle aim focus**

- c. Pull the trigger straight to the rear by applying smooth, continuous pressure without disturbing sight alignment.
- d. Release the trigger far enough for the sear to reset.

**Note:** You will feel and hear a metallic click as the sear resets. Slight pressure should be maintained on the trigger until engagement is complete or reloading is necessary. The action of releasing the trigger must happen during the recoil.

- e. Assess effects on target.
  - (1) Continue engagement if target is not destroyed or an additional target is identified.
    - (a) Adjust point of aim, as needed.
    - (b) Re-engage target.
  - (2) Cease fire, if target is/targets are destroyed, suppressed, or you receive an order to cease fire.
    - (a) Fully release the trigger.

- (b) Remove trigger finger from the trigger guard and rest it along the lower receiver.
  - (c) Engage the manual safety.
4. Reload the weapon, if necessary.

**Notes:** Reloading can be performed anytime during the engagement process.

The two types of reloads for the rifle/carbine are reload without immediate retention and reload with immediate retention. The purpose of the reload without retention is to bring an empty weapon back to firing condition in the shortest possible time. The reload with immediate retention is a tactical reload used to bring the weapon back to its fully loaded status after firing one or more rounds but with ammunition remaining in both the chamber and magazine.

- a. Ensure trigger finger is free of the trigger guard and resting along the lower receiver.
- b. Ensure the manual safety is engaged.
- c. Reload using one of the following procedures:
  - (1) Reload without immediate retention.

**Note:** Though the empty magazine is not immediately retained, you should retain it as the situation permits or prior to leaving your firing position.

- (a) Cant the weapon 45 degrees to your nonfiring side.

**Note:** The muzzle of the weapon, your body, and your eyes remain oriented towards the threat area.

- (b) Press the magazine release while simultaneously reaching for and securing a new magazine with the nonfiring hand.

**Note:** The magazine should fall free. If it does not, forcefully remove the magazine from the weapon. Left-handed fires will press the magazine release with their nonfiring hand, then secure a new fully loaded magazine with their nonfiring hand.

- (c) Visually observe that empty magazine falls free of the magazine well.
- (d) Insert a new loaded magazine.
- (e) Press bolt catch to release the bolt, as necessary.
- (f) Rotate the weapon 45 degrees to the firing side so that it is returned to the upright position and ready to engage.

- (2) Reload with immediate retention.

- (a) Bring weapon back into workspace with the firing hand while simultaneously reaching for and securing a new magazine with the nonfiring hand.

**Note:** The workspace is a spherical area, 12 to 18 inches in diameter centered on Soldiers' chins and about 12 inches in front of their chin. The workspace is where the majority of weapons manipulations occur.

- (b) Press the magazine release.

**Note:** The magazine should release and sit loose in the magazine well. If it does not, keep the magazine release depressed until the new loaded magazine has been loaded.

- (c) Secure the old magazine with the nonfiring hand by placing the new loaded magazine parallel to it.
- (d) Remove the old magazine and insert the new loaded magazine.
- (e) Press bolt catch to release the bolt, as necessary.

**Note:** If the weapon was empty with the bolt locked to the rear, visually observe the round enter the chamber.

- (f) Secure the empty magazine in a magazine pouch.
- d. Engage target(s), as necessary.

Performance Measures	GO	NO-GO
1. Acquired target(s).	_____	_____
2. Assumed appropriate firing position.	_____	_____
3. Engaged target(s).	_____	_____
4. Reloaded the weapon, if necessary.	_____	_____

References Required	Primary
TM 9-1005-319-10/T.O. 11W3-5-5-41/SW370-BY-OPI-010 Operator's Manual for Rifle, 5.56 MM, M16A2 (NSN 1005-01-128-9936) (EIC:4GM) Rifle, 5.56 MM, M16A3 (NSN 1005-01-357-5112) Rifle, 5.56 MM, M16A4 (NSN 1005-01-383-2872) (EIC:4F9) Carbine, 5.56 MM, M4 (NSN 1005-01-231-0973)(EIC:4FJ) Carbine, 5.56 MM, M4A1 (NSN 1005-01-382-0953 ) (EIC:4GC)	TC 3-22.9 Rifle and Carbine

**071-701-0008****Mount an AN/PEQ-15-Series Aiming Light on a Weapon System****DANGER**

**Always ensure the weapon is clear and on safe before installation of accessories.**

**Conditions:** You have been issued an AN/PEQ-15 Advanced Target Pointer Illuminator Light or an AN/PEQ-15A Dual-Beam Aiming Laser-Advanced<sup>2</sup> to mount to your weapon. You are assigned an M16 rifle, M4 carbine, M240 machine gun, or M249 machine gun.

**Standards:** Clear the weapon. Inspect the AN/PEQ-15 for completeness and operability. Securely mount the AN/PEQ-15 and the remote cable switch to the weapon.

**Note:** The AN/PEQ-15 is equipped with a rail grabber bracket that is designed for direct attachment to weapons with a military standard (MIL-STD) 1913 rail.

**Performance Steps**

1. Clear the weapon.
2. Inspect the AN/PEQ-15.
3. Install the battery.
4. Mount the AN/PEQ-15 to the weapon.

**Notes:** Table 3-5 lists possible AN/PEQ-15 mounting configurations to be used with various weapons.

The AN/PEQ-15 may be placed at any position (forward and aft) on the rail that is most convenient for the operator.

If the AN/PEQ-15 is removed from the rail, the operator must make note of the position at which it was zeroed and return it to that same position in order to ensure that zero is retained.

**Table 3-5. Mounting configurations**

<b>Weapon</b>	<b>Configurations</b>
M16A4	Top, Left, or Right Mount
M4/M4A1	Top, Left, or Right Mount
M240B	Feed Tray Cover Rail Mount
M240B	Left or Right Side Mount on Forward Rails
M249 SAW	Feed Tray Cover Rail Mount
M249 SAW	Left or Right Side Mount on Forward Rails

**Legend:** SAW – squad automatic weapon

- a. Mount the AN/PEQ-15 (see figure 3-79).

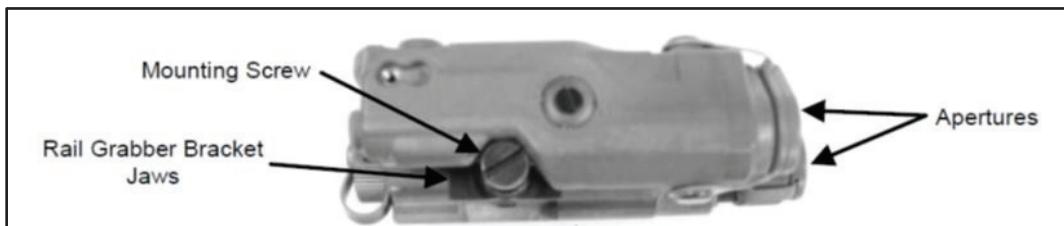


Figure 3-79. AN/PEQ-15

**CAUTION**

Loosening the mounting screw beyond the point where resistance is first met may result in damage to the rail grabber assembly.

- (1) Loosen the mounting screw on the rail grabber bracket until the jaws have sufficient space to fit over the MIL-STD-1913 rail.
- (2) Hold the AN/PEQ-15 with the laser apertures facing in the direction of the muzzle of the weapon.
- (3) Position the AN/PEQ-15 on the rail ensuring the mounting screw in the mounting channel engages the weapon recoil grooves.
- (4) While pushing down and forward on the AN/PEQ-15, firmly tighten the mounting screw by turning clockwise, ensuring not to overtighten.

**Note:** Failure to properly secure and tighten the AN/PEQ-15 to the rail may lead to boresight failure and the need to repeat zeroizing procedures. The tightness of the mounting screw should be checked after each basic load of ammunition.

- b. Mount the AN/PEQ-15A (see figure 3-80).

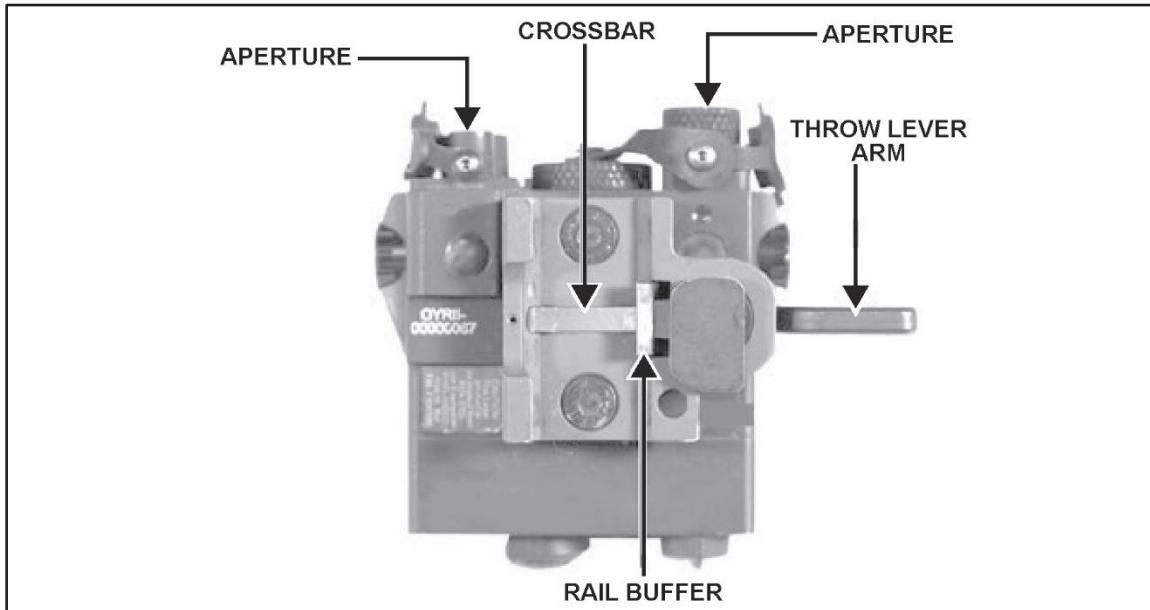


Figure 3-80. AN/PEQ-15A

- (1) Open the throw lever mount so that it is perpendicular to the AN/PEQ-15A housing.
- (2) Hold the AN/PEQ-15A with the laser apertures facing in the direction of the muzzle of the weapon.
- (3) Place the rail buffer against the left side of the MIL-STD-1913 rail and align the crossbar on the bottom of the mount with a slot on the rail buffer.
- (4) While pushing down and forward on the AN/PEQ-15A so that the crossbar contacts the front of the slot on the rail, rotate the throw lever arm so that it is parallel with the body of the laser housing.

**Note:** Failure to fully close the throw lever mount will cause zero retention issues.

5. Install the remote cable switch.
  - a. Plug the remote cable switch into the remote jack on the AN/PEQ-15.
  - b. Secure the remote cable switch to the weapon, to best suit the operator's firing preference, using the hook and loop fastener tape.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the weapon.	_____	_____
2. Inspected the AN/PEQ-15.	_____	_____
3. Installed battery.	_____	_____
4. Mounted the AN/PEQ-15 to the weapon.	_____	_____
5. Installed the remote cable switch.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-5855-1914-13&P/TM 10470B-OI/1 Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)	TM 9-5855-1912-13&P Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Dual Beam Aiming Laser-Advanced <sup>2</sup> (DBAL-A <sup>2</sup> ) AN/PEQ-15A (NSN: 5855-01-535-6166) (LIN: J03261)

**071-701-0009****Dismount an AN/PEQ-15-Series Aiming Light on a Weapon System**

**Conditions:** You have an AN/PEQ-15 Advanced Target Pointer Illuminator Light or an AN/PEQ-15A Dual Beam Aiming Laser-Advanced<sup>2</sup> that you need to remove from your weapon. You are assigned an M16 rifle, M4 carbine, M240 machine gun, or M249 machine gun.

**Standards:** Clear the weapon. Remove the AN/PEQ-15 and remote cable switch from the weapon. Perform required preventive maintenance checks and services (PMCS) on the AN/PEQ-15 and stow it in the carrying case.

**Performance Steps**

1. Clear the weapon.
2. Remove the remote cable switch.
  - a. Unplug the remote cable switch from the remote jack on the AN/PEQ-15.
  - b. Remove the remote cable switch by detaching the hook and loop fastener tape.
3. Remove the AN/PEQ-15 from the weapon.
  - a. Make a note of where the AN/PEQ-15 is mounted on the rail.
  - b. Loosen the mounting screw on the AN/PEQ-15 or open the throw lever on the AN/PEQ-15A, and remove it from the weapon.
4. Perform PMCS on the AN/PEQ-15.
5. Stow the AN/PEQ-15.
  - a. Turn the AN/PEQ-15 mode switch to OFF.
  - b. Remove the battery.
  - c. Replace all caps and covers.
  - d. Place the AN/PEQ-15 and all components in the carrying case.

Performance Measures	GO	NO-GO
1. Cleared the weapon.	_____	_____
2. Removed the remote cable switch.	_____	_____
3. Removed the AN/PEQ-15 from the weapon.	_____	_____
4. Performed PMCS on the AN/PEQ-15.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Stowed the AN/PEQ-15.	—	—
<b>References Required</b>	<b>Primary</b>	
TM 9-5855-1914-13&P/TM 10470B-OI/1 Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)	TM 9-5855-1912-13&P Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Dual Beam Aiming Laser-Advanced <sup>2</sup> (DBAL-A <sup>2</sup> ) AN/PEQ-15A (NSN: 5855-01-535-6166) (LIN: J03261)	

**071-701-0002**  
**Operate an AN/PEQ-15-Series Aiming Light**

**WARNING**

- Do not stare into the laser beams.**
- Do not look into the laser beams through binoculars or telescopes.**
- Do not point the laser beams at mirror-like surfaces.**
- Do not shine the laser beams into other individuals' eyes.**

**Conditions:** You have an AN/PEQ-15-series aiming light mounted on your weapon and must prepare it for operation. You have a night vision device and all components and batteries for the AN/PEQ-15.

**Standards:** Install the battery in the AN/PEQ-15 and ensure that the safety screw is configured properly. Set up the AN/PEQ-15 in the desired mode of operation and activate the aiming light. Power down the AN/PEQ-15 when no longer needed.

**Note:** When not in use, the aiming light should be stored in its carrying case or stowage bag. When in use, the aiming light should be mounted on a weapon.

**Performance Steps**

1. Install batteries.
  - a. Move the mode selector to OFF.
  - b. Unscrew the battery cap.
  - c. Install one lithium DL123A battery observing terminal polarities marked on housing.

**CAUTION**

Use of an incorrect battery may permanently damage the aiming light. Batteries with different voltages, but with the same physical dimensions, do exist in the supply system. Ensure that only a 3-volt battery is used in the aiming light.

- d. Reinstall battery caps by hand-tightening battery caps onto housing.
2. Ensure the safety screw is configured properly (see figure 3-81, page 3-238).

**Note:** A removable safety screw installed in the lockout position prevents the mode selector from being turned to the high-power laser settings (for example, AH, IH, DH). This configuration is appropriate for a training environment or when the AN/PEQ-15 is being stored.

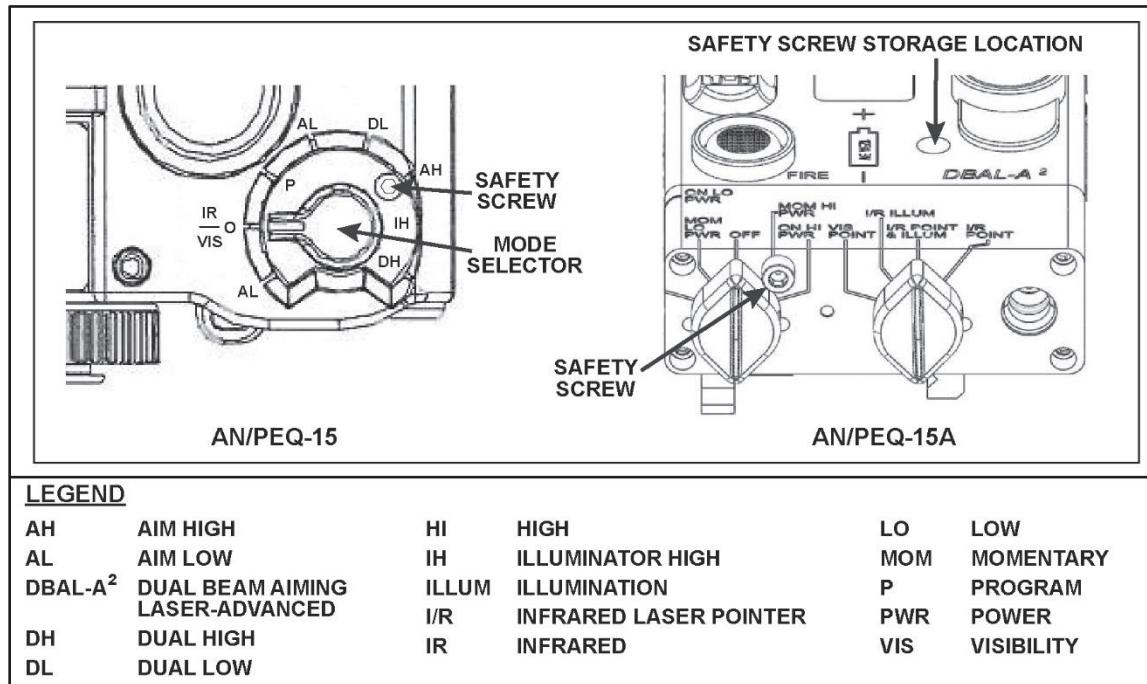


Figure 3-81. Safety screw location

3. Set the desired mode of operation.
  - a. Determine proper position of the mode switch (see figure 3-82).

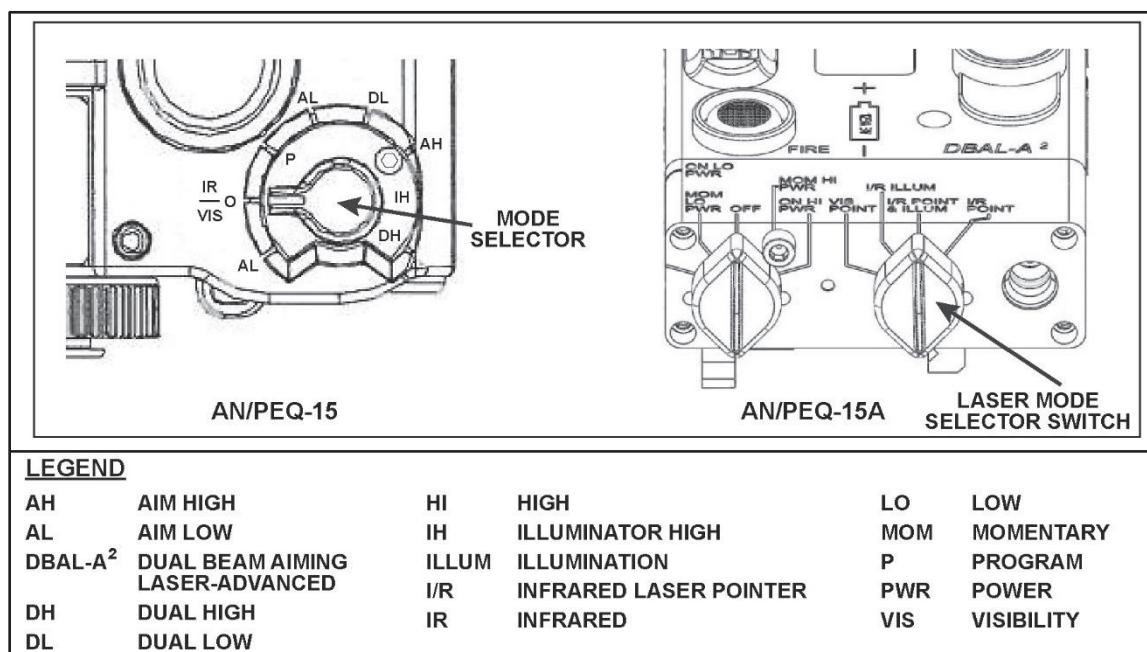


Figure 3-82. Laser mode selector switch

- b. Move mode switch to the desired position.

**Note:** A removable safety screw is installed in the lockout position to prevent the mode selector from being turned to the high power laser settings (for example, AH, IH, DH). To access the high-power laser settings, remove the safety screw by using a hexagon head wrench and then secure the safety screw to the nearby screw storage location.

4. Activate the aiming light based on the desired mode of operation.
  - a. Activate during momentary operation.
    - (1) Press and hold the activation button (or the remote cable switch) to operate the aiming light in the operational mode set by the mode selector.
    - (2) Release the button (or the remote cable switch) to turn off the aiming light.
  - b. Activate during continuous operation.
    - (1) Press the activation button (or the remote cable switch) twice in rapid succession (double-tap) to turn the aiming light laser(s) on continuously.
    - (2) Rotate the illuminator focus knob to vary the illumination beam when using the infrared illuminator mode of operation.
    - (3) Put neutral density/opaque lens cap on aim laser exit ports when operating visible laser.

**Note:** Under certain operating conditions, particularly at night, it may be desirable to prevent inadvertent emission of visible laser energy. The neutral density/opaque lens cap helps you prevent inadvertent emission.

- (4) Press the button (or the remote cable switch) a third time (single-tap) to turn off the aiming light.

**Note:** The aiming light is equipped with a shut-down feature that will automatically turn off any laser that has been activated for 5 continuous minutes. To reactivate, press (single-tap) the activation button.

5. Power down the aiming light by moving the mode switch to the OFF position.

Performance Measures	GO	NO-GO
1. Installed batteries.	_____	_____
2. Ensured the safety screw was configured properly.	_____	_____
3. Set the desired mode of operation.	_____	_____
4. Activated the aiming light.	_____	_____
5. Powered down the aiming light.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-5855-1914-13&P/TM 10470B-OI/1 Advanced  
Target Pointer Illuminator Aiming Light (ATPIAL)  
AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-  
01-577-7174) (LIN: J03261)

**071-701-0007****Boresight an AN/PEQ-15 to an M16-Series Rifle or M4-Series Carbine****DANGER**

**Before using the borelight, ensure that the weapon is clear and on SAFE and that the bolt is locked in the forward position.**

**Do not stare into the visible laser beam.**

**Do not look into the visible laser beam through binoculars or telescopes.**

**Do not point the visible laser beam at mirror-like surfaces.**

**Do not shine the visible laser beam into other individuals' eyes.**

**WARNING**

**When rotating the borelight to zero it, ensure that the mandrel is turning counterclockwise (from the firer's point of view) to avoid loosening the borelight from the mandrel.**

**Conditions:** You are a member of a squad or team preparing to conduct a mission. You have just mounted an AN/PEQ-15 aiming light to your M16-series rifle or M4-series carbine and have been directed to boresight the AN/PEQ-15 to your weapon. You have an AN/PEM-1 laser borelight system, a 10-meter target, a field expedient method of support (sand bags, rucksack, and so forth), night vision goggles (NVG), and assistant available.

**Standards:** Prepare the weapon and prepare the target. Zero the borelight to the weapon and boresight the AN/PEQ-15 to the weapon.

**Performance Steps**

1. Prepare the weapon.
  - a. Ensure the weapon is clear.
  - b. Stabilize the weapon without a cant.

**Note:** The weapon can be stabilized by placing the weapon in a rifle box rest or laying two rucksacks side by side with another rucksack on top of the weapon. The weapon does not have to be perfectly level with the ground when boresighting.

- c. Insert the boresight filter to reduce blooming of the laser (optional).
- d. Attach the 5.56-millimeter mandrel to the borelight.
- e. Insert the mandrel into the weapon's muzzle.

**Note:** The borelight is seated properly when the mandrel cannot be moved any further into the muzzle and the mandrel spins freely.

## 2. Prepare the target.

**Note:** It is best to use two Soldiers to boresight. The firer zeros the borelight by making adjustments on the optic or aiming laser being used. The target holder matches the beam and zeroing mark, secures the target straight up and down (aligned with the cant of the weapon) 10 meters from the borelight, and directs the firer to make necessary adjustments. The target holder must wear NVG when boresighting infrared aiming lasers. Both Soldiers must clearly communicate their actions.

- Verify that the target includes the correct boresight offset (see tables 3-6 and 3-7).

**Note:** Tables 3-6 and 3-7 provide 10-meter target offsets marked in centimeters (cm) for a specific point of aim and point of impact. The offsets must be applied to a locally created target so that the aiming device/weapon combination can be properly boresighted. Ranges shown in the ZERO column are listed in meters.

**Table 3-6. M16A4/M4 10-meter boresight offsets**

<b>M16A4/M4</b>			
<b>Device</b>	<b>Mount</b>	<b>Zero</b>	<b>Offset</b>
AN/PEQ-15	Insight Rail Grabber Top Rail	300	VIS 2.0R / 1.5U IR 1.0R / 2.5U
AN/PEQ-15	Insight Rail Grabber Left Rail	300	VIS 3.0R / 0.0 IR 4.0L / 1.0D
AN/PEQ-15	Insight Rail Grabber Right Rail	300	VIS 3.0R / 4.5D IR 4.0R / 3.5D

**Legend:** D – down, IR – infrared aim laser, L – left, R – right, u – up, VIS – visible aim laser

**Table 3-7. M16A4/M4 with M203 10-meter boresight offsets**

<b>M16A4/M4 with M203</b>			
<b>Device</b>	<b>Mount</b>	<b>Zero</b>	<b>Offset</b>
AN/PEQ-15	Insight Rail Grabber Top Rail	300	VIS 2.0R / 4.5U IR 1.0R / 5.5U
AN/PEQ-15	Insight Rail Grabber Left Rail	300	VIS 3.5L / 0.5U IR 4.5L / 0.5D
AN/PEQ-15	Insight Rail Grabber Right Rail	300	VIS 3.5R / 1.0D IR 4.5R / 0.5D

**Legend:** D – down, IR – infrared aim laser, L – left, R – right, u – up, VIS – visible aim laser

- If the boresight target has the correct offset marked, proceed to step 2b.
- If the boresight target does not have the correct offset marked, prepare an offset target.
  - Divide a blank sheet of paper into 1 cm x 1 cm gridlines.
  - Draw the laser borelight symbol around a gridline intersection centered in the lower third of the target.
  - Obtain the offset from tables 3-6 or 3-7 for the device/weapon combination being used.
  - Apply the target offset to the target by counting the specified number of squares up or down, and left or right, from the center of the laser borelight symbol.
  - Label this point with the appropriate symbol for the aiming light/sighting device being used.

- b. Measure 10 meters or pace off eleven paces.
- c. Turn on the borelight.
- d. Ensure the laser strikes the target.

**Note:** If the visible laser cannot be located on the target or does not remain on the target as it is spun, then boresight at 2 meters instead of 10 meters. When the visible laser is zeroed at 2 meters, restart the procedure at 10 meters.

- e. Place the borelight in the start position.

**Note:** When rotating the borelight to zero it, ensure that the mandrel is turning counterclockwise, from the firer's point of view, to avoid loosening the borelight from the mandrel.

- f. Align the boresighting target with the laser striking the zeroing mark.
- g. Secure the boresighting target.

3. Zero the borelight to the weapon.

**Note:** Before boresighting the weapon system, the borelight must first be zeroed to the weapon.

- a. Determine the boresighting reference point.
  - (1) Place the borelight in the half turn position.
    - (a) Rotate the borelight counterclockwise 180 degrees until the battery compartment is facing down.
    - (b) Ensure the adjusters are on the bottom while watching the path made by the laser dot on the target.
  - (2) Mark the target where the laser strikes the target (battery down mark).
  - (3) Identify the reference point half way between the zeroing mark (battery up position) and the current battery down position.
- b. Determine if the borelight is boresighted (zeroed) to the weapon.

**Note:** A 1 cm or less circle means the borelight has been boresighted to the weapon.

- (1) Rotate the borelight counterclockwise.
- (2) Ensure the laser dot remains stationary or rotates around the reference point no more than 1 cm.
  - (a) Proceed to step 3c, adjust the borelight, if the laser dot rotates in a circle greater than 1 cm.
  - (b) If the laser dot remains stationary or rotates around the reference point no more than 1 cm, proceed to step 4.
- c. Adjust the borelight, as required.
  - (1) Turn the windage and the elevation adjusters, as required, to move the visible laser to the reference point.

- (2) Repeat steps 3b and 3c until the visible laser spins a 1 cm or less circle, then proceed to step 4, and boresight the aiming light.
4. Boresight the AN/PEQ-15 to the weapon.

- a. Set the zero preset for the AN/PEQ-15.

**CAUTION**

Do not force adjusters beyond their end of travel.

- b. Ensure target is prepared correctly.
  - (1) Confirm the target is at 10 meters (eleven paces).
  - (2) Confirm the boresight laser is striking the zero mark.
  - (3) Confirm the 10-meter AN/PEQ-15 boresight offset mark is the correct distance from the center of the zero mark.
  - (4) Confirm the target is secure.
- c. Place the AN/PEQ-15 into operation.
- d. Establish the AN/PEQ-15 boresight zero.
  - (1) Identify, on the target, the location of the AN/PEQ-15 aiming laser dot and the AN/PEQ-15 offset mark.
  - (2) Adjust the AN/PEQ-15 aiming laser adjuster knobs until the aiming laser is on the offset mark on the target.
  - (3) Adjust the aiming light illumination beam adjuster knobs until the illumination beam is collocated with the aiming laser on the offset mark on the target.
- e. Establish a positive load on each AN/PEQ-15 adjuster.

**Note:** Positive load is the controlled compression of the spring within the adjuster mechanism to ensure the highest level of accuracy is maintained after the AN/PEQ-15 / weapon combination is boresighted or zeroed. A positive load is achieved by rotating the adjuster by turning each adjuster eight clicks ( $\frac{1}{4}$  turn) clockwise, then back (counterclockwise) to the boresight/zero position.

- (1) Select one adjuster.
  - (a) Turn the adjuster eight clicks clockwise.
  - (b) Turn the adjuster eight clicks counterclockwise to the zero position.
- (2) Repeat for each of the other three adjusters.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the weapon.	_____	_____
2. Prepared the target.	_____	_____
3. Zeroed the borelight to the weapon.	_____	_____
4. Boresighted the AN/PEQ-15 to the weapon.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-5860-226-13&P/TM 10471-OI/1A Operator and Field Maintenance Including Repair Parts and Special Tools List for the Laser Borelight System (LBS), AN/PEM-1 (NSN: 5860-01-471-2091)	TM 9-5855-1914-13&P Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)

**071-701-0006**

## **Zero an AN/PEQ-15 Aiming Light to an M16-Series Rifle or M4-Series Carbine**

### **WARNING**

**The AN/PEQ-15 is a laser and as such you must be aware of the dangers and safety procedures for lasers.**

**Do not stare into the laser beams.**

**Do not look into the laser beams through binoculars or telescopes.**

**Do not point the laser beams at mirror-like surfaces.**

**Do not shine the laser beams into other individuals' eyes.**

**Conditions:** You are equipped with an AN/PEQ-15 Advanced Target Pointer Illuminator Aiming Light mounted on M16- rifle or M4-series carbine. Your squad leader has instructed you to zero the AN/PEQ-15 aiming light to the M16A4 rifle or M4-series carbine. You are at a firing range and have been given 20 rounds of 5.56-millimeters ammunition and a 25-meter zero target (300-meter target preferred).

**Standards:** Prepare the zero target, and set the aiming light to the zero preset. Fire the weapon and adjust the AN/PEQ-15 so that five out of six rounds strike within the 3-centimeter designated strike zone, using 20 rounds or less. Bullets that break the line of the 3-centimeter circle are accepted.

**Note:** A zero is typically achieved in one of three ways: through boresighting, with 25-meter paper targets, or by field zeroing at range.

### **Performance Steps**

1. Prepare the zeroing target.
  - a. Choose an appropriate target (M16A2 25-meter target for a 300-meter zero is preferred).
  - b. (Optional) Cut out the 3-centimeter center mass aiming circle/square from the target. This allows for easier sighting of the beam as the beam will appear dimmer when it passes through the hole.
  - c. Mark the 25-meter zero offset on the target based on the weapon type and mounting location. (See figure 3-83.)

Weapon	Mount	Range Zeroed To	10m Boresight Target Offset Squares	25m M16A2/A4 Target Zero Offset Squares	
M4/M16A4 MWS	Top Rail	300m	VIS 2.0R / 1.5U IR 1.0R / 2.5U	VIS IR	2.5L / 1.5U 1.5L / 0.5U
M4/M16A4 MWS	Left Rail	300m	VIS 3.0L / 0.0 IR 4.0L / 1.0D	VIS IR	2.5R / 3.5U 3.5R / 4.5U
M4/M16A4 MWS	Right Rail	300m	VIS 3.0R / 4.5D IR 4.0R / 3.5D	VIS IR	3.0L / 7.0U 4.0L / 6.0U
M4/M16A4 MWS w/M203	Top Rail	300m	VIS 2.0R / 4.5U IR 1.0R / 5.5U	VIS IR	2.5L / 0.0 1.5L / 0.5U
M4/M16A4 MWS w/M203	Left Rail	300m	VIS 3.5L / 0.5U IR 4.5L / 0.5D	VIS IR	2.5R / 2.5U 3.5R / 3.5U
M4/M16A4 MWS w/M203	Right Rail	300m	VIS 3.5R / 1.0D IR 4.5R / 1.5D	VIS IR	4.0L / 5.0U 5.0L / 6.0U

<u>LEGEND</u>					
D DOWN	M METERS	U UP			
IR IR (INFRARED AIM LASER)	MWS MODULAR WEAPON SYSTEM	VIS VISIBILITY LASER			
L LEFT	R RIGHT	W WITH			

**Figure 3-83. Mounting configurations and offsets**

- d. Draw 3-centimeter strike zone centered on the offset point.
  - e. Attach the target to a flat surface at a distance of 25 meters.
2. (Skip step if AN/PEQ-15 was boresighted.) Set the aiming light to the zero preset.
- a. Rotate both the azimuth and elevation Aim Laser Adjusters to the full counterclockwise end of travel position.
  - b. Rotate the azimuth and elevation Aim Laser Adjusters back 2.5 turns to align the slotted head in a 12 o'clock / 6 o'clock orientation.
3. Aim the AN/PEQ-15 aiming light at the aiming point.
- a. Identify the aiming point on 25-meter zero target.
  - b. Assume a prone supported firing position.
  - c. Rotate the Mode Selector to Visible Aim Laser.
  - d. Activate the Visible Aim Laser in continuous mode by double-tapping the activation button.
  - e. Direct the Visible Aim Laser at the center of the target.
4. Establish a tight shot group.

**Note:** A tight shot group is two or three consecutive rounds within a 4 centimeter or less circle/square.

- a. Direct the Visible Aim Laser at the center of the target.
- b. Fire a three-round shot group at the target.

- c. Determine if the shot group is tight by observing the center point and size of the shot group.
  - d. Perform retightening on the integral rail grabber bracket.
5. Adjust the AN/PEQ-15 to obtain a zero.
- a. Observe the center of the new shot group relative to the designated strike point.
  - b. Determine the necessary sight adjustments by identifying the center of the last fired shot group.
  - c. Rotate the Aim Laser Adjusters to move the center of the shot group to the designated strike point.
6. Establish a zero.
- Note:** Adjusters move the aiming beams at the rate of 0.2 milliradians per click. Two clicks equals one box on a standard M16A1 or M16A2 25-meter zeroing target.
- a. Fire a three-round shot group at the target.
  - b. Identify the location of the shot group on the target.
    - (1) Return to step 5 if two of three rounds do not strike within the strike zone (zero offset).
    - (2) Proceed to step 7 if two of three rounds strike within the strike zone (zero offset).
7. Confirm the zero.
- a. Fire a five-round shot group at the target.
  - b. Identify the location of the shot group on the target.
    - (1) Return to step 5 if two of three rounds do not strike within the strike zone (zero offset).
    - (2) Cease fire (zero is confirmed) if two of three rounds strike within the strike zone (zero offset).
8. Align the illumination and infrared beams.
- a. Rotate the Mode Selector to the DL (DUAL LOW) or DH (DUAL HIGH) position.
  - b. Observe both the infrared (IR) aiming and illumination beams.
  - c. Rotate the Illuminator Adjusters to center the illumination beam over the IR aiming beam.
9. Establish a positive load on each adjuster.
- a. Select on adjuster.
    - (1) Turn the adjuster eight clicks clockwise.
    - (2) Turn the adjuster counterclockwise to the zero position.
  - b. Repeat for each of the other three adjusters.

Performance Measures	GO	NO-GO
1. Prepared the zeroing target.	_____	_____
2. Set the aiming light to the zero preset.	_____	_____
3. Aimed the AN/PEQ-15 aiming light at the aiming point.	_____	_____
4. Established a tight shot group.	_____	_____
5. Adjusted the AN/PEQ-15	_____	_____
6. Established a zero.	_____	_____
7. Confirmed the zero.	_____	_____
8. Aligned the illumination and IR beams.	_____	_____
9. Established a positive load on each adjuster.	_____	_____

References Required	Primary
TC 3-22.9 Rifle and Carbine	TM 9-5855-1914-13&P/TM 10470B-OI/1 Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)

**071-701-0005**

**Engage Targets with an M16-Series Rifle or M4-Series Carbine Using an AN/PEQ-15 Aiming Light**

**WARNING**

- Do not stare into the laser beams.**
- Do not look into the laser beams through binoculars or telescopes.**
- Do not point the laser beams at mirror-like surfaces.**
- Do not shine the laser beams into other individuals' eyes.**

**Conditions:** You are a member of a squad or team conducting a mission and you have been directed to acquire and engage any enemy targets within your sector of fire. You have a loaded M16-series rifle or M4-series carbine with a zeroed and operational AN/PEQ-15 Advanced Target Pointer Illuminator Aiming Light (known as ATPIAL), night vision goggles, and individual combat equipment.

**Standards:** Detect, identify, and determine range to targets in your assigned sector of fire. Verify target as enemy. Engage targets using AN/PEQ-15 ATPIAL and appropriate engagement techniques until they are destroyed, suppressed, or you receive an order to cease fire.

**Performance Steps**

1. Ensure the mode selector switch is set to the correct position.

**Note:** The mode selector switch has eight positions:

- VISIBLE AIM—Visible Aim Laser is selected. Visible without the use of night vision devices.
- OFF—The ATPIAL will not operate. Prevents inadvertent emission of laser energy.
- PROGRAM—Programming Mode is selected to set the desired Infrared (IR) Illuminator pulse rate.
- AIM LOW—IR Aim Laser is selected at low power. Visible with the use of night vision devices.
- DUAL LOW—IR Aim Laser and IR Illuminator are both selected at low power. Visible with the use of night vision devices.
- AIM HIGH—IR Aim Laser is selected at high power. Visible with the use of night vision devices.
- ILLUMINATOR HIGH—IR Illuminator is selected at high power. Visible with the use of night vision devices.
- DUAL HIGH—IR Aim Laser and IR Illuminator are both selected at high power. Visible with the use of night vision devices.

2. Detect targets.

**Note:** Detection of targets depends on your position, your skill in scanning, and your ability to observe the area and recognize target indicators. The three search methods are: self-preservation method, 50-meter overlapping strip method, and maintaining area observation.

3. Assume an appropriate firing position.

**Note:** Assuming an appropriate firing position includes selecting the best available cover the situation allows. The firing position selected should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire.

4. Determine range to targets.
5. Identify targets as threat.
6. Engage targets using the AN/PEQ-15.
  - a. Activate the AN/PEQ-15.
    - (1) Activate momentary operation by pressing and holding the activation button (or the remote cable switch).
    - (2) Activate continuous operation by pressing the activation button (or the remote cable switch) twice in rapid succession (double-tap).
  - b. Obtain the desired point of impact on the target with the AN/PEQ-15.
  - c. Fire on target using appropriate engagement technique.
  - d. Cease fire when directed or when target has been destroyed or suppressed.
    - (1) Activate momentary operation by pressing and holding the activation button (or the remote cable switch).
    - (2) Activate continuous operation by pressing the activation button (or the remote cable switch) twice in rapid succession (double-tap).
  - e. Deactivate the AN/PEQ-15.

Performance Measures	GO	NO-GO
1. Ensured the mode selector switch was set to the correct position.	_____	_____
2. Detected targets.	_____	_____
3. Assumed an appropriate firing position.	_____	_____
4. Determined range to targets.	_____	_____
5. Identified targets as threat.	_____	_____
6. Engaged targets using the AN/PEQ-15.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-5855-1914-13&P/TM 10470B-OI/1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)	TC 3-22.9 Rifle and Carbine
TM 9-1005-319-10/T.O. 11W3-5-5-41/SW370-BY-OPI-010 Operator's Manual for Rifle, 5.56 MM, M16A2 (NSN 1005-01-128-9936) (EIC:4GM) Rifle, 5.56 MM, M16A3 (NSN 1005-01-357-5112) Rifle, 5.56 MM, M16A4 (NSN 1005-01-383-2872) (EIC:4F9) Carbine, 5.56 MM, M4 (NSN 1005-01-231-0973)(EIC:4FJ) Carbine, 5.56 MM, M4A1 (NSN 1005-01-382-0953 ) (EIC:4GC)	

**071-025-0038****Engage Targets with an M240B or M240L Machine Gun using an AN/PEQ-15 Aiming Light**

**Conditions:** You are a member of a squad or team conducting a mission and you have been directed to acquire and engage any enemy targets within your sector of fire. You have a loaded M240B or M240L machine gun with a zeroed and operational AN/PEQ-15 (Advanced Target Pointer Illuminator Aiming Light) or AN/PEQ-15A (Dual Beam Aiming Laser-Advanced<sup>2</sup>), night vision goggles, and individual combat equipment. The machine gun may be mounted on a bipod, tripod, or vehicle mount.

**Standards:** Detect, identify, and determine range to targets in your assigned sector of fire. Verify all targets as enemy. Engage targets using the AN/PEQ-15 and appropriate engagement techniques until they are destroyed, suppressed, or you receive an order to cease fire.

**Performance Steps**

1. Select position based on the situation.

**Note:** Select a physical position and assume an appropriate firing position based on the situation. Your position should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire. Your position may vary from a fixed location to a temporary location during movement.

2. Detect targets.
  - a. Use scanning technique.
  - b. Use observation techniques.
  - c. Recognize target indicators.
3. Determine range to targets.
4. Identify targets by distinguishing between threat and nonthreat targets.
5. Determine how to engage the targets.
  - a. Determine the class of fire.
  - b. Determine rate of fire that is best for the type of target.

**WARNING**

**Do not stare into the laser beams. Do not look into the laser beams through binoculars or telescopes. Do not point the laser beams at mirror like surfaces. Do not shine the laser beams into other individuals' eyes.**

6. Fire on targets using the AN/PEQ-15.
  - a. Ensure the AN/PEQ-15 Mode Selector Switch is set to the appropriate position.
  - b. Activate AN/PEQ-15 in the desired mode of operation.

- (1) Activate momentary operation by pressing and holding the Activation Button (or the remote cable switch).

**WARNING**

**To reduce the risk of detection by an enemy using night vision devices, avoid prolonged activation of the laser.**

- (2) Activate continuous operation by pressing the activation button (or the remote cable switch) twice in rapid succession (double-tap).

**Note:** The laser(s) will remain on until the button is pressed a third time (single-tap) or for a period of 5 minutes.

- c. Fire the weapon when the AN/PEQ-15 aiming light is on the desired point of impact using five- to seven-round bursts.
- d. Adjust machine gun fire based on observation of fire and type of target.
- e. Fire on the targets until they are destroyed, suppressed, or you receive an order to cease fire.
- f. Deactivate the AN/PEQ-15.
  - (1) Deactivate momentary operation by releasing the activation button (or the remote cable switch).
  - (2) Deactivate continuous operation by pressing the activation button (or the remote cable switch) a third time.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Selected position based on the situation.	_____	_____
2. Detected targets.	_____	_____
3. Determined the range to targets.	_____	_____
4. Identified targets as threat and nonthreat targets.	_____	_____
5. Determined how to engage the targets.	_____	_____
6. Fired on targets using the AN/PEQ-15.	_____	_____

References Required	Primary
TM 9-5855-1914-13&P/TM 10470B-OI/1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)	TC 3-22.240 Medium Machine Gun
TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Operator's Manual for Machine Gun, 7.62MM, M240 (1005-01-025-8095); M240B (1005-01-412-3129); M240C (1005-01-085-4758) M240D (1005-01-481-6695); M240E1 (1005-01-252-4288) M240H (1005-01-518-2410; M240L (1005-01-549-5837) M240N (1005-01-493-1666)	
TM 9-5855-1912-13&P Operator and Field Maintenance Manual Including Repair Parts And Special Tools List For Dual Beam Aiming Laser-Advanced <sup>2</sup> (DBAL-A <sup>2</sup> ) AN/PEQ-15A (NSN: 5855-01-535-6166) (LIN: J03261)	

**071-701-0001**  
**Maintain an AN/PEQ-15 Aiming Light**

**WARNING**

- Do not stare into the laser beams.**
- Do not look into the laser beams through binoculars or telescopes.**
- Do not point the laser beams at mirror-like surfaces.**
- Do not shine the laser beams into other individuals' eyes.**
- Remove the Advanced Target Pointer Illuminator Aiming Light (known as ATPIAL) from the weapon before inspecting, cleaning, or performing other maintenance functions on the ATPIAL.**

**CAUTION**

Use of gun cleaning agents containing perchloroethylene or methylene chloride may permanently damage the ATPIAL system.

**Conditions:** You are assigned AN/PEQ-15 ATPIAL and must ensure it is complete and fully operational. You have TM 9-5855-1914-13&P, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), and all materiel required to perform operator maintenance on the aiming light.

**Standards:** Clean and inspect the aiming light, components, and accessories for serviceability. Record unserviceable items, if found, on DA Form 2404 or DA Form 5988-E. Stow the aiming light and components. Report unserviceable items to your supervisor, as required.

**Performance Steps**

1. Conduct preventive maintenance checks and services (PMCS).
  - a. Conduct inventory of all major components.
  - b. Maintain AN/PEQ-15 components.
    - (1) Turn stowage bag upside down to shake out loose particles of dirt.
    - (2) Remove dirt, debris, and mud from the stowage bag.
    - (3) Inspect stowage bag for rips, tears, and frays.
    - (4) Inspect rail grabber bracket for damage.
  - c. Maintain the aiming light.
    - (1) Maintain battery compartment.
      - (a) Remove battery cap.

- (b) Remove batteries (if present) from battery compartment.
- (c) Turn aiming light upside down to shake out loose corrosion.
- (d) Inspect battery compartment for dirt or corrosion.
- (e) Clean battery compartment, threads, and contacts with isopropyl alcohol and disposable applicator.
- (f) Inspect battery cap and O-ring.
- (g) Clean battery cap and battery cap threads.
- (h) Apply lubricant to the O-ring using silicone grease.
- (i) Replace battery cap.

**Note:** If AN/PEQ-15 will be stored, do not replace the batteries.

- (2) Maintain outer surface of the aiming light.
  - (a) Remove as much dirt and dust from the aiming light as possible.
  - (b) Rinse the aiming light housing with water.
  - (c) Clean around buttons, switches, adjusters, and attachment points with a soft cloth or disposable applicator.
  - (d) Wipe with clean cloth.
  - (e) Dry with clean soft cloth.
  - (f) Inspect for cracks, chips, or dents.
- (3) Maintain optical lenses.
  - (a) Remove the aim neutral density/opaque lens cap, pattern generator, and infrared (IR) illuminator diffuser lens cap.
  - (b) Brush off all loose dirt from the lens using a dry lens cleaning tissue.
  - (c) Inspect the aim laser lens cap lanyards for tears, rips, and for snug fit when in place over lasers.
- (4) Maintain remote jack.
  - (a) Remove the remote cable switch or remote jack plug, if installed.
  - (b) Inspect jack contacts for corrosion, dirt, or damage.
  - (c) Clean contacts with isopropyl alcohol and disposable applicator.
  - (d) Replace remote cable switch or remote jack plug.
- (5) Maintain laser.

- (a) Activate each mode of operation.
  - (b) Ensure visible aim laser is visible.
  - (c) Ensure IR aim laser and illuminator are visible when using night vision devices.
- d. Maintain the remote cable switch.
- (1) Install remote cable switch.
  - (2) Activate the remote cable switch.
  - (3) Verify that remote cable switch is functioning and not damaged.
2. Record deficiencies, if found, on DA Form 2404 or DA Form 5988-E.
  3. Stow the aiming light and components in the stowage bag or storage case.
  4. Report unserviceable items to your supervisor, as required.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Conducted PMCS.	_____	_____
2. Recorded deficiencies on DA Form 2404 or DA Form 5988-E.	_____	_____
3. Stowed the aiming light and components in the stowage bag or storage case.	_____	_____
4. Reported unserviceable items to supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-5855-1914-13&P/TM 10470B-OI/1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Advanced Target Pointer Illuminator Aiming Light (ATPIAL) AN/PEQ-15 (NSN 5855-01-534-5931) (NSN 5855-01-577-7174) (LIN: J03261)
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**071-008-0018****Mount an AN/PAS-13 Thermal Weapon Sight on a Weapon System****DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to destroy. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of the target, backstop and beyond.**

**CAUTION**

Avoid handling or carrying the thermal weapon sight (known as TWS) by the eyecup, objective lens cover, or battery cover latch. These items may detach from the system, causing it to drop.

**Conditions:** You are a member of a squad or team preparing to conduct a mission. You have been issued an AN/PAS-13-series TWS and have been directed to mount it to your weapon system. You are assigned an M16 rifle, M4 carbine, M249 machine gun, M240B or M240L machine gun, M2-series heavy machine gun, or an MK19 grenade machine gun (known as GMG).

**Standards:** Ensure weapon is clear and inspect the TWS. Install the mounting bracket to the weapon system, if required. Install the TWS, ensuring that it is securely mounted on the weapon system.

**Performance Steps**

1. Ensure weapon is clear.
2. Inspect the TWS.
  - a. Confirm all components are present.
  - b. Inspect for damage (cracks, missing or loose knobs, and so forth).
  - c. Ensure the AN/PAS-13-series TWS data plate is present and readable.
  - d. Report any deficiencies to unit maintenance, if applicable.
3. Install the mounting bracket to the weapon system, if required.
  - a. Install the mounting bracket on an M16-series rifle.
    - (1) Place threaded rod of bracket through hole on the carrying handle.
    - (2) Install thumbwheel on threaded rod and rotate clockwise by hand until tight.
  - b. Install the M2 bracket on the M2-series machine gun.
    - (1) Fold the rear sight forward to the storage position.

- (2) Raise the feed tray cover.
- (3) Release the three locking arms on the bracket.
- (4) Place the bracket over the breech of the M2-series machine gun.

**Note:** If the bracket sticks before reaching the position, rock the bracket up and down while sliding.

- (5) Slide the bracket rearward over the top of the M2-series machine gun until the inside edge of the bracket touches the front edge of the rear sight base.
- (6) Rotate the side-locking arm towards the rear of the M2-series machine gun.
- (7) Rotate the two top locking arms towards rear of the M2-series machine gun.
- (8) Lower the feed tray cover until the cover latch engages.
- (9) Loosen the range lever locking knob by turning the knob counterclockwise.
- (10) Rotate the range lever to the NEAR position.
- (11) Turn the range lever locking knob clockwise by hand until tight.

c. Install the MK19 bracket on the MK19 GMG.

- (1) Fold the rear sight down into the storage position.
- (2) Raise elevation arm to uppermost position (2,057 meters) by loosening and pushing in locking knob of bracket.
- (3) Tighten the locking knob hand-tight.
- (4) Place MK19 bracket onto MK19 by pulling out the locking pin and sliding the bracket down onto the MK19 until the locking pin engages in hole on the MK19.
- (5) Ensure the locking pin is fully seated by attempting to move MK19 mount.

4. Install the TWS.

- a. Install the TWS on the M16-series rifle mounting bracket.
  - (1) Loosen torque limiting knob on rail grabber by turning knob counterclockwise.
  - (2) Select slot on rail for mounting.

**Note:** Any slot may be used as long as mount does not hang over edge of rail.

- (3) Place the bar of rail grabber in slot of rail.
  - (4) Turn the torque limiting knob clockwise by hand until two clicks are heard.

b. Install the TWS on the M4-series carbine.

**Note:** The carrying handle or optic must be removed prior to the installation of the TWS. If using the AN/PAS-13C or D (v1), ensure the vertical spacer has been installed on the TWS.

- (1) Ensure back-up iron sight (known as BUIS) is in the stowed position.
- (2) Loosen torque limiting knob on rail grabber by turning knob counterclockwise.
- (3) Select the slot on the rail for mounting the TWS.

**Note:** Ensure a minimum of one slot gap between the BUIS and the rail grabber.

- (4) Ensure that the mount does not hang over the edge of the rail.
  - (5) Place the bar of rail grabber in slot of the rail.
  - (6) Turn the torque limiting knob clockwise by hand until two clicks are heard.
- c. Install the TWS on the M249 or M240B or M240L machine gun.

**Note:** Ensure the vertical spacer is installed to the AN/PAS-13D (v2) prior to mounting to the M249.

- (1) Ensure that the rear sight is completely down.
- (2) Loosen torque limiting knob on rail grabber by turning knob counterclockwise.

#### **CAUTION**

The rail slot required varies depending on AN/PAS-13 version. The AN/PAS-13B must be mounted on slot T4 (M240B or M240L) or T5 (M249). The AN/PAS-13C must be mounted on slots T5 or T6 (M249) or slots T4 through T12 (M240B or M240L). The AN/PAS-13D must be mounted on slots T5 through T10 (M249) or slots T4 through T10 (M240B or M240L). Failure to mount the TWS in the correct slot may result in damage to the TWS.

- (3) Select the slot on the rail for mounting the TWS.
  - (4) Ensure that the mount does not hang over the edge of the rail.
  - (5) Place the bar of rail grabber in slot of the rail.
  - (6) Turn the torque limiting knob clockwise by hand until two clicks are heard.
- d. Install the TWS on the M2-series mounting bracket or MK19 GMG mounting bracket.
- (1) Loosen torque limiting knob on rail grabber by turning knob counterclockwise.
  - (2) Select the slot on the rail for mounting the TWS.

**Note:** Any slot may be used as long as the mount does not hang over the edge of the rail.

- (3) Ensure that the mount does not hang over the edge of the rail.
- (4) Place the bar of rail grabber in slot of the rail.
- (5) Turn the torque limiting knob clockwise by hand until two clicks are heard.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the weapon was clear.	_____	_____
2. Inspected the TWS.	_____	_____
3. Installed the mounting bracket to the weapon system, if required.	_____	_____
4. Installed the TWS.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-316-10 Operator's Manual AN/PAS-13C(V)1 Sight, Thermal (NSN 5855-01-523-7707) (EIC: JG7) AN/PAS-13C(V)2 Sight, Thermal (NSN 5855-01-523-7713) (EIC: JH4) AN/PAS-13C(V)3 Sight, Thermal (NSN 5855-01-523-7715) (EIC: JNQ).	TM 11-5855-312-10/TM 10091B/10092B-10/1 Operator's Manual Sight, Thermal AN/PAS-13B(V)2 (NSN 5855-01-464-3152) (EIC: N/A) AN/PAS-13B(V)3 (NSN 5855-01-464-3151) (EIC: N/A)
TM 11-5855-317-10/TM 10091C/10092C-OR Operator's Manual for Sight, Thermal AN/PAS-13D(V)2 (NSN 5855-01-524-4313) (EIC: JH5) (MWTS) AN/PAS-13D(V)3 (NSN 5855-01-524-4314)	
TM 11-5855-324-10 Operator's Manual for Sight, Thermal AN/PAS-13D(V)1 (NSN: 5855-01-524-4308) (EIC: JG8) (LWTS)	

**071-008-0019****Dismount an AN/PAS-13 Thermal Weapon Sight from a Weapon System****DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to shoot. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of the target, backstop and beyond.**

**CAUTION**

Avoid handling or carrying the thermal weapon sight (known as TWS) by the eyecup, objective lens cover, or battery cover latch. These items may detach from the system, causing it to drop.

**Conditions:** You have an AN/PAS-13-series TWS mounted on an M16 rifle, M4 carbine, M249 machine gun, M240B or M240L machine gun, M2-series heavy machine gun, or an MK19 grenade machine gun, and no longer have a requirement for the TWS. You have all basic issue items for the TWS and weapon.

**Standards:** Ensure the weapon is clear. Remove the TWS and the mounting bracket from the weapon. Stow the TWS in the carrying case.

**Performance Steps**

1. Ensure the weapon is clear.
2. Remove the TWS from the weapon.
  - a. Close the objective lens cover.
  - b. Power down the TWS.
  - c. Loosen torque limiting knob by turning knob counterclockwise.
  - d. Remove the TWS from the rail.
  - e. Turn the torque limiting knob clockwise by hand until two clicks are heard.
3. Remove the mounting bracket from the weapon system, if required.
  - a. (M16A1 or M16A2) Remove the M16A1 or M16A2 bracket.
    - (1) Loosen thumbwheel by turning counterclockwise.
    - (2) Remove thumbwheel from thread rod.
    - (3) Remove bracket from weapon handle.
  - b. Remove the M2 bracket.

- (1) Open and fully raise feed tray cover.
  - (2) Release two top locking cams.
  - (3) Release side locking cam.
  - (4) Slide the bracket off of the M2-series machine gun.
  - (5) Close feed tray cover.
- c. Remove the MK19 bracket.
    - (1) Fold the rear sight down into the storage position.
    - (2) Raise elevation arm to uppermost position (2,057 meters) by loosening and pushing in locking knob of bracket.
    - (3) Tighten the locking knob hand tight.
    - (4) Pull out the locking pin and lift the bracket away from MK19.
4. Stow the TWS in the carrying case.
    - a. Ensure that the TWS is turned off.
    - b. Remove the battery.
    - c. Stow the TWS and the battery in their proper compartments in the carrying case.
    - d. Close the carrying case.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the weapon was clear.	_____	_____
2. Removed the TWS from the weapon.	_____	_____
3. Removed the mounting bracket from the weapon system, if required.	_____	_____
4. Stowed the TWS in the carrying case.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-316-10 Operator's Manual AN/PAS-13C(V)1 Sight, Thermal (NSN 5855-01-523-7707) (EIC: JG7) AN/PAS-13C(V)2 Sight, Thermal (NSN 5855-01-523-7713) (EIC: JH4) AN/PAS-13C(V)3 Sight, Thermal (NSN 5855-01-523-7715) (EIC: JNQ)	TM 11-5855-312-10/TM 10091B/10092B-10/1 Operator's Manual Sight, Thermal AN/PAS-13B(V)2 (NSN 5855-01-464-3152) (EIC: N/A) AN/PAS-13B(V)3 (NSN 5855-01-464-3151) (EIC: N/A)

<b>References Required</b>	<b>Primary</b>
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TM 11-5855-317-10/TM 10091C/10092C-OR  
Operator's Manual for Sight, Thermal AN/PAS-  
13D(V)2 (NSN 5855-01-524-4313) (EIC: JH5)  
(MWTS) AN/PAS-13D(V)3 (NSN 5855-01-524-  
4314)

TM 11-5855-324-10 Operator's Manual for Sight,  
Thermal AN/PAS-13D(V)1 (NSN: 5855-01-524-  
4308) (EIC: JG8) (LWTS)

**071-008-0021**  
**Zero an AN/PAS-13 Thermal Weapon Sight to a Weapon System**

**Conditions:** You are a member of a squad or team preparing to conduct a mission. You have just mounted an AN/PAS-13-series light weapon thermal sight (known as LWTS), medium weapon thermal sight (known as MWTS), or heavy weapon thermal sight (known as HWTS) to your weapon system and have been directed to zero the AN/PAS-13 to your weapon. You have ammunition, a cutting tool (knife or scissors), adhesive tape, silhouette with E-type thermal silhouette, cardboard and a 25-meter zeroing target.

**Standards:** Prepare the zero target and the AN/PAS-13-series thermal weapon sight (known as TWS) for zeroing based on weapon type. Assume a prone supported position and establish a tight shot group. Adjust sight and establish a zero. Confirm the zero and record setting of azimuth (AZ) and elevation (EL) indicators and slot used on rail.

**Note:** This task covers all individual and crew served weapons except for the MK19.

A zero is typically achieved in one of three ways: through boresighting, with 25-meter paper targets, or by field zeroing at range. All machine guns should be field zeroed at actual range (between 300 and 700 meters), while all optics and aiming lights should be zeroed at 25 meters. Boresighting, while it may be done as a stand-alone zero, is often done to save time and ammunition prior to a live-fire zero.

#### Performance Steps

1. Prepare the zero target.
  - a. Cut out a hole four squares wide by four squares high from the center of the 25-meter zeroing target.
  - b. Draw a 4 x 4 square box on the target centered on the desired point of impact (based on weapon type and mounting location (see tables 3-8, 3-9, and 3-10).

**Note:** (For M249 with an AN/PAS-13C & D MTWS only) Draw a 6 x 6 square box centered on the desired point of impact.

**Table 3-8. AN/PAS-13B desired point of impact at 25-meter range**

<i><b>AN/PAS 13B Desired Point of Impact at 25-Meter Range</b></i>	
<i><b>Weapon</b></i>	<i><b>Point of Impact – Squares Above or Below Point of Aim</b></i>
M16A2	8.1 (7.3 cm) Below
M16A4 & M4	6.0 (5.4 cm) Below
M249	2.75 (2.5 cm) Below
M240	2.3 (2.1 cm) Above
M2	12.8 (11.8 cm) Below
M24	7.7 (7.0 cm) Below

**Legend:** cm – centimeter

**Table 3-9. AN/PAS-13D desired point of impact at 25-meter range**

Weapon	AN/PAS 13D Desired Point of Impact at 10- and 25-Meter Range					
	LWTS		MWTS		HWTS	
	10m	25m	10m	25m	10m	25m
M16A2	9.6 cm	6.5 cm	10.6 cm	7.4 cm	10.6 cm	7.4 cm
M16A4 & M4	6.8 cm	3.4 cm	7.8 cm	4.4 cm	7.8 cm	4.4 cm
M249			10.4 cm	4.4 cm		
M240			7.6 cm	0.6 cm		
M2					17.4 cm	14.6 cm
M24					7.6 cm	9.7 cm
M107						10 cm

**Legend:** cm – centimeter, HWTS – heavy weapon thermal sight, LWTS – light weapon thermal sight, m – meter, MWTS – medium weapon thermal sight

**Table 3-10. AN/PAS-13C desired point of impact at 25-meter range**

Weapon	AN/PAS 13D Desired Point of Impact at 10- and 25-Meter Range					
	LWTS		MWTS		HWTS	
	10m	25m	10m	25m	10m	25m
M16A2	12.6 cm	9.4 cm	14.4 cm	11.2 cm	14.4 cm	11.2 cm
M16A4 & M4	8.5 cm	5.1 cm	9.3 cm	5.9 cm	9.3 cm	5.9 cm
M249			11.9 cm	6 cm		
M240			9.2 cm	2.2 cm		
M2					19 cm	14.7 cm
M24					11.4 cm	10.7 cm
M107						11.1 cm

**Legend:** cm – centimeter, HWTS – heavy weapon thermal sight, LWTS – light weapon thermal sight, m – meter, MWTS – medium weapon thermal sight

- c. Cut a piece of corrugated cardboard the same size as the 25-meter zeroing target.
- d. Measure 1 inch from each side of the corrugated cardboard and cut out a rectangle.
- e. Tape the cardboard frame to the back of the 25-meter zeroing target.
- f. Affix the target to a standard silhouette with E-type thermal silhouette located 25-meters from firing position.

**Note:** Only attach corners of the 25-meter target to the silhouette to allow airflow behind the target.

2. Prepare the AN/PAS-13.
    - a. Prepare the AN/PAS-13B.
      - (1) Push in on and turn the BRIGHTNESS switch fully clockwise.
    - (2) Press eye to eyecup and push in to activate the display.
- Note:** This will turn on the TWS. The TWS will enter into a cool-down period for approximately 2 minutes. During the cool-down period, the NOT COOL indicator is displayed in the center of the display.

- (3) Adjust BRIGHTNESS knob to the desired level.
  - (4) Adjust diopter ring to focus display symbology.
  - (5) Remove eye from eyecup and wait for cool-down period to complete.
  - (6) Open objective lens cap.
  - (7) Press eye to eyecup and push in to activate the display.
  - (8) Set CONTRAST knob to AUTO.
  - (9) Adjust FOCUS on the sight for desired clarity.
  - (10) Rotate FOV ring to WIDE.
  - (11) Press and hold RETICLE SELECT switch for 5 seconds.
  - (12) Press RETICLE SELECT button until the appropriate weapon system is displayed.
  - (13) Use RETICLE ADJUST switch to set windage and elevation indicators to 000L and 000D.
- b. Prepare the AN/PAS-13C.
- (1) Press and release the ON/OFF button.
  - (2) Press eye to eyecup and push in to activate the display.
  - (3) Adjust brightness and contrast control.
    - (a) Press and release MODE button.
    - (b) Press FUNCTION switch up and down to achieve desired brightness level.
    - (c) Press and release MODE to enter contrast adjustment.
  - (4) Adjust diopter ring to focus display symbology.
  - (5) Open objective lens cap.
  - (6) Adjust objective focus ring to desired clarity.
  - (7) Press the FOV button to select NFOV.
  - (8) Press the MODE switch twice to enter ZERO state.
  - (9) Select the reticle appropriate for the weapon.
  - (10) Use FUNCTION switch to set the elevation and windage to 000R and 000U.

**Note:** Only do this if the weapon has not been laser boresighted.

- c. Prepare the AN/PAS-13D.

- (1) Turn AN/PAS-13D on.

- (2) Press eye to eyecup and push in to activate the display.
- (3) Press and hold the FOV/MODE button for 5 seconds.

**Note:** The MENU will appear in the display.

- (4) Use the GAIN (EL) switch to navigate to RET on the display.
- (5) Press FOV/MODE to select RET.

**Note:** The RET submenu will appear.

- (6) Use the GAIN (EL) switch, navigate to WEAPON menu.
- (7) Press FOV/MODE to select WEAPON.
- (8) Use the GAIN (EL) or BRT (AZ) button, highlight the appropriate weapon system and press FOV/MENU.
- (9) Use the GAIN (EL) switch, navigate to the ADJUST menu.
- (10) Press FOV/MODE to select ADJUST.
- (11) Use the BRT (AZ) to set AZ to L000 and the GAIN (EL) to set the EL to U000.

**Note:** If you cannot set either the AZ to L000 or the EL to U000, change to narrow field of view (known as NFOV) and set the AZ and EL to zero.

- (12) Press the FOV/MODE button to save the AZ and EL.
  - (13) Exit the MENU system by selecting X and pressing and releasing the FOV/MODE button.
3. Assume a prone firing position 25 meters from the zero target.
  4. Establish a tight shot group.
    - a. Identify zero target.
    - b. Align the zeroing (0 to 250 meters) aiming point of the sight reticle to the point of aim on the target.
    - c. Obtain a good sight picture.
    - d. Fire a three-round shot group.

**Note:** For M24 and M107, fire one round at center mass.

- e. Retighten torque knob until two clicks are heard.
- f. Identify the size of the shot group.
  - (1) If all three of the fired rounds impact within a 4x4 cm area, a tight shot group has been obtained and you may continue to the next step.
  - (2) If the rounds do not fall within a 4x4 centimeter (cm) area, reapply the fundamentals of marksmanship and repeat step 4.

5. Adjust sight to obtain a zero.
  - a. Identify the center of the last fired three round shot group.
  - b. Measure distance in azimuth and elevation from the center of shot group to the desired point of impact.
  - c. Adjust the reticle based on your measurement.

**Note:** At 25-meter range, each increment (one click) of azimuth or elevation moves the strike of the round 1.5 centimeters for the MWTS wide field of view (known as WFOV) and 0.5 centimeter for MWTS NFOV and  $\frac{3}{4}$  centimeters for HWTS WFOV. However, when calculating for adjustments, use one click of azimuth or elevation to move strike of round one square on the 25-meter zero target.

- (1) Adjust the AN/PAS-13B.
  - (a) Use the RETICLE ADJUST switch to adjust windage to desired point of impact.
  - (b) Use the RETICLE ADJUST switch to adjust elevation to desired point of impact.
- (2) Adjust the AN/PAS-13C.
  - (a) Press the FUNCTION switch down or up to adjust elevation, as necessary.
  - (b) Press the FUNCTION switch left or right to adjust windage, as necessary.
- (3) Adjust the AN/PAS-13D.
  - (a) Select the RET and ADJUST submenu.
  - (b) Adjust the elevation by using the EL menu function to decrease the up (U) EL setting or increase the down (D) EL setting.
  - (c) Adjust the azimuth by using the AZ menu function to decrease the left (L) AZ setting or increase the right (R) AZ setting.
  - d. Turn the torque limiting knob clockwise by hand until two clicks are heard.

6. Establish a zero.
  - a. Fire a three-round shot group at the target.

**Note:** For M24 and M107, fire one round at center mass.

- b. Identify the location of the shot group on the target.
  - (1) Return to step 5, if two of three rounds do not strike within the desired point of impact.
  - (2) Proceed to step 7, if two of three rounds strike within the desired point of impact.

7. Confirm the zero.
  - a. Fire a three-round shot group at the target.

**Note:** For M24 and M107, fire one round at center mass.

- b. Identify the location of the shot group on the target.
    - (1) Return to step 5, if two of three rounds do not strike within the desired point of impact.
    - (2) Cease fire (zero is confirmed), if two of three rounds strike within the desired point of impact.
  - c. AN/PAS-13D only: Save the AZ and EL values by pressing and releasing the FOV/MODE button.
  - d. AN/PAS-13D only: Exit the MENU system by selecting X and pressing and releasing the FOV/MODE button.
8. Record the setting of AZ and EL indicators and slot used on rail.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the zero target.	_____	_____
2. Prepared the AN/PAS-13.	_____	_____
3. Assumed a prone firing position 25 meters from the zero target.	_____	_____
4. Established a tight shot group.	_____	_____
5. Adjusted sight to obtain a zero.	_____	_____
6. Established a zero.	_____	_____
7. Confirmed the zero.	_____	_____
8. Recorded the setting of A and EL indicators and slot used on rail.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-312-10/TM 10091B/10092B-10/1 Operator's Manual Sight, Thermal AN/PAS-13B(V2) (NSN 5855-01-464-3152) (EIC: N/A) AN/PAS-13B(V3) (NSN 5855-01-464-3151) (EIC: N/A)	TM 11-5855-317-10/TM 10091C/10092C-OR Operator's Manual for Sight, Thermal AN/PAS-13D(V2) (NSN 5855-01-524-4313) (EIC: JH5) (MWTS) AN/PAS-13D(V3) (NSN 5855-01-524-4314)
TM 11-5855-316-10 Operator's Manual AN/PAS-13C(V1) Sight, Thermal (NSN 5855-01-523-7707) (EIC: JG7) AN/PAS-13C(V2) Sight, Thermal (NSN 5855-01-523-7713) (EIC: JH4) AN/PAS-13C(V3) Sight, Thermal (NSN 5855-01-523-7715) (EIC: JNQ)	
TM 11-5855-324-10 Operator's Manual for Sight, Thermal AN/PAS-13D(V1) (NSN: 5855-01-524-4308) (EIC: JG8) (LWTS)	

**071-008-0020**

## **Engage Targets using an AN/PAS-13 Thermal Weapon Sight**

### **DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to shoot. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of the target, backstop and beyond.**

**Conditions:** You are a member of a squad or team conducting tactical operations and have been directed to engage enemy targets within your sector of fire. You have a loaded M16 rifle, M4 carbine, M249 machine gun, M240B or M240L machine gun, M2-series heavy machine gun, or an MK19 grenade machine gun equipped with a mounted and zeroed AN/PAS-13-series thermal weapon sight (known as TWS).

**Standards:** Ensure the TWS has the proper sighting reticle selected. Detect and identify targets by distinguishing between threat and nonthreat targets. Assume an appropriate firing position. Determine range to targets and engage targets.

### **Performance Steps**

1. Ensure the TWS has the proper sighting reticle selected.

- a. Turn power switch to ON position.

**Note:** The AN/PAS-13 internal modules power on in a sequential order. The sensor module is initially powered on before the display module. Therefore, allow up to 2 minutes from power on until a thermal scene appears on the display.

- b. Place your eye over the eyecup and press forward.

**Note:** This activates the magnetic sensors within the eyecup and places the AN/PAS-13 in the ON mode. The display will momentarily flash (approximately  $\frac{1}{4}$  second) indicating the system has been properly powered ON.

- c. After reticle appears, adjust diopter focus ring for best display focus.

- d. Enter the on-screen menu.

**Note:** AN/PAS-13D, long press FOV/MODE. AN/PAS-13C, long press MODE, AN/PAS-13B, long press ZOOM/RETICLE SELECT.

- e. Select the appropriate reticle.

- f. Open the objective lens cover.

- g. Select an object greater than 10 meters away, and adjust objective focus ring for best thermal scene.

- h. Using the menu key pad, adjust POL, BRT, and GAIN for best thermal scene.

- i. Repeat steps g. and h. as needed to optimize thermal scene.

2. Detect targets.

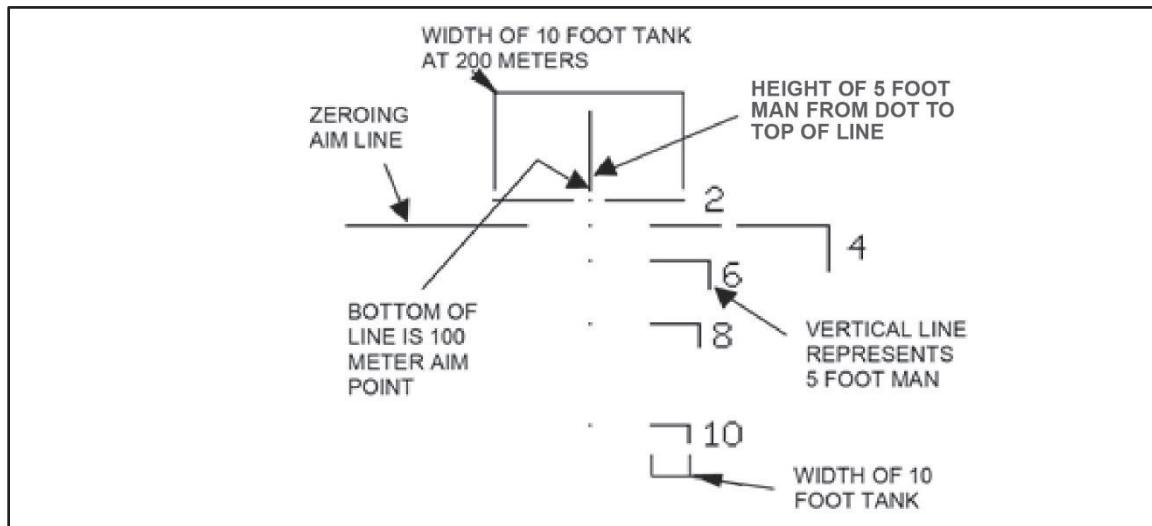
**Note:** Detection of targets depends on your position, your skill in scanning, and your ability to observe the area and recognize target indicators.

3. Identify targets by distinguishing between threat and nonthreat targets.
4. Assume an appropriate firing position.

**Note:** Your position may vary from a fixed location to a temporary location during movement. Select a physical position and assume an appropriate firing position based on the situation. Your position should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire.

5. Determine range to targets.

**Note:** The reticles provide multiple dot aim points used for range estimation and target firing (see figure 3-84). Each dot aim point is used at a different range. The range, at which to use a specific dot aim point, is indicated on side of the range gauge in the hundreds digit in meters (example: 8 = 800 meters). For both the wide field of view and narrow field of view reticles, the bottom of the vertical line above the 200-meter aim point is the 100-meter aim point. The vertical line of the range gauge reflects the height of a 5-foot man at the specified range. The horizontal line of the range gauge reflects the width of a 10-foot tank at the specified range. The firing aim point is the dot aim point for each specific range.



**Figure 3-84. Example of reticle indicators**

- a. Align the target with the range mark.
- b. Identify the associated range number.

**Note:** The number represents the range in hundreds of meters. This is the range to the target.

6. Engage targets.
  - a. Obtain correct sight picture in the TWS.
  - b. Fire the weapon using engagement techniques appropriate to the weapon system.
  - c. Adjust fire based on observation of fire and type of target.
  - d. Fire on targets until they are destroyed suppressed, or you receive an order to cease fire.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the TWS had the proper sighting reticle selected.	_____	_____
2. Detected targets.	_____	_____
3. Identified targets by distinguishing between threat and nonthreat targets.	_____	_____
4. Assumed an appropriate firing position.	_____	_____
5. Determined range to targets.	_____	_____
6. Engaged targets.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 11-5855-316-10 Operator's Manual AN/PAS-13C(V)1 Sight, Thermal (NSN 5855-01-523-7707) (EIC: JG7) AN/PAS-13C(V)2 Sight, Thermal (NSN 5855-01-523-7713) (EIC: JH4) AN/PAS-13C(V)3 Sight, Thermal (NSN 5855-01-523-7715) (EIC: JNQ)	TM 11-5855-312-10/TM 10091B/10092B-10/1 Operator's Manual Sight, Thermal AN/PAS-13B(V)2 (NSN 5855-01-464-3152) (EIC: N/A) AN/PAS-13B(V)3 (NSN 5855-01-464-3151) (EIC: N/A)
TM 11-5855-317-10/TM 10091C/10092C-OR Operator's Manual for Sight, Thermal AN/PAS-13D(V)2 (NSN 5855-01-524-4313) (EIC: JH5) (MWTS) AN/PAS-13D(V)3 (NSN 5855-01-524-4314)	
TM 11-5855-324-10 Operator's Manual for Sight, Thermal AN/PAS-13D(V)1 (NSN: 5855-01-524-4308) (EIC: JG8) (LWTS)	

**071-703-0001**  
**Operate the M145 Telescope**

**Conditions:** You are a member of a squad or team conducting operation and you have an M249, M240B, or M240L machine gun with a mounted M145 telescope. You have already zeroed the M145 telescope.

**Standards:** Install batteries, power up, and employ the M145 telescope. Operate the telescope under unusual conditions, as required. Power down the telescope when no longer needed.

**Note:** The M145 telescope is a fixed 3.4 power, 28-millimeter optical sight that has been designed to engage targets accurately out to 1,200 meters while mounted on the M249, M240B, or M240L machine guns.

**Performance Steps**

1. Install the battery.

- a. Remove the battery cap.

- (1) Turn the battery cap counterclockwise.

- (2) Hold the rotary reticle switch stationary.

**CAUTION**

Moisture and dirt, and/or a missing O-ring could result in loss of power and shorten battery life.

- b. Inspect the threads on the battery housing and battery cap.

- (1) Ensure battery cap is free of dirt and moisture.

- (2) Ensure the O-ring in the battery cap is present.

- c. Insert battery with positive end to cap.

- d. Replace battery cap.

- (1) Hold rotary reticle illumination switch stationary.

- (2) Turn battery cap clockwise until snug.

**WARNING**

**Use of the telescope without laser filter is not eye safe.**

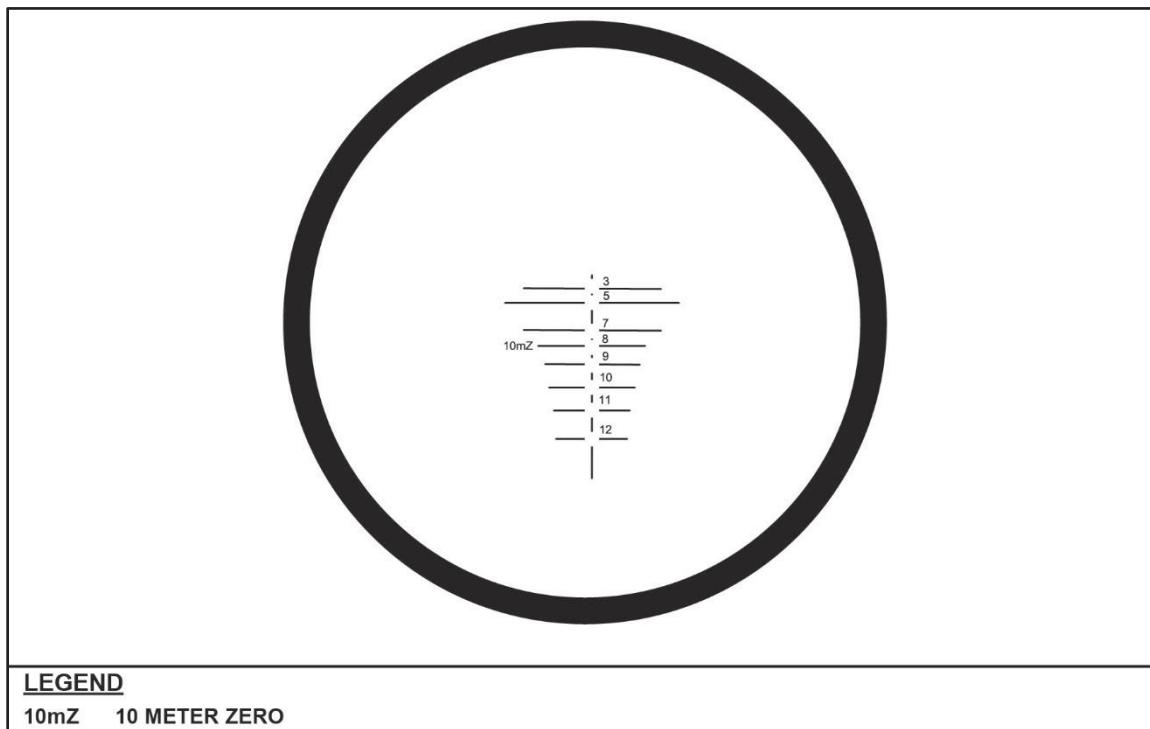
2. Power up the telescope.

- a. Open rear lens cover.

- b. Turn rotary switch one click counterclockwise.

- c. Look through rear lens.
  - d. Verify that the reticle is illuminated.
  - e. Replace the battery if reticle is not illuminated.
3. Employ the telescope.
    - a. Open both the rear and front lens covers.
    - b. Turn both covers inside out to place them in the stow position.
    - c. Look through rear lens to ensure a maximum field of view and correct eye relief (see figure 3-85).

**Note:** For low-light operations, the reticle can be illuminated to show the 300-meter, 500-meter, 700-meter, and 800-meter aiming marks.



**Figure 3-85. Maximum field of view and correct eye relief**

- d. Adjust the reticle intensity to the desired level.

**Note:** The M145 rotary switch has 10 reticle intensity positions: the OFF position and nine positions for different reticle intensity settings.

4. Operate the telescope under unusual conditions, as required.
  - a. Operate the telescope under extreme cold conditions.

**Note:** Extreme cold will shorten battery life.

- (1) Keep spare batteries in a nonconductive container in your inner pockets to keep them warm.

- (2) After bringing the telescope from cold to warm, wipe off condensation.
- b. Operate the telescope under dusty or sandy conditions.
  - (1) Close both front and rear lens covers when sight is not being used.
  - (2) Clean lens with lens paper and dry sight with a cloth as soon as possible after being exposed to dusty or sandy conditions.
- c. Operate the telescope under wet, muddy, and snow conditions.
  - (1) Ensure battery cap is hand-tight before exposing the sight to water, mud, or snow.
  - (2) Ensure both adjustment screw caps are hand-tight before exposing to water, mud, or snow.
  - (3) Close both front and rear lens covers when sight is not being used.
  - (4) Clean lens with lens paper and dry sight with a cloth as soon as possible after being exposed to water, mud, or snow.
  - (5) Use antifogging compound in wet or snow conditions.
  - (6) Attempt to acclimatize telescope to environment to minimize fogging.
- d. Operate the telescope under chemical, biological, radiological, and nuclear conditions.
  - (1) Remove all rubber items.

**Note:** All rubber items must be disposed of in accordance with unit standard operating procedures.

- (2) Decontaminate sight while mounted to the weapon.
  - (3) Decontaminate sight using M258A1 individual Soldier's personal decontamination kit.
  - (4) Replace disposed rubber items with new rubber items.
5. Power down the telescope.
- a. Turn rotary switch to the OFF position.
  - b. Replace both lens covers.

Performance Measures	GO	NO-GO
1. Installed the battery.	_____	_____
2. Powered up the telescope.	_____	_____
3. Employed the telescope.	_____	_____
4. Operated the telescope under unusual conditions, if required.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Powered down the telescope.	—	—
<b>References Required</b>	<b>Primary</b>	
TC 3-22.240 Medium Machine Gun TC 3-22.249 Light Machine Gun M249 Series	TM 9-1240-415-13&P/TO 11W2-13-11-1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Telescope, Straight: M145 (1240-01-411-6350)	

**071-703-0002**  
**Maintain the M145 Telescope**

**Conditions:** You are a member of a squad or team conducting maintenance on assigned equipment. You have been directed to perform operator maintenance on the M145 telescope. You have TM 9-1240-415-13&P/ TO 11W2-13-11-1, the required cleaning material, and a battery (OE890) DL1/3N.

**Standards:** Inventory, clean, inspect, and conduct preventive maintenance checks and services (PMCS) on the M145 telescope in accordance with TM 9-1240-415-13&P/TO 11W2-13-11-1. Report any deficiencies found to unit maintenance.

**Note:** The M145 telescope is a fixed 3.4 power, 28-millimeter optical sight that has been designed to engage targets accurately to 1,200-meter range while mounted on the M249, M240B, or M240L machine guns.

**Performance Steps**

1. Inventory the M145 telescope.
2. Clean the M145 telescope.
  - a. Clean the exterior of the M145 telescope and metal components.
    - (1) Flush with water.
    - (2) Wipe with a soft cloth.
  - b. Clean the lens.
    - (1) Remove large particles from exposed lens surfaces.
      - (a) Blow as much dust and dirt as possible from the exposed lens surfaces.
      - (b) Gather the center of a sheet of lens paper and use the edges to brush dust from the front and back lens.
    - (2) Remove mud using optical lens cleaning compound or by splashing water onto the lens.
    - (3) Moisten a piece of lens paper and gently wipe over the lens surface.
    - (4) Dry with clean lens paper.
  - c. Clean the signature reduction device.
    - (1) Remove the signature reduction device by rotating in a counterclockwise direction.
    - (2) Clean the signature reduction device by running water through the honeycomb.
    - (3) Shake out excess water and leave to dry.
  - d. Clean the laser filter.
    - (1) Remove the laser filter by rotating in a counterclockwise direction.
    - (2) Clean the laser filter with lens paper.

**CAUTION**

Do not tighten with any tools.

- (3) Replace the laser filter and signature reduction device by screwing the device clockwise onto the front objective lens.

**Note:** The laser filter unit acts like a mirror; therefore, to minimize reflections, it is installed at a slight angle. The signature reduction device is screwed on straight to the objective lens, finger-tight.

3. Inspect the M145 telescope.

- a. Inspect the exterior of the sight for loose or missing parts and cleanliness.
- b. Inspect for visual obstruction of target image by looking through the sight.
- c. Ensure that the 300-meter, 500-meter, 700-meter, and 800-meter marks in the reticle are visible.
- d. Inspect the battery cap and ensure that the battery cap threads are clean and undamaged.
- e. Ensure the O-ring and spring is in the battery cap.
- f. Inspect mount for damage that will prevent sight from being installed.
- g. Inspect both lens covers and ensure they can be snapped in place.
- h. Inspect torque limiting knob for damage that will prevent sight from being installed.
- i. Inspect torque limiting shaft and ensure threads are not stripped.
- j. Ensure signature reduction device and laser filter is present.

4. Perform PMCS on the M145 telescope.

- a. Conduct before, during, or after checks and services, as required.
- b. Record results of PMCS.

5. Report deficiencies to unit maintenance personnel, if necessary.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inventoried of M145 telescope.	_____	_____
2. Cleaned the M145 telescope.	_____	_____
3. Inspected the M145 telescope.	_____	_____
4. Performed PMCS on the M145 telescope.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Reported deficiencies to unit maintenance personnel, if necessary.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-1240-415-13&P/TO 11W2-13-11-1 Operator and Field Maintenance Manual Including Repair Parts and Special Tools List for Telescope, Straight: M145 (1240-01-411-6350)		

**071-706-0006****Install the AN/PSQ-20 Night Vision Goggle on the Advanced Combat Helmet**

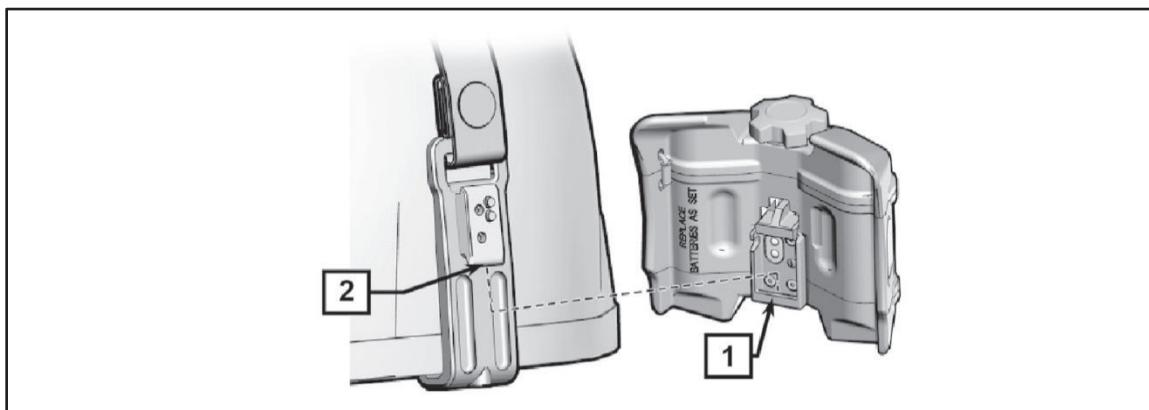
**Conditions:** You are a member of a squad or team preparing for night operations. You have an AN/PSQ-20B night vision goggle (NVG) that you must mount on your advanced combat helmet (ACH). The helmet mount wiring assembly has already been installed on your ACH.

**Standards:** Mount the AN/PSQ-20B NVG on the helmet in preparation for use.

**Note:** This task covers the AN/PSQ-20B NVG. See appropriate technical manual for earlier version of the AN/PSQ-20.

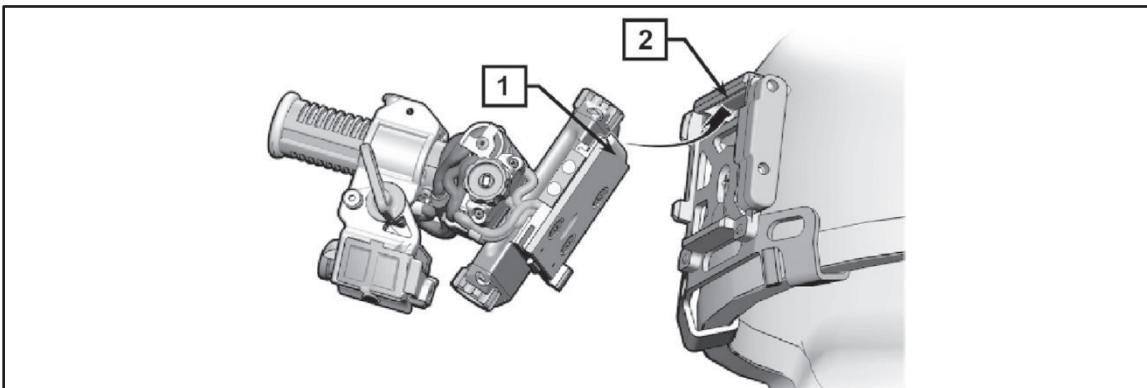
**Performance Steps**

1. Install the battery pack assembly on the helmet. (See figure 3-86.)



**Figure 3-86. Attaching battery pack to helmet**

- a. Install four AA lithium batteries.
  - b. Hook the bottom of the battery pack hotshoe receptacle (see figure 3-86, item 1) onto the bottom tab of the helmet's hotshoe connector (see figure 3-86, item 2).
  - c. Pivot the battery pack toward the helmet until the hotshoe connector and receptacle snap into place.
  - d. Pull the battery pack to ensure it is secure.
  - e. Turn on the battery pack by moving the power switch to either the right or left from the center.
2. Attach the helmet mount to the helmet. (See figure 3-87.)



**Figure 3-87. Attaching the helmet mount**

- a. Hook the top lip of the helmet mount (see figure 3-87, item 1) under the top lip of the helmet mount bracket (see figure 3-87, item 2).
- b. Pivot the helmet mount toward the helmet until the two brackets snap and lock together.

**DANGER**

**Emission of stray light from the eyepiece (even with eyecup installed) may be detectable by the enemy.**

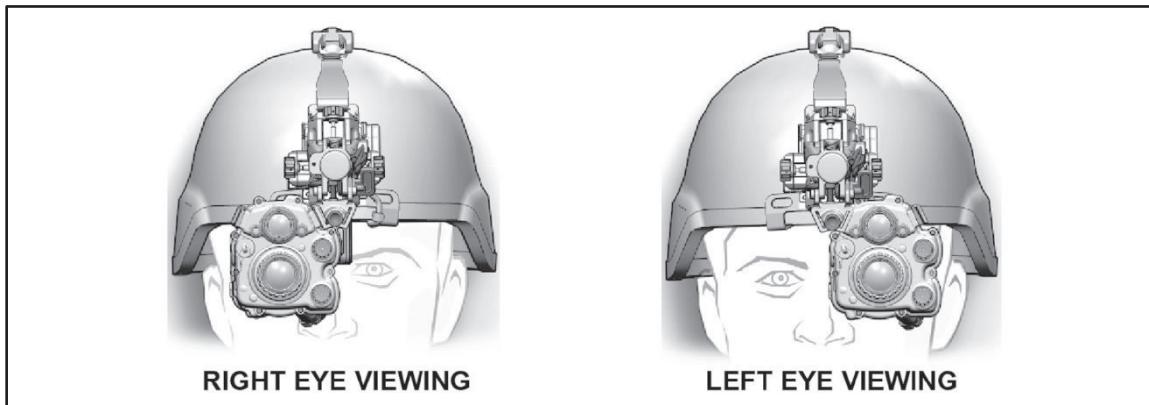
3. Attach the imaging system to the helmet mount.

**Note:** The imaging system can be configured for right eye or left eye viewing depending on which of the imaging system's hotshoe connectors is attached to the helmet mount.

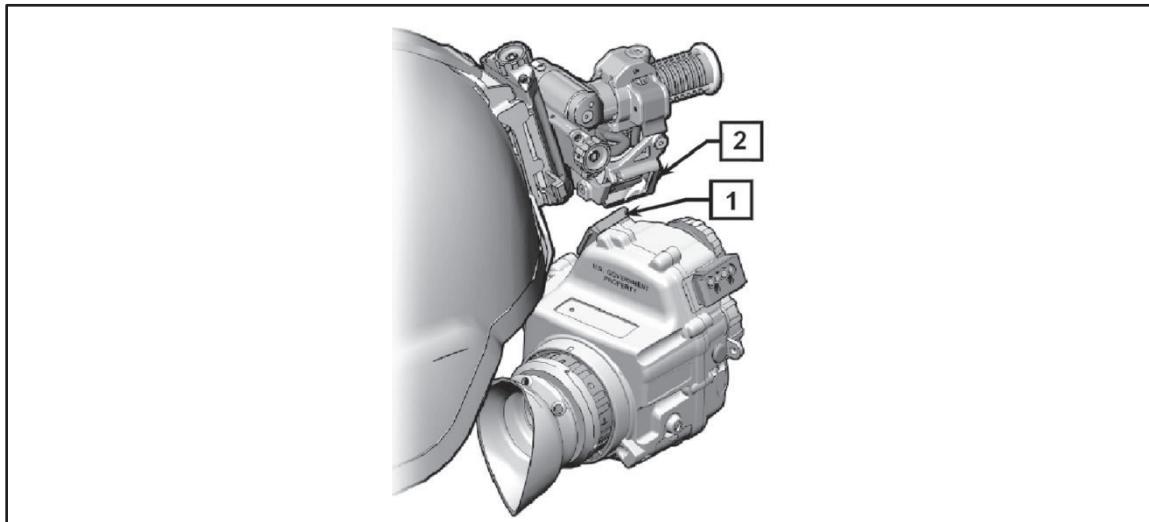
- a. Install the light interference filter (known as LIF) on the imaging system.

**Note:** The LIF (tinted) is used to protect the imaging system's internal components from potential damage in a laser threat environment and should be installed whenever the AN/PSQ-20B is placed in operation.

- b. Snap the eyecup into place over the eyepiece and rotate to a left- or right-eye orientation.
- c. Align the appropriate imaging system hotshoe connector for the desired viewing configuration (see figure 3-88, page 3-284) with the appropriate hotshoe receptacle on the helmet mount.

**Figure 3-88. Viewing configuration**

- d. Hook the far tab of the imaging system's hotshoe connector (see figure 3-89, item 1) into the hotshoe receptacle (see figure 3-89, item 2) on the helmet mount.

**Figure 3-89. Imaging system attachment**

- e. Pivot the eyepiece of the imaging system toward the helmet mount until the two parts snap and lock together.
- f. Install the rubber receptacle protector (secured to the helmet mount) in the unused hotshoe receptacle, if necessary.

**Performance Measures****GO****NO-GO**

1. Installed the battery pack assembly on the helmet.
2. Attached the helmet mount to the helmet.
3. Attached the imaging system to the helmet mount.

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<b>References Required</b>	<b>Primary</b>
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TM 11-5855-336-10 Operator's Manual for  
AN/PSQ-20B Night Vision Device (NVD) (NSN  
5855-01-603-0486) (EIC: GMZ)

**071-706-0007**  
**Operate the AN/PSQ-20 Night Vision Goggle**

**Conditions:** You are a member of a squad or team conducting night operations. You have just mounted AN/PSQ-20B, night vision goggle (NVG), on your advanced combat helmet.

**Standards:** Prepare the AN/PSQ-20B NVG for operation.

**Performance Steps**

1. Adjust the position of the NVG. (See figure 3-90.)

**Note:** Positioning adjustments must be made for maximum performance and comfort. The adjustments are made with the imaging system attached to the helmet mount, the eyecup installed, and the helmet properly donned. The imaging system cannot be properly adjusted until the helmet itself is correctly fitted. Optimal system performance and comfort of the operator relies on carefully following the adjustment procedures. The best visual performance is possible only when the optical axis of the device is aligned with the visual axis of the eye.

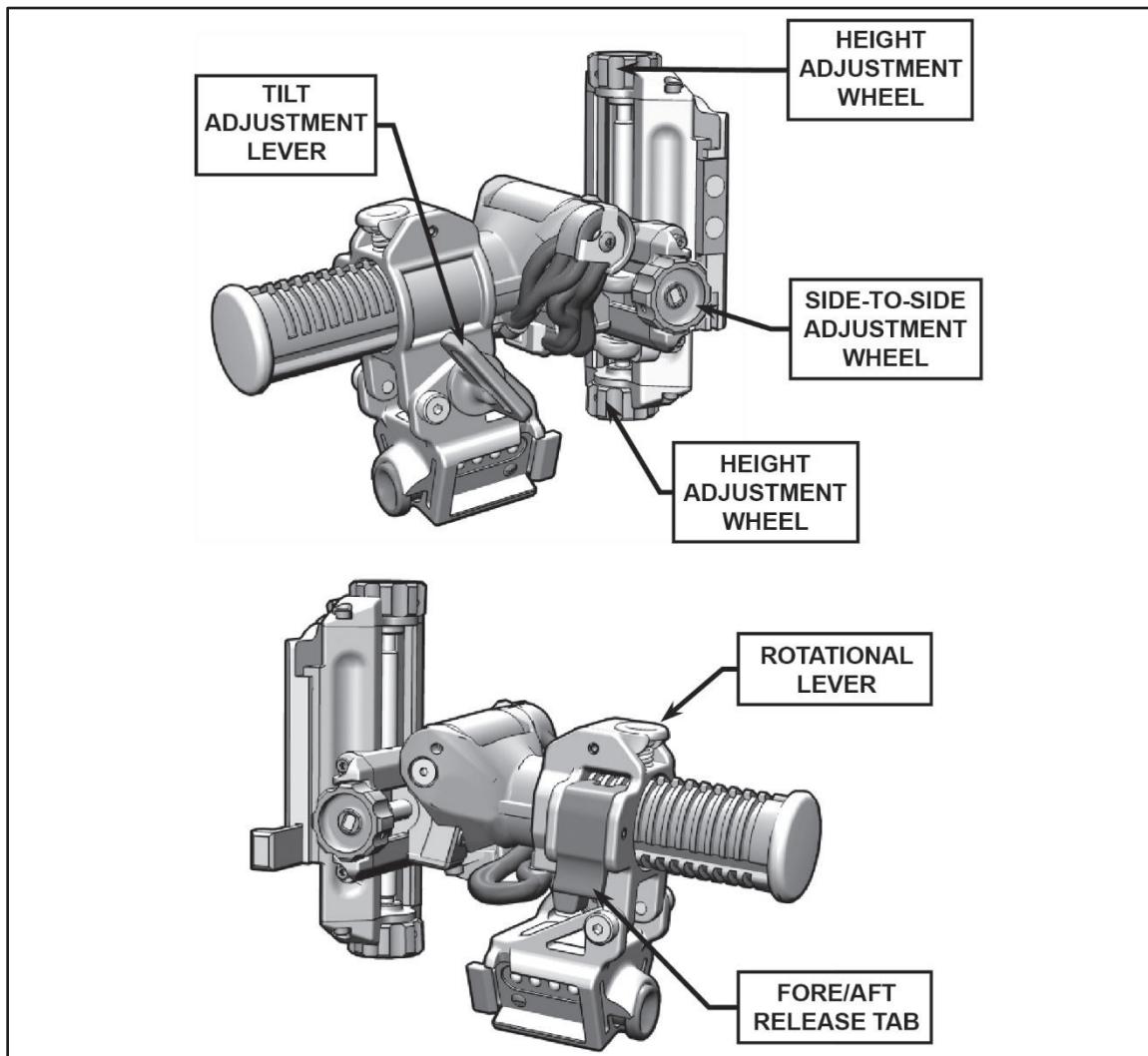


Figure 3-90. Helmet mount positioning adjustments

- a. Turn the NVG on by placing the mode switch to I2 ONLY (Position 2).
- b. Turn the height adjustment wheel on the helmet mount until the eyepiece of the imaging system is level with your eyes.
- c. Turn the side-to-side adjustment wheel on the helmet mount until the eyepiece of the imaging system is directly in front of your eye.
- d. Rotate the tilt adjustment lever toward or away from the helmet until an optimum view of the image area is obtained.
- e. Hold in on the fore/aft release tab and slide the imaging system toward or away from the helmet until a good eye/cheek weld is obtained with the eyecup.
- f. Verify alignment to achieve optimal field of view. (See figure 3-91.)

Field of View	Remarks / Corrective Action
	Optimal alignment.
	Eye relief too long. Correct fore and aft adjustment.
	Eye relief too short. Correct fore and aft adjustment.
	Too far right. Correct side-to-side adjustment.
	Too far left. Correct side-to-side adjustment.
	Positioned too high. Correct height adjustment.
	Positioned too low. Correct height adjustment.

Imaging system field of view  
 Eyepiece field of view  
 Obstructed imaging system field of view

Figure 3-91. Fields of view and positioning adjustments

2. Perform startup procedures.

**Note:** The NVG modes of operation are identified in figure 3-92.

Switch Position	Mode	Description
1	OFF	The imaging system will not operate.
2	I <sup>2</sup> ONLY	In I <sup>2</sup> ONLY mode, the imaging system amplifies ambient light from sources such as the moon and stars, so that the viewed scene becomes clearly visible to the operator.
3	FUSED	In FUSED mode, the imaging system amplifies available light and thermal signatures, and fuses them together to produce a clear viewed image. The image may be adjusted from 100% I <sup>2</sup> to 100% thermal, or a varying mix of the two.
4	TH ONLY	In TH ONLY (Thermal Only) mode, the imaging system detects thermal energy and produces an image based on the temperature difference of objects within the viewing scene.
5	MENU	Used to adjust default parameters for the imaging system.

**LEGEND**

I<sup>2</sup> IMAGE INTENSIFIED

**Figure 3-92. Modes of operation**

- a. Perform image intensification only (I2 ONLY) startup.
  - (1) Turn the mode switch to I2 ONLY (Position 2).
  - (2) Rotate the I2 control knob to achieve the desired level of image intensity.

**Note:** If necessary, due to extreme darkness, activate the I2 Illuminator.

- (3) Adjust for sharpest image.
- (4) Rotate the I2 objective focus ring for best image clarity.
- b. Perform fused mode startup.
  - (1) Remove the thermal objective lens cover, if installed.
  - (2) Turn the mode switch to FUSED (Position 3).
  - (3) Press the thermal control knob until the desired polarity setting (WHITE HOT, BLACK HOT, or OUTLINE) is selected.

- (4) Rotate the thermal control knob to set the thermal brightness level to the minimum necessary for detection of live or hot objects.
- (5) Rotate the I2 control knob to achieve the desired level of intensity for the I2 image.

**Note:** For extreme darkness, activate the I2 Illuminator.

- (6) Adjust for sharpest image.
    - (a) Look through the eyepiece at an object greater than 18 inches from the imaging system.
    - (b) Rotate the diopter focus ring to achieve the sharpest possible image.
  - (7) Rotate the I2 objective focus ring for best image clarity.
- c. Perform thermal only (TH ONLY) startup.
- (1) Turn the mode switch to TH ONLY (Position 4).
  - (2) Press the thermal control knob until the desired polarity setting (WHITE HOT, BLACK HOT, or OUTLINE) is selected.
  - (3) Rotate the thermal control knob to set the thermal brightness level to the minimum necessary for detection of live or hot objects.
  - (4) Adjust for sharpest image.
    - (a) Look through the eyepiece at an object greater than 18 inches from the imaging system.
    - (b) Rotate the diopter focus ring to achieve the sharpest possible image.

**DANGER**

**The I2 illuminator (when activated) is detectable by an enemy using night vision devices. Detection is easier in smoky, foggy, or rainy conditions. To reduce the risk of detection, avoid prolonged activation of the I2 Illuminator.**

3. Activate the I2 illuminator, if necessary.

**Note:** The I2 Illuminator is used to provide a supplementary light source in conditions of extreme darkness.

- a. Momentary use.
  - (1) Press and hold the I2 control knob.
  - (2) Release the I2 control knob.
- b. Continuous use.
  - (1) Activate the I2 illuminator by pressing the I2 control knob twice in rapid succession (double-tapping).

- (2) Deactivate the I2 illuminator using one of the following:
  - (a) Press the control knob.
  - (b) Turn the mode switch to TH ONLY, MENU, or OFF position.
  - (c) Place the imaging system in the stow position.

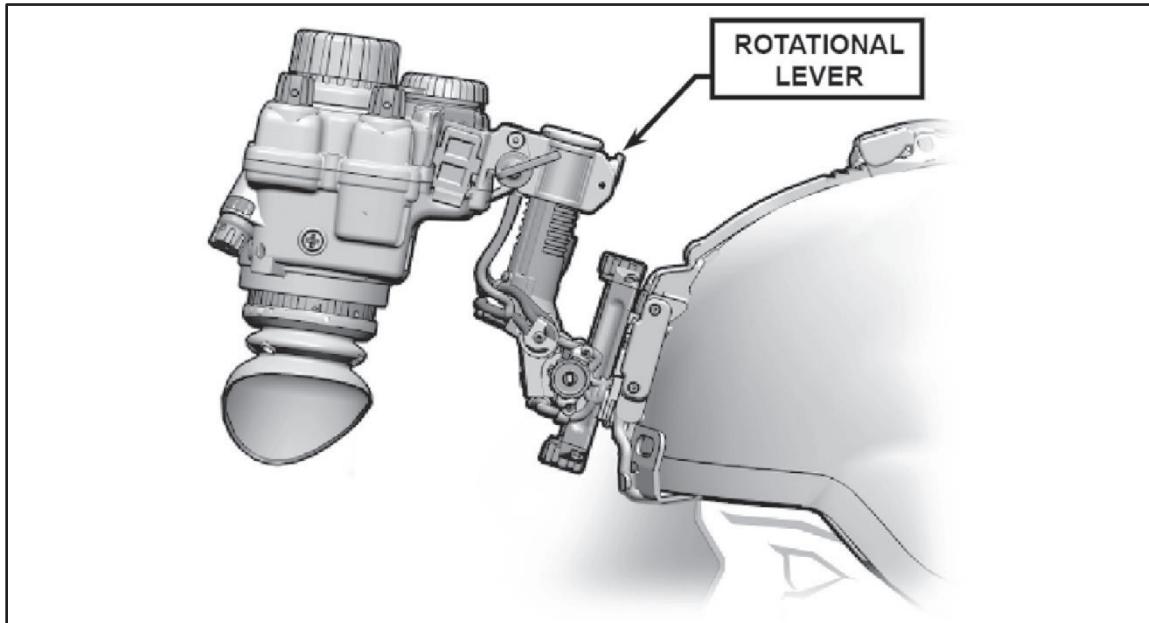
**DANGER**

**The imaging system will not enter a sleep state if it is not placed in correct stow positions. Emission of stray light from the eyepiece (even with the eyecup installed) may be detectable by the enemy.**

4. Place the imaging system in the stow position.

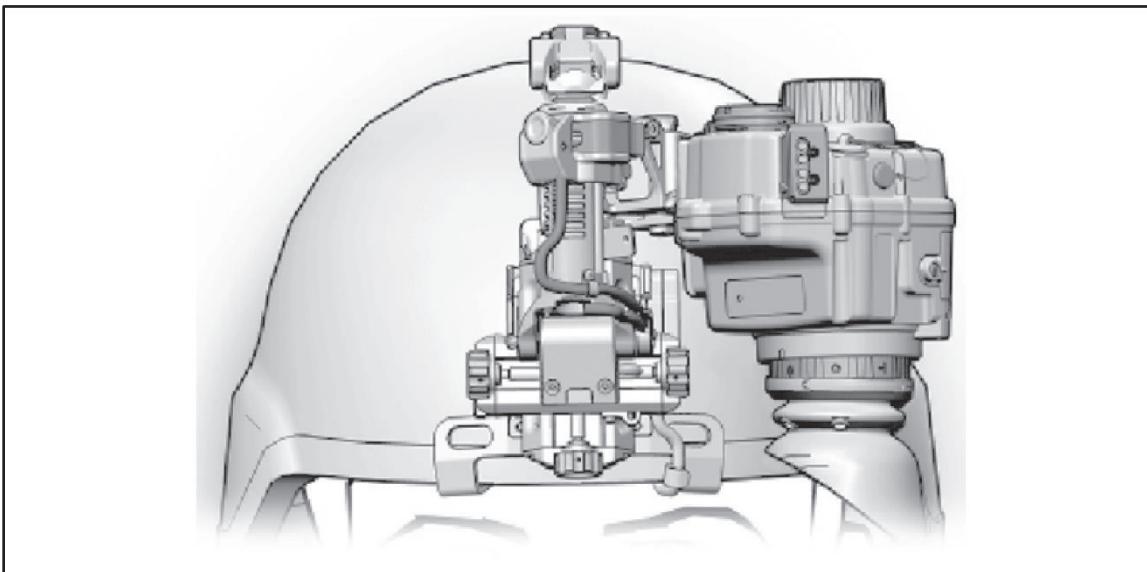
**Note:** When placed in either stow position, the imaging system enters a reduced power consumption sleep state. If the imaging system is maintained in either stow position for more than 60 minutes, it will shut down to conserve power. However, the sleep state still draws a significant amount of power. Therefore, if the imaging system is not expected to be used, it should be turned off before being placed in one of the stow positions. While in sleep state, the imaging system may be flipped down to the operational position from either stow position. This will immediately return the imaging system to an active mode with all settings as they were before being stowed.

- a. Place the imaging system in the rapid stow position by pivoting it upward until it locks into place. (See figure 3-93.)



**Figure 3-93. Imaging system in rapid stow position**

- b. Place the imaging system in the full stow position. (See figure 3-94.)



**Figure 3-94. Imaging system in the full stow position Imaging system in full stow position**

- (1) Pivot the imaging system upward to the rapid stow position.
  - (2) Press the rotational lever (see figure 3-93) and swing the imaging system toward the helmet in a direction opposite of the viewing eye until it locks into place.
5. Place the imaging system in the operational position.
- a. If in the full stow position, press the rotational lever and swing the imaging system to the rapid stow position.
  - b. Pivot the imaging system downward (from rapid stow position) until it locks into place.

Performance Measures	GO	NO-GO
1. Adjusted the position of the NVG.	_____	_____
2. Performed startup procedures.	_____	_____
3. Activated the I2 illuminator, if necessary.	_____	_____
4. Placed the imaging system in a stow position.	_____	_____
5. Placed the imaging system in the operational position.	_____	_____

References Required	Primary
TM 11-5855-336-10 Operator's Manual for AN/PSQ-20B Night Vision Device (NVD) (NSN 5855-01-603-0486) (EIC: GMZ)	

**071-706-0005**  
**Maintain the AN/PSQ-20 Night Vision Goggle**

**Conditions:** You are a member of a squad or team conducting maintenance on all assigned equipment and you have been directed to perform maintenance on the AN/PSQ-20B night vision goggle (NVG). You have the required cleaning material, TM 11-5855-336-10, and a DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*).

**Standards:** Inventory, clean and perform preventive maintenance checks and services (PMCS) on the AN/PSQ-20B NVG in accordance with TM 11-5855-336-10. Record any deficiencies found on DA Form 2404. Report results of PMCS to supervisor.

**Performance Steps**

1. Inventory the NVG. (See figure 3-95.)

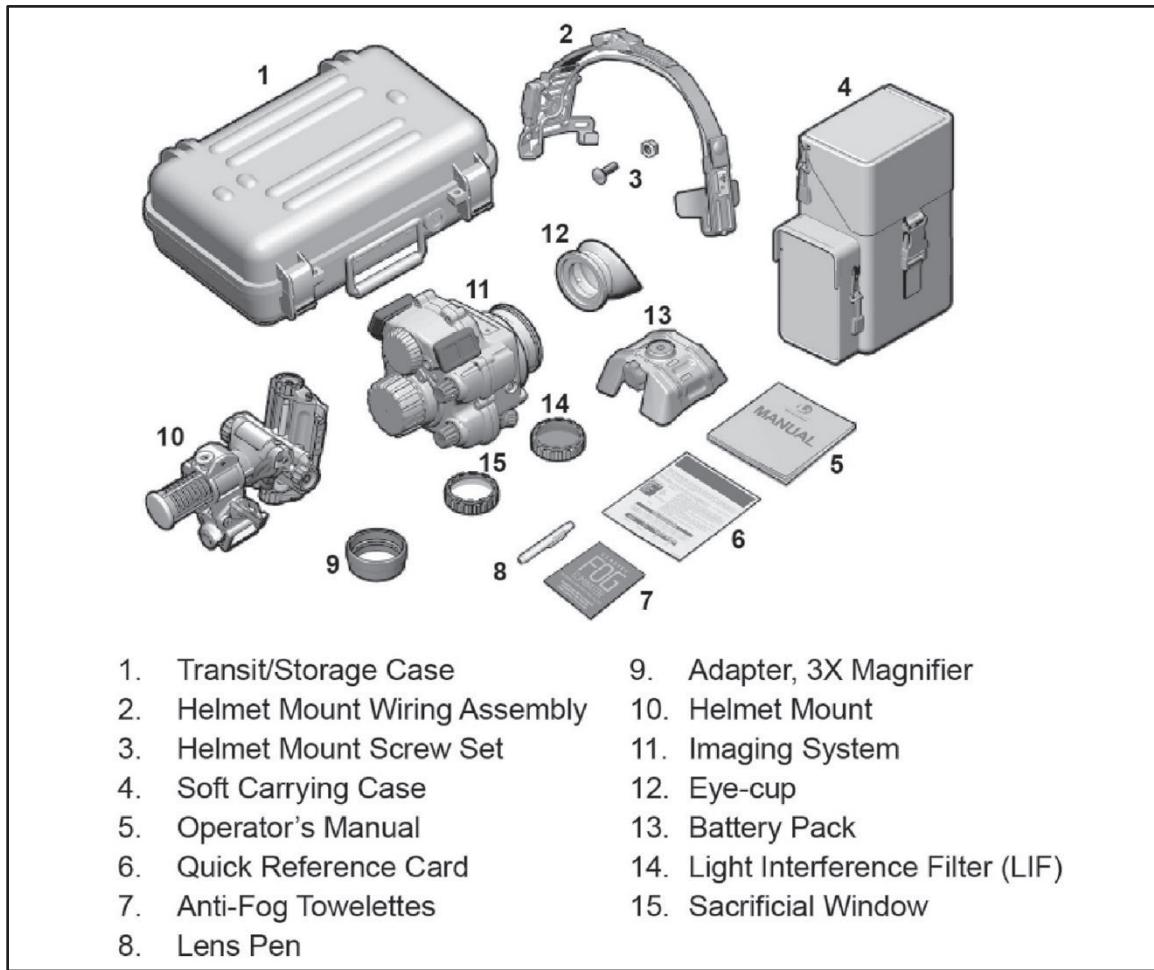


Figure 3-95. AN/PSQ-20B night vision goggle components

**WARNING**

**Isopropyl alcohol is flammable and toxic. To avoid injury, keep away from open fire and use in a well-ventilated area.**

**CAUTION**

Do not scratch the external lens surfaces or touch them with your fingers.

Do not wipe a dry lens. Fine particles of dust and dirt that collect on the lenses could scratch the lenses.

2. Clean the NVG.
  - a. Clean the imaging system.
    - (1) Rinse thoroughly with fresh water, if necessary.
    - (2) Dry with clean soft cloth.
    - (3) Clean around knobs, switches, and detailed portions of the housing using fresh water and a disposable applicator.
  - b. Clean the battery pack.
    - (1) Remove any dirt or debris from the inside of the battery pack.
    - (2) Use a disposable applicator dipped in isopropyl alcohol to gently clean the battery contacts and contact pins, if necessary.
    - (3) Thoroughly rinse the exterior of the battery pack with fresh water.
    - (4) Clean around the thumbscrew and detailed portions of the exterior using fresh water and a disposable applicator, if necessary.
    - (5) Dry with clean soft cloth.
    - (6) Use a disposable applicator dipped in isopropyl alcohol to gently clean the electrical contacts in the hotshoe receptacle, if necessary.
  - c. Clean helmet mount and wiring assembly.
    - (1) Rinse the battery pack bracket, helmet mount bracket, power cable, and strap components thoroughly with fresh water.
    - (2) Wipe clean with a soft cloth.
    - (3) Use a disposable applicator dipped in isopropyl alcohol to gently clean the electrical contacts, if necessary.

**CAUTION**

Avoid using excessive force as this may scratch the lenses.

- d. Clean the optical surfaces.
  - (1) Remove any large particles or loose dirt using the brush portion of the lens pen.
  - (2) Fine clean using the cleaning tip of the lens pen.
3. Perform PMCS in accordance with TM 11-5855-336-10.
4. Record any deficiencies on DA Form 2404.
5. Report operational status of the NVG to supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inventoried the NVG.	_____	_____
2. Cleaned the NVG.	_____	_____
3. Performed PMCS in accordance with TM 11-5855-336-10.	_____	_____
4. Recorded any deficiencies on DA Form 2404.	_____	_____
5. Reported operational status of the NVG to supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 11-5855-336-10 Operator's Manual for AN/PSQ-20B Night Vision Device (NVD) (NSN 5855-01-603-0486) (EIC: GMZ)

**071-706-0001**  
**Operate the AN/PVS-14 Monocular Night Vision Device**

**WARNING**

The lithium battery contains sulfur dioxide gas under pressure and should be handled in the following manner: (1) The lithium batteries have safety vents to prevent explosion. When they are venting sulfur dioxide gas, you may smell it or hear the sound of gas escaping. When the safety vents have operated, the batteries are fairly safe from bursting but will be hot and must be handled with care. (2) Do not heat, puncture, disassemble, short circuit, attempt to recharge, or otherwise tamper with the batteries. (3) Turn off the equipment if the battery compartment becomes unduly hot. Do not open the battery compartment, but turn in the night vision device (NVD) to maintenance and report the problem.

**Conditions:** You are member of a squad, team or crew conducting operations in limited visibility and have an AN/PVS-14 monocular NVD that is prepared for operation. You have all your assigned personal equipment.

**Standards:** Place the AN/PVS-14 NVD into operation under normal conditions. Properly stow the AN/PVS-14 NVD after use.

**Note:** Prior to operating the NVD, make certain that assembly and preparation for use have been performed.

**Performance Steps**

**CAUTION**

Operate the NVD only under darkened conditions or use the lens cap to cover the objective lens for daylight conditions.

1. Operate AN/PVS-14 under normal conditions.
  - a. Use the AN/PVS-14 handheld.
    - (1) Turn the power switch to ON.
    - (2) Adjust the diopter for the clearest view of the image intensifier screen.
    - (3) Observe an object, then focus the objective lens for the sharpest image.
  - b. Use the AN/PVS-14 with the headset.
    - (1) Align the headset adapter's latch to the headset's mounting socket.
    - (2) Press and hold down the latch lever while installing the NVD into the headset's mounting socket.
    - (3) Turn the power switch to ON.
    - (4) Readjust the vertical adjustment of the headset until the NVD is properly aligned with your eye.

- (5) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

**Note:** Any readjustment of eye relief requires readjustment of the diopter.

- (6) Adjust the eye relief by depressing the eye relief adjustment and moving NVD fore or aft to obtain a full field of view image.

- (7) Adjust the diopter for the best image.

- (8) Observe an object and focus the objective lens for sharpest image.

- c. Use the AN/PVS-14 mounted on a helmet.

- (1) Don the helmet.

- (2) Place the NVD in the socket of the helmet mount.

- (3) Depress the side buttons (or press down on side lever on metal mount) to set the eye relief.

- (4) Move the NVD fore or aft until the eyecup comfortably seals around the eye.

- (5) Turn the NVD ON.

- (6) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

- (7) Adjust the eye relief distance.

- (a) Press the side buttons (or press down on side lever on metal mount).

- (b) Slide the NVD fore or aft to obtain a full field-of-view of the image.

- (8) Adjust the objective lens focus, while observing an object, until the sharp image is obtained.

- (9) Grasp the helmet tilt and flip-up assembly and rotate upward and rearward until the latch is firmly engaged.

**Note:** The NVD will automatically power off when flipped up.

- (10) Grasp the helmet tilt and flip-up assembly and rotate downward and forward until the latch is firmly engaged.

- (11) Turn the power switch to the ON position to resume viewing.

- d. Use the AN/PVS-14 mounted on a weapon.

- (1) Assemble the weapon mount to the NVD.

- (2) Turn the power switch to ON.

- (3) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

- (4) Adjust the objective lens focus, while observing an object, until the sharp image is obtained.

- e. Use the compass.

**WARNING**

**The compass illuminator can be seen by others using NVDs.**  
**The compass reading is the magnetic North, not true North.**

**CAUTION**

Using the compass with the plastic headset or plastic helmet mount will result in inaccurate compass readings. The magnet cannot be removed from these mounts.

The magnet is removed from the ruggedized metal helmet mount before installation of the compass. Failure to do so will result in inaccurate compass readings.

If the magnet is not removed, turn the ruggedized metal helmet mount in to unit maintenance for removal.

(1) Remove the sacrificial window or objective lens cap.

(2) Turn NVD ON.

(3) Rotate the objective lens focus completely counterclockwise.

**Note:** The O-ring must be in place in the compass in order for the compass to fit properly.

(4) Press the compass onto the objective lens at an angle using the left hand.

(5) Ensure that the compass fits tightly to the objective lens.

(6) Adjust the objective lens focus slightly by gripping the compass and turning clockwise.

(7) Grip the compass with index finger on top and thumb on illumination button on bottom to view the compass through the NVD.

(8) Press button slowly with thumb until proper brightness is obtained.

(9) Rotate or tap compass slightly to ensure compass is operating correctly.

**Note:** The compass readings should change when you move your head from side to side.

(10) Hold the NVD in a level position to assure free rotation of the compass scale.

f. Use the 3x magnifier.

(1) Thread the 3X magnifier into the focus ring adapter.

(2) Slip the 3x magnifier focus ring adapter over the end of the objective lens with the light interference filter (known as LIF) installed.

**Note:** If directed by higher authority, the 3X magnifier can be threaded directly into the objective lens with the LIF removed.

- (3) Adjust the objective lens focus, while observing an object, until the sharp image is obtained.
  - (4) Adjust the gain control knob to balance the illumination input to the eye.
2. Stow the AN/PVS-14.
- a. Turn NVD OFF.
  - b. Remove the NVD from the headset or helmet mount.
  - c. Remove battery or batteries.
  - d. Inspect the battery compartment for corrosion or moisture.
  - e. Replace battery cap.
  - f. Remove eyecup, demist shield, sacrificial window, compass or 3X magnifier.
  - g. Replace eyepiece and objective lens cap.
  - h. Ensure monocular is clean and dry before placing into carrying case.
  - i. Replace all equipment in the carrying case.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Operated AN/PVS-14 under normal conditions.	_____	_____
2. Stowed the AN/PVS-14.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 11-5855-306-10/TO 12S10-2PVS14-1/TM  
10271A-OR/1C Operator's Manual for Monocular  
Night Vision Device (MNVD) AN/PVS-14 (NSN  
5855-01-432-0524) (EIC: IPX)

**071-706-0002**  
**Maintain the AN/PVS-14 Night Vision Device**

**CAUTION**

The monocular night vision device (known as MNVD) is a precision optical instrument and must be handled carefully. Do not scratch the external lens surfaces or touch them with your fingers. The coating on the demist shield can be damaged if cleaned while wet or if cleaned with wet lens paper. Clean only when demist shield is dry and only with dry lens paper.

**Conditions:** You are a member of a squad or team conducting maintenance on assigned equipment. You have been directed to perform maintenance on the AN/PVS-14 MNVD. You have the AN/PVS-14 with all components, TM 11-5855-306-10, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), batteries, and the required cleaning supplies.

**Standards:** Inventory, perform preventive maintenance checks and services (PMCS) on, and clean the AN/PVS-14 in accordance with TM 11-5855-306-10. Record any deficiencies, if found, on DA Form 2404 or DA Form 5988-E and report results of PMCS to supervisor.

**Performance Steps**

1. Inventory the AN/PVS-14. (See figure 3-96.)

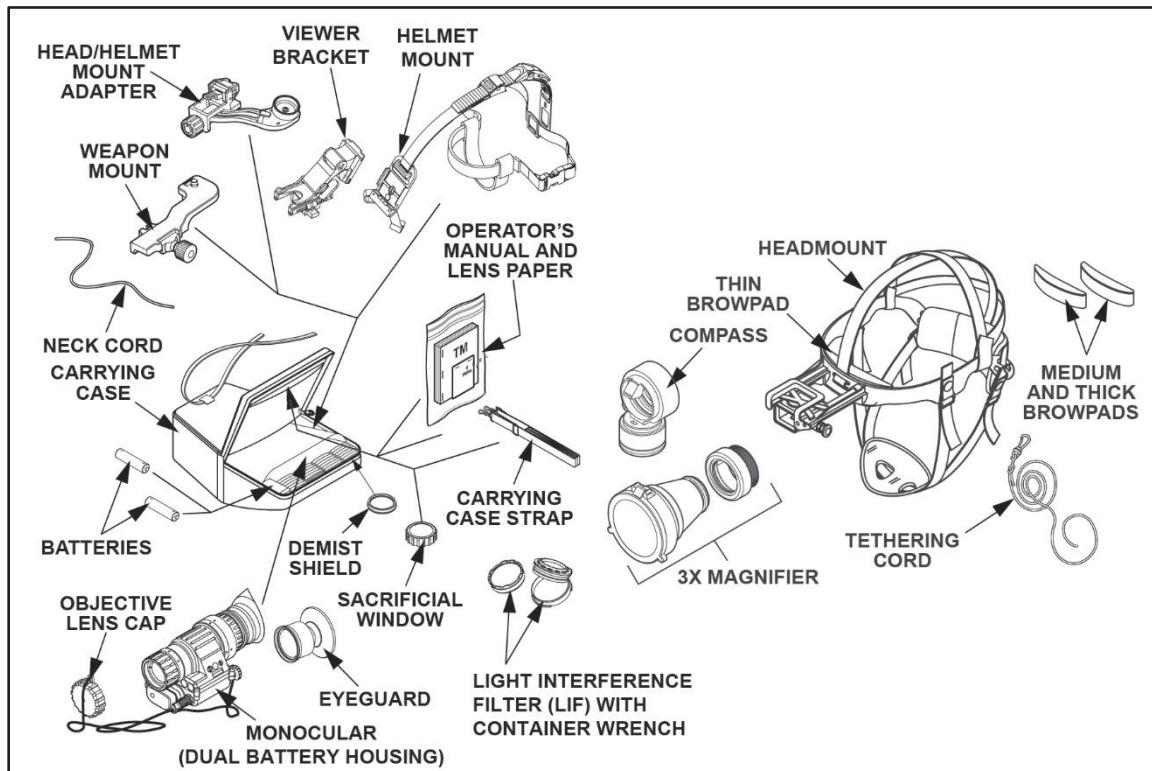


Figure 3-96. AN/PVS-14 monocular night vision device with components

2. Perform PMCS on the AN/PVS-14 in accordance with TM 11-5855-306-10.
3. Clean the AN/PVS-14 in accordance with TM 11-5855-306-10.
4. Record any deficiencies on DA Form 2404 or DA Form 5988-E.
5. Report results of PMCS to supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inventoried the AN/PVS-14.	_____	_____
2. Performed PMCS on the AN/PVS-14 in accordance with TM 11-5855-306-10.	_____	_____
3. Cleaned the AN/PVS-14 in accordance with TM 11-5855-306-10.	_____	_____
4. Recorded deficiencies, if found, on DA Form 2404 or DA Form 5988-E.	_____	_____
5. Reported results of PMCS to supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 11-5855-306-10/TO 12S10-2PVS14-1/TM 10271A-OR/1C Operator's Manual for Monocular Night Vision Device (MNVD) AN/PVS-14 (NSN 5855-01-432-0524) (EIC: IPX)
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

## Subject Area 6: TACTICAL OPERATIONS

**052-COM-1271  
Identify Visual Indicators of an Improvised Explosive Device****WARNING**

**Secondary and tertiary improvised explosive devices (IEDs) should be expected in the area. Failure to comply could result in immediate personal injury or damage to equipment.**

**Conditions:** In the operational environment in an area known to contain possible IEDs, you are given optics (binoculars, spotting scopes, and so forth).

**Standards:** Identify the visual indicators of IEDs using the naked eye and/or optics to 100-percent accuracy without causing injury to personnel or damage to equipment.

**Note:** The primary indication of an IED will be a change in the environment, something new on the route that was not there yesterday. The enemy may leave behind visual indicators of an emplaced IED by accident, or, in some cases, on purpose to inform the local population, or for use as an aiming reference point. Vigilant observation for these subtle indicators can increase the likelihood of IED detection by friendly forces before detonation.

**Performance Steps**

1. Identify the three components of an IED.

a. Main charge (explosives).

**Note:** Common hardware, such as ball bearings, bolts, nuts, or nails, can be used to enhance the fragmentation. Propane tanks, fuel cans, and battery acid can and have been added to IEDs to propagate the blast and thermal effects of the IED.

(1) Military munitions (mortar rounds, artillery rounds, and so forth).

(2) Military grade explosives.

(3) Commercial explosives.

(4) Homemade explosives.

b. Initiating system (sets off the IED).

c. Casing (contains any or all components of the IED).

**Note:** Casings can be anything that can contain any or all components of the IED. The casing can provide enhanced fragmentation and also camouflage the IED. The following are not all inclusive; the casing can be virtually anything:

(1) Animal carcasses.

(2) Plastic bags.

- (3) Soda cans.
  - (4) Vests or satchels for suicide bombers.
  - (5) Plastic jugs.
  - (6) Barrels.
2. Identify initiation methods used to detonate IEDs.
- a. Time.
    - (1) Igniferous (producing fire).
    - (2) Chemical.
    - (3) Mechanical.
    - (4) Electric.
  - b. Command.
    - (1) Command wire.
    - (2) Radio-controlled devices.
      - (a) Long-range cordless telephones.
      - (b) Cellular phones.
      - (c) Remote car openers and alarms.
  - c. Victim-operated.
    - (1) Pull or trip.
    - (2) Pressure.
    - (3) Pressure release.
    - (4) Movement-sensitive.
    - (5) Light-sensitive.
    - (6) Proximity.
    - (7) Electric switches.
3. Identify roadside IED indicators (suspicious objects or activities that seem out of place).
- a. Unusual behavior patterns or changes in community patterns, such as noticeably fewer people or vehicles in a normally busy area, open windows, or the absence of women or children.
  - b. Vehicles following a convoy for a long distance and then pulling to the roadside.

- c. Personnel on overpasses.
  - d. Signals from vehicles or bystanders (flashing headlights).
  - e. People videotaping ordinary activities or military actions.
  - f. Metallic objects, such as soda cans and cylinders.
  - g. Colors that seem out of place, such as freshly disturbed dirt, concrete that does not match the surrounding areas, colored detonating cord, or other exposed parts of an IED.
  - h. Markers by the side of the road, such as tires, rock piles, ribbon, or tape, that may identify an IED location to the local population or serve as an aiming reference (such as light poles, fronts or ends of guardrails, and road intersections or turns).
  - i. New or out of place objects in an environment, such as dirt piles, construction, dead animals, or trash.
  - j. Graffiti symbols or writing on buildings.
  - k. Signs that are newly erected or seem out of place.
  - l. Chemical containers (such as cylinders and drums) that appear out of place.
4. Identify common areas of IED emplacements.
- a. Previous IED sites (past successes).
  - b. Frequently traveled, predictable routes, such as roads leading to unit locations and along common patrol routes.
  - c. Culverts.
  - d. Area of operations turnaround points (established patterns).
  - e. Roadway shoulders (usually within 10 feet) and medians.
  - f. Buried under the surface of any type of road, often in potholes and covered with dirt or reheated asphalt.
  - g. Trees, light posts, signs, overpasses, and elevated bridge spans.
  - h. Unattended vehicles, such as trucks, cars, carts, or motorcycles (attached or installed in them).
  - i. Guardrails (hidden inside) or under any type of material or packaging.
  - j. Potential incident control points.
  - k. Occupied or abandoned structures (sometimes partially demolished).
  - l. Cinder blocks (hidden behind) or piles of sand to direct blast into the kill zone.
  - m. Animal carcasses and deceased human bodies.
  - n. Fake bodies or scarecrows in coalition uniforms.

5. Identify the IED threat types.
  - a. Disguised static IED, which includes anything that the IED can be concealed in.
    - b. Disguised moveable IED.
      - (1) Vehicle-borne improvised explosive device.
        - (a) Abandoned vehicle on the roadside.
        - (b) Vehicle may appear overloaded, with chassis low to the ground.
        - (c) Donkey carts or other loaded trailers left on the roadside.
        - (d) Darkened windows or shades.
        - (e) Parked near a high-profile target or route.
        - (f) Parked unusually close to moving traffic.
        - (g) License plates or vehicles that are unusual for the area of operations.
        - (h) Illegally parked or broken down at a choke point.
        - (i) Recently painted.
        - (j) Fake markings.
      - (2) Suicide vehicle-borne improvised explosive device (known as SVBIED).

**Note:** Often, multiple vehicles are involved. The lead vehicle is used as a decoy or barrier buster. Once it is stopped, forces move in to clear or inspect the vehicle. Then the SVBIED vehicle approaches the crowd and detonates.

- (a) Drivers may ignore orders to stop.
  - (b) Drivers may attempt to circumvent security.
  - (c) Drivers may allow a convoy to come to them (pull over and let a convoy begin to pass).
  - (d) Drivers may appear sedated/intoxicated (for example, driving erratically).
  - (e) Vehicle may be moving erratically or not in a normal traffic pattern (trolling).
  - (f) May target traffic merging from an on-ramp.
  - (g) May target traffic merging from intersections or breaks in the median.
  - (h) May target oncoming traffic with no hard barrier or median separating it from the patrol.
- (3) Person-borne improvised explosive device.
  - (a) Attacker may appear calm, yet intensely focused.
  - (b) May stand out from others in mood or behavior.

- (c) May have a fixed stare and be unaware of environment.
  - (d) May shout a brief political or religious statement; muttering (praying).
  - (e) May exhibit sweating.
  - (f) Bulging coat or clothing that does not fit the season or event.
  - (g) May walk in an unusually erect manner or have a lump under their clothing.
  - (h) Briefcase with protruding wires or a visible arming or firing switch.
- c. Thrown or projected IEDs (improvised grenades or mortars) used mostly from overhead passes or from the roadside in front of approaching vehicles or in the middle of convoys.
- d. Hoax IEDs, which may include something resembling an actual IED, but have no charge or a fully functioning initiator device.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Identified the three components of an IED.	_____	_____
2. Identified initiation methods used to detonate IEDs.	_____	_____
3. Identified roadside IED indicators	_____	_____
4. Identified common areas of IED emplacements.	_____	_____
5. Identified the IED threat types.	_____	_____

<b>References Required</b>	<b>Primary</b>
ATP 3-34.20 Countering Explosive Hazards	ATP 3-90.37 Countering Improvised Explosive Devices

**071-326-0512**  
**Estimate Range**

**Conditions:** As a Soldier assigned to a unit conducting dismounted operations, you are required to estimate the range of a variety of objects. You have been assigned a sector of fire.

**Standards:** Identify the factors within your current operational environment that can affect your range estimates. Estimate range to each object with no more than a 20-percent (+/-) error.

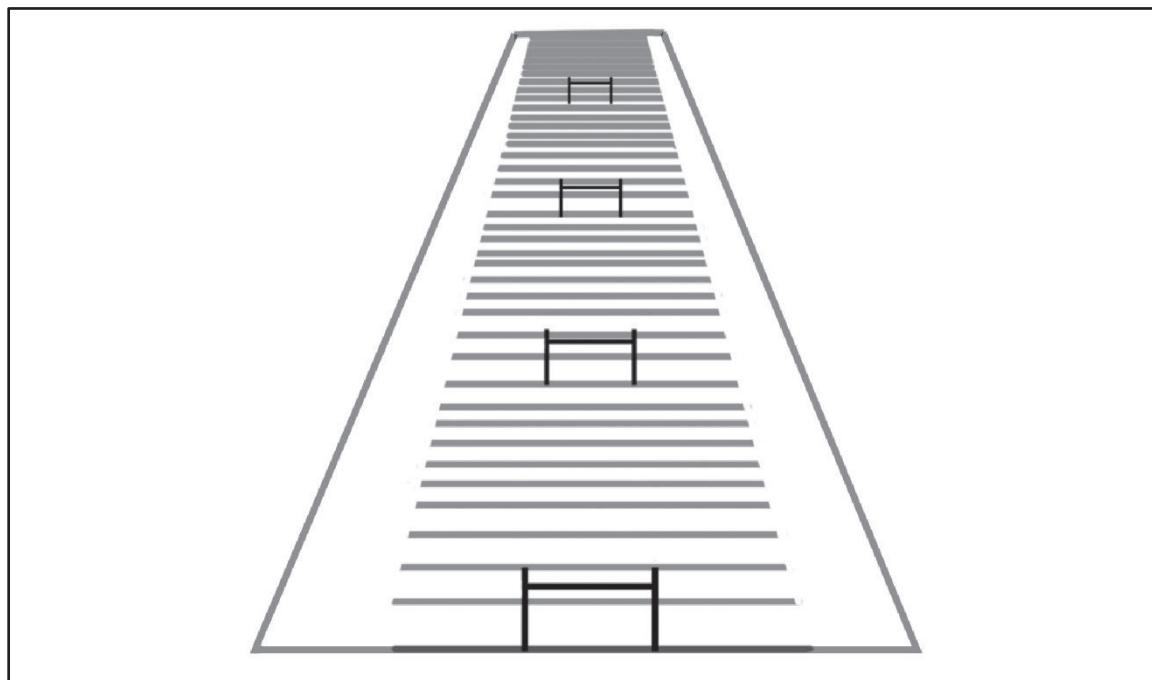
**Note:** Estimating range is one of the most difficult skills to learn, but it is an indispensable one to have when it is needed. Your estimates will be easier to make and more accurate if you know various range-estimation techniques.

**Performance Steps**

1. Identify the factors that can affect your range estimates.
  - a. The nature of the object.
    - (1) Outline—An object with a regular outline, such as a house, appears closer than one with an irregular outline, such as a clump of trees.
    - (2) Contrast—A target that contrasts with its background appears to be closer than it actually is.
    - (3) Exposure—A partly exposed target appears more distant than it actually is.
  - b. The nature of terrain.
    - (1) Contoured terrain—Looking across contoured terrain makes an object seem more distant.
    - (2) Smooth terrain—Looking across smooth terrain, such as sand, water, or snow, makes a distant object seem closer.
    - (3) Downhill—Looking downhill at an object makes it seem more distant.
    - (4) Uphill—Looking uphill at an object makes it seem closer.
  - c. The light conditions.
    - (1) Sun behind observer—A front-lit object seems closer.
    - (2) Sun behind object—A back-lit object seems farther away.
2. Estimate range to objects in your sector of fire.
  - a. Use the 100-meter-unit-of-measure method.

**Note:** To use this method, the Soldier must be able to visualize a distance of 100 meters on the ground.

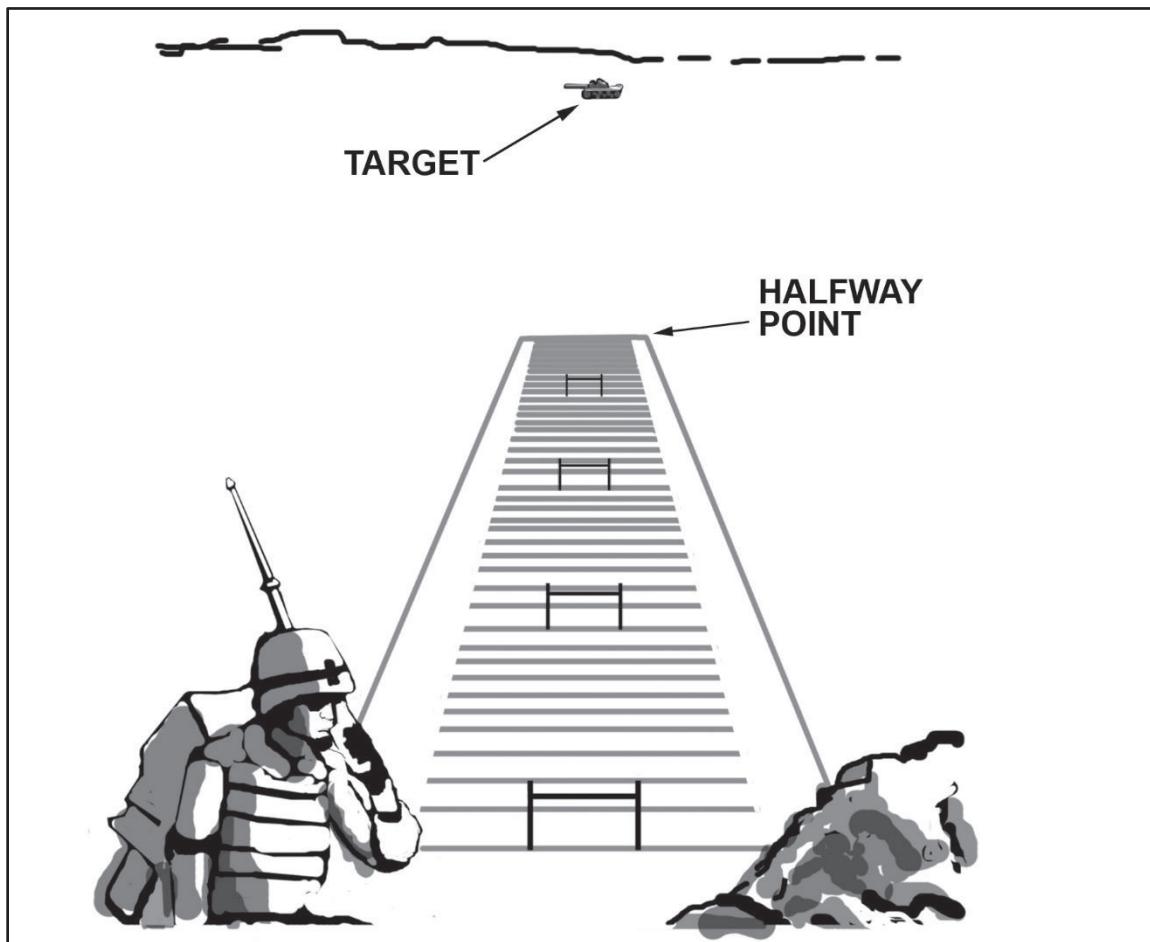
- (1) Determine what a 100-meter distance looks like on the ground. (See figure 3-97.)



**Figure 3-97. Football field method**

- (2) Estimate the number of 100-meter lengths between you and your target; you want to measure for ranges up to 500 meters.
- (3) Select a point halfway to the target. (See figure 3-98, page 3-308.)

**Note:** The accuracy of the 100-meter method depends on how much ground is visible. This is most true at long ranges. If a target is at a range of 500 meters or more, and you can only see part of the ground between yourself and the target, it is hard to use this method with accuracy.



**Figure 3-98. Halfway-point method**

- (4) Determine the number of 100-meter lengths to the halfway point.
- (5) Double that number to get the range to the target beyond 500 meters.
- (6) Determine the effects of terrain and weather conditions on target appearance. (See figure 3-99.)

<b>CONDITIONS IN WHICH TARGETS SEEM CLOSER</b>	<b>CONDITIONS IN WHICH TARGETS SEEM FARTHER AWAY</b>
Bright, clear, daylight conditions	Foggy, rainy, hazy, or twilight conditions
Targets with sun in front of them	Targets with sun behind them
Targets at higher elevations	Targets at lower elevations
Large targets	Small targets
Brightly colored targets (white, red, yellow)	Darkly colored targets
Targets that have contrast	Camouflaged targets
Targets viewed across a ravine, hollow, river, or depression	
Targets at sea	

**Figure 3-99. Effects of terrain and weather on target appearance**

- b. Use the appearance-of-object method. (See figure 3-100.)

**Notes:** To use the appearance-of-objects method, you must be familiar with the characteristics of objects as they appear at various ranges.

You must be able to see those characteristics to make the method work; anything that limits visibility (such as weather, smoke, or darkness) will limit the effectiveness of this method. If you know the apparent size and detail of troops and equipment at known ranges, then you can compare those characteristics to similar objects at unknown ranges. When the characteristics match, the range does also.

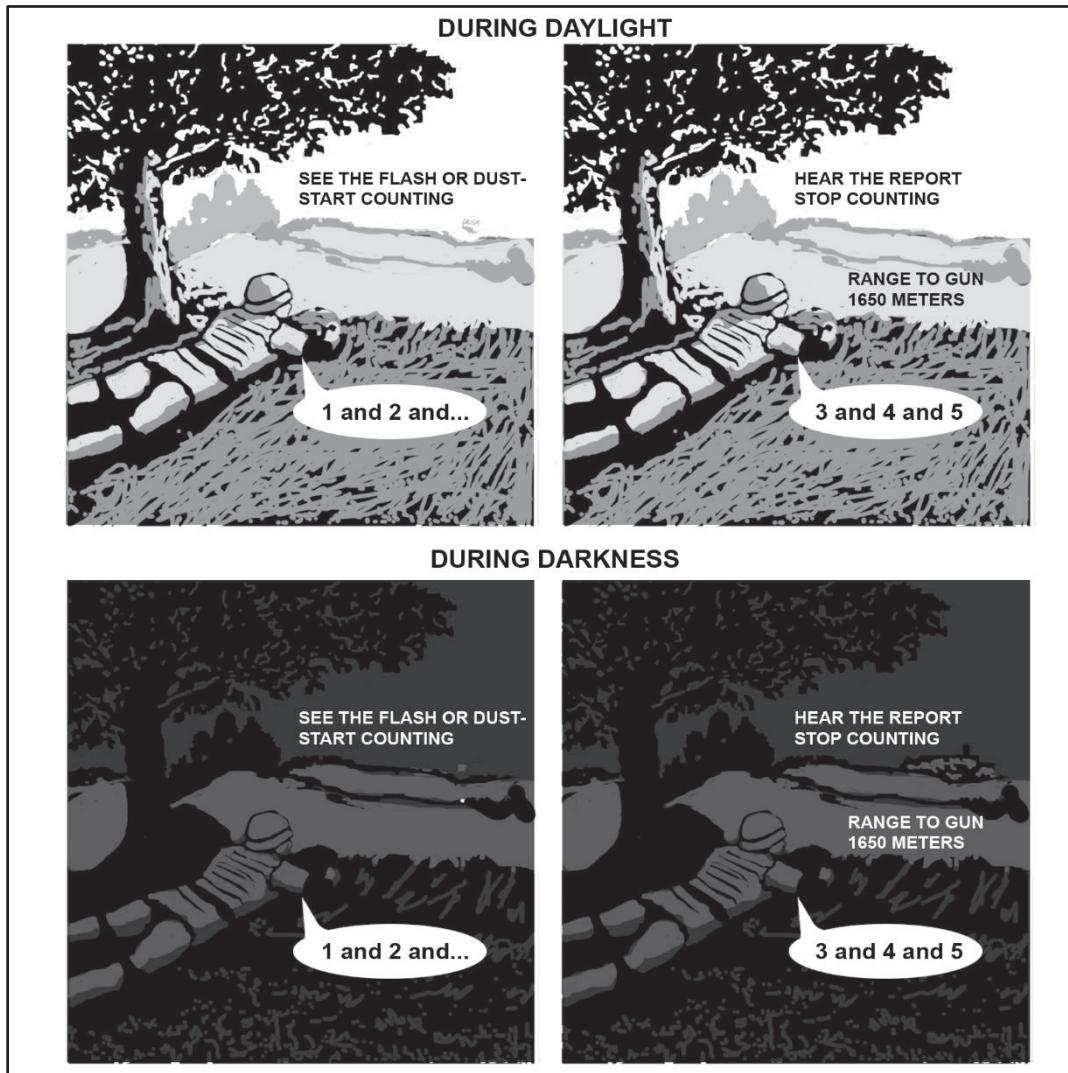
<b>RANGE (in meters)</b>	<b>WHAT YOU SEE</b>
200	Clear in all detail such as equipment, skin color
300	Clear body outline, face color good, remaining detail blurred
400	Body outline clear, other details blurred
500	Body tapered, head indistinct from body
600	Body a wedge shape, with no head apparent
700	Solid wedge shape (body outline)

**Figure 3-100. Appearance of a body using appearance-of-objects method**

- c. Use the flash-to-sound method.

**Note:** Use this method to determine range to an explosion or enemy fire. This method is best at night.

- (1) Observe the flash of the target or weapon firing and immediately start counting.
- (2) Count the seconds until you hear the weapon fire. (See figure 3-101, page 3-310.)



**Figure 3-101. Flash-to-bang method**

- (3) Stop counting when you hear the sound associated with the action.
- (4) Multiply the number of seconds by 300 meters to get the approximate range.

**Note:** Example: If you stop at one, the distance is approximately 300 meters. If you stop at three, the distance is approximately 900 meters.

- d. Use the mil-relation method.

**Note:** This is the easiest and best way to estimate range.

- (1) Divide the estimated height of the target in meters (obtained using the reticle in the M22 binoculars) by the size of the target in mils.
- (2) Multiply by 1,000 to get the range in meters.

- e. Use a combination of methods.

**Note:** If the terrain limits the use of the 100-meter unit-of-measure method and poor visibility limits the use of the appearance-of-objects method, you may have to use a combination of methods.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Identified the factors that can affect your range estimates.	_____	_____
2. Estimated range to objects in your sector of fire.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-21.75 The Warrior Ethos and Soldier Combat Skills	

## **061-283-1002**

### **Locate a Target by Grid Coordinates**

**Conditions:** In a field environment given an observer location, map with observed-fire fan, compass, artillery binoculars, left and right limits to zone of responsibility, writing instrument, blank paper, and a center reference point.

**Standards:** Locate a target by grid coordinates within 250 meters of the actual target location.

**Note:** This task can be accomplished in a classroom or simulated environment.

**Special Conditions:**

Mission-oriented protective posture gear

Inclement weather

Night operations

**Performance Steps**

1. Locate observer position on map.
  - a. With the map horizontal, place the compass with the straightedge along the north-south grid lines with the cover of the compass pointing toward the top of the map.
  - b. Rotate the map and compass until the north-seeking arrow is aligned with the compass index line.

**Note:** This procedure will orient the map close enough to the terrain features to allow location of the target.

2. Orient map using compass and terrain association.
3. Apply observed-fire fan to map.
  - a. Place the vertex of the fan exactly over the observer's location.
  - b. Place the center radial in the direction of the center of the observer's area of responsibility.
  - c. Move the fan slightly until one of the radial lines is parallel to a grid line. The direction of that radial line is the same cardinal direction as the grid line.

**Note:** The observed-fire fan does not have to be oriented at a right angle. Any radial line can be parallel with a grid line.

- d. Secure fan to map with tape.
4. Label observed-fire fan.

**Note:** The observed-fire fan has 17 radial arms that are 100-mils apart and cover 1,600 mils. Arcs marked on the radial arms every 500 meters starting at 1,000 and extending to 6,000 meters represent the observer-target distance.

- a. With a nonwater-based map pen, number the radial of known direction. Drop the last two zeros (1,600 would be 16).
- b. Label every other radial line with the appropriate direction.

**Note:** Radial lines are 100-mils apart.

5. Measure direction to target.
  - a. Using precision measuring devices.
  - b. Measuring from a reference point.
  - c. Using a compass.
  - d. Scaling from a map.
  - e. Estimating.
  
6. Measure distance to target.
  - a. Using laser range finder.
  - b. Using flash-to-bang method.

**Note:** Observers want to determine the approximate distance from their position to a burst. They begin counting when the burst appears and stops when they hear the sound. They count 4 seconds. Therefore, the distance from the burst to their position is approximately 1,400 meters ( $350 \times 4$ ).

- c. Estimating.
- d. Using observed-fire fan.
  
7. Apply direction and distance on the observed-fire fan.
  
8. Determine coordinates on the map to within 250 meters of target location.

Performance Measures	GO	NO-GO
1. Located observer position on map.	_____	_____
2. Oriented map using compass and terrain association.	_____	_____
3. Applied observed-fire fan to map.	_____	_____
4. Labeled observed-fire fan.	_____	_____
5. Measured direction to target.	_____	_____
6. Measured distance to target.	_____	_____
7. Applied direction and distance on the observed-fire fan.	_____	_____
8. Determined coordinates on the map to within 250 meters of target location.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-25.26 Map Reading and Land Navigation	ATP 3-09.32/MCRP 3-31.6/NTTP 3-09.2/
ATP 3-09.30 Observed Fires	AFTTP 3-2.6 Multi-Service Tactics, Techniques, and Procedures for Joint Application of Firepower

## 171-138-0028

### Identify Combat Vehicles and Aircraft

**Conditions:** You are a member of a team or crew conducting a tactical operations and have detected a vehicle or aircraft. You have received a briefing and training on the types of vehicles and aircraft in your area of operations. You also have been given a vehicle identification smartbook or cards to identify specific vehicles and aircraft. Your weapon or vehicle system may be equipped with day/night optics and thermal sights.

**Standards:** Identifying the type, characteristics, and exact name or nomenclature of the combat vehicle(s). Determine if vehicle is friendly or threat based on identification. Soldier must correctly identify all U.S. vehicles.

**Note:** Soldiers required level of proficiency in vehicle and aircraft identification is based on their skill level and military occupational specialty. Combat identification systems used by U.S forces and friendly elements conducting operations in the operational environments are identified in operation orders and fragmentary orders and can help Soldiers quickly recognize friendly forces. Additional training aids for this task include:

- Recognition of combat vehicles (known as ROC-V)—Helps Soldiers learn to identify the thermal signatures of combat vehicles through the use of an interactive curriculum that teaches the unique "hotspots," and overall shapes, characteristics, and capabilities for 276 U.S., allied, and foreign vehicles. ROC-V uses real thermal and visible images, not simulations. ROC-V also provides Soldiers with practical experience in the use of thermal sensor image controls. Through the use of virtual sight controls, Soldiers learn to effectively adjust thermal image settings to find targets and bring out their thermal identification cues. ROC-V can be launched with a web-based version, downloaded, or you can request a DVD from the Recognition of Combatants website.
- Operational environment data integration network—Provides a worldwide equipment guide for military systems, variants, and upgrades that U.S. forces may encounter and can be found at the OE Data Integration Network (ODIN) website.

#### Performance Steps

1. Identify the type of vehicle(s)/aircraft.
  - a. Determine the type of combat vehicle(s).
    - (1) Identify whether the combat vehicle is tracked or a wheeled.
    - (2) Identify whether the combat vehicle is a tank, an armored personnel carrier or another type of combat vehicle.
  - b. Determine type of aircraft (rotary or wing).
2. Identify the characteristics of the observed vehicle(s)/aircraft.

**Note:** Four areas of characteristics are used to determine the nomenclature: hull, armament, turret, and suspension (known as HATS).

- a. Identify vehicle characteristics.

**Note:** Four areas of characteristics are used to determine the HATS.

- (1) Identify hull characteristics.
  - (a) Identify the general characteristics of the hull front.

- \_1\_ Identify proportionality.
  - \_2\_ Identify lights, trim vane, spade, and other exterior characteristics.
  - \_3\_ Identify driver position/hatches.
- (b) Identify the general characteristics of the hull side.
  - \_1\_ Identify slope/shape.
  - \_2\_ Identify skirting shape and composition.
  - \_3\_ Identify door or hatch locations and shapes.
- (c) Identify the general characteristics of the hull rear.
  - \_1\_ Identify slope/shape.
  - \_2\_ Identify skirting shape and composition.
  - \_3\_ Identify door or hatch locations and shapes.
- (2) Identify armament characteristics.
  - (a) Identify the main gun (if present).
    - \_1\_ Identify the presence of a main gun bore evacuator to include location on the tube, size, and shape.
    - \_2\_ Identify the presence of a muzzle brake or bore deflector.
  - (b) Identify the size, shape, type, and location of missiles or rockets.
- (3) Identify turret/commander's cupola characteristics.
  - (a) Identify location and shape of the turret/commander's cupola.
  - (b) Identify presence of searchlight or external optics.
  - (c) Identify presence of ammunition/storage boxes or baskets.
  - (d) Identify presence of smoke dispensers.
- (4) Identify suspension characteristics.
  - (a) Identify tracked system characteristics.
  - (b) Identify wheeled system characteristics.
- b. Identify characteristics of aircraft.

**Notes:** Identification of classified aircraft focuses on the key features of wings, engine, fuselage, and tail assembly. These key recognition features are found on both rotary and fixed wing aircraft.

The list is not all-inclusive but provides the essential characteristics to make a rapid, effective, and accurate identification of potential aircraft threats.

- (1) Identify the features of the wings.
    - (a) Type of wings.
    - (b) Position, slant, and shape of the wings.
    - (c) Taper and tip shape of the wings.
    - (d) Rotary mounting (single, double, or coaxial).
  - (2) Identify the features of the engine.
    - (a) Propeller or jet engine.
    - (b) Location of the engine.
    - (c) Location of exhaust and air intakes on the engine.
  - (3) Identify features of the fuselage.
    - (a) Shape of fuselage.
    - (b) Type of nose.
    - (c) Type of midsection.
    - (d) Type of rear shape.
    - (e) Type of canopy.
    - (f) Note any special features.
  - (4) Identify features of the tail.
    - (a) Location of tail flats.
    - (b) Positive or negative tail slant.
    - (c) Shape and taper.
    - (d) The number and shape of fins.
    - (e) Type of rear rotor mounting on rotary aircraft.
3. Determine the exact names or nomenclatures of the observed combat vehicle(s)/aircraft.
  4. Determine if vehicle(s)/aircraft is(are) friendly, enemy, or neutral based on identification.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Identified the type of vehicle(s)/aircraft.	_____	_____
2. Identified the characteristics of the observed vehicle(s)/aircraft.	_____	_____
3. Determined the name or nomenclature of the observed combat vehicle(s)/aircraft.	_____	_____
4. Determined if vehicle(s)/aircraft is (are) friendly, enemy, or neutral based on identification.	_____	_____

<b>References Required</b>	<b>Primary</b>
ATP 3-90.1 Armor and Mechanized Infantry Company Team	
TC 3-20.31-1 Gunnery Skills Test	

**071-060-0001**  
**Construct a Fighting Position for a Javelin**

**Conditions:** You are a Javelin gunner and have been directed to prepare a defensive fighting position. You have been assigned a position and sector of fire. You have your personal weapon and equipment. You have been given the tools and construction material needed to construct and camouflage the fighting position. You may have an assistant gunner.

**Standards:** Construct a Javelin fighting position with frontal, side, rear protection, overhead cover and camouflage which allows the engagement of targets in the entire sector of fire.

**Note:** A Javelin gunner may use a hasty fighting position or a deliberate fighting position. Normally, a hasty fighting position is dug first and then this position transitions into a deliberate one. Both fighting positions are based on the gunner firing from the sitting position, which is the preferred firing position. This position affords the gunner a low silhouette and a steady and comfortable position while maintaining the ability to engage targets in the assigned sector of fire. The gunner should only select a location that affords cover, concealment, a clear field of view, a clear overhead path for the missile, and a clear backblast area.

**Performance Steps**

1. Construct a hasty Javelin fighting position (see figure 3-102).



**Figure 3-102. Hasty Javelin fighting position**

- a. Dig out an area about two M4s wide by two M4s long and one helmet deep.
  - b. Build cover around the front edge of the position by using the dirt dug from the hole.
  - c. Improve the fighting position, as time permits.
2. Construct a deliberate stage 1 of the Javelin fighting position.

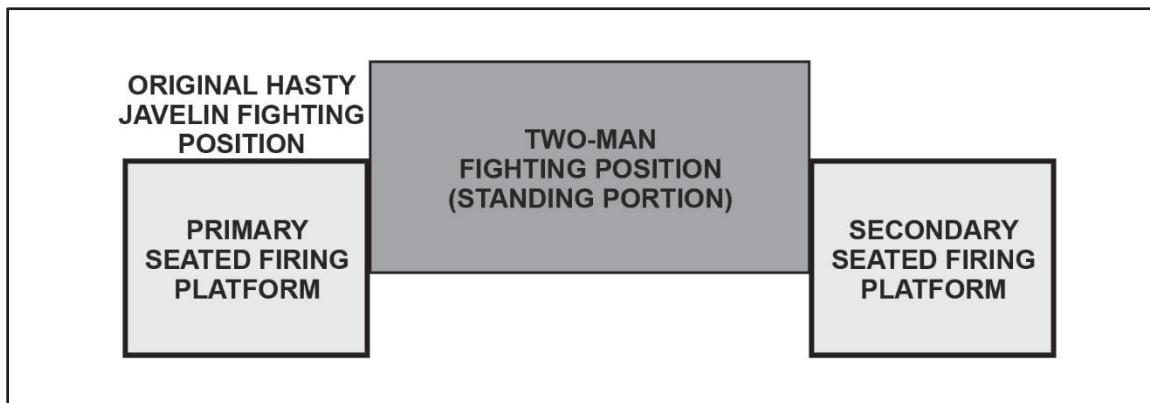
**Note:** A deliberate Javelin fighting position is a standard two-man fighting position with a Javelin firing platform (same configuration as the hasty Javelin fighting position) added on one or both sides, depending on the expected battle situation. The steps of construct individual fighting position for a two-man fighting position are embedded within the steps of construct a deliberate Javelin fighting position.

- a. Verify fighting position is at least 65 to 2,000 meters from the target area.
- b. Identify sector(s) of fire (at least primary and possibly secondary) for the Javelin and the two-man fighting position.
- c. Check the fields of fire from the Javelin sitting position and the two-man fighting position from the prone position.
- d. Emplace sector stakes (right and left) to define your two-man fighting position sectors of fire.
- e. Emplace aiming and limiting stakes for the two-man fighting position.
- f. Emplace grazing fire logs or sandbags to achieve grazing fire for the two-man fighting position.
- g. Decide whether to build overhead cover up or down for the two-man fighting position.

**Note:** Overhead cover may be built up or down. Built-up overhead cover is constructed on top of the parapets up to 18 inches (46 centimeters) and provides for maximum room inside the fighting position and adequate space between the end walls of the fighting position and the overhead cover. Built-down overhead cover is constructed at or below ground level and should not exceed 12 inches (30 centimeters). This lowers the profile of the fighting position, which aids in avoiding detection. However, it restricts the fighting space between the end walls of the fighting position and the overhead cover. To account for this restricted space the width of the fighting position should be extended to four M4s in lengths.

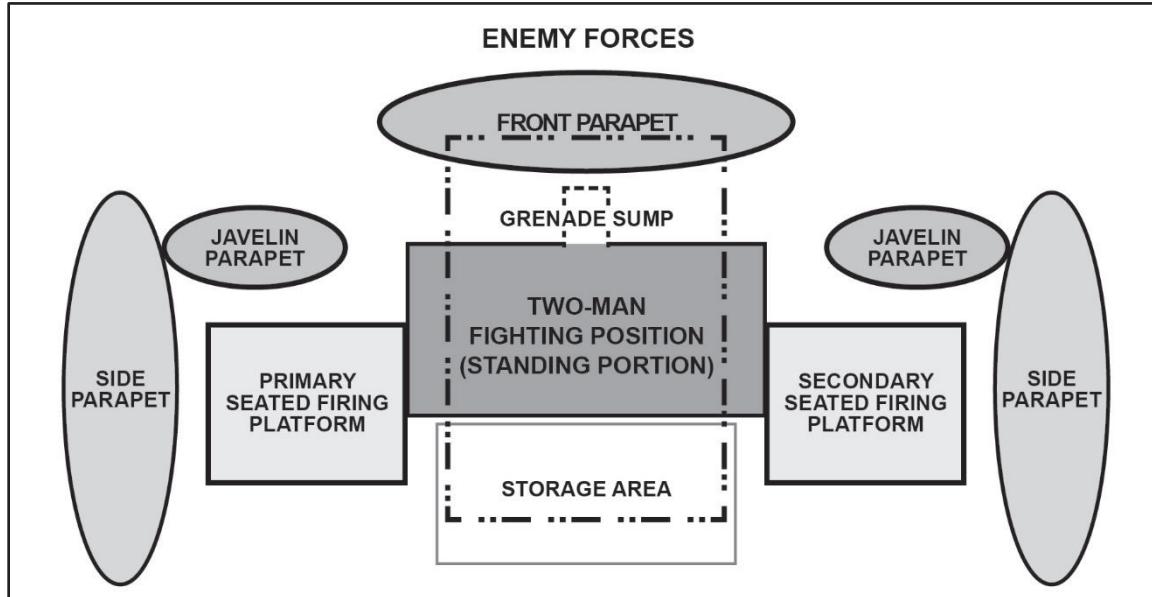
- h. Scoop out elbow holes to keep your elbows from moving around when you fire from the two-man fighting position.
- i. Trace position outline of both the Javelin firing platform and two-man fighting position (see figure 3-103).

**Note:** A hasty Javelin position is easily incorporated into a deliberate Javelin fighting position as it becomes either the left- or right-side firing platform.



**Figure 3-103. Trace position outline of both the Javelin firing platform and two-man fighting position**

- j. Clear primary and secondary (if applicable) fields of fire for both the Javelin and the two-man fighting positions.
- 3. Construct a deliberate stage 2 of the Javelin fighting position.
  - a. Emplace overhead cover supports to front and rear of the two-man fighting position.
  - b. Ensure you have at least 12 inches (30 centimeters).
  - c. Construct parapet retaining walls (see figure 3-104).



**Figure 3-104. Javelin parapets**

- (1) Construct two-man position front retaining wall at least 10-inches (25 centimeters) high (two filled sandbags) deep and two-and-a-half M4s long.
- (2) Construct Javelin front retaining wall at least 10-inches (25 centimeters) high (two filled sandbags) deep and two-and-a-half M4s long.

**Note:** One per Javelin firing platform.

- (3) Construct rear retaining wall at least 10-inches (25 centimeters) high, and one fully extended M4 long.

**Note:** Be careful to not block the backblast area.

- (4) Construct flank retaining walls at least 10-inches (25 centimeters) high and two-and-a-half M4s long.

**Note:** Flank retaining walls are longer for the Javelin to compensate for the greater width.

- d. Verify parapets are high enough to cover your head.
- e. Remove the top layer of dirt from the hole.

(1) Set aside grass or foliage for camouflage.

(2) Use soil to fill sandbags for walls.

4. Construct deliberate stage 3 of the Javelin fighting position.

a. Dig out the primary Javelin firing platform (unless an appropriate hasty Javelin fighting position already exists).

(1) Dig out an area about two M4s wide by one and a half M4s long and one helmet deep.

(2) Build cover around the front edge of the position by using the dirt dug from the hole.

b. Dig two-man fighting position with vertical walls to a maximum depth of armpit deep (if soil conditions permit).

**Note:** If site soil properties cause unstable soil conditions, construct revetments and consider sloping walls. For sloped walls, first dig a vertical hole, and then slope walls at 1:4 ratio (move 12 inches [30 centimeters] horizontally for each 4 feet [1.22 meters] vertically).

c. Dig out the secondary Javelin firing platform, if needed.

d. Use soil from hole to fill parapets in the order of front, flanks, and rear.

e. Build a backblast berm to the rear of the position one helmet thick and 18-inches high with dirt dug from the position.

**Note:** The berm deflects hot gases and debris up and out.

f. Verify you can fire to the front, oblique, and cover the entire sector of fire from this position.

g. Dig two grenade sumps in the floor (one on each end).

**Note:** Grenade sumps are as wide as the entrenching tool blade, at least as deep as an entrenching tool and as long as the position floor is wide.

h. Slope the floor toward the grenade sumps.

i. Dig a large storage compartment in the bottom of the back wall; the size of the compartment must be large enough to store Javelin rounds.

j. Install revetments, if required, to prevent wall collapse/cave-in.

k. Emplace stringers for overhead cover.

(1) Use 2x4s, 4x4s, or pickets ("U" facing down).

(2) Make overhead cover stringers standard length, which is 8 feet (2.4 meters).

5. Construct deliberate stage 4 of the Javelin fighting position.

a. Install overhead cover.

**Note:** The overhead cover should not restrict the gunner from firing the Javelin and should not completely cover the firing platform. This allows the missile to exit the launch tube assembly without obstruction.

- (1) Emplace dustproof layer, typically 4-foot by 4-foot sheets of  $\frac{3}{4}$ -inch plywood centered over dug position.
- (2) Nail plywood dustproof layer to stringers.
- (3) Emplace at least 18 inches (46 centimeters) of sand-filled sandbags for overhead burst protection (four layers).

**Note:** At a minimum, these sandbags must cover an area that extends to the sandbags used for the front and rear retaining walls.

- (4) Use plastic or a poncho for waterproofing layer.
  - (5) Fill center cavity with soil from dug hold and surrounding soil.
- b. Camouflage the Javelin fighting position.
- (1) Mold the overhead cover and parapets to blend with the surrounding terrain.
  - (2) Camouflage the position with natural materials that do not have to be replaced.
  - (3) Verify that the position is concealed to an observer from out in front of the position.

Performance Measures	GO	NO-GO
1. Constructed a hasty Javelin fighting position.	_____	_____
2. Constructed a deliberate stage 1 of the Javelin fighting position.	_____	_____
3. Constructed a deliberate stage 2 of the Javelin fighting position.	_____	_____
4. Constructed deliberate stage 3 of the Javelin fighting position.	_____	_____
5. Constructed deliberate stage 4 of the Javelin fighting position.	_____	_____

References Required	Primary
TC 3-22.37 Javelin-Close Combat Missile System, Medium	

**171-300-0037**  
**Establish a Listening Post or Observation Post**

**Conditions:** You are a member of a squad or platoon conducting operations. You have been given an order to establish a listening post (known as LP) or observation post (OP). Your section or team leader has selected an LP or OP location, which provides observation of the assigned sector, provides cover and concealment, contains covered and concealed routes to and from the LP or OP location, does not attract attention, and does not skyline the LP or OP. You have been briefed on the following: unit mission, target reference points, trigger points, break points, primary and secondary avenues of approach, means of communication (visual, wire, radio), covered and concealed routes to and from the LP or OP, actions on contact, displacement criteria for the LP or OP, rules of engagement, and relief time. The unit standard operating procedures (SOPs) are available.

**Standards:** Establish an LP or OP equipment kit, ensure personnel are prepared, occupy the site, and improve the site throughout the occupation.

**Notes:** Soldiers should always consider some or all the elements of the combat identification process and emphasize the importance of maintaining situational awareness (SA). Accurate target identification and maintaining SA result in increased combat effectiveness. Improper target identification and lack of SA are the main causes of fratricide.

It takes a minimum of two Soldiers to man an observation post, and then for no more than 12 hours. One man establishes security, records information, and reports to higher headquarters while the other observes. These men switch jobs every 20–30 minutes because the efficiency of the observer decreases with time. Three or more Soldiers are required to increase security. For extended periods of time (12 hours or more), the unit occupies long-duration observation posts by squad-sized units.

**Performance Steps**

1. Establish an LP or OP kit to include the following items:
  - a. Map with graphics.
  - b. Compass.
  - c. Communications equipment in accordance with unit SOP.
    - (1) Visual.
    - (2) Wire.
    - (3) Radio.
  - d. Observation devices.
    - (1) Binoculars.
    - (2) Telescope.
    - (3) Night vision.
    - (4) Thermal devices.
  - e. Signal operating instruction extract.
  - f. Report formats contained in the SOP.

- g. Weapons.
    - (1) Crew-served.
    - (2) Light antitank.
    - (3) Mines.
  - h. Operational combat identification system with the identification markings in use in the area of operations.
  - i. Sufficient class I supplies to last for 72 hours.
  - j. Ensure serviceability of all equipment.
2. Ensure personnel are prepared for LP or OP operations.
- a. Brief mission.
  - b. Verify all personal equipment is present and serviceable to include—
    - (1) Weapon.
    - (2) Advanced combat helmet.
    - (3) Modular lightweight load-carrying equipment.
    - (4) Protective mask.
    - (5) Mission-oriented protective posture suit.
    - (6) Other essential items required by unit SOP.
3. Occupy LP or OP site.
- a. Move to the LP or OP site using a covered and concealed route.
  - b. Make sure the LP or OP position provides adequate cover and concealment until it can be improved.
  - c. Conduct a hasty occupation of the LP or OP.
  - d. Ensure that contact with locals is kept to a minimum if occupying an LP or OP in or near a built-up area.
  - e. Maintain secrecy and security.
  - f. Report to the platoon leader or platoon sergeant when set.
4. Improve the LP or OP throughout the occupation.
- a. Develop a complete sector sketch or map to include—
    - (1) A rough sketch of key and significant terrain including buildings.
    - (2) Location of the LP or OP.

- (3) Location of the vehicle hide positions or overwatch personnel.
  - (4) Locations of the vehicle fighting positions and observation positions.
  - (5) Alternate hide, fighting, and LP or OP positions.
  - (6) Routes to the LP or OP and fighting positions.
  - (7) Sectors of observation.
  - (8) Preplanned artillery targets.
  - (9) Target reference points.
  - (10) Maximum engagement lines.
- b. Dig in to enhance cover and concealment if in a field environment.
  - c. Camouflage LP or OP and vehicle positions.
  - d. Employ hasty protective obstacles.
    - (1) Mines.
    - (2) Trip flares.
    - (3) Wires.
  - e. Reconnoiter routes to—
    - (1) Fighting positions.
    - (2) Observation positions.
    - (3) Alternate positions.
  - f. Perform maintenance on all equipment.
  - g. Emplace a chemical agent alarm.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Established an LP or OP kit.	_____	_____
2. Ensured personnel are prepared for the LP or OP operations.	_____	_____
3. Occupied the LP or OP site.	_____	_____
4. Improved the LP or OP throughout the occupation.	_____	_____

<b>References Required</b>	<b>Primary</b>
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ATP 3-20.98 Scout Platoon

**171-300-0014**  
**Conduct Surveillance from an Observation Post**

**Conditions:** As a member of a platoon in a tactical environment, you have established an observation post (OP) that may be mounted, dismounted, or a combination of both. You have developed a complete range card, sector sketch, or map. You have coordinated with any adjacent units and reported to higher headquarters that you are ready to start surveillance. Enemy contact is possible.

**Standards:** Perform the duties of an observer at an OP to include observation of sector and avenues of approach. Patrol dead space and emplace early warning devices. Watch for suspicious activity, unusual patterns, and military operations. Report all activity to higher headquarters.

**Notes:** OPs are conducted to observe the named area(s) of interest (NAI), provide early warning, or outpost a route.

The duty of the observer should be rotated between Soldiers every 20 minutes to avoid complacency and eye strain.

**Performance Steps**

1. Conduct observation of the sector, avenues of approach, and NAIs.
  - a. Conduct a hasty search of the sector by taking quick looks at key features of the sector starting close in and working your way out.
  - b. Conduct a second search in detail of a belt 50 meters in depth across the sector.
  - c. Continue to search in this manner by overlapping each belt by 10 meters from close in to farther out.
  - d. Condition your eyes as darkness approaches by using sunglasses and/or not looking at lights or flames.
2. Continue to improve the position.
  - a. Improve the position with overhead cover or by placing concertina wire around vehicles.
  - b. Continue to improve the range card or sector sketch by—
    - (1) Adding ranges.
    - (2) Adding new items found during surveillance.
    - (3) Adding any note that will add detail or clarity.
  - c. Replace camouflage as needed.
3. Patrol dead space or emplace early warning devices to ensure coverage of areas that cannot be observed.
4. Look for suspicious activities, unusual patterns, and military operations while conducting surveillance in an area to include—
  - a. The presence of known threats.

- b. Persons leaving items unattended for extended periods.
  - c. Abrupt changes in human activity patterns.
  - d. Unattended illegally parked vehicles.
  - e. The sudden appearance of unfamiliar vehicles in an area where a vehicle pattern has been established.
  - f. Lights on or off at unusual times.
  - g. Persons, including local law enforcement personnel, conducting surveillance on the same area.
  - h. Preparatory or suppressive fires.
  - i. Assembling of combatants.
  - j. Distribution of equipment.
  - k. Unnecessary work or equipment brought into the area.
5. Submit reports to higher headquarters.
- a. Report the arrival of enemy forces or any significant enemy activity immediately.

**Note:** If in doubt on whether an activity is significant or not, report it since it may support or shed new light on other intelligence information that has been collected.

- b. Send updated situation reports to higher headquarters in accordance with unit standing operating procedure.
  - c. Practice communication security by using an alternate means of communications if you have any reason to believe your primary means has been compromised.
6. Report immediately to higher headquarters and displace to an alternate OP site if the OP displacement criteria is met during surveillance.
7. Report to higher headquarters for guidance on whether to displace to an alternate OP or to withdraw if OP security becomes threatened but the displacement criteria has not been met.

Performance Measures	GO	NO-GO
1. Conducted observation of the sector, avenues of approach, and/or NAIs.	_____	_____
2. Continued to improve the position.	_____	_____
3. Patrolled dead space or emplaced early warning devices to ensure coverage of areas that could not be observed.	_____	_____
4. Looked for suspicious activities, unusual patterns, and military operations.	_____	_____
5. Submitted reports to higher headquarters.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
6. Reported immediately to higher headquarters and displaced to an alternate OP site, if the OP displacement criteria was met during surveillance.	_____	_____
7. Reported to higher headquarters for guidance on whether to displace to an alternate OP or withdraw if OP security became threatened but the displacement criteria had not been met.	_____	_____
<b>References Required</b>	<b>Primary</b>	
ATP 3-20.15/MCRP 3-10B.1 Tank Platoon	ATP 3-20.98 Scout Platoon	
ATP 3-90.1 Armor and Mechanized Infantry Company Team		

**061-283-1011**  
**Conduct an Immediate Smoke Fire Mission**

**Conditions:** You are given a field environment a target (to include cross, head or tail wind), map (1:50,000), compass, modified table of organization and equipment targeting equipment which includes laser range finder (LRF) with direction-finding capabilities, Global Positioning System device, binoculars, night vision googles (during hours of limited visibility) and communications with the fire direction center.

**Standards:** Engage a target by completing an immediate smoke call for fire within 25 seconds of target identification with an initial target location error of 250 meters or less.

**Note:** This task is written to be accomplished either manually or digitally aided.

**Note:** This task can be accomplished in a classroom or simulated environment.

**Performance Steps**

1. Locate target.

a. Locate targets with one of the following methods:

- (1) Grid.
- (2) Polar.
- (3) Shift from a known point.
- (4) Laser.

b. Locate target by utilizing any of the following devices:

- (1) Map.
- (2) Compass.
- (3) LRF with direction-finding capabilities.
  - (a) Laser polar.
  - (b) Laser grid.
  - (c) LRF/digital device.

\_1\_ Fire laser and verify target data on digital device.

\_2\_ Refine target data utilizing imagery as necessary.

\_3\_ Manually input TGT data into Digital Device

2. Initiate call for fire (known as CFF).

a. Send complete CFF in one transmission.

- (1) Announce OBSERVER ID, IMMEDIATE SMOKE, TARGET LOCATION OVER.

- (2) Send digital CFF mission.
- (3) Omit target description.
- b. Adjust smoke as necessary.
  - (1) Deviation 50 meters.
  - (2) Range 100 meters.
3. Verify effects.
  - a. If insufficient, adjust rounds and repeat.
  - b. If effects are sufficient, move to end of mission.
4. Transmit end of mission and report mission success.
  - a. Report mission success.
  - b. Report friendly element screened.
  - c. Report enemy obscured.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Located target.	_____	_____
2. Initiated CFF.	_____	_____
3. Verified effects.	_____	_____
4. Transmitted end of mission and reported mission success.	_____	_____

<b>References Required</b>	<b>Primary</b>
FM 3-09 Fire Support and Field Artillery Operations	ADP 3-19 Fires
ATP 3-09.30 Observed Fires	

## 061-COM-1000

### Adjust Indirect Fire

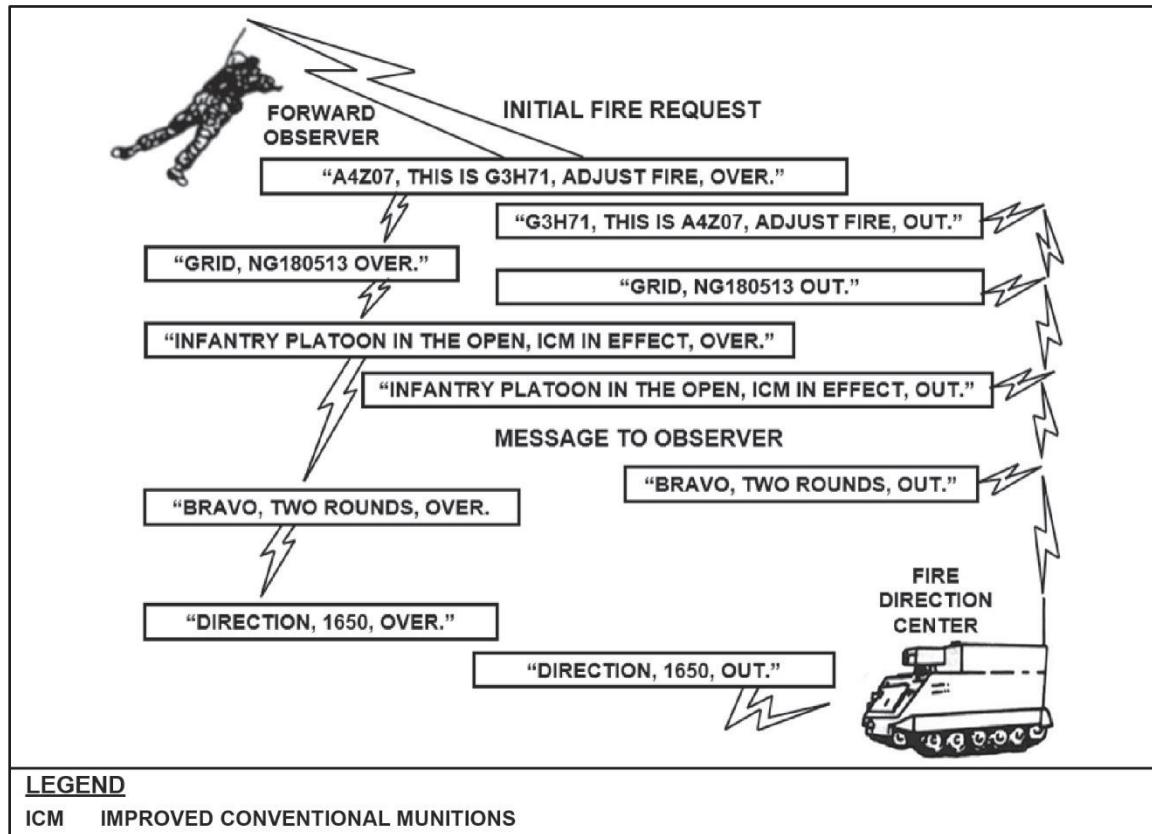
**Conditions:** You are given a pair of binoculars, radio, compass, pens/pencils, coordinate scale, map of the target area, target to engage within the area, and grid locations of friendly troops.

**Standards:** Determine the target location to within 250 meters of its actual location. The initial call for fire is sent within 3 minutes after the target has been identified. Adjustments are sent within 45 seconds after each round impacts. Observer must enter the fire-for-effect phase using no more than six rounds (initial round plus five for adjustment). Fire for effect must be within 50 meters of the target using successive bracketing procedures (or creeping fire if danger close).

#### Performance Steps

1. Locate the target within 250 meters of the actual target location.
  - a. Locate the target by grid coordinates.
  - b. Determine the direction from your position to the target.
  - c. Formulate a call for fire. Include the following elements of the call for fire in sequence:
    - (1) Observer identification (your call sign).
    - (2) Warning order (adjust fire).
    - (3) Location of target (grid data).
    - (4) Description of the target (for example, INFANTRY PLATOON IN THE OPEN.).
    - (5) Method of engagement (may be omitted if area fire is desired).
      - (a) If the target is within 600 meters of friendly troops, announce DANGER CLOSE to the fire direction center (FDC) in the initial call for fire in the method of engagement phase.
      - (b) Use creeping procedures to adjust danger close fire; range corrections should not exceed 100 meters.
      - (c) Initial target location is reported on the enemy side of the target.
    - (6) Method of fire control.

**Note:** The request for a fire mission would be similar to figure 3-105, page 3-334.

**Figure 3-105. Initial fire request**

2. Transmit the call for fire to the FDC within 3 minutes of target identification.
  - a. Conduct three transmissions.
    - (1) Send observer identification and warning order. Example: A4Z57, THIS IS G3H71, ADJUST FIRE, OVER.
    - (2) Send target location. Example: GRID 180513, OVER. (Give the six-digit grid of the target, with the grid zone identifier, to within 250 meters of the actual target location.)
    - (3) Send target description, method of engagement, method of fire, and control. Example: INFANTRY PLATOON IN THE OPEN, ICM IN EFFECT, OVER.
  - b. Give the direction to the target within 100 mils (M2 compass) or 5 degrees (lensatic compass) or give an accurate cardinal direction (no compass available) of the target's actual location. This should be sent before the first correction or with the first correction.
3. Adjust rounds to within 50 meters of the target, within 45 seconds of the impact of each adjusting round.
  - a. Spot each round when it impacts as right or left, over or short of your target.
  - b. Determine corrections for deviation left or right of the target.

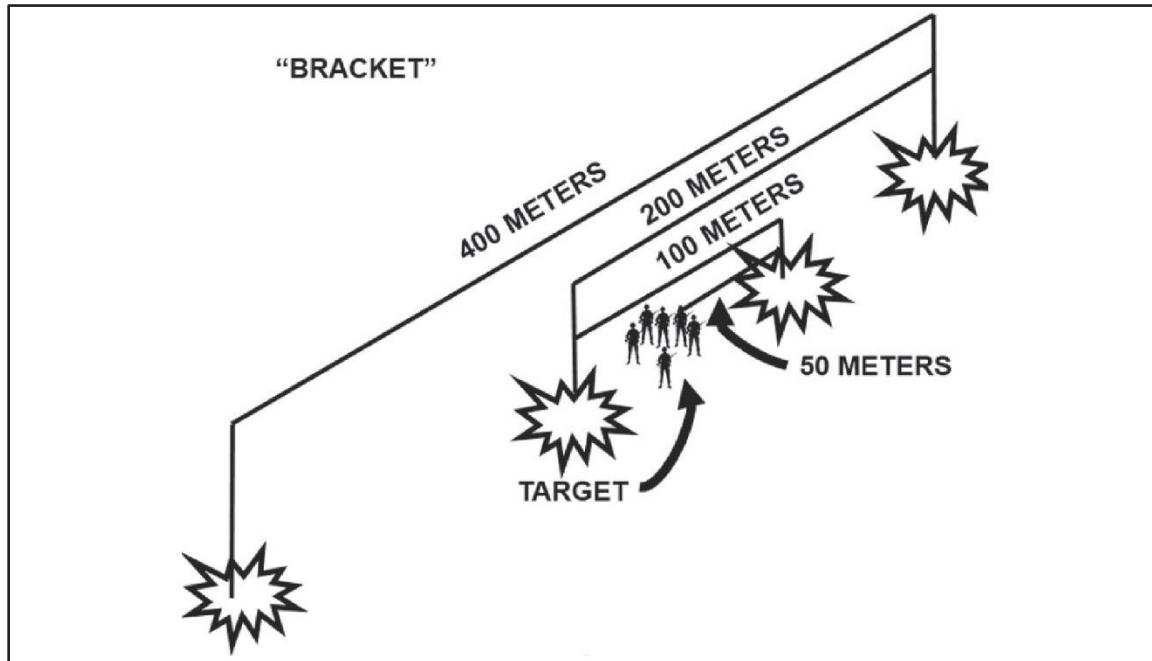
**Note.** Measure deviation. Measure the horizontal angle in mils, using the reticle pattern in the binoculars or hand measurement of angular deviation. Estimate the range to the target and divide by 1,000. This is the

observer-target (known as OT) factor. If the OT distance is 1,000 meters or greater, the OT factor is expressed to the nearest whole number. If the OT distance is less than 1,000 meters, the OT factor is expressed to the nearest 1/10th. For example, 800 equals 0.8. Multiplying the OT factor by the deviation measured in mils produces deviation corrections in meters.

- c. When the first range spotting is observed, make a range correction that would result in a range spotting in the opposite direction. For example, if the first round is short, add enough to get an over on the next round. This is called successive bracketing (see figure 3-106). Figure 3-107, page 3-336, shows the impact of your initial round. The target is 2,100 meters away. Since the round is beyond the target, you must drop. You estimate that the round is 250 meters beyond the target. Therefore, you must drop 400 meters to start successive bracketing procedures. The round impacted 50 mils left of the target. With an OT factor of 2, the round impacted 100 meters left. Your correction to the FDC is RIGHT 100-DROP 400-OVER.

### **WARNING**

**DO NOT BRACKET when DANGER CLOSE, it could result in friendly casualties, use the creeping fire procedure (all corrections are 100 meters or less).**



**Figure 3-106. Bracketing**

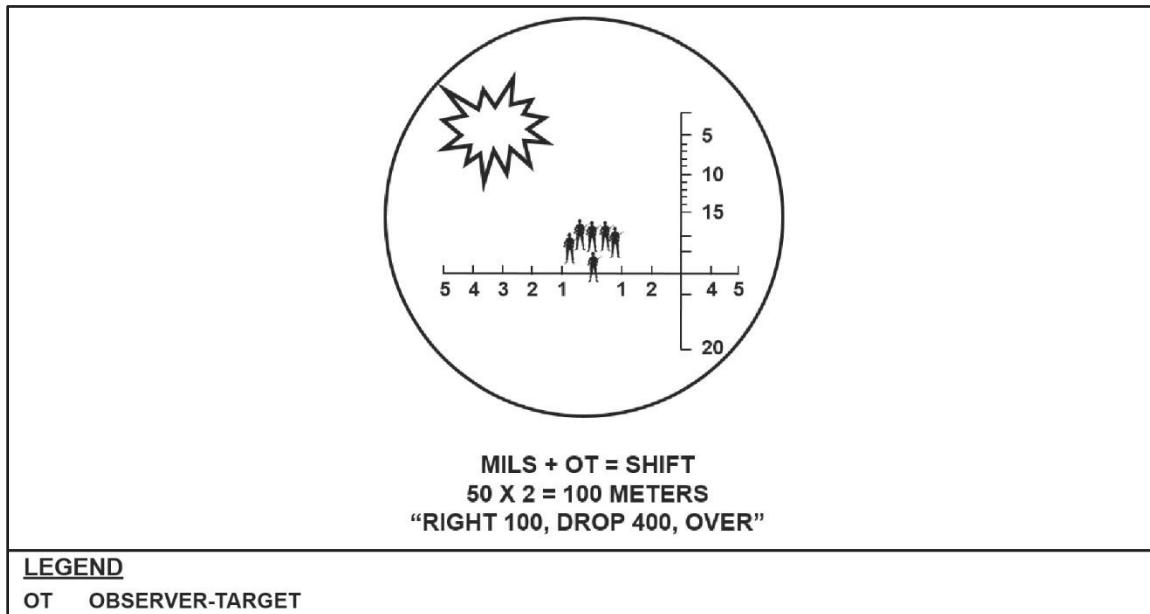


Figure 3-107. Reticle pattern

- d. Continue splitting the range bracket until a 100-meter bracket is split or range correct spotting is observed, maintaining deviation on line. Figures 3-108 and 3-109 show the next adjustments.

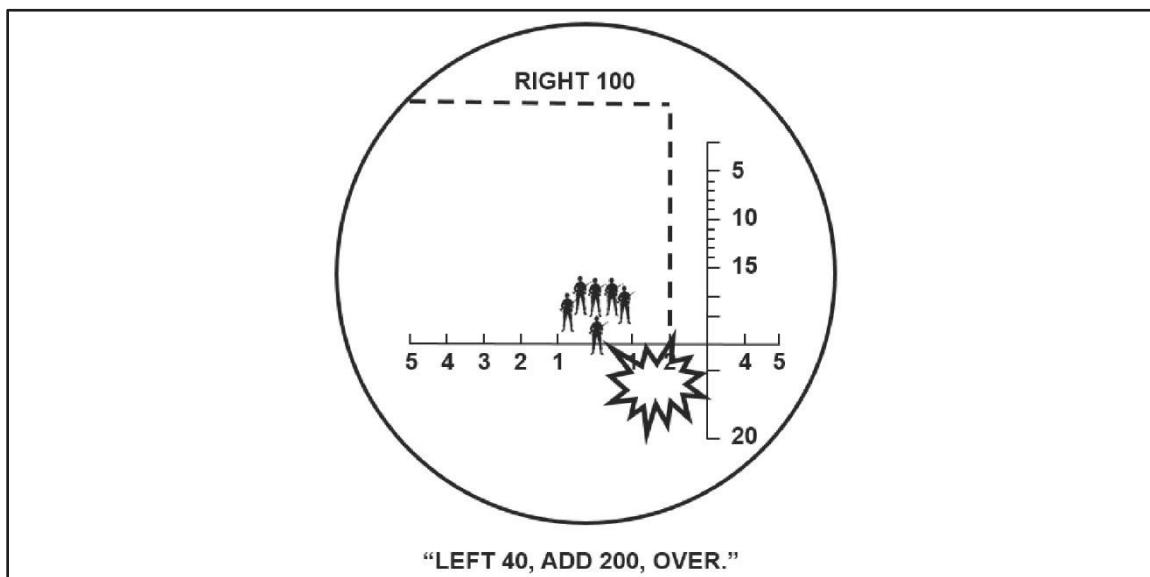
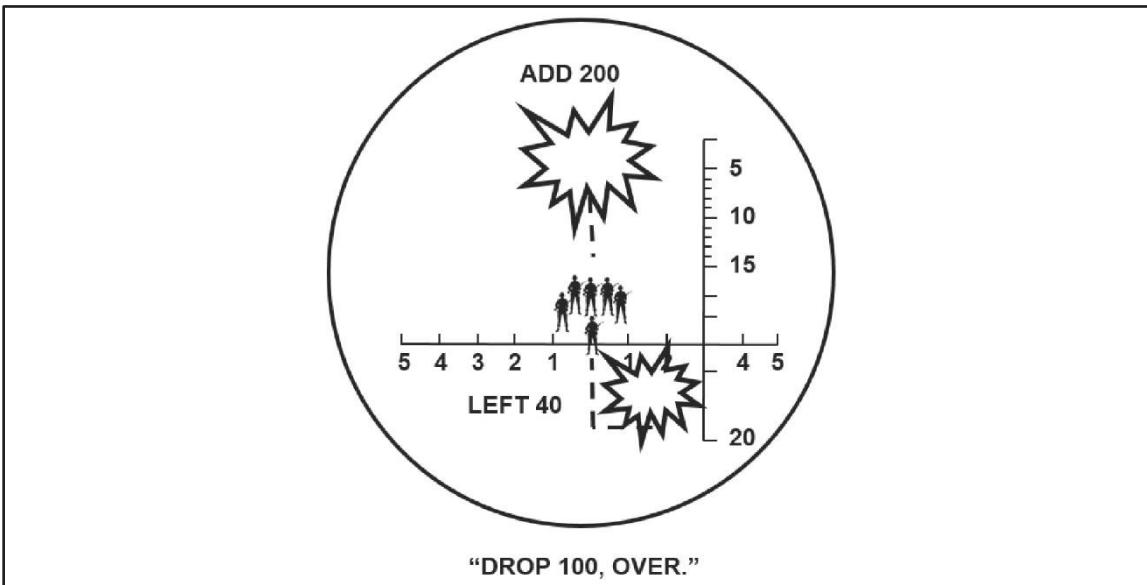
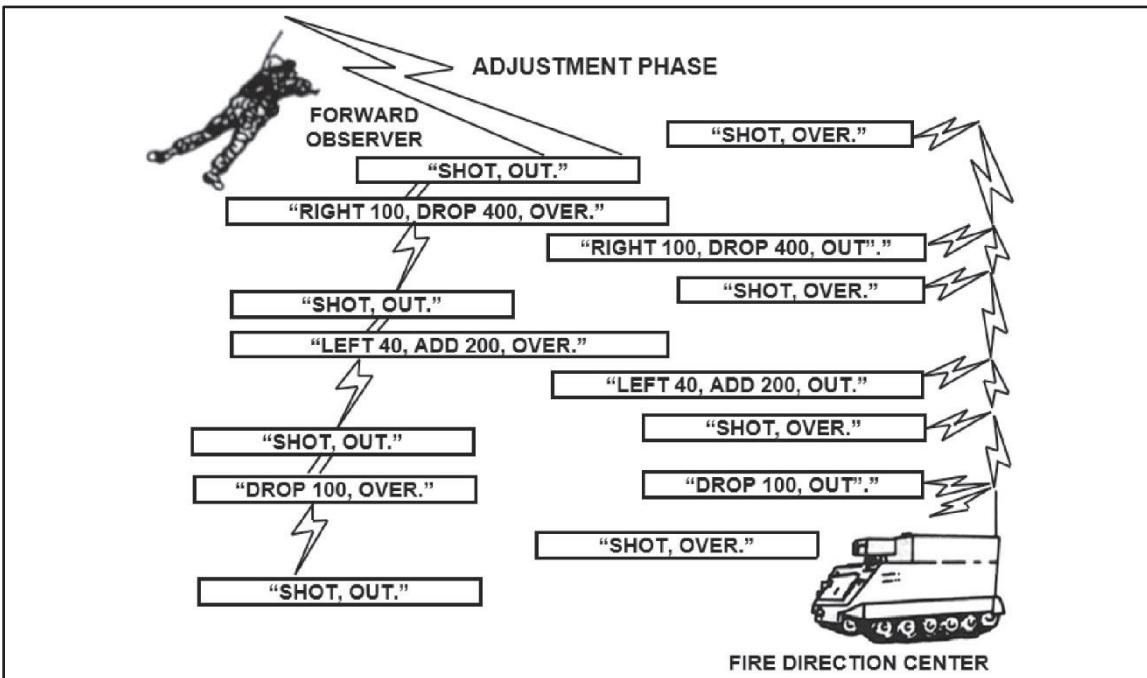


Figure 3-108. Second round

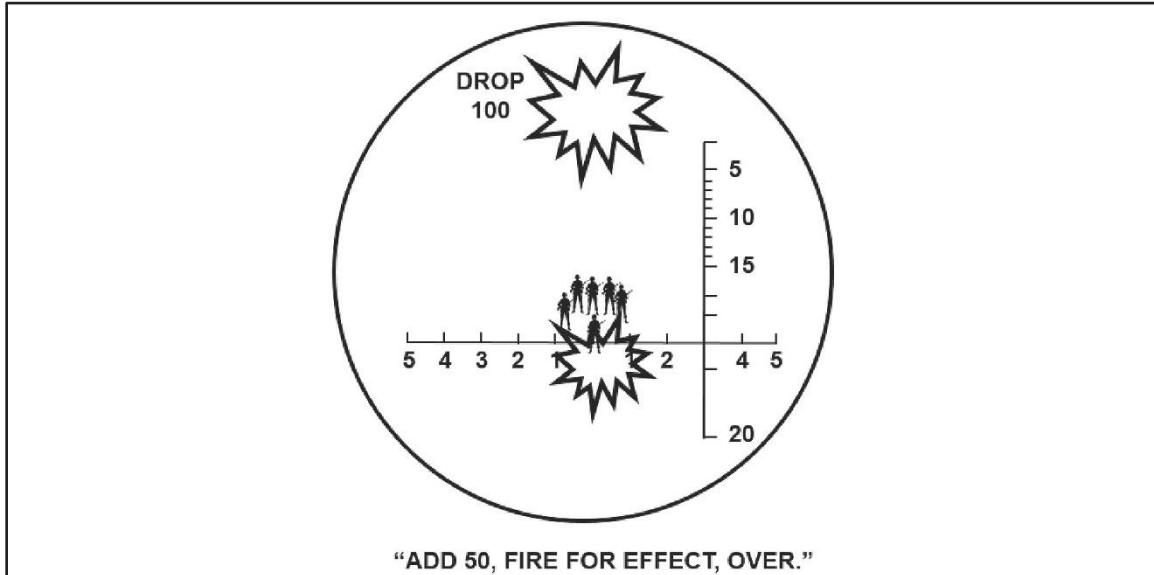
**Figure 3-109. Third round**

- e. Transmit corrections to the FDC in meters. The initial correction should bracket the target in range. The adjustment phase of a fire mission would resemble the example shown in figure 3-110. Deviation correction should be made to keep the rounds on the OT line.

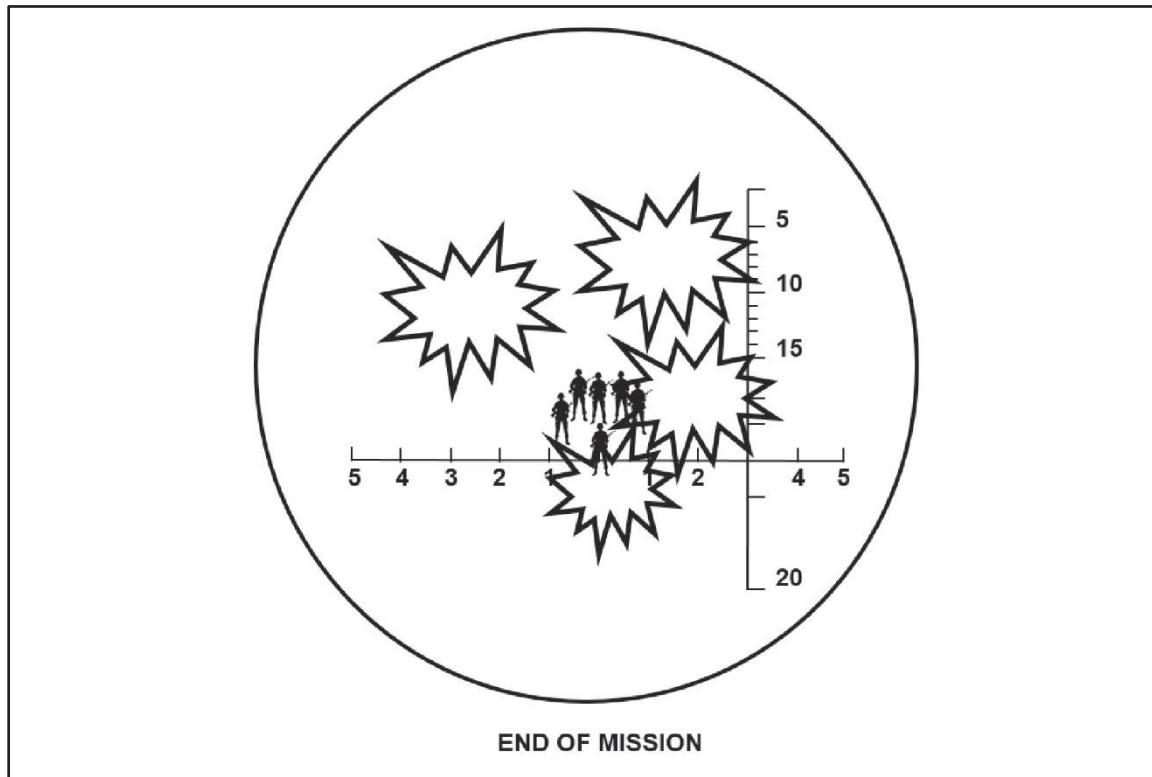
**Figure 3-110. Adjust phase**

- f. Use the following guide to establish a bracket. When the estimated round impact distance to the target is—
  - (1) More than 400 meters, add or drop 800 meters.

- (2) More than 200 but less than 400 meters, add or drop 400 meters.
  - (3) More than 100 but less than 200 meters, add or drop 200 meters.
  - (4) Less than 100 meters, add or drop 100 meters.
  - (5) Add or drop 50 meters and announce fire for effect.
4. Initiate fire for effect. When a 100-meter bracket is split or a range correct spotting is made, the fire-for-effect phase is entered (see figure 3-111). Figure 3-112 shows a simulated pattern that might be observed in the fire-for-effect phase and the observed results of fire for effect are reported.

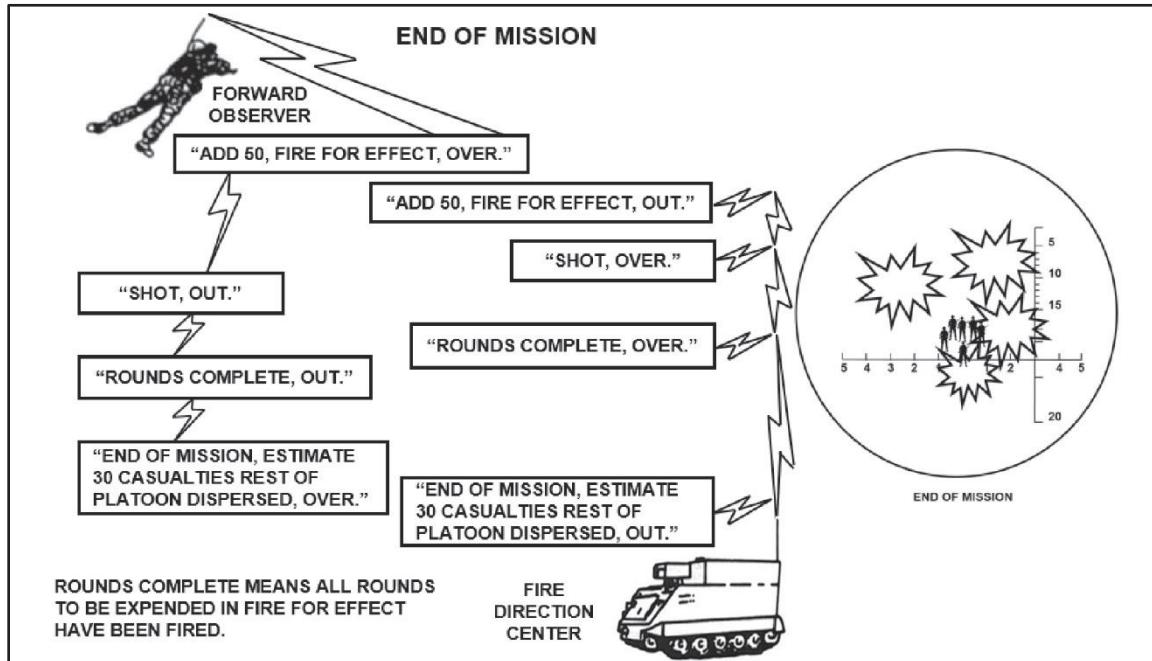


**Figure 3-111. Fourth round**



**Figure 3-112. Fire for effect pattern**

- Observe the results of fire for effect, transmit refinements (if necessary), and provide end of mission and surveillance (see figure 3-113).



**Figure 3-113. End of mission**

- a. Determine the effects on the target.
- b. Give a brief description of what happened to the target. Example: EOM, TARGET DESTROYED, ESTIMATE TWO CASUALTIES, OVER.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Located the target to within 250 meters of the actual target location.	_____	_____
2. Transmitted the call for fire to the FDC within 3 minutes of target identification.	_____	_____
3. Adjusted rounds to within 50 meters of the target, within 45 seconds of the impact of each adjusting round.	_____	_____
4. Initiated fire for effect phase when a 100 meter bracket was split, or when a range correct spotting was obtained.	_____	_____
5. Observed the results of fire for effect, transmitted refinements (if necessary), and provided end of mission and surveillance	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-25.26 Map Reading and Land Navigation	ATP 3-09.30 Observed Fires

**171-300-0048**  
**Apply the Detect, Identify, Decide, Engage, and Assess Process**

**Conditions:** You are a Soldier conducting tactical operations as part of a larger force. You have the use of a weapon, weapon system, or you are the commander of a weapon platform. You have received an operation order. Joint, interagency, intergovernmental, multinational partners, civilians, and the international media may be present in the area. Contact with friendly, enemy, neutral, or unknown targets is possible. You have received guidance on the rules of engagement (ROE) and the unit standard operating procedure (SOP). Some iterations of this task should be performed in mission-oriented protective posture 4.

**Standards:** Apply the detect, identify, decide, engage, and assess (known as DIDEA) process by doing the following: detect an unknown entity; identify the entity as friendly, enemy, or neutral; determine a course of action; engage targets identified as enemy; and assess the battle damage to determine effects on target.

**Notes:** Situational awareness (SA) is the foundation of target engagement. Soldiers must maintain a timely, relevant, and accurate assessment of friendly, enemy, neutral, and other operations within the operational environment during all operations.

The operational environment should always be considered during this task. All Army elements must be prepared to enter any environment and perform their missions while simultaneously dealing with a wide range of unexpected threats and other influences. Units should be ready to counter these threats and influences and, at the same time, be prepared to deal with various third-party actors, such as international humanitarian relief agencies, news media, refugees, and civilians on the battlefield. These groups may or may not be hostile to us, but they can potentially affect the unit's ability to accomplish its mission.

The engagement process is the process of detecting, identifying, engaging, and assessing targets on the battlefield to ensure their rapid destruction. The DIDEA process provides an iterative, standardized, and systematic approach to target engagement activities across the surface-to-surface, surface-to-air, air-to-surface, and air-to-air mission areas. DIDEA applies across the user spectrum, from the individual infantryman, to direct fire surface platforms, to aviation platforms, to indirect fire controllers.

#### **Performance Steps**

1. Detect an unknown entity.
  - a. Identify sectors of responsibility.
  - b. Perform individual-crew-sensor search techniques of designated areas:
    - (1) Perform ground search techniques using one or more of the following techniques:
      - (a) Rapid scan.
      - (b) Slow (50-meter) scan.
      - (c) Detailed search.
      - (d) Off-center vision search at night when optics are not available.

**Note:** Restrictions should be considered when operating in an urban environment.

- (2) Perform air search techniques:
  - (a) Horizontal search and scan.

- (b) Vertical search and scan.

**Note:** Terrain will dictate which type of air search technique works best.

- (3) Perform sector search techniques.

- (a) Sector overlapping technique.
- (b) Sector divided technique.
- (c) Near-to-far sector technique.

- c. Conduct target detection:

- (1) Detect the following using thermal sights.

- (a) Solar heat.
  - (b) Fuel combustion.
  - (c) Friction.
  - (d) Thermal reflections.
  - (e) Body heat.

- (2) Recognize the following:

- (a) Soldier signatures.
  - (b) Tracked weapon system or vehicle or aircraft signatures.
  - (c) Antitank signatures.
  - (d) Artillery signatures.
  - (e) Obstacles and mine signatures.
  - (f) Aircraft signatures.
  - (g) Detection challenges.

- (3) Designate or mark the target with a visible weapon system effect.

- d. Determine target location by one of the following techniques or methods:

- (1) Target direction technique.
  - (2) Clock method.
  - (3) Sector method.
  - (4) Traverse method.
  - (5) Target-reference point.

- 
- (6) Grid method.
  - 2. Identify the entity.
    - a. Classify targets by type (truck, tank, personnel).
    - b. Determine the identity of the target positively by nomenclature or series (BRDM 2, T-80, Leopard).
    - c. Discriminate the target as friendly, enemy, or neutral by some of the following means:
      - (1) Joint Combat Identification Marking System.
      - (2) Unit marking SOPs.

**Note:** Entities that cannot be identified as friendly, enemy, or neutral are characterized as unidentified or unknown. Unknown entities should never be engaged. The identification process should continue until positive identification has been achieved.

- d. Maintain SA.
  - e. Send acquisition reports to higher headquarters.
- 3. Decide on a course of action when the target is determined to be enemy.

**Note:** The ROE defines the circumstances and limitations to initiate or continue combat engagements. Based on the situation and escalation of force guidelines in the ROE, an engagement could escalate directly to using lethal force.

- a. Determine the target threat level as one of the following:
  - (1) Most dangerous.
  - (2) Dangerous.
  - (3) Least dangerous.

**Note:** Depending on the situation, different instances pose different threat levels. For instance, an M3A2 would consider small arms fire as

- (4) LEAST dangerous but a dismounted team would consider it dangerous or worse.
  - b. Select a weapon system and ammunition to fire.
  - c. Determine the range.
- 4. Engage the target using available weapon systems.
    - a. Use the appropriate fire commands - dismounted.
    - b. Use the appropriate fire commands - mounted.
    - c. Use the appropriate fire control method or combination of methods (dismounted - mounted):
      - (1) Sound signals.

- (2) Trigger points and lines to control fires.
  - (3) Visual signals to control fires.
  - (4) Time to control fires.
  - (5) Target reference points to control fires.
  - (6) Techniques of fire to control fires.
- d. Use the principles of fire control (dismounted - mounted):
- (1) Mass fires effects.
  - (2) Destroy the greatest threat first.
  - (3) Avoid target overkill.
  - (4) Employ the best weapon for the target.
  - (5) Minimize friendly exposure.
  - (6) Prevent fratricide.
  - (7) Plan for extremely limited visibility conditions.
  - (8) Develop contingencies for diminished capabilities.
- e. Use fire control measures.
- (1) Use terrain-based fire control measures:
    - (a) Target reference point technique.
    - (b) Engagement area technique.
    - (c) Sector of fire technique.
    - (d) Direction of fire technique.
    - (e) Quadrant technique.
    - (f) Maximum engagement line technique.
    - (g) Restrictive fire line technique.
    - (h) Final protective line technique.
  - (2) Use threat-based fire control measures:
    - (a) Fire patterns control measure.
    - (b) Target array control measure.
    - (c) Prioritize the engagement.

- f. Maintain the weapons ready posture.
    - (1) Utilize the trigger ready posture.
    - (2) Utilize the weapons control status process.
    - (3) Understand the ROE.
    - (4) Maintain a weapons safety posture.
    - (5) Utilize engagement techniques.
  - g. Confirm target identification one final time.
  - h. Engage the target.
5. Assess battle damage.
- a. Determine effects on the target from the engagement.
  - b. Decide to perform one of the following:
    - (1) Re-engage.
    - (2) Stop engaging.
    - (3) Hand off the target to another Soldier or unit.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Detected an unknown entity.	_____	_____
2. Identified the entity.	_____	_____
3. Decided on a course of action necessary when the target was determined to be enemy.	_____	_____
4. Engaged the target using available weapon systems.	_____	_____
5. Assessed the battle damage.	_____	_____

<b>References Required</b>	<b>Primary</b>
ADP 3-0 Operations	FM 3-20.21/MCWP 3-12.2 Heavy Brigade Combat Team (HBCT) Gunnery
ATP 3-06 Urban Operations	

**Subject Area 7: VEHICLE - CREWMEMBER**

**071-001-0005**

**Operate the CBRN System on an M2A3/M3A3 Bradley Fighting Vehicle**

**Conditions:** You are the driver of an M2A3/M3A3 Bradley fighting vehicle (known as BFV) and have been directed to place the chemical, biological, radiological, and nuclear (CBRN) system into operation. You have your M42A1 protective mask.

**Standards:** Uncover air intake holes on precleaner, put on your protective mask, and activate the CBRN system. When no longer needed, deactivate the CBRN system and remove the protective mask.

**Performance Steps**

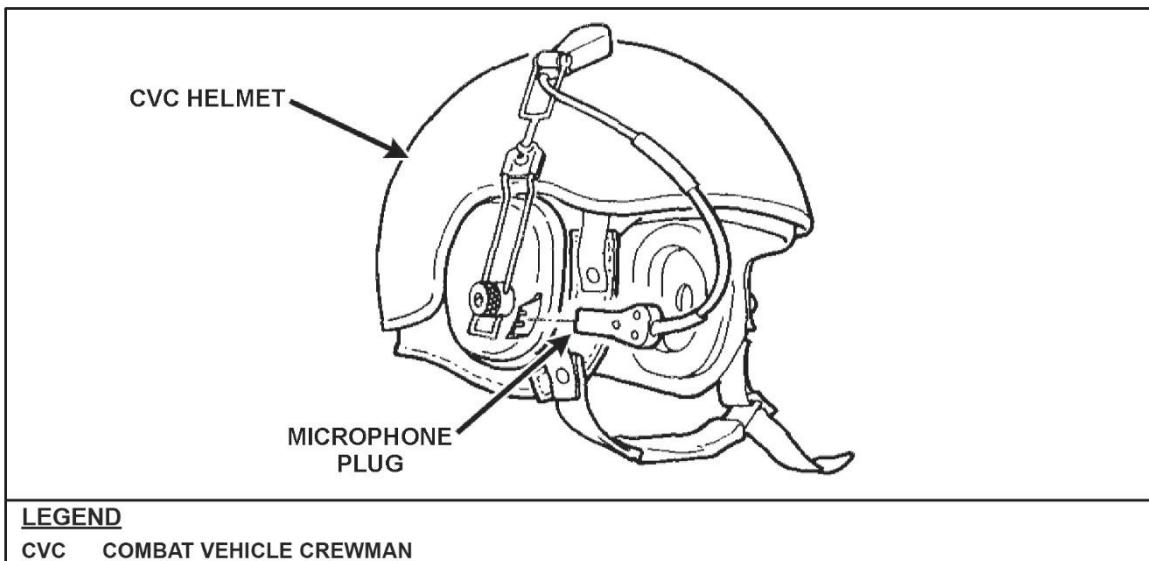
**WARNING**

**Engine and personnel heater exhaust are poisonous. Do not breathe exhaust gases. Make sure power unit access panels are closed before starting engine. The CBRN mask will not protect you from exhaust poisoning. See warning in front of manual.**

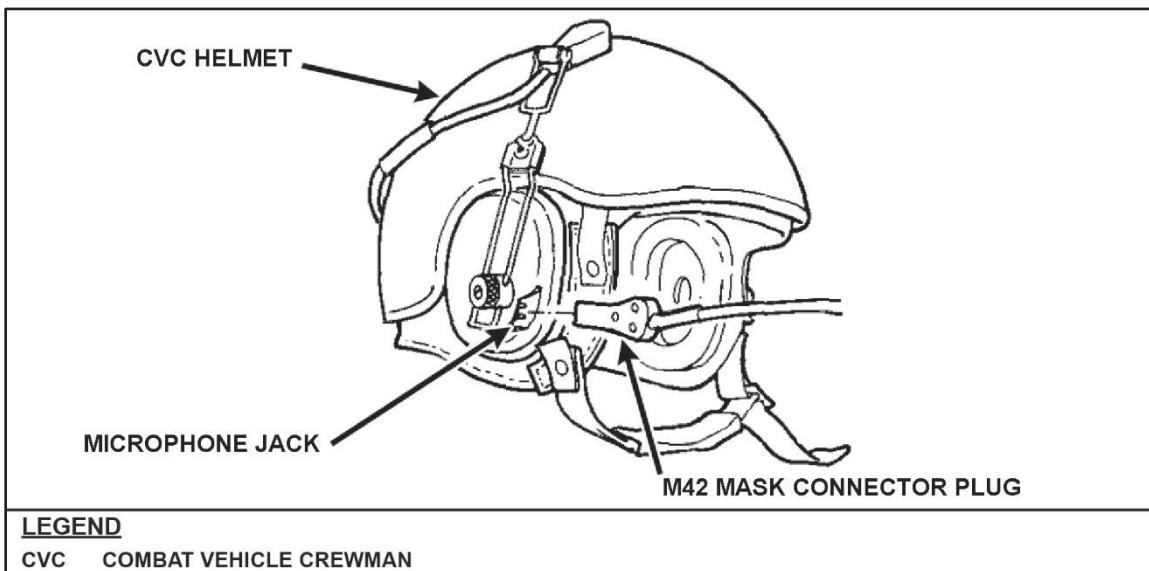
1. Uncover air intake holes on precleaner.

**Note:** CBRN system will not operate until spring clip is removed from air intake holes.

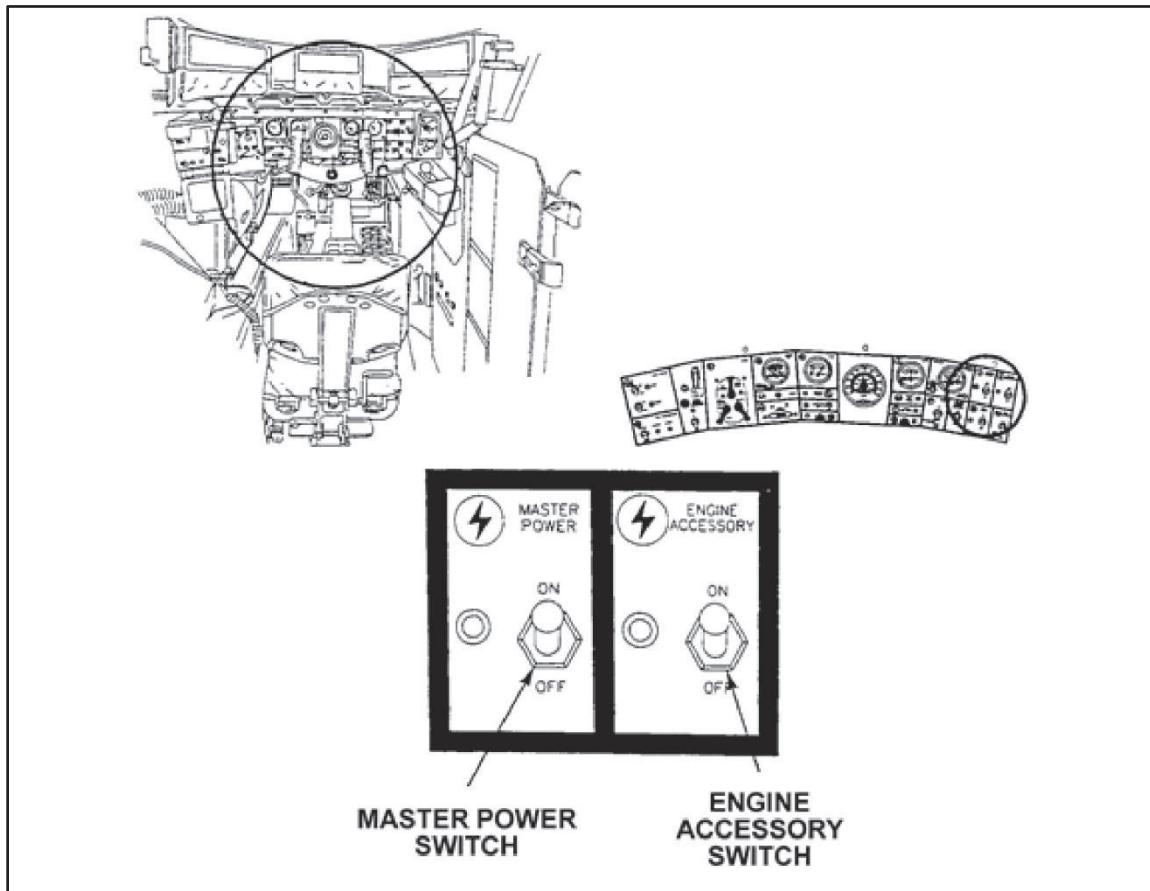
- a. Slide spring clip to either side of precleaner air intake holes.
  - b. Uncover cover intake holes.
2. Put on protective mask.
    - a. Remove combat vehicle crewman (known as CVC) helmet.
    - b. Remove the microphone plug from the CVC helmet (see figure 3-114).

**Figure 3-114. Combat vehicle crewman helmet**

- c. Unstow protective mask from protective mask carrier.
- d. Don protective mask.
- e. Insert protective mask connector plug into CVC helmet at microphone jack. (See figure 3-115.)

**Figure 3-115. M42 connector**

- f. Put on CVC helmet.
3. Activate CBRN system.
  - a. Move the master power switch to ON (see figure 3-116, page 3-348).



**Figure 3-116. Master power and engine accessory switch**

- b. Move the engine accessory switch to ON.
- c. Move the CBRN systems switch to ON (see figure 3-117).

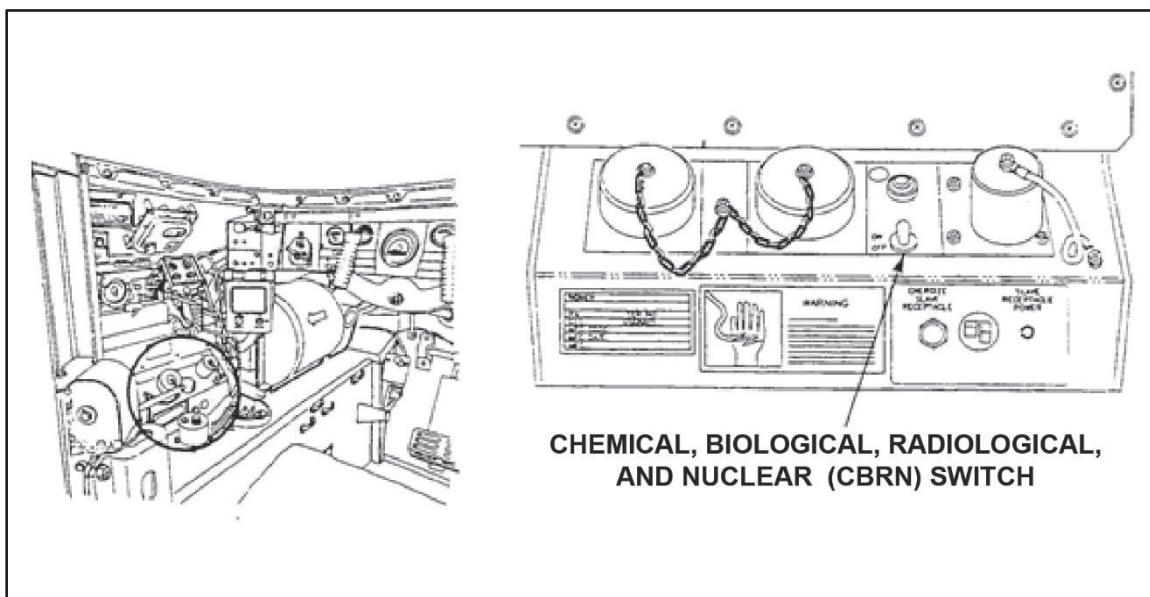


Figure 3-117. Chemical, biological, radiological, and nuclear system switch

**WARNING**

You can get frostbite on your face when you inhale subfreezing air. During cold weather, do not connect air outlet hose to protective mask until air is warm. Hold your hand over air outlet hose and feel if air is warm.

- d. Feel the air coming out of the air outlet hose (see figure 3-118, page 3-350).

**Note:** In M2A3, there are eight outlet hoses in the hull (driver's and seven crewmembers). In M3A3 and M3A3 Bradley fire support team vehicle, there are three outlet hoses in the hull.

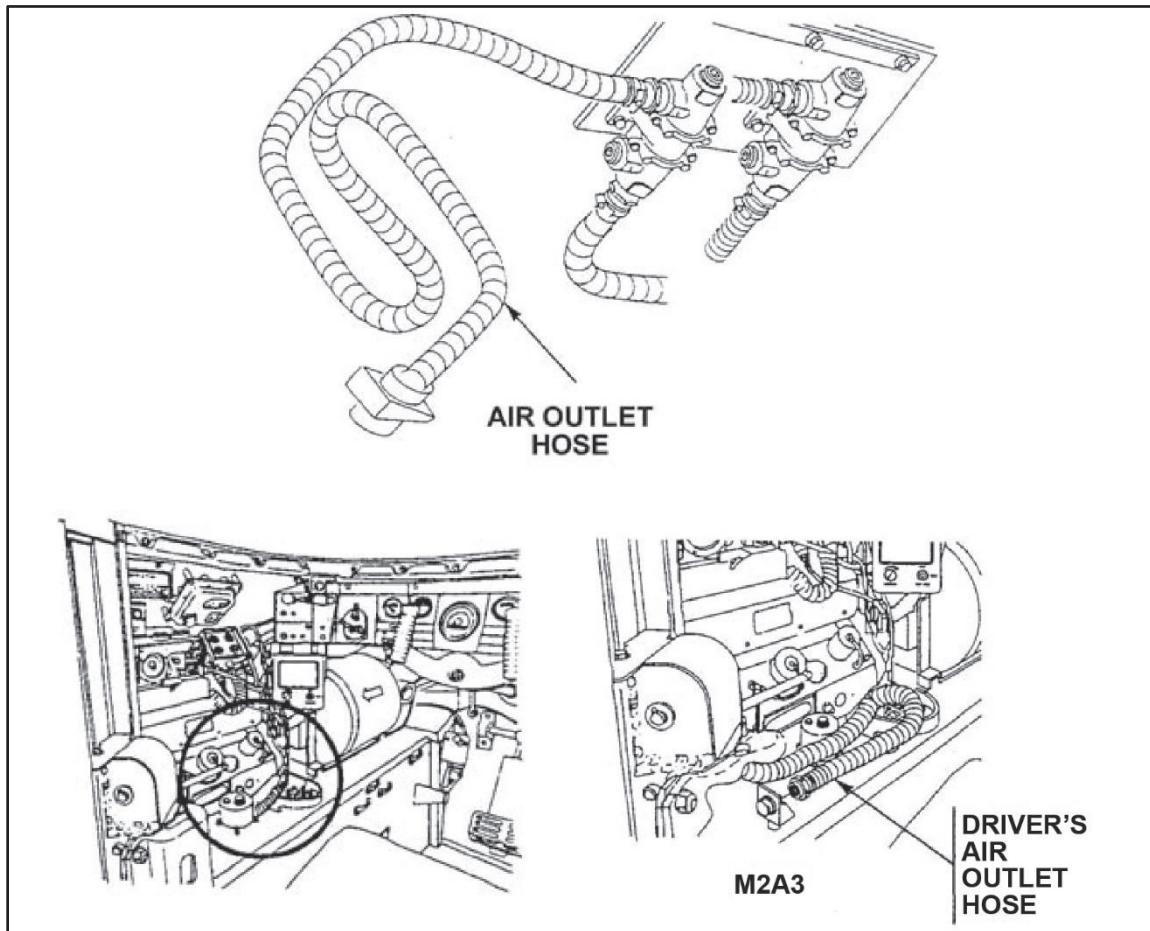
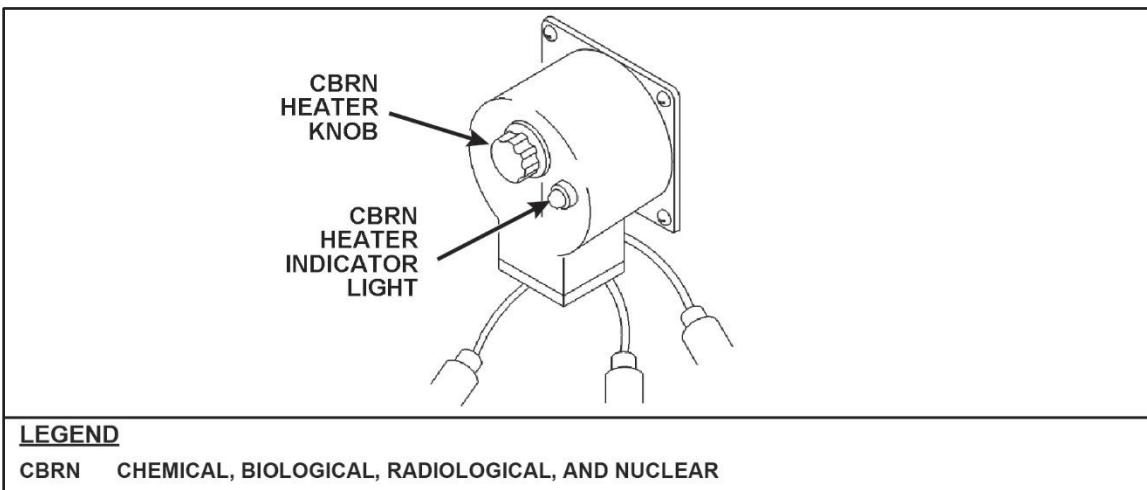


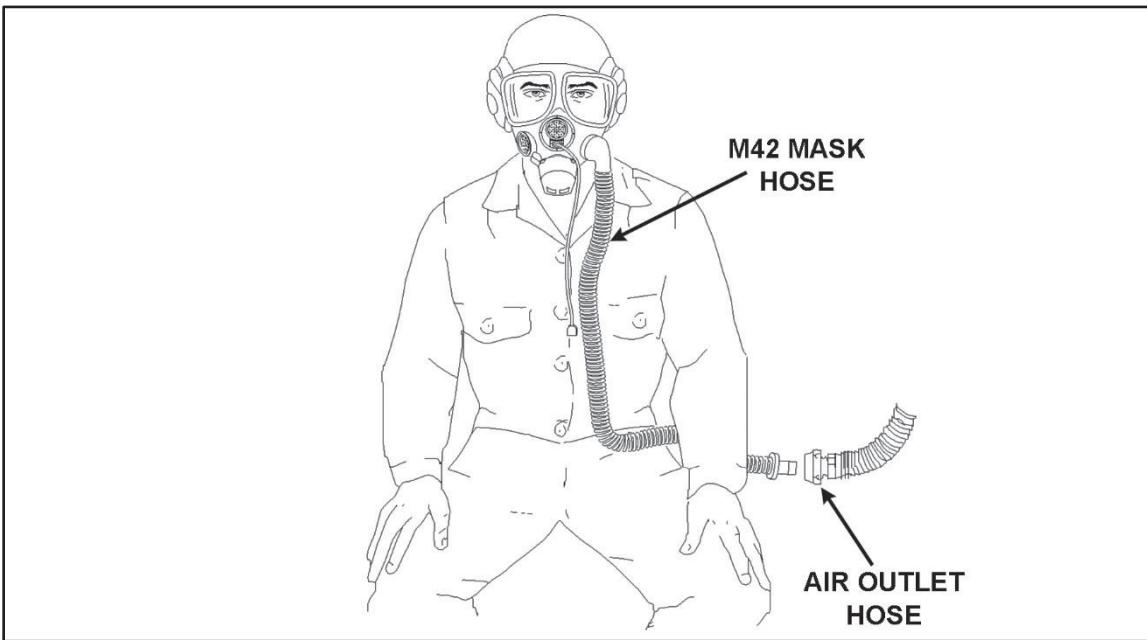
Figure 3-118. Air outlet hose

- (1) If the air is too cold to be breathed safely, go to step e.
  - (2) If the air coming from the air outlet hose can be breathed safely, go to step f.
- e. Operate the CBRN heater system (see figure 3-119).



**Figure 3-119. Chemical, biological, radiological, and nuclear heater switch**

- (1) Turn CBRN heater knob to the right until the green CBRN heater indicator light comes on.
  - (2) Turn the knob to the right/left to adjust air temperature, as needed.
- f. Install an air outlet hose on the protective mask (see figure 3-120).



**Figure 3-120. Air outlet hose quick disconnect**

- (1) Remove the air outlet hose from the quick disconnect on the hull.
  - (2) Place the air outlet hose on the connector of the protective mask.
4. Deactivate the CBRN system.
- a. Turn CBRN heater knob to the off position.

- b. Move CBRN switch to OFF.
  - c. Move engine accessory switch to OFF.
  - d. Pull fuel control handle all the way out to the off position.
  - e. Move master power switch to OFF.
  - f. Remove air outlet hose from protective mask.
  - g. Place the air outlet hose on the quick disconnect.
5. Remove the protective mask.
    - a. Remove the CVC helmet.
    - b. Remove the microphone plug that is connected to the protective mask from the CVC helmet.
    - c. Take off the protective mask.
    - d. Put on the CVC helmet.
    - e. Install microphone plug on CVC helmet.
    - f. Stow protective mask in the carrier.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Uncovered the air intake holes on precleaner.	_____	_____
2. Put on the protective mask.	_____	_____
3. Activated CBRN system.	_____	_____
4. Deactivated the CBRN system.	_____	_____
5. Removed the protective mask.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-411-10 Operator Manual for Fighting Vehicle, Infantry, Operation Desert Storm, M2A2 ODS (NSN 2350-01-405-9886) (EIC APE)	TM 3-4240-340-10 Operator's Manual for Chemical-Biological Mask: Combat Vehicle, M42A1 (4240-01-369-7854 – Small) (4240-01-370-2622 – Medium) (4240-01-369-7855 -- Large

**071-324-6025**  
**Start a Bradley Fighting Vehicle Using Auxiliary Power**

**Conditions:** You are a driver on a Bradley fighting vehicle (known as BFV) that will not start. You have slave cables and another BFV and crewmembers to assist.

**Standards:** Start the BFV with discharged batteries using a slave cable and another BFV.

**Performance Steps**

**DANGER**

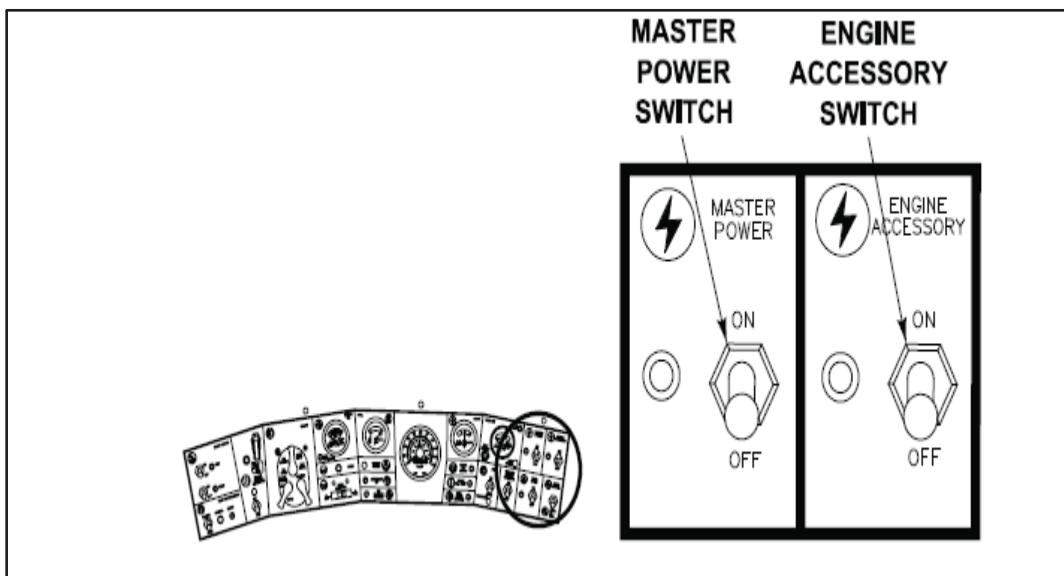
**Never use ether to assist cold starting the engine. Ether can explode, causing injury to personnel and damage to equipment.**

**Do not park the vehicles nose to nose, if possible. Parking side by side is safer.**

**CAUTION**

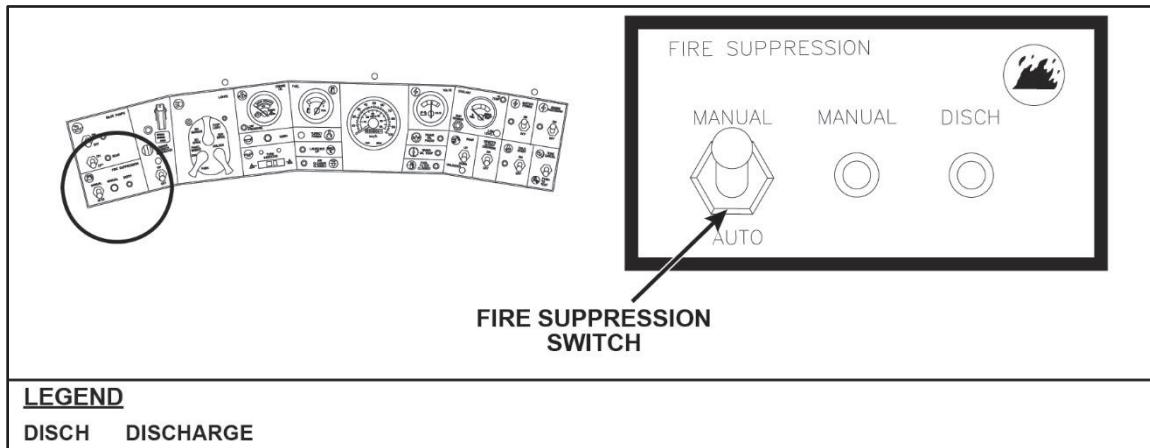
Battery or electrical damage can occur if electrical switches are left on.

1. Prepare the disabled vehicle for slave cable installation.
  - a. Turn MASTER POWER switch to OFF. (See figure 3-121.)
  - b. Turn the ENGINE ACCESSORY switch to OFF. (See figure 3-121.)



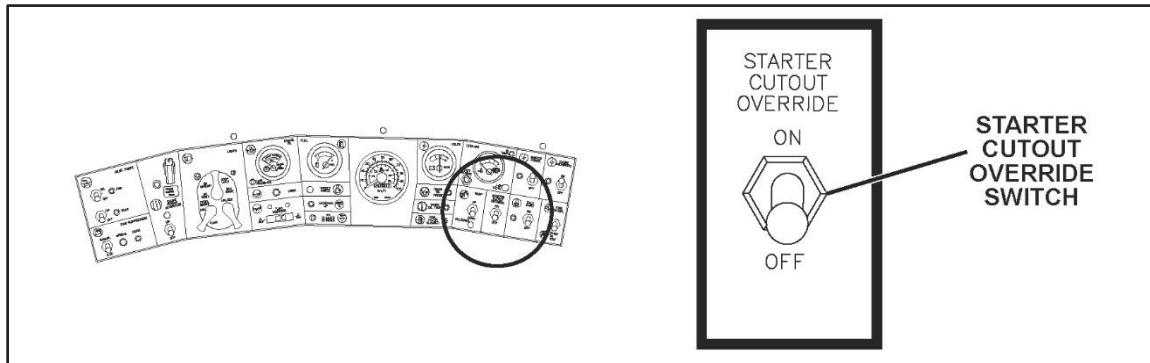
**Figure 3-121. MASTER POWER and ENGINE ACCESSORY switch**

- c. Ensure the TURRET POWER switch is OFF.
- d. Ensure the FIRE SUPPRESSION switch is in MANUAL. (See figure 3-122, page 3-354.)



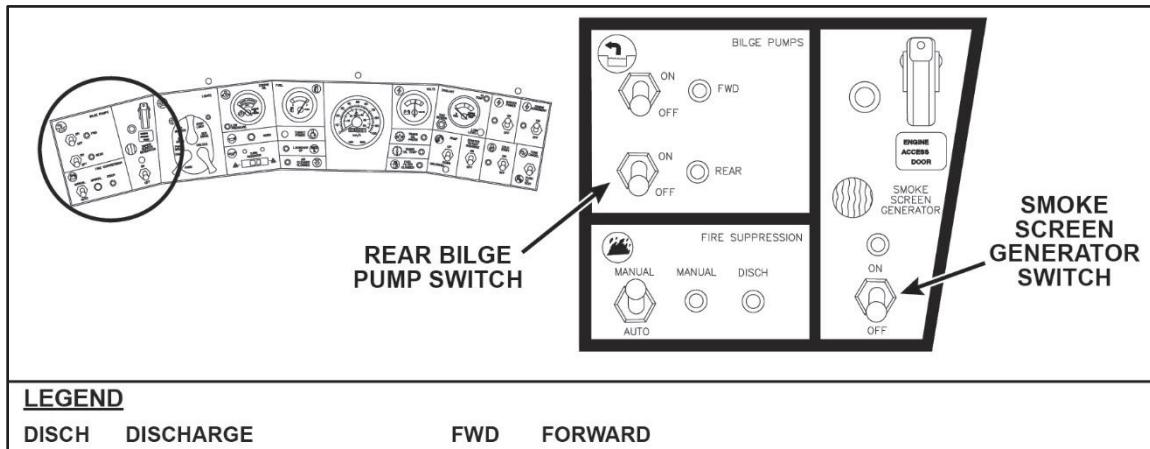
**Figure 3-122. FIRE SUPPRESSION switch**

- e. Ensure the STARTER CUTOUT OVERRIDE switch is OFF. (See figure 3-123.)



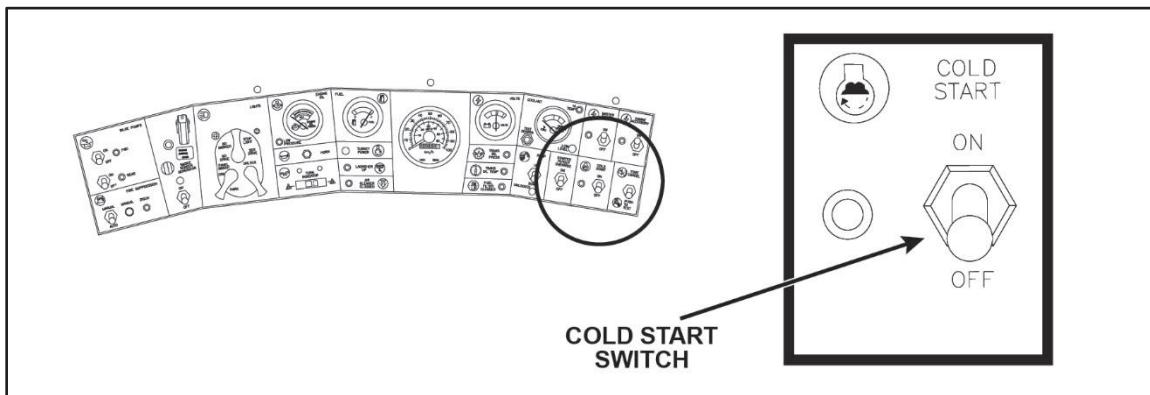
**Figure 3-123. STARTER CUTOUT OVERRIDE switch**

- f. Ensure the FWD and REAR BILGE PUMP switches are OFF. (See figure 3-124.)
- g. Ensure the SMOKE SCREEN GENERATOR switch is OFF. (See figure 3-124.)



**Figure 3-124. FWD AND REAR BILGE PUMPS switches and SMOKE SCREEN GENERATOR switch**

- h. Ensure the COLD START switch is OFF. (See figure 3-125.)



**Figure 3-125. COLD START switch**

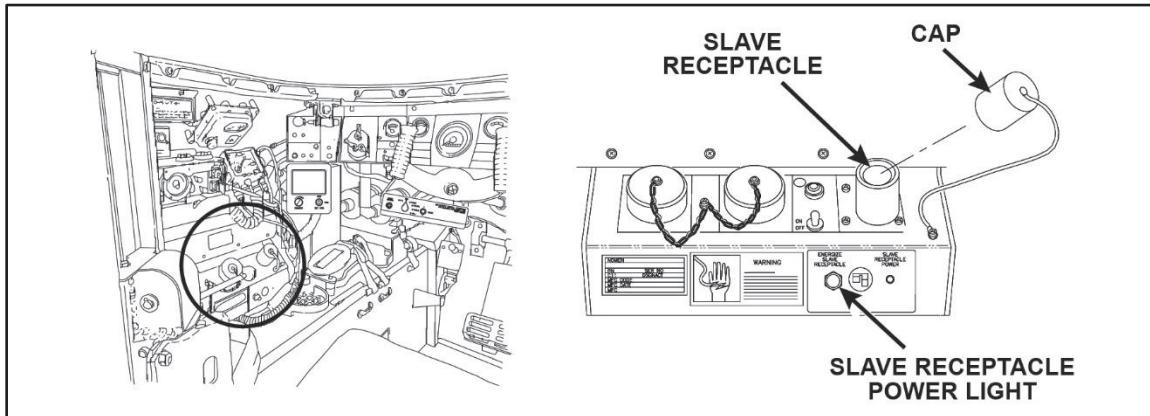
**CAUTION**

Equipment can be damaged if the slave receptacle is energized before installing slave cable. The SLAVE RECEPTACLE POWER light must be off when installing the slave cable.

2. Install the slave cable.
  - a. Connect slave cable to the disabled vehicle.
    - (1) Ensure that the SLAVE RECEPTACLE POWER light is off before installing slave cable. (See figure 3-126.)

**Note:** Equipment can be damaged if slave receptacle is energized before installing slave cable.

- (2) Remove the cap from slave receptacle. (See figure 3-126.)



**Figure 3-126. Slave receptacle**

- (3) Plug the slave cable into the slave receptacle. (See figure 3-127, page 3-356.)

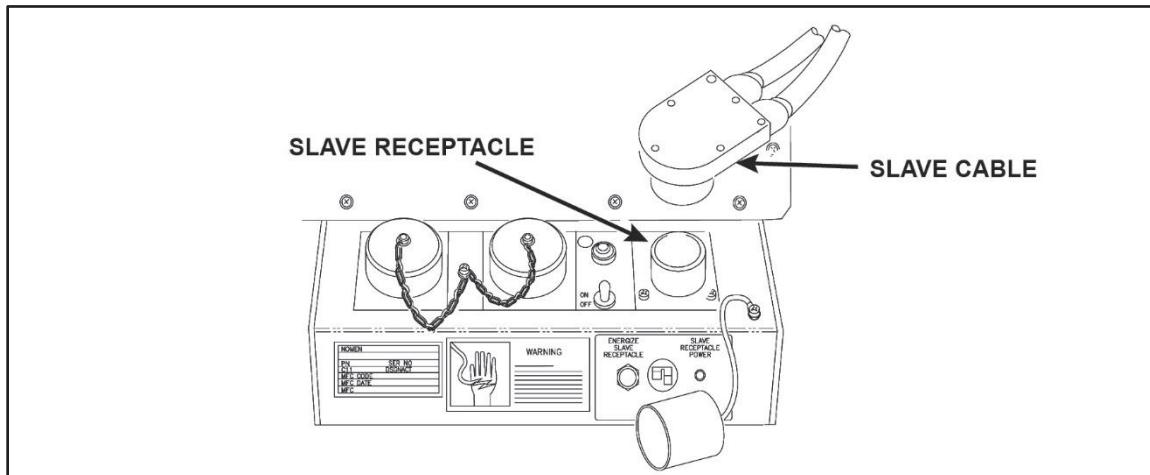


Figure 3-127. Slave receptacle and slave cable

- b. Connect slave cable to operational vehicle by repeating steps 2a(1) through 2a(3).

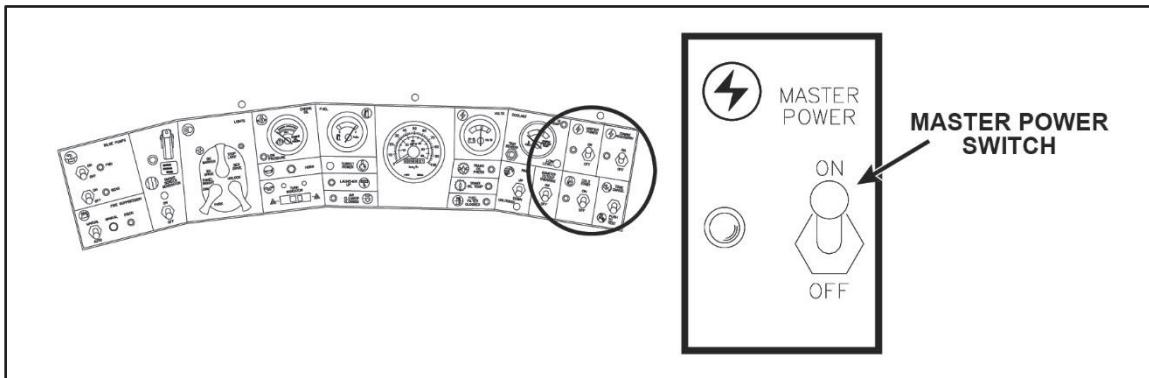
**DANGER**

Batteries can explode if you start engine with outside power source when SLAVE RECEPTACLE POWER light is red. Soldiers could be killed or injured. If SLAVE RECEPTACLE POWER light is red, stop task immediately.

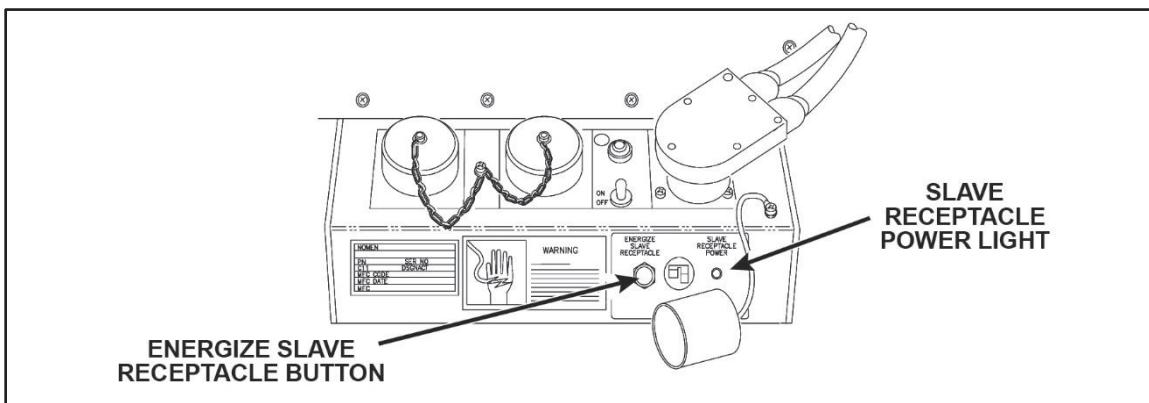
**WARNING**

Battery and/or electrical system can be damaged if SLAVE RECEPTACLE POWER light is red. Both SLAVE RECEPTACLE POWER lights must be green before you try to start disabled vehicle with operational vehicle. SLAVE RECEPTACLE POWER light in disabled vehicle must be green when using 24-volt power source.

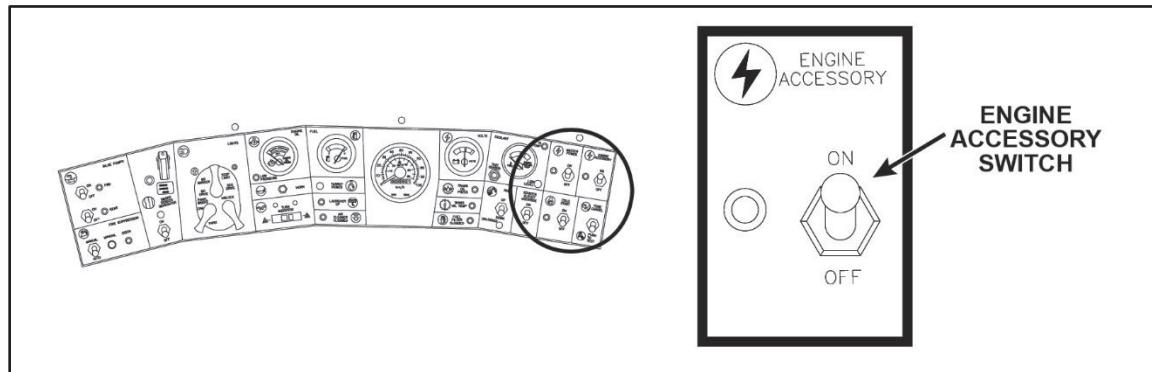
3. Move the operational vehicle's MASTER POWER switch to ON. (See figure 3-128.)

**Figure 3-128. MASTER POWER switch**

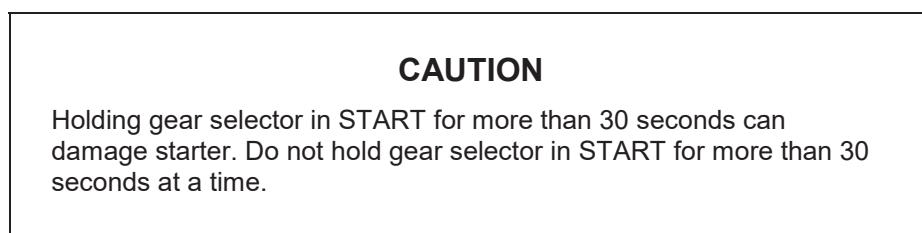
4. Check the SLAVE RECEPTACLE POWER light on both vehicles. (See figure 3-129.)

**Figure 3-129. Slave receptacle power light**

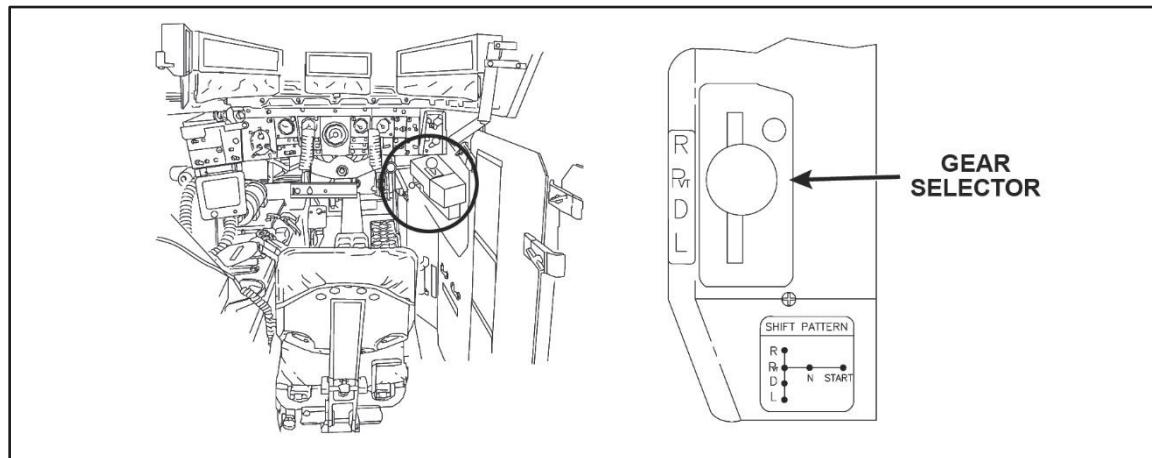
- a. Press the ENERGIZE SLAVE RECEPTACLE button in operational vehicle only.
- b. If both SLAVE RECEPTACLE POWER lights are green, continue process (step 5).
- c. If either SLAVE RECEPTACLE POWER light is red, immediately turn off power.
  - (1) Do not attempt to start vehicle.
  - (2) Notify unit maintenance.
5. Start the operational vehicle.
6. Start the disabled vehicle.
  - a. Move the ENGINE ACCESSORY switch to ON. (See figure 3-130, page 3-358.)

**Figure 3-130. ENGINE ACCESSORY switch**

- b. Turn on the FUEL CONTROL by pushing the FUEL control handle toward instrument panel to the ON position.



- c. Move the GEAR SELECTOR to START and hold it until the engine starts but not for more than 30 seconds. (See figure 3-131.)

**Figure 3-131. Gear selector**

- (1) If vehicle does not start, wait 1 minute and try again.
- (2) If engine does not start after three tries, notify unit maintenance.

**WARNING**

**If slave receptacle is not de-energized before slave cable is removed, the slave cable and slave receptacle could be damaged.**

7. Move the operational vehicle's MASTER POWER switch to OFF, then back to ON to de-energize the slave receptacle.
8. Remove the slave cable.
  - a. Unplug slave cable from slave receptacle on disabled vehicle.
  - b. Remove slave cable from operational vehicle.
  - c. Install caps on the slave receptacles of both vehicles.
9. Move the slaved (disabled) vehicle's MASTER POWER switch to ON.
10. Ensure slaved (disabled) vehicle is operating properly.
  - a. Check transmission oil pressure.

**Note:** Engine speed may have to be increased above idle for TRANS OIL PRESS warning light to go off.

- (1) (M2A3/M3A3) Check that the TRANS OIL PRESS LOW and TRANS OIL TEMP HIGH warning indicators are OFF.
- (2) (M2A2/M3A2) Check that the TRANS OIL PRESS warning light goes OFF.
  - b. Check engine oil pressure.
    - (1) (M2A3/M3A3) Check that ENGINE OIL pressure gauge is in the normal operating zone.
    - (2) (M2A2/M3A2) Ensure that the ENGINE OIL LOW PRESSURE warning light goes OFF.
  - c. Ensure that the warning tone stops sounding.
  - d. If warning lights and warning tone do not go off within 30 seconds after engine is running, stop the engine and notify field maintenance.
  - e. (M2A3/M3A3) Check that the driver's switch indicator panel is not on.
  - f. Check the VOLTS gauge.
    - (1) If VOLTS gauge pointer is in the normal zone, continue mission.
    - (2) If VOLTS gauge pointer is in red zone, perform the following:
      - (a) Cycle the ENGINE ACCESSORY switch.
        - \_1\_ Fully depress accelerator pedal and hold.

\_2\_ Move engine accessory switch to OFF for 5 seconds.

\_3\_ Move engine accessory switch to ON.

\_4\_ Release accelerator pedal and allow engine to idle.

(b) Check the VOLTS gauge.

\_1\_ If VOLTS gauge pointer is in the normal zone, continue mission.

\_2\_ If VOLTS gauge pointer remains in red zone, stop engine and notify unit maintenance.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the disabled vehicle for slave cable installation.	_____	_____
2. Installed the slave cable.	_____	_____
3. Moved the operational vehicle's MASTER POWER switch to ON.	_____	_____
4. Checked the SLAVE RECEPTACLE POWER light on both vehicles.	_____	_____
5. Started the operational vehicle.	_____	_____
6. Started the disabled vehicle.	_____	_____
7. Moved the operational vehicle's MASTER POWER switch to OFF, then back to ON to de-energize the slave receptacle.	_____	_____
8. Removed the slave cable.	_____	_____
9. Moved the slaved vehicle's MASTER POWER switch to ON.	_____	_____
10. Ensured slaved vehicle was operating properly.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull	TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull

**071-324-6001**  
**Drive a Bradley Fighting Vehicle**

**DANGER**

**The Bradley fighting vehicle (known as BFV) can roll over and kill or injure Soldiers. Avoid high speeds and sudden turns when driving on hills or rough terrain. Wear seat belts.**

**WARNING**

**Sudden vehicle movement can throw Soldiers out of their seats. Wear the lap safety belt while the vehicle is in motion. Do not use any seat with missing lock pin or inoperative lap safety belt.**

**Conditions:** You have been assigned as a driver for a BFV that is operational and has all basic issue items. The BFV master power switch is ON. The vehicle commander is in the commander's station and has directed you on a route that includes rough terrain.

**Standards:** Start the BFV and safely drive it over directed route.

**Performance Steps**

**CAUTION**

**Seatbelt and combat vehicle crewman (known as CVC) helmet must be worn while driving the BFV.**

1. Start the BFV.

**Note:** To start the BFV below +40 degrees ( $^{\circ}$ ) Fahrenheit (F), see the procedures in the appropriate technical manuals.

- a. Ensure the master power switch is ON.
- b. Move the engine accessory switch to ON.
- c. Check the instrument panel to ensure all gauges and warning lights are operational and within normal ranges as designed.
- d. Turn on the fuel control.

**Note:** If the tactical situation permits, the horn should be sounded to warn the Soldiers that the engine is about to be started.

**CAUTION**

Holding gear selector in start for more than 30 seconds can damage the starter. If the engine does not start on the first try, wait 1 minute and try again.

- e. Move the gear selector to start and hold it until the engine starts, but do not hold it longer than 30 seconds.
- f. Check the driver's instrument panel.
- g. Warm up the engine by allowing it to idle for about 1 minute.

**Note:** To start the BFV below +40° F, see the procedures in the appropriate technical manuals.

2. Release hand brake.
  - a. Push down and hold brake pedal firmly.
  - b. Rotate knob on hand brake handle away from instrument panel and lift handle up to disengage brake.
  - c. Allow hand brake handle to slide forward.
  - d. Release brake pedal.

**Note:** Brake pedal should come back up.

3. Sound horn, if situation permits.
4. Set the gear selector to appropriate position.
  - a. Step on brake pedal.
  - b. Move gear selector from N (neutral) to appropriate position.

**CAUTION**

The BFV can get stuck in trenches wider than 8 feet (2.5 meters). The transmission can be damaged if the gear selector is pulled past the LOW position into the TOW START position while the BFV is moving.

5. Move the vehicle over directed route.
  - a. Drive the BFV over trenches.
    - (1) Drive to the trench straight on.

**DANGER**

**Do not drive on side slopes steeper than 40 percent (22 degrees).**

- (2) Move the gear selector to LOW.

**CAUTION**

Obstacles higher than 36 inches (91 centimeters) can damage the BFV's drive sprockets.

- (3) Center the steering yoke and drive slowly over the trench.
- (4) Accelerate as soon as the vehicle clears the trench.
- b. Drive the vehicle over an obstacle (for example, fallen trees, rocks, and shallow streams).
- (1) Drive to the obstacle straight on.
- (2) Move the gear selector to LOW.

**WARNING**

**Do not drive on side slopes steeper than 40 percent (22 degrees).**

- (3) Center the steering yoke and drive slowly over the obstacle.
- (4) Accelerate as soon as the vehicle clears the obstacle.
- c. Drive the vehicle on side slopes.
- (1) Move the gear selector to LOW before driving on a steep side slope.
- (2) Slowly turn the vehicle uphill if the rear of the vehicle is sliding downhill.

**CAUTION**

Sharp turns on snow, ice, or mud can cause the BFV to throw a track.  
Make a series of small, wide turns instead of one sharp turn.

- (3) Slowly turn the vehicle downhill if the front of the vehicle is sliding downhill.
- d. Drive the vehicle on snow, ice, or mud.
- (1) Control the vehicle speed and drive it as smoothly as possible.

- (2) Slow the vehicle smoothly before making turns.
- (3) If the vehicle breaks through the crust of deep snow or soft soil, steer the vehicle straight to get back on the crust.

**Note:** Remove the track shoe pads, if directed by the vehicle commander.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Started the BFV.	_____	_____
2. Released hand brake.	_____	_____
3. Sounded horn, if situation permitted.	_____	_____
4. Set the gear selector to appropriate position.	_____	_____
5. Moved the vehicle over directed route.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-252-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2 (2350-01-048-5920); M2A1 (2350-01-179-1027) and Fighting Vehicle Cavalry, M3 (2350-01-049-2695); M3A1 (2350-01-179-1028) Hull	TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull	

**071-329-1300**  
**Operate the Driver's Compass Display on an M2A3/M3A3 Bradley Fighting Vehicle**

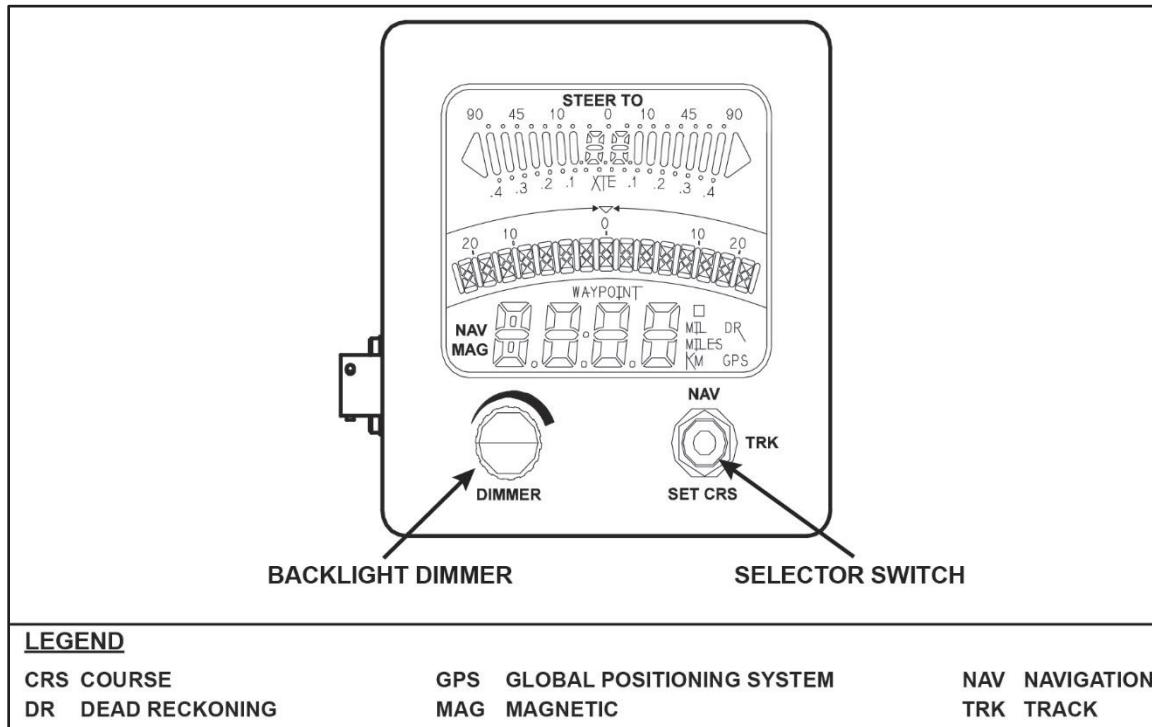
**Conditions:** As a driver on an M2A3/M3A3 Bradley fighting vehicle (known as BFV), equipped with a driver's compass display (known as DCD), and a requirement to operate the BFV on a predetermined course.

**Standards:** Power up the M2A3/M3A3 BFV turret, complete the self-test, and adjust the DCD so that the driver can drive the M2A3/M3A3 BFV safely without causing damage to the equipment or injury to personnel.

**Note:** The task steps must be performed in sequence.

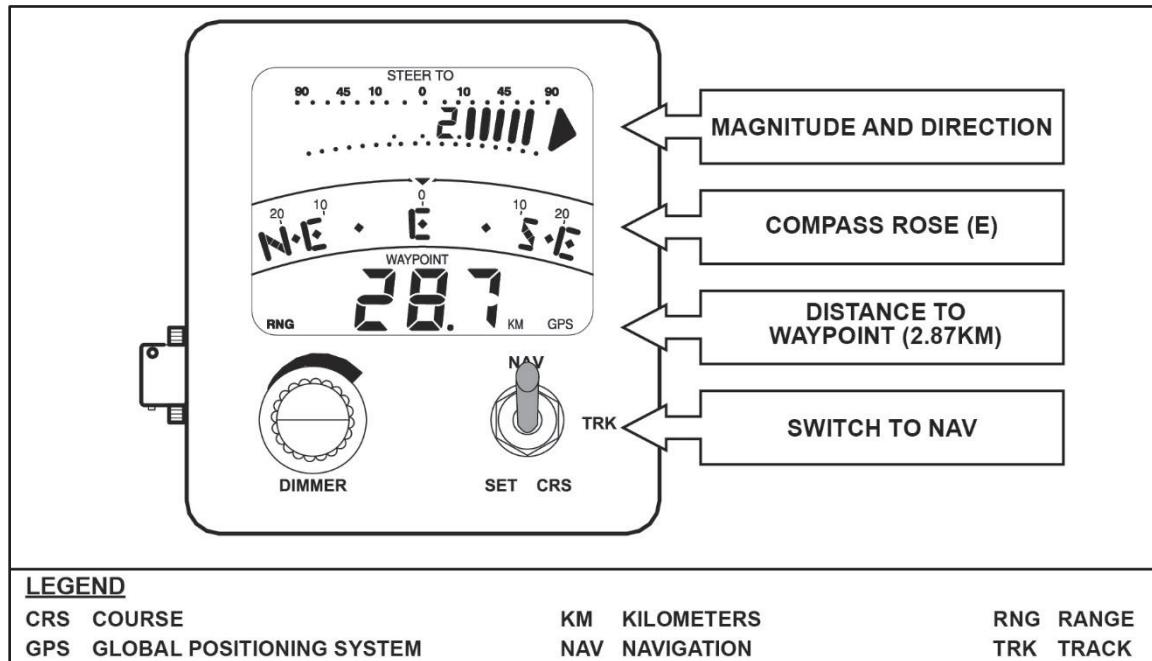
**Performance Steps**

1. Turn on the vehicle master power.
2. Turn on the turret power.
3. Ensure the DCD initializes correctly (see figure 3-132).



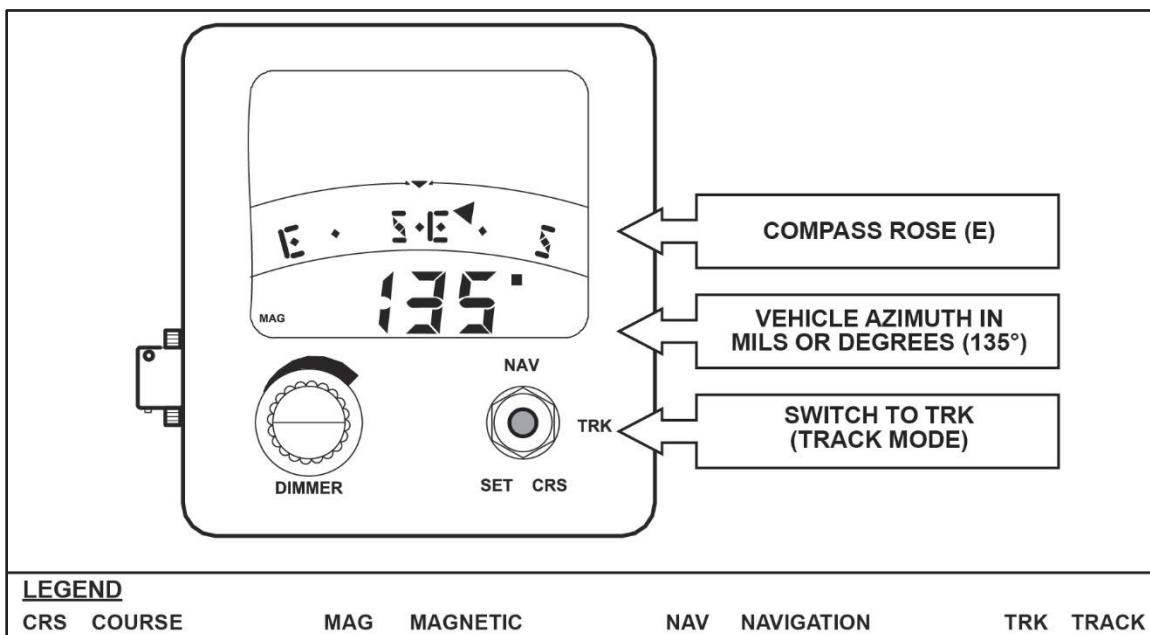
**Figure 3-132. Driver's compass display module assembly**

- a. Observe that the DCD face is backlit and all icons are being displayed correctly.
- b. Observe the "NO NAV" message on the DCD.
4. Select the desired mode on the DCD.
  - a. Select the NAV mode on the DCD (see figure 3-133, page 3-366).

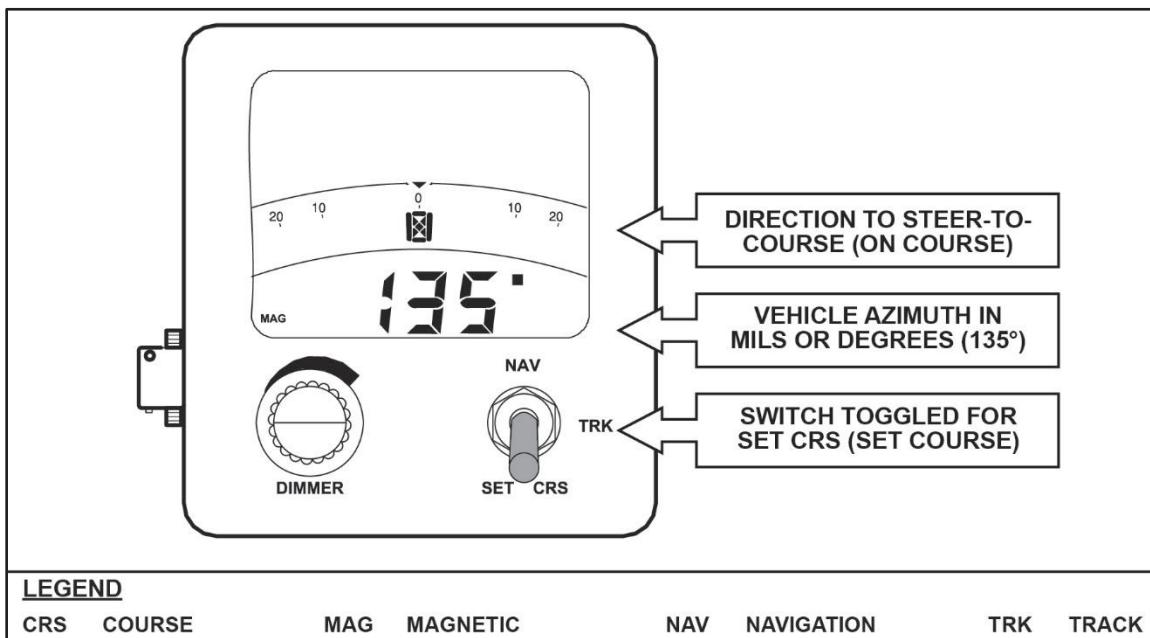


**Figure 3-133. Driver's compass display navigation mode**

- (1) Observe that the DCD displays the STEER TO direction of travel, magnitude, the direction of travel on a compass rose, and distance to the next waypoint.
  - (2) Observe that the DCD updates when the commander has acknowledged the advisory message on the commander's tactical display.
  - (3) Observe that the Global Positioning System indicator is illuminated on the DCD.
  - (4) Observe that the azimuth is indicated in either mils or degrees and that the position distance is indicated.
- b. Select the TRK and SET CRS mode on the DCD.
- (1) Observe that the cardinal direction and azimuth are displayed on the DCD.
  - (2) Depress the mode switch to the SET CRS position and release and observe that the compass rose has displayed the vehicle azimuth (see figure 3-134).

**Figure 3-134. Driver's compass display track mode**

- (3) Depress the mode switch to the SET CRS position and release for a second time and observe that the STEER TO indicator is displayed (see figure 3-135).

**Figure 3-135. Driver's compass display set course mode**

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Turned on the vehicle master power.	_____	_____
2. Turned on the vehicle turret power.	_____	_____
3. Ensured the DCD initialized correctly.	_____	_____
4. Selected the desired mode on the DCD.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-411-10 Operator Manual for Fighting Vehicle, Infantry, Operation Desert Storm, M2A2 ODS (NSN 2350-01-405-9886) (EIC APE)	

**071-216-0023**  
**Maintain the Hull on a Bradley Fighting Vehicle**

**Conditions:** You are a Bradley fighting vehicle (known as BFV) driver and have been directed to perform operator maintenance on the vehicle hull. You have DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), vehicle basic issue items, the appropriate technical manual, an assisting crewmember, and the appropriate cleaning equipment (lint-free cloth, cleaning solvents and solutions, lens paper, wiping rags, and clean water).

**Standards:** Perform preventative maintenance checks and services (PMCS) on the BFV's hull and hull auxiliary equipment in accordance with the appropriate technical manual. Record all deficiencies, corrective action taken, and parts replaced on DA Form 2404 or DA Form 5988-E. Inform supervisor of PMCS results and submit completed DA Form 2404 or DA Form 5988-E to the chain of command.

**Note:** Keep the hull clean at all times. Dirt, grease, oil, and debris get in the way and may cover up a serious problem. For example, spent casings may be caught underneath the turret slowing the turret's rate of traverse.

**Performance Steps**

1. Prepare the BFV for hull maintenance.
  - a. Verify the vehicle is parked.
  - b. Verify the turret is powered down.
  - c. Obtain the required tools and cleaning supplies.
2. Conduct the appropriate type of PMCS at the appropriate interval on the hull.
  - a. Turn to the appropriate PMCS section in the BFV variant's technical manual (hard copy or electronic technical manual).
  - b. Identify faults by following the instructions in the technical manual PMCS section for each numbered item.
    - (1) Comply with troubleshooting procedures or maintenance procedures to attempt to correct all identified faults.
    - (2) Direct an assistant as required.
    - (3) Record all deficiencies, corrective action taken, and parts replaced on DA Form 5988-E or DA Form 2404.
  - c. Lubricate parts as per the specific instructions in the PMCS lubrication tables.
3. Conduct PMCS on hull auxiliary equipment.
  - a. Turn to the appropriate PMCS section in the auxiliary equipment's technical manual (hard copy or electronic technical manual).

**Note:** Auxiliary equipment includes weapons, radios, vehicle intercommunications set, and chemical, biological, radiological, and nuclear equipment, as appropriate.

- a. Turn to the appropriate PMCS section in the auxiliary equipment's technical manual (hard copy or electronic technical manual).

- b. Identify faults by following the instructions in the technical manual PMCS section for each item.
    - (1) Comply with troubleshooting procedures or maintenance procedures to attempt to correct all identified faults.
    - (2) Direct an assistant as required.
    - (3) Record all deficiencies, corrective action taken, and parts replaced on a separate DA Form 5988-E or DA Form 2404 for each piece of auxiliary equipment.
  - c. Lubricate parts as per the specific instructions in the PMCS lubrication tables.
4. Inform supervisor of the results of the PMCS.
  5. Submit each completed DA Form 5988-E or DA Form 2404 to unit maintenance through the chain of command.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the BFV hull for maintenance.	_____	_____
2. Conducted the appropriate type of PMCS at the appropriate interval on the hull.	_____	_____
3. Conducted PMCS on hull auxiliary equipment.	_____	_____
4. Informed supervisor of the results of the PMCS.	_____	_____
5. Submitted each completed DA Form 5988-E or DA Form 2404 to unit maintenance through the chain of command.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-2350-284-10-1 Operator's Manual For Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	
TM 9-2350-252-10-2 Fighting Vehicle, Infantry, M2 (NSN 2350-01-048-5920) (EIC: APA) M2A1 (2350-01-179-1027) (EIC: ALE) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) (EIC: APB) M3A1 (2350-01-179-1028) (EIC: ALF) Turret	
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	

<b>References Required</b>	<b>Primary</b>
----------------------------	----------------

TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

**171-132-1018**

**Stow Ammunition on an M2A3 or M3A3 Bradley Fighting Vehicle**

**DANGER**

**Handle ammunition cans with care.**

**Do not drop ammunition or bump primers.**

**Keep ammunition away from electrical sparks and high heat.**

**Do not use or handle damaged ammunition.**

**Do not stow equipment or munitions directly on floorboards, to include under the Bradley Advanced Survivability Seats (known as BASS), in environments that have a greater likelihood of under vehicle blast event.**

**WARNING**

**Unsecured missiles can fall and strike personnel during vehicle operation. Make sure stowage clamps securely hold missiles.**

**The M919 sabot round uses a depleted uranium penetrator which emits low levels of radiation. Wear gloves when handling depleted uranium or M919 rounds. Wash hands before eating or touching your face. If depleted uranium corrosion (yellow or white powder or stain) is visible on the surface of the round, dispose of gloves in accordance with AR 385-10.**

**CAUTION**

**Missiles in cases are easily damaged. Handle missiles with care.**

**Conditions:** You are a crewmember on an M2A3 or M3A3 Bradley fighting vehicle (known as BFV) preparing for a mission and must stow the ammunition on the vehicle. You have a vehicle load plan and have been issued a basic load of ammunition.

**Standards:** Stow basic load of ammunition on the M2A3 or M3A3 BFV.

**Performance Steps**

1. Lower ramp.
2. Stack high-explosive (HE) and armor-piercing (known as AP) ammunition boxes in separate stacks on ramp or on ground nearby.
3. Load 25-millimeter (mm) ammunition in hotboxes.
  - a. Remove hotbox floor mat.
    - (1) Move seats to upright position.

- (2) Remove scoop floor plate from vehicle.
  - (a) Remove two hitch pins from stiffeners.
  - (b) Lift scoop plate up and remove.
- (3) Remove hotbox floor mat from vehicle with assistance from helper.
  - (a) Remove three quick release pins from bushings and torsion bar straps at front of floor mat.
  - (b) Remove eight quick release pins from bushings in mat and anchors on both sides of mat.
  - (c) Lift floor mat and remove from vehicle.
- b. Remove hotboxes from vehicle and place on ramp.
- c. Remove hotbox from containment bag.
  - (1) Release two snap hooks and fold top flap back over hotbox.
  - (2) Release click buckle and fold open the left and right flaps.
  - (3) Remove stop strap from in front of hotbox.
  - (4) With helper holding the containment bag, pull hotbox from bag.
- d. Load HE ammunition.
  - (1) Link 50 rounds of HE ammunition.
  - (2) Release three fasteners and open lid on ammunition container.
  - (3) Starting from back of container, lay 17 rounds of HE ammunition with projectile facing right and links down.
  - (4) With projectile facing right and links down, lay 17 rounds in second layer.
  - (5) With projectile facing right and links down, lay 16 rounds in third and final layer with an empty link at the end.
  - (6) Close lid and fasten three fasteners.
- e. Load AP ammunition.
  - (1) Link 50 rounds of AP ammunition.
  - (2) Release three fasteners and open lid on ammunition container.
  - (3) Starting from back of container, lay 17 rounds of AP ammunition with projectile facing left and links up.
  - (4) With projectile facing left and links down, lay 17 rounds in second layer.
  - (5) With projectile facing left and links up, lay 16 rounds in third and final layer with an empty link at the end.

- (6) Close lid and fasten three fasteners.
- f. Install hotboxes in vehicle.
  - (1) Install hotbox into containment bag.
    - (a) Hold loaded hotbox with hinged access panel on the top side.
    - (b) Starting at the end away from the front hinged access panel of the hotbox and with top flap of bag on top, slide containment bag over hotbox, pulling up on side straps as necessary.
    - (c) Ensuring hotbox is all the way into the containment bag, pull stop strap across front of hotbox.
    - (d) Pull end of bag over hotbox.
    - (e) Fold right flap over hotbox.
    - (f) Fold left flap over hotbox and fasten click buckle.
    - (g) Pull top flap down over the left and right flaps.
    - (h) Fasten two snap hooks on containment bag.
    - (i) Place hotbox in vehicle.
  - (2) Install hotbox floor mat in vehicle with assistance from helper.
    - (a) Position mat inside of vehicle with hinged section in front.
    - (b) Align bushings in mat with anchors and install eight quick release pins.
    - (c) Align bushings in mat with bushings in torsion bar straps and install three quick release pins.
  - (3) Install scoop plate in vehicle.
    - (a) Position and lower scoop floor plate.
    - (b) Install two hitch pins on stiffeners.
4. Stow remaining 25-mm ammunition boxes.
  - a. Stow remaining ammunition boxes in M2A3.
    - (1) Stow two ammunition boxes under right front floor plate.
      - (a) Lift and turn three fasteners and remove right front floor plate.
      - (b) Stow two ammunition boxes under right front floor plate.
      - (c) Install right front floor plate and secure with three fasteners.
      - (d) Lower right squad BASS seat and secure with strap.
    - (2) Stow three ammunition boxes in right side of squad area.

- (a) Lower backrest on right squad BASS seat.
  - (b) Unbuckle straps from 25-mm ammunition racks.
  - (c) Stow three ammo boxes on top of 25-mm ammunition racks.
  - (d) Fasten and tighten straps on ammunition boxes.
  - (e) Raise backrest on right squad BASS seat.
- (3) Stow six ammunition boxes in turret stowage basket.
- (a) Unbuckle straps from turret basket.
  - (b) Stow ammunition boxes in turret basket.
  - (c) Fasten and tighten straps on ammunition boxes.
- b. Stow remaining ammunition boxes in M3A3.
- (1) Stow two ammunition boxes under right front floor plate.
    - (a) Lift and turn three fasteners and remove right front floor plate.
    - (b) Stow two ammunition boxes under right front floor plate.
    - (c) Install right front floor plate and secure with three fasteners.  - (2) Stow 16 ammunition boxes on right floor plates.
    - (a) Unbuckle straps from 25-mm ammunition racks.
    - (b) Stow 16 ammunition boxes in 25-mm ammunition racks.
    - (c) Fasten and tighten straps on ammunition racks.  - (3) Stow eight ammunition boxes in left side of squad area.
    - (a) Lower backrest on left squad BASS seat.
    - (b) Unbuckle straps from 25-mm ammunition racks.
    - (c) Stow eight ammunition boxes in 25-mm ammunition racks.
    - (d) Fasten and tighten straps on ammunition boxes.  - (4) Stow six ammunition boxes in turret stowage basket.
    - (a) Unbuckle straps from turret basket.
    - (b) Stow ammunition boxes in turret basket.
    - (c) Fasten and tighten straps on ammunition boxes.
5. Stow tube launched, optically tracked, wire guided (TOW) missiles.

- a. Stow TOW missiles on M2A3.

**Note:** M2A3 holds a maximum of seven TOW missiles: five stowed and two in launcher.

- (1) Stow TOW missile in left-side missile rack.
  - (a) Fold down backrest on left-side squad BASS seat.
  - (b) Place missile in two saddles with nose end toward rear of vehicle.
  - (c) Rotate missile until electrical connector cover faces you.
  - (d) Secure missile with two straps.
  - (e) Rock missile to check that it is secure.
  - (f) Raise backrest on left-side squad BASS seat.
- (2) Stow two TOW missiles under right-side squad BASS seat.
  - (a) Raise right-side squad BASS seat.
  - (b) Place outboard missile in two saddles with nose end toward rear of vehicle.
  - (c) Rotate missile until electrical connector cover faces you.
  - (d) Secure missile with two straps.
  - (e) Place inboard missile in two saddles with nose end toward rear of vehicle.
  - (f) Rotate missile until electrical connector cover faces you.
  - (g) Secure missile with two straps.
  - (h) Rock two missiles to check that they are secure.
  - (i) Lower right-side squad BASS seat.

**WARNING**

**Missile racks can spring up and hit you. Hold rack with one hand when releasing latches.**

- b. Stow TOW missiles on M3A3.

**Note:** M3A3 holds a maximum of 12 TOW missiles: 10 stowed and 2 in launcher.

- (1) Push down on two release levers and unhook latches.

**Note:** Carefully allow missile rack arms to spring back toward hull (start with upper missile rack arms).

- (2) Stow TOW missiles in lower missile rack.

- (a) Strap bottom middle missile rack arms out of way by hooking straps of upper missile rack arms to rungs of bottom middle missile rack arms.
  - (b) Place missile in saddles with nose end toward rear of vehicle.
  - (c) Rotate missile until any protruding exterior features are not contacting saddles.
  - (d) Stagger missiles in lower missile rack.
  - (e) Lower top arms of lower missile rack.
  - (f) Lower bottom arms of middle missile rack.
  - (g) Hook latches on rungs and tighten straps.
  - (h) Push down on release levers to lock straps.
- (3) Stow TOW missiles in middle missile rack.
- (a) Raise and hold top arms of middle missile rack up and out of way.
  - (b) Place missile in saddles with nose end toward rear of vehicle.
  - (c) Rotate missile until any protruding exterior features are not contacting saddles.
  - (d) Stagger missiles in middle missile rack.
  - (e) Lower top arms of middle missile rack
  - (f) Hook latches on lower rungs and tighten straps.
  - (g) Push down on release levers to lock straps.
- (4) Stow TOW missiles in upper missile rack.
- (a) Place missile in saddles with nose end toward rear of vehicle.
  - (b) Rotate missile until any protruding exterior features are not contacting saddles.
  - (c) Stagger missiles in upper missile rack.
  - (d) Lower upper missile rack arms.
  - (e) Hook latches on upper rungs and tighten straps.
  - (f) Push down on release levers to lock straps.
- (5) Stow TOW missile on top of upper missile rack.
- (a) Place missile in saddles on top of upper missile rack with nose end toward rear of vehicle.
  - (b) Rotate missile until any protruding exterior features are not contacting saddles.
  - (c) Place two straps over missile and hook latches on inner rungs.

- (d) Tighten straps and push down on release levers to lock in place.
6. Stow AT4 missiles in M2A3.
    - a. Stow two AT4 missiles under left-side squad BASS seats.
      - (1) Raise left-side squad BASS seats.
      - (2) Place outboard missile on two saddles with nose end toward rear of vehicle.
      - (3) Rotate missile until trigger housing faces you.
      - (4) Place inboard missile on two saddles with nose end toward rear of vehicle.
      - (5) Rotate missile until trigger housing faces you.
      - (6) Secure two missiles with straps.
      - (7) Rock missiles to check that they are secure.
      - (8) Lower left-side squad BASS seats.
    - b. Stow AT4 missile above right-side sponson.
      - (1) Position missile on two missile brackets with nose end toward rear of vehicle.
      - (2) Rotate missile until trigger housing faces you.
      - (3) Secure missile with two straps.
      - (4) Rock missile to check that it is secure.
  7. Stow Javelin missiles in M2A3.
    - a. Fold down backrest on left-side squad BASS seat.
    - b. Stow Javlin in outboard left-side missile rack.
      - (1) Place missile in outboard saddles with nose end toward rear of vehicle.
      - (2) Rotate missile until electrical connector faces you.
      - (3) Secure missile with two straps.
      - (4) Rock missile to check that it is secure.
    - c. Stow Javlin missile in upper left-side missile rack.
      - (1) Lower upper missile support and secure with two straps.
      - (2) Place missile in upper saddles with nose end toward rear of vehicle.
      - (3) Rotate missile until electrical connector faces you.
      - (4) Secure missile with two straps.

- (5) Rock missile to check that it is secure.
- d. Raise backrest on left-side squad bench seat.

Performance Measures	GO	NO-GO
1. Lowered ramp.	_____	_____
2. Stacked HE and AP ammo boxes in separate stacks on ramp or on ground nearby.	_____	_____
3. Stowed 25-mm ammunition in hotbox.	_____	_____
4. Stowed remaining 25-mm ammunition.	_____	_____
5. Stowed TOW missiles.	_____	_____
6. Stowed AT4 missiles.	_____	_____
7. Stowed Javelin missiles.	_____	_____

References Required	Primary
TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull	

**171-132-1019**

**Stow Ammunition on an M2A2 or M3A2 Bradley Fighting Vehicle**

**DANGER**

Ammunition can explode when mishandled or exposed to heat. Handle ammunition with care. Do not drop ammunition or bump primers. Keep ammunition away from electrical sparks and high heat. Do not use or handle damaged ammunition.

**WARNING**

Unsecured missiles can fall and strike personnel during vehicle operation. Make sure stowage clamps securely hold missiles.

The M919 sabot round uses a depleted uranium penetrator which emits low levels of radiation. Wear gloves when handling depleted uranium or M919 rounds. Wash hands before eating or touching your face. If depleted uranium corrosion (yellow or white powder or stain) is visible on the surface of the round, dispose of gloves in accordance with AR 385-10.

**CAUTION**

Missiles in cases are easily damaged. Handle missiles with care. Do not drop missiles.

**Conditions:** You are a crewmember on an M2A2 or M3A2 Bradley fighting vehicle (known as BFV) preparing for a mission and must stow the ammunition on the vehicle. You have a vehicle load plan and have been issued a basic load of ammunition.

**Standards:** Stow a basic load of ammunition on the M2A2 or M3A2 BFV.

**Performance Steps**

1. Lower ramp.
2. Stow 25-millimeter (mm) ammunition under floor plates.
  - a. Stow squad seats in the up position.
  - b. Stack ammunition boxes by type on the ramp or ground nearby.
  - c. Remove three ammunition containers from floor.
    - (1) Lift and turn fasteners that secure the floor plates.
    - (2) Remove floor plates.
    - (3) With assistant, remove ammunition containers from floor.

**Notes:** Twenty boxes of 25-mm ammunition can be stowed in M2A2. Five boxes are loaded into three ammunition containers. Fifteen boxes are stowed throughout vehicle.

Thirty-five boxes of 25-mm ammunition can be stowed in M3A2. Five boxes are loaded into three ammunition containers. Thirty boxes are stowed throughout vehicle.

- d. Loading high-explosive (HE) ammunition.
    - (1) Link 50 rounds of HE ammunition.
    - (2) Release three fasteners and open lid on ammunition container.
    - (3) Starting from back of container, lay 17 rounds of HE ammunition with projectile facing right and links down.
    - (4) With projectile facing right and links up, lay 17 rounds in second layer.
    - (5) With projectile facing right and links down, lay 16 rounds in third and final layer with an empty link at the end.
    - (6) Close lid and fasten three fasteners.
  - e. Loading armor-piercing (known as AP) ammunition.
    - (1) Link 50 rounds of AP ammunition.
    - (2) Release three fasteners and open lid on ammunition container.
    - (3) Starting from back of container, lay 17 rounds of AP ammunition with projectile facing left and links up.
    - (4) With projectile facing left and links up, lay 17 rounds in second layer.
    - (5) With projectile facing left and links up, lay 16 rounds in third and final layer with an empty link at the end.
    - (6) Close lid and fasten three fasteners.
  - f. With assistant, stow three ammunition box containers with hinged door toward front of vehicle.
  - g. Install floor plates and secure with fasteners.
3. Stow remaining ammunition boxes.
- a. Stow remaining ammunition boxes M2A2.
    - (1) Stow two ammunition boxes under right front floor plate.
      - (a) Lift and turn three fasteners and remove right front floor plate.
      - (b) Stow two ammunition boxes under right front floor plate.
      - (c) Install right front floor plate and secure with three fasteners.
      - (d) Lower right squad bench seat and secure with strap.

- (2) Stow seven ammunition boxes in right side of squad area.
    - (a) Lower backrest on right squad bench seat.
    - (b) Unbuckle straps from 25-mm ammunition racks.
    - (c) Stow seven ammunition boxes on top of 25-mm ammunition racks.
    - (d) Fasten and tighten straps on ammunition boxes.
    - (e) Raise backrest on right squad bench seat.
  - (3) Stow six ammunition boxes in turret stowage basket.
    - (a) Unbuckle straps from turret basket.
    - (b) Stow six ammunition boxes in turret basket.
    - (c) Fasten and tighten straps on ammunition boxes.
    - (d) Lower squad seat.
- b. Stow remaining ammunition boxes M3A2.
- (1) Stow two ammunition boxes under right front floor plate.
    - (a) Lift and turn three fasteners and remove right front floor plate.
    - (b) Stow two ammunition boxes under right front floor plate.
    - (c) Install right front floor plate and secure with three fasteners.
  - (2) Stow 16 ammunition boxes on right front floor plate.
    - (a) Unbuckle straps from 25-mm ammunition racks.
    - (b) Stow 16 ammunition boxes in ammunition racks.
    - (c) Fasten and tighten straps on ammunition racks.
  - (3) Stow eight ammunition boxes in left side of squad area.
    - (a) Lower backrest on left squad bench seat.
    - (b) Unbuckle straps from 25-mm ammunition racks.
    - (c) Stow eight ammunition boxes in 25-mm ammunition racks.
    - (d) Fasten and tighten straps on ammunition boxes.
  - (4) Stow nine ammunition boxes in turret stowage basket.
    - (a) Unbuckle straps from turret basket.
    - (b) Stow nine ammunition boxes in turret basket.

- (c) Fasten and tighten straps on ammunition boxes.
  - (d) Lower squad seat.
4. Stow tube launched, optically tracked, wire guided (TOW) missiles.
- a. Stow TOW missiles M2A2.

**Note:** M2A2 holds a maximum of seven TOW missiles: five stowed and two in TOW launcher.

- (1) Stow TOW missile in left-side missile rack.
  - (a) Fold down backrest on left-side squad bench seat.
  - (b) Place missile in two saddles with nose end toward rear of vehicle.
  - (c) Rotate missile until electrical connector cover faces you.
  - (d) Secure missile with two straps.
  - (e) Rock missile to check that it is secure.
  - (f) Raise backrest on left-side squad bench seat.
- (2) Stow two TOW missiles under right-side squad bench seat.
  - (a) Raise right-side squad bench seat.
  - (b) Place outboard missile in two saddles with nose end facing rear of vehicle.
  - (c) Rotate missile until electrical connector cover faces you.
  - (d) Secure missile with two straps.
  - (e) Place inboard missile in two saddles with nose end toward rear of vehicle.
  - (f) Rotate missile until electrical connector cover faces you.
  - (g) Secure missile with two straps.
  - (h) Rock two missiles to check that they are secure.
  - (i) Lower right-side squad bench seat.

**WARNING**

**Missile racks can spring up and hit you. Hold rack with one hand when releasing latches.**

- b. Stow TOW missiles M3A2.

**Note:** M3A2 holds a maximum of 12 TOW missiles: 10 stowed and 2 in launcher.

- (1) Unhook straps on missile rack arms.
  - (a) Pull up on two release levers and unhook latches on lower missile rack and slowly allow top arms to spring back toward hull.
  - (b) Pull up on two release levers and unhook latches on middle missile rack.
  - (c) Push down on two release levers and unhook latches on upper missile rack and slowly allow arms to spring back toward hull.
  - (d) Push down on release levers and unhook latches on top missile rack.
- (2) Stow TOW missiles in lower missile rack.

**Note:** Three TOW missiles are stowed in lower missile rack. For ease of stowage, first TOW missile should be stowed in saddles closest to hull.

- (a) Strap bottom middle missile rack arms out of way by hooking straps of upper missile rack arms to rungs of bottom middle missile rack arms.
- (b) Place missile in saddles with nose end toward rear of vehicle.
- (c) Rotate TOW missile until electrical connector cover faces you.
- (d) Lower bottom arms of middle missile rack.
- (e) Lower top arms of lower missile rack.
- (f) Hook latches on lower rungs and tighten straps.
- (g) Push down on release levers.

- (3) Stow TOW missiles in middle missile rack.

**Note:** Three TOW missiles are stowed in middle missile rack. For ease of stowage, first TOW missile should be stowed in saddles closest to hull.

- (a) Raise and hold top arms of middle missile rack up and out of way.
- (b) Place TOW missile in saddles. Position TOW missile with nose end toward rear of vehicle.
- (c) Rotate TOW missile until electrical connector cover faces you.

- (d) Lower top arms of middle missile rack.
  - (e) Hook latches on lower rungs and tighten straps.
  - (f) Push down on release levers.
- (4) Stow TOW missiles in upper missile rack.

**Note:** Three TOW missiles are stowed in upper missile rack. For ease of stowage, first TOW missile should be stowed in saddles closest to hull.

- (a) Place TOW missile in saddles with nose end toward rear of vehicle.
- (b) Rotate TOW missile until electrical connector cover faces you.
- (c) Lower upper missile rack arms.
- (d) Hook latches on upper rungs and tighten straps.
- (e) Pull up on release lever.

- (5) Stow TOW missile on top of upper missile rack.

**Note:** One TOW missile is stored on top of upper missile rack.

- (a) Place TOW missile in saddles on top of upper missile rack with nose end toward rear of vehicle.
- (b) Rotate TOW missile until electrical connector cover faces you.
- (c) Place two straps over TOW missile, hook latches on inner rungs and tighten straps.
- (d) Pull up on release lever.

5. Stow AT4 missiles.

- a. Stow two AT4 missiles under left-side squad bench seats.
  - (1) Raise three left-side squad bench seats.
  - (2) Place outboard AT4 missile on two saddles with nose end toward rear of vehicle.
  - (3) Rotate missile until trigger housing faces you.
  - (4) Place inboard AT4 missile on two saddles with nose end toward rear of vehicle.
  - (5) Rotate missile until trigger housing faces you.
  - (6) Secure two AT4 missiles with straps.
  - (7) Rock two AT4 missiles to check that they are secure.
  - (8) Lower three left-side squad bench seats.
- b. Stow AT4 missile above right-side sponson.

- (1) Position AT4 missile on two missile brackets with nose end toward rear of vehicle.
- (2) Rotate missile until trigger housing faces you.
- (3) Secure AT4 missile with two straps.
- (4) Rock AT4 missile to check that it is secure.

6. Stow Javelin missile in M2A2.

**Notes:** The M2A2 can have a maximum of two Javelin missiles stowed.

Do not stow Javelin missile in inboard missile rack. Missile will interfere with backrest on squad bench seat.

- a. Stow Javelin missile in outboard left-side missile rack.
  - (1) Fold down backrest on left-side squad bench seat.
  - (2) Place Javelin missile in outboard saddles with nose end toward rear of vehicle.
  - (3) Rotate Javelin missile until electrical connector faces you.
  - (4) Secure Javelin missile with two straps.
  - (5) Rock Javelin missile to check that it is secure.
  - (6) Raise backrest on left-side squad bench seat.
- b. Stow Javelin missile in upper left-side missile rack.
  - (1) Fold down backrest on left-side squad bench seat.
  - (2) Lower upper missile support and secure with two straps.
  - (3) Place Javelin missile in upper saddles with nose end toward rear of vehicle.
  - (4) Rotate Javelin missile until electrical connector faces you.
  - (5) Secure Javelin missile with two straps.
  - (6) Rock Javelin missile to check that it is secure.
  - (7) Raise backrest on left-side squad bench seat.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Lowered ramp.	_____	_____
2. Stowed 25-mm ammunition under floor plates.	_____	_____
3. Stowed remaining ammunition boxes.	_____	_____
4. Stowed TOW missiles.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Stowed AT4 missiles.	_____	_____
6. Stowed Javelin missile in M2A2.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull	

**071-034-0005**

**Load the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle**

**DANGER**

**Static discharge from transmitting radios or counter radio-controlled improvised explosive device electronic warfare (CREW) equipment could cause smoke grenades to detonate. Ensure radios and CREW equipment are powered off prior to handling and reloading smoke grenades.**

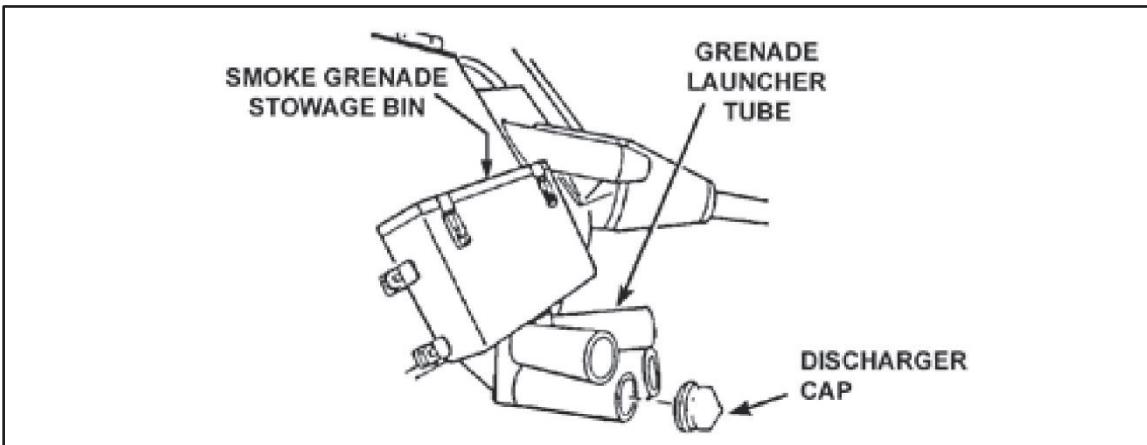
**Conditions:** You are a gunner on a Bradley fighting vehicle (known as BFV) and have been directed to load the M257 smoke grenade launchers. You have been issued the smoke grenades.

**Standards:** Load the M257 smoke grenade launchers on a BFV.

**Note:** There is no interior stowage for smoke grenades; they must be loaded when they are received.

**Performance Steps**

1. Depress gun rotor to maximum depression while in power mode.
2. Set turret travel lock.
3. Move turret drive system switch to OFF.
4. Move turret power switch to OFF.
5. Move master power switch to OFF.
6. Open the smoke grenade stowage bins (see figure 3-136).
  - a. Unlatch and open the lids to the smoke grenade stowage bins.
  - b. Ensure the bins are free of debris.
7. Prepare the smoke grenade launchers.
  - a. Remove the discharger cap from the eight launch tubes. (See figure 3-136.)
  - b. Check that each grenade launcher tube is free of damage or debris.



**Figure 3-136. Smoke grenade stowage bins and launchers**

### DANGER

**Do NOT maintain and clean damaged grenades; the red phosphorus can cause severe burns if the round explodes. Keep grenades away from electrical sparks and high heat. Do NOT drop or throw them. Do NOT force grenades into tubes. Death or injury could occur.**

**Mishandled smoke grenades can explode. Exploding smoke grenades can kill or seriously injure Soldiers. Do not drop grenades or expose to heat. Never put any part of your body in front of loaded launcher tubes. Handle grenades with care when loading and unloading launcher tubes. Make sure that VEHICLE MASTER POWER and GRENADE LAUNCHER POWER switches are off before loading and unloading grenades.**

8. Unpack the smoke grenades.

**Note:** There are four smoke grenades in each ammunition box.

- a. Open ammunition boxes.
- b. Remove packing material carefully.
- c. Remove smoke grenades, one at a time.

### DANGER

**Smoke grenades can launch unexpectedly and injure or kill Soldiers.**

**WARNING**

**Keep turret pointed downrange when grenades are loaded in launcher. Make sure VEHICLE MASTER POWER and GRENADE LAUNCHER POWER switches are off. Do not place any part of your body in front of launcher tubes when loading or unloading grenades.**

9. Stow eight smoke grenades in the smoke grenade stowage bins.
  - a. Carefully insert four smoke grenades, with metal ends down, one at a time into each of the smoke grenade stowage bins.
  - b. Close and latch smoke grenade stowage bins.
10. Load the smoke grenades into the launcher tubes.
  - a. Carefully insert the smoke grenade, with the metal end down.
  - b. Gentle push the grenade in until you feel two clicks.

**Note:** This tells you that the grenade is seated.

  - c. Turn the grenade one-half turn to ensure it has a good electrical contact.
  - d. Repeat process for each grenade.
11. Install the discharger caps on the grenade launcher tubes.

Performance Measures	GO	NO-GO
1. Depressed gun rotor to maximum depression while in power mode.	_____	_____
2. Set turret travel lock.	_____	_____
3. Moved turret drive system switch to OFF.	_____	_____
4. Moved turret power switch to OFF.	_____	_____
5. Moved master power switch to OFF.	_____	_____
6. Opened the smoke grenade stowage bins.	_____	_____
7. Prepared the smoke grenade launchers.	_____	_____
8. Unpacked the smoke grenades.	_____	_____
9. Stowed eight smoke grenades in the smoke grenade stowage bins.	_____	_____
10. Loaded the smoke grenades into the launcher tubes.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
11. Installed the discharger caps on the grenade launcher tubes.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret	
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret		

**071-034-0006**

## **Unload the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle**

**Conditions:** You are a crewman on a Bradley fighting vehicle with an operational M257 smoke grenade launcher and smoke grenades. You have been directed to unload the M257 grenade launcher.

**Standards:** Unload the launch tubes and stow smoke grenades in the stowage bins.

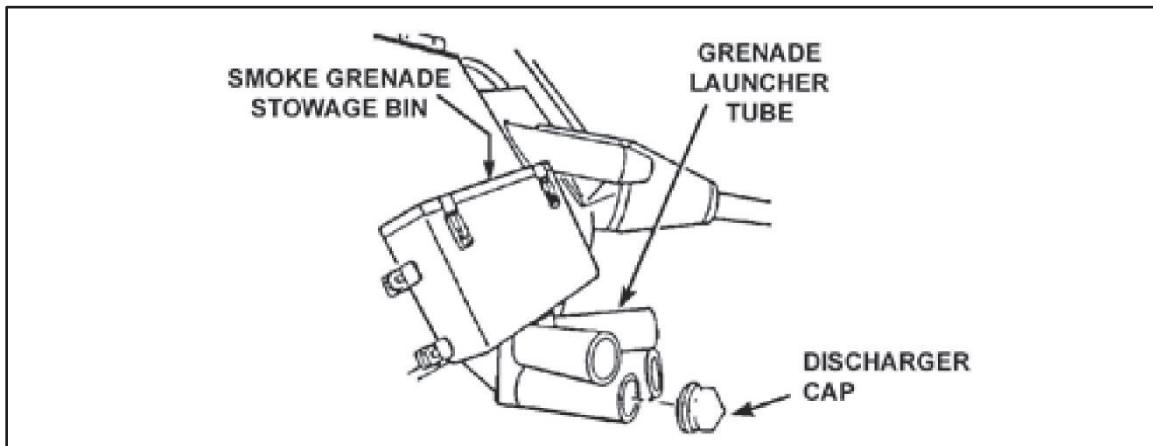
### **Performance Steps**

1. Set gun to maximum depression.
2. Engage travel lock.
3. Move turret drive switch to OFF.
4. Move turret power switch to OFF.
5. Have driver move master power switch to OFF.

### **DANGER**

**Do NOT put any part of your body in front of the loaded tubes.  
Death or injury could occur.**

6. Open smoke grenade stowage box.
  - a. Inspect stowage box for debris.
  - b. Clean stowage box if necessary.
7. Unload the launch tubes (see figure 3-137).



**Figure 3-137. Smoke grenade and launcher**

- a. Remove discharge caps from launch tubes.

- b. Remove the smoke grenades from grenade launcher tube.
- (1) Straddle the smoke grenade launch tubes.
  - (2) Grasp the grenade with the thumb and first finger and pull while twisting to the left (counterclockwise).
  - (3) Lift the grenade out of the launch tube.
  - (4) Repeat the steps above to unload all eight launch tubes.
8. Stow smoke grenades with metal end pointing down in stowage bins.
- Note:** Four smoke grenades can fit in each stowage bin.
9. Reinstall the discharger caps.

Performance Measures	GO	NO-GO
1. Set gun to maximum depression.	_____	_____
2. Engaged the travel lock.	_____	_____
3. Moved turret drive switch to OFF.	_____	_____
4. Moved turret power switch to OFF.	_____	_____
5. Had the driver move the master power switch to OFF.	_____	_____
6. Open smoke grenade stowage box.	_____	_____
7. Unloaded the launch tubes.	_____	_____
8. Stowed smoke grenades with metal end pointing down in stowage bins.	_____	_____
9. Reinstalled the discharger caps.	_____	_____

References Required	Primary
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01-248-7620) (EIC: ALH) Turret	

**071-034-0008**

**Maintain an M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle**

**Conditions:** You are a crewmember on a Bradley fighting vehicle (known as BFV) that is performing operator maintenance and you have been directed to clean and service the M257 smoke grenade launchers. You have all the cleaning equipment and supplies required.

**Standards:** Ensure vehicle power is off. Clean the smoke grenade launcher by removing all grease, dirt, and debris. Inspect the smoke grenade launcher for serviceability and report any deficiencies to the supervisor.

**Performance Steps**

1. Ensure vehicle power is off.
  - a. Ensure vehicle master power switch is in the OFF position.
  - b. Ensure vehicle turret power switch is in the OFF position.
  - c. Ensure vehicle turret drive system switch is in the OFF position.
  - d. Ensure the vehicle power-on indicators are not lit.
2. Remove rubber caps from the smoke grenade launcher tubes.
3. Clean drain holes.
  - a. Use a pipe cleaner to get into the drain hole at the bottom of each tube.
  - b. Clean out any dirt and debris.
4. Clean inside of smoke grenade launcher tubes.
  - a. Use rifle bore cleaner on a 25-millimeter bore brush.
  - b. Wipe dry with a dry, soft cloth.
5. Inspect smoke grenade launcher tubes for any damage, such as crushed or bent tubes.
6. Ensure electrical firing pin is not corroded and smoke grenade launcher is securely mounted.
7. Install rubber caps on the smoke grenade launcher tubes.
8. Report any deficiencies to supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured vehicle power was off.	_____	_____
2. Removed rubber caps from the smoke grenade launcher tubes.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
3. Cleaned drain holes.	_____	_____
4. Cleaned inside smoke grenade launcher tubes.	_____	_____
5. Inspected smoke grenade launcher tubes.	_____	_____
6. Ensured electrical firing pin was not corroded and smoke grenade launcher was securely mounted.	_____	_____
7. Installed rubber caps on the smoke grenade launcher tubes.	_____	_____
8. Reported any deficiencies to supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01-248-7620) (EIC: ALH) Turret	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret

**071-324-6027**  
**Extinguish a Fire on a Bradley Fighting Vehicle**

**DANGER**

**Carbon dioxide discharged from portable fire extinguishers may result in dizziness, severe injury, or death. A chemical, biological, radiological, and nuclear (CBRN) mask will not protect personnel from carbon dioxide. If possible, have crew exit vehicle or open hatches before discharging extinguisher within vehicle.**

**WARNING**

**Hydrogen fluoride is produced when Halon or FM 200 is discharged onto a fire. Hydrogen fluoride can burn your skin and lungs. Avoid breathing fumes and evacuate vehicle immediately following discharge of fire suppression system.**

**Hydrogen fluoride is produced if Halon or FM 200 are burned through the engine. Hydrogen fluoride is very toxic and can burn your skin and lungs. Stop engine before discharging engine fire suppression system. Avoid engine exhaust if extinguisher is discharged with engine running.**

**You can get burned when you open engine access door during an engine fire. DO NOT open engine access door during an engine fire.**

**Accidental discharge of fire bottles can seriously injure you. Deactivate fire suppression system and insert anti-recoil plugs and safety pins before you work near fire bottles.**

**Vehicles impacted by depleted uranium munitions or burned vehicles uploaded with M919 depleted uranium rounds may be contaminated with uranium oxide dust. Personnel should refrain from unnecessary entry into such vehicles.**

**Fire suppression agent can irritate your throat and eyes. Prolonged exposure can make you dizzy. After discharging fire suppression system, open hatch covers and turn on vent fans, or get all Soldiers out of the vehicle within 5 minutes.**

**Conditions:** You are a driver or squad member on a Bradley fighting vehicle conducting operations and detect a fire on the vehicle.

**Standards:** Alert crew and extinguish fire using onboard and/or portable fire suppression systems.

**Note:** For Bradley vehicles that have been hit in combat by depleted uranium munitions or burned while M919 depleted uranium rounds were uploaded, refer to TB 9-1300-278. To recover vehicles that have been hit in combat or burned with TB 9-1300-278 rounds uploaded, contact your chain of command in accordance with AR 700-48.

## Performance Steps

1. Alert crew and squad members.
2. Stop the engine (driver).

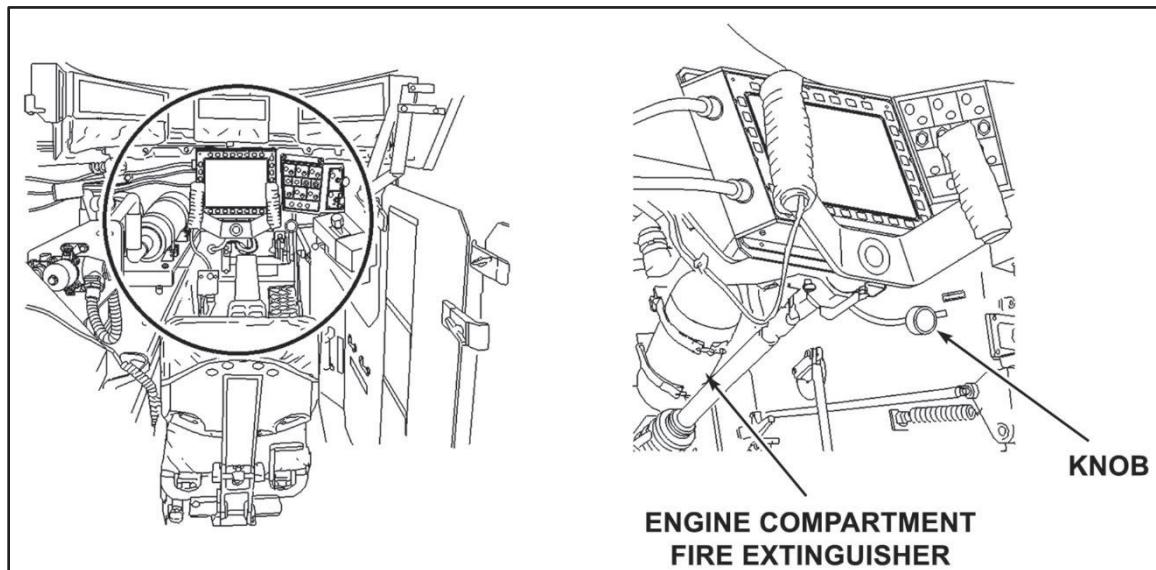
**Note:** Bradley commander will direct crew and squad members to either put on protective masks or exit the vehicle, based on the operational situation.

3. Put on CBRN protective mask before discharging fire extinguisher.
4. Extinguish an engine fire.

**Note:** Engine compartment fire extinguisher system is not automatic. It must be manually operated from inside or outside the vehicle.

- a. Extinguish engine fire from driver's compartment.

- (1) Turn the knob to left to activate engine compartment fire extinguisher. (See figure 3-138.)

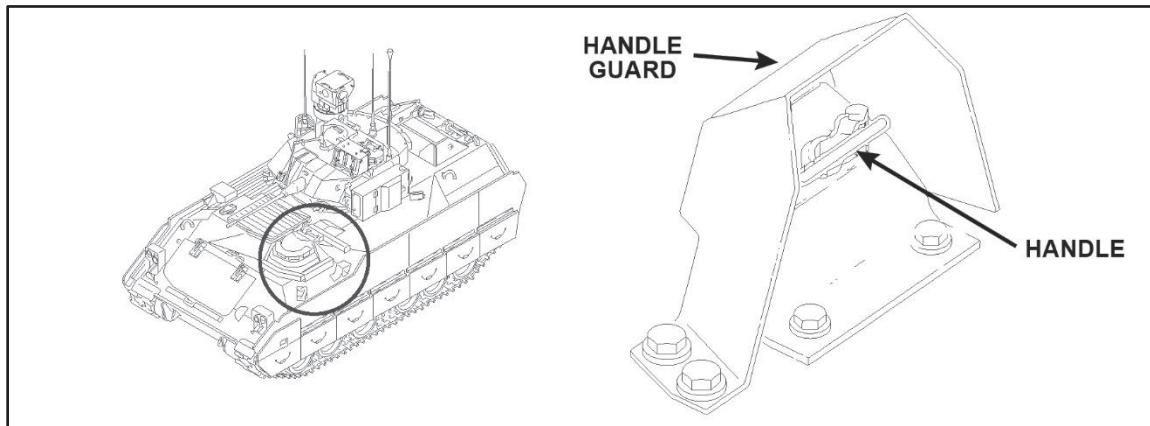


**Figure 3-138. Engine compartment fire extinguisher**

- (2) Exit vehicle as soon as possible.
- b. Extinguish engine fire from outside vehicle. (See figure 3-139, page 3-398.)

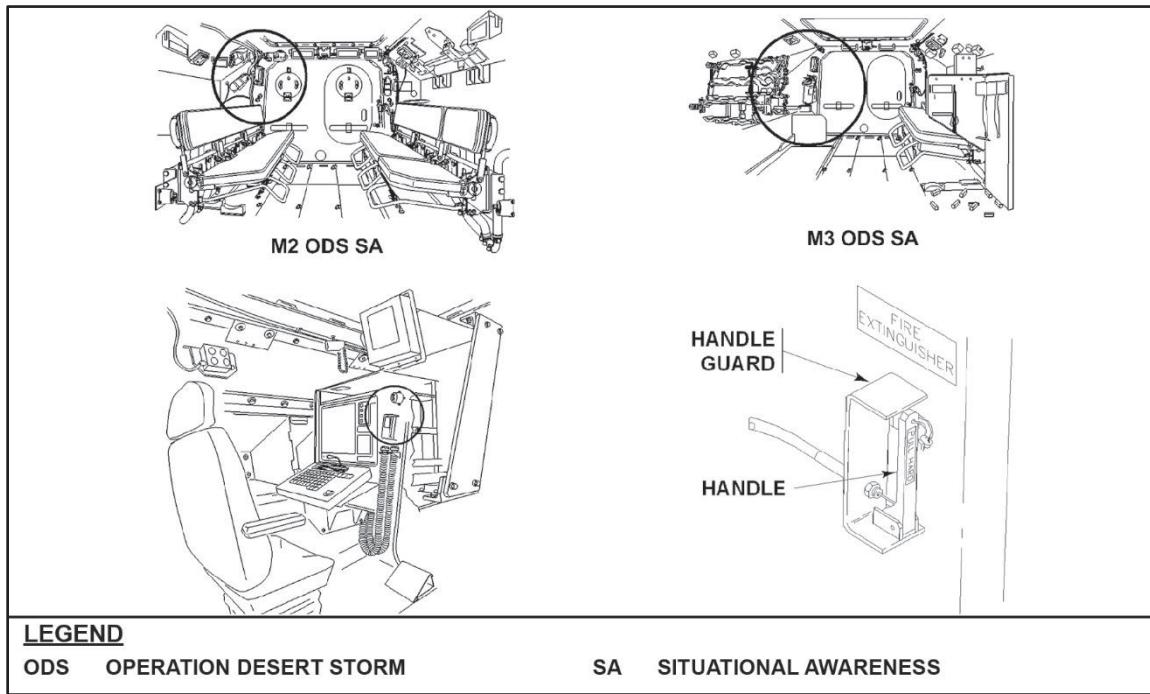
**Note:** Bradley commander will direct crew and squad where to exit vehicle.

- (1) Lower ramp, if required.
- (2) Ensure all crewmembers have exited the vehicle.
- (3) Reach under handle guard.
- (4) Pull handle.



**Figure 3-139. Exterior engine fire suppression handle**

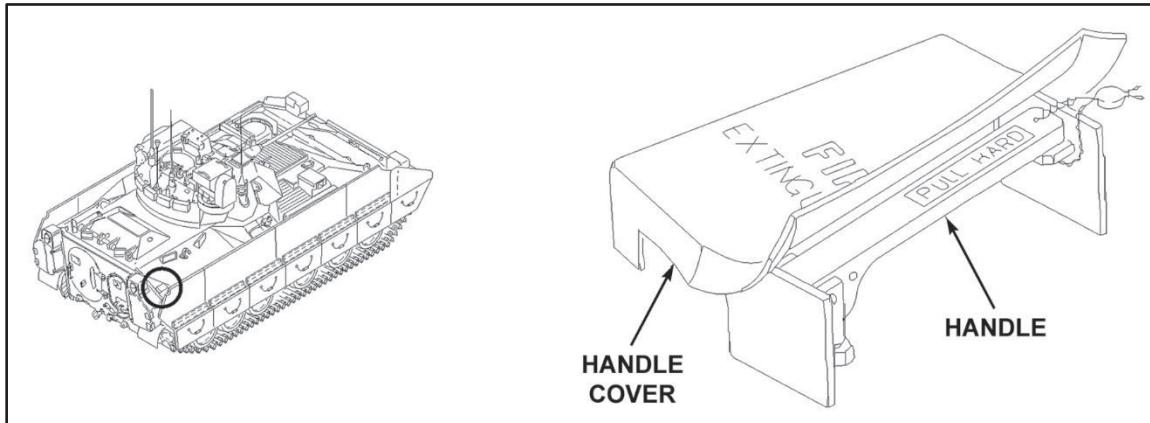
5. Extinguish a fire in the squad area.
  - a. Extinguish squad area fire from inside. (See figure 3-140.)
    - (1) Ensure all crew and squad members have on a CBRN protective mask.
    - (2) Lower ramp or open hatches/troop door based on the vehicle commander's instructions.
    - (3) Alert crew to exit the vehicle.
    - (4) Reach into handle guard.
    - (5) Pull handle.



**Figure 3-140. Interior crew area fire extinguisher**

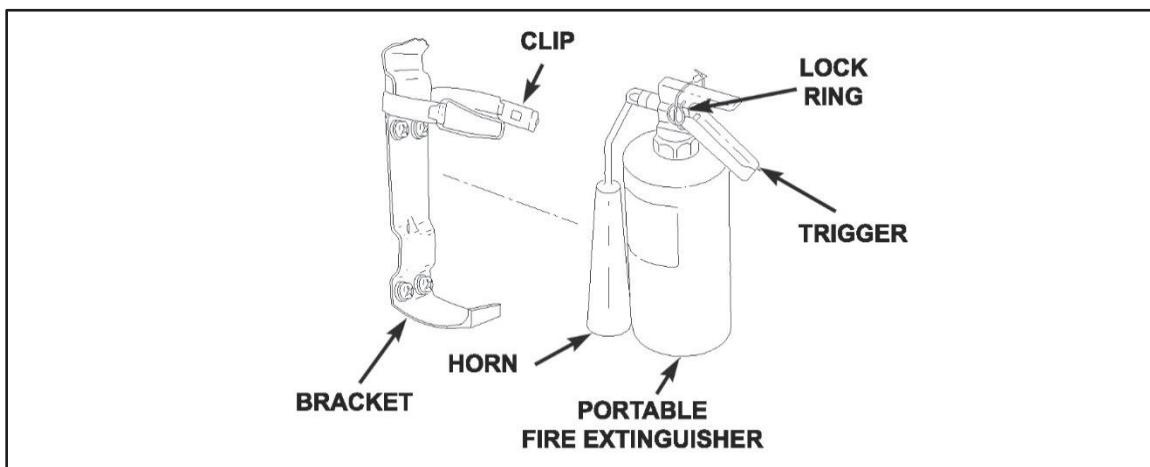
- (6) Exit the vehicle.
- b. Extinguish crew area fire from outside. (See figure 3-141.)
  - (1) Ensure all crewmembers have exited the vehicle.
  - (2) Reach under handle guard.
  - (3) Pull handle to activate squad area fire extinguisher.

**Note:** Handle must be pulled 8–12 inches to activate.



**Figure 3-141. Exterior crew fire suppression handle**

6. Extinguish fire using a portable fire extinguisher.
  - a. Release the clip on bracket to remove portable fire extinguisher. (See figure 3-142.)
  - b. Pull the lock ring from extinguisher.
  - c. Point the horn at base of fire.
  - d. Squeeze the trigger to discharge.



**Figure 3-142. Portable fire extinguisher**

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Alerted crew and squad members.	_____	_____
2. Stopped the engine (driver).	_____	_____
3. Donned CBRN protective mask before discharging fire extinguisher.	_____	_____
4. Extinguished an engine fire.	_____	_____
5. Extinguished a fire in the squad area.	_____	_____

<b>References Required</b>	<b>Primary</b>
AR 700-48 Management of Equipment Contaminated with Depleted Uranium or Radioactive Commodities	TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull
TB 9-1300-278 Guidelines for Safe Response to Handling, Storage, and Transportation Accidents Involving Army Tank Munitions Or Armor Which Contain Depleted Uranium	
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull	

**071-056-0001****Load the TOW Missile Launcher on a Bradley Fighting Vehicle****CAUTION**

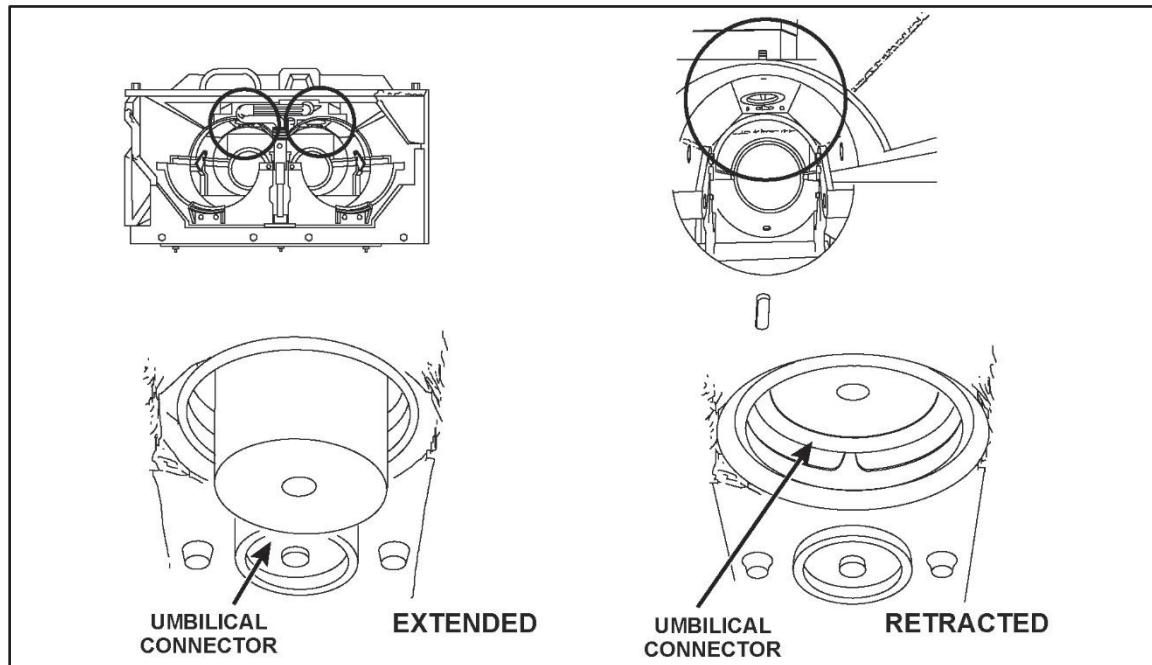
Handle the tube launched, optically tracked, wire guided (TOW) missile with extreme care to avoid damage to the plastic diaphragm at each end. If a TOW missile with a damaged diaphragm is loaded, it could misfire.

**Conditions:** You are a crewmember on a Bradley fighting vehicle and have been directed to load the TOW missile launcher. The turret is set to TOW load, turret drive is off, and travel lock is on.

**Standards:** Load the TOW missile launcher.

**Performance Steps**

1. Open the cargo hatch to the mid position.
2. Prepare the TOW launcher for loading.
  - a. Remove the dust cover from the TOW launcher, if present.
  - b. Push and hold the lock handles.
  - c. Pull down the loading handles to align the lug channels in the missile tubes.
  - d. Release the handle lock.
3. Inspect the TOW missile launch tubes.
  - a. Remove all obstructions, such as leaves and dirt, if present.
  - b. Verify that umbilical connectors do not extend down into the tubes. (See figure 3-143, page 3-402.)

**Figure 3-143. Umbilical connector**

- c. If umbilical connector is extended, inform gunner.
- 4. Unstow a TOW missile from stowage.
  - a. Remove the forward handling ring from the nose end of the TOW missile.
  - b. Remove the electrical connector cover from the TOW electrical connector.

**Note:** Save the forward handling rings and electrical connector covers for reuse if unfired TOW missiles are unloaded at a later date.

- 5. Inspect the TOW missile.

### WARNING

**Except in combat situations, do not load a TOW missile if the diaphragm is damaged, the electrical connector is damaged, or if humidity indicator on the rear diaphragm is pink. Damaged TOW missiles can hangfire.**

- a. Ensure that the nose and rear diaphragms are not damaged.
- b. Ensure that the humidity indicator is not pink.

**Note:** The humidity indicator should be blue or white.

- c. Ensure that the electrical connector is not damaged.

6. Load a TOW missile into the left missile tube (missile tube 1).

**Note:** Missile tube 1 (left tube) should be loaded before loading tube 2 (right tube).

- a. Lift the TOW missile out through the cargo hatch nose end first, with the electrical connector facing upwards.
- b. Slide the lugs on the sides of the nose end of the TOW missile into the missile tube lug channels.
- c. Slide the TOW missile all the way into the missile tube.

**Note:** The lug channels in the missile tubes can get out of alignment and block the loading of the TOW missile. If the missile meets resistance about halfway into the missile tube, then realign the lug channels by pulling down hard on the locking handle.

- d. Hold the TOW missile in the tube.
- e. Push the locking handle up until it is engaged by the locking handle lock.
7. Load a second TOW missile, if required, by repeating loading process (steps 4 through 6).
8. Close the cargo hatch.
9. Informed gunner that TOW launcher is loaded.

Performance Measures	GO	NO-GO
1. Opened the cargo hatch to the mid position.	_____	_____
2. Prepared the TOW launcher.	_____	_____
3. Inspected the TOW missile launch tubes.	_____	_____
4. Unstowed a TOW missile from stowage.	_____	_____
5. Inspected the TOW missile.	_____	_____
6. Loaded a TOW missile into the left missile tube.	_____	_____
7. Loaded a second TOW missile, if required.	_____	_____
8. Closed the cargo hatch and announce when it is closed.	_____	_____
9. Informed gunner that TOW launcher was loaded.	_____	_____

References Required	Primary
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry, M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull	TM 9-2350-284-10-2 Operators Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01- 248-7619) (EIC: ALG) and Fighting Vehicle, Cavalry M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

<b>References Required</b>	<b>Primary</b>
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TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005)  
(EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull

**071-056-0002**  
**Unload TOW Missile Launcher on a Bradley Fighting Vehicle**

**CAUTION**

Handle the tube launched, optically tracked, wire guided (TOW) missile with extreme care to avoid damage to the plastic diaphragm at each end. A TOW missile with a damaged diaphragm can misfire.

**Conditions:** You are a crewmember on a Bradley fighting vehicle and you have been directed to unload the TOW missile launcher. The turret has been set to TOW load, turret drive is off, and travel lock is engaged.

**Standards:** Unload the TOW missile launcher.

**Performance Steps**

1. Open the cargo hatch to the mid position.
2. Unload the TOW missile tube 2.

**Note:** Missile tube 2 (right tube) should be unloaded before unloading tube 1 (left tube).

- a. Push and hold the lock latch on the loading handle.
  - b. Pull loading handle down.
  - c. Inform gunner to reset TOW system if loading handle will not release.
  - d. Release the lock latch, if the loading handle is all the way down.
  - e. Pull the TOW missile carefully out of the tube.
  - f. Place the TOW missile onto the floor of the crew compartment.
3. Inspect the TOW missile.

**WARNING**

**Except in combat situations, do not load a TOW missile if the diaphragm is damaged, the electrical connector is damaged, or if humidity indicator on the rear diaphragm is pink. Damaged TOW missiles can hangfire.**

- a. Ensure that the nose and rear diaphragms are not damaged.

**Note:** The rear diaphragm may be inspected while the TOW missile is still in the tube.

- b. Ensure that the humidity indicator is not pink.

**Note:** The humidity indicator should be blue or white.

- c. Ensure that the electrical connector is not damaged.
4. Stow the TOW missiles.
  - a. Install the forward handling ring onto the nose end of the TOW missiles.
  - b. Install the electrical connector cover onto the TOW electrical connector.

**Note:** The forward handling rings and electrical connector covers are saved for reuse when they are removed during the loading of the TOW missiles.

- c. Place the TOW missile into the appropriate stowage slot.
5. Unload a second TOW missile.
6. Install the dust cover onto the TOW missile launcher, if required.
7. Close the cargo hatch.
8. Inform gunner that TOW launcher is unloaded.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Opened the cargo hatch to the mid position.	—	—
2. Unloaded the TOW missile tube 2.	—	—
3. Inspected the TOW missile.	—	—
4. Stowed the TOW missiles.	—	—
5. Unload a second TOW missile.	—	—
6. Installed the dust cover onto the TOW missile launcher, if required.	—	—
7. Closed the cargo hatch.	—	—
8. Informed gunner that the TOW launcher was unloaded.	—	—

<b>References Required</b>	<b>Primary</b>
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TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

**071-316-3015****Remove a Misfired TOW Missile from a Bradley Fighting Vehicle****DANGER**

**Unexpected firing of a tube launched, optically tracked, wire guided (TOW) missile can kill or injure personnel and damage equipment. Ensure a misfired TOW is kept pointed in a safe direction for firing, away from friendly troops and equipment. Keep all personnel inside vehicle or 245 feet away from vehicle for 30 minutes after last firing attempt. Be sure that all hatches and ramp are closed.**

**Conditions:** You are a gunner on a Bradley fighting vehicle (known as BFV) engaging a target with the TOW missile. The TOW missile has misfired. You have performed immediate-action procedures and the TOW missile did not fire.

**Standards:** Prepare the BFV for misfire TOW removal. Remove the misfired TOW missile(s) from TOW missile launcher and hand to assisting crewmember. Ensure assisting crewmember places the misfired TOW missile in a safe, marked position. Inform your chain of command of the existence and location of the misfired TOW missile.

**Performance Steps****WARNING**

**The misfired missile is unload from outside the vehicle, not from the cargo hatch.**

1. Prepare the BFV for misfired TOW removal.

**Note:** The gunner notifies squad members which TOW missile misfired.

- a. Set the ARM-SAFE-RESET switch to SAFE. (See figure 3-144, page 3-408.)

**Note:** In a training environment, after setting the ARM-SAFE-RESET switch to SAFE, immediately set the turret power and the turret drive to OFF, wait 30 minutes, then resume the step after turning the turret power and the turret drive switches back to ON.

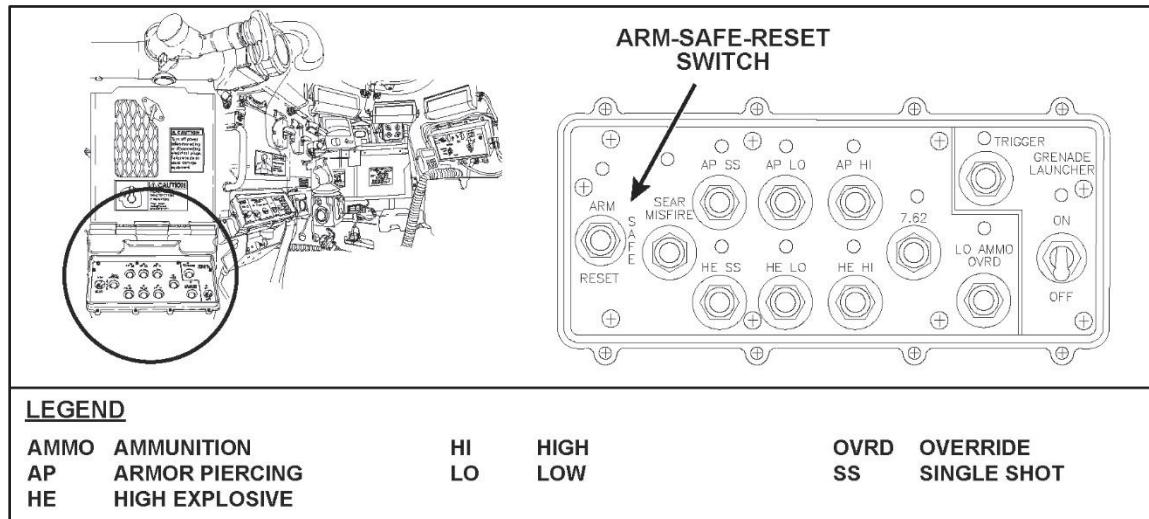
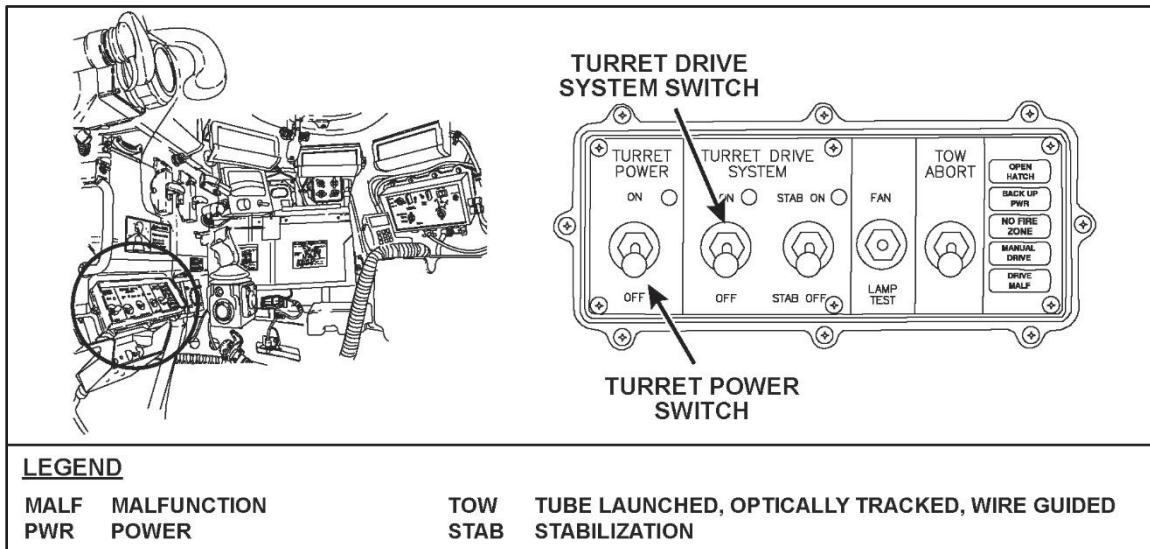


Figure 3-144. ARM-SAFE-RESET switch

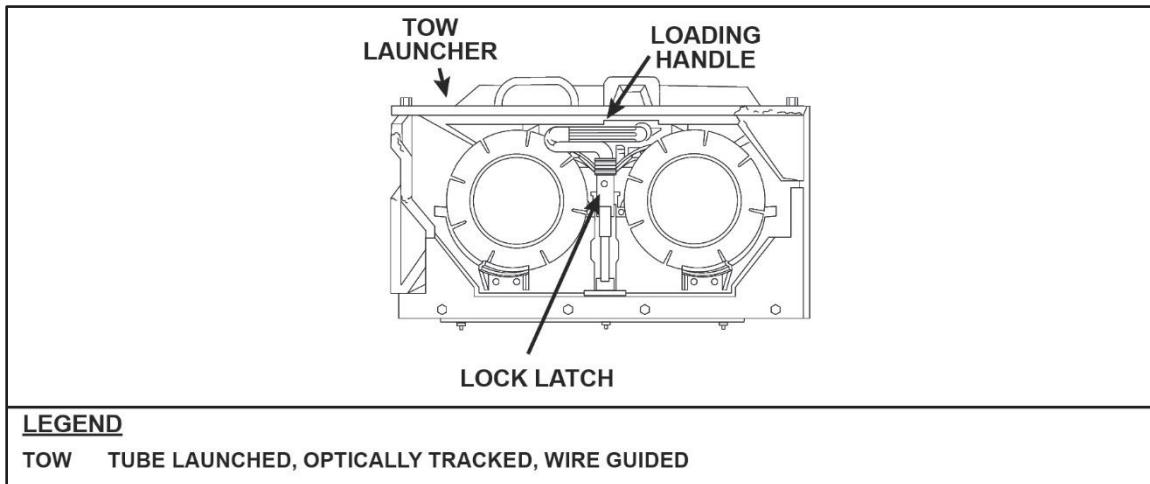
**WARNING**

The TOW missile must be kept pointed in a safe direction in case it fires and the backblast area must remain clear of friendly personnel and equipment. The BFV may need to pivot or move as the turret is traversed.

- b. Verify the BFV is in an appropriate position to traverse the turret to 1,600 mils or 4,800 mils (right angle to the BFV hull).
  - (1) Move to a better location, if appropriate.
  - (2) Ensure the BFV's position is acceptable.
- c. Traverse the turret to either 1,600 mils or 4,800 mils.
- d. Elevate the turret to maximum elevation.
- e. Set the TURRET DRIVE SYSTEM switch is OFF. (See figure 3-145.)
- f. Set the TURRET POWER to OFF. (See figure 3-145.)

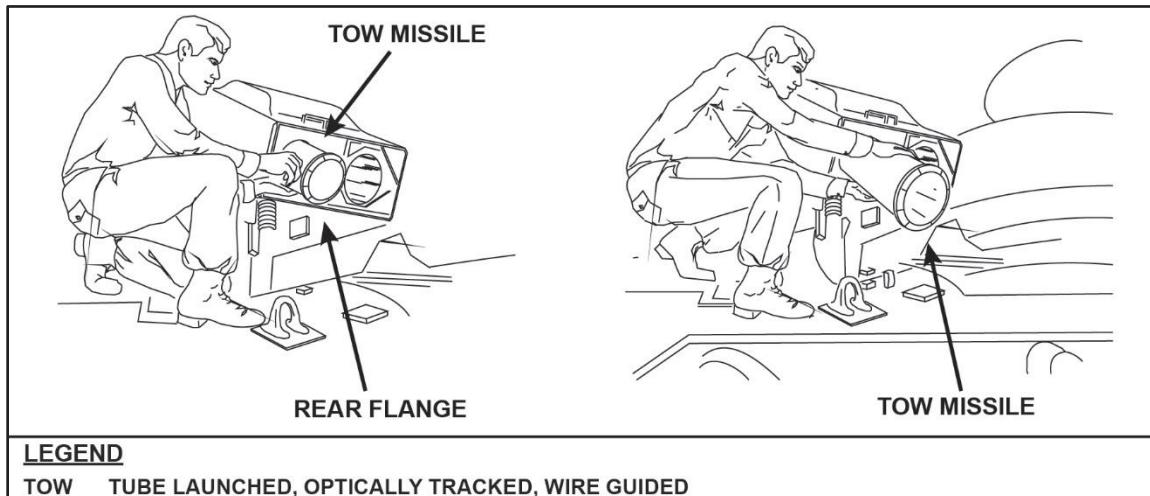
**Figure 3-145. TURRET DRIVE SYSTEM switch and TURRET POWER switch**

2. Remove the misfired TOW missile from the TOW missile launcher.
  - a. Exit the vehicle.
  - b. Climb on top of the hull and position yourself next to the TOW missile launcher.
  - c. Unlock the misfired TOW missile launcher. (See figure 3-146.)

**Figure 3-146. TOW missile launcher**

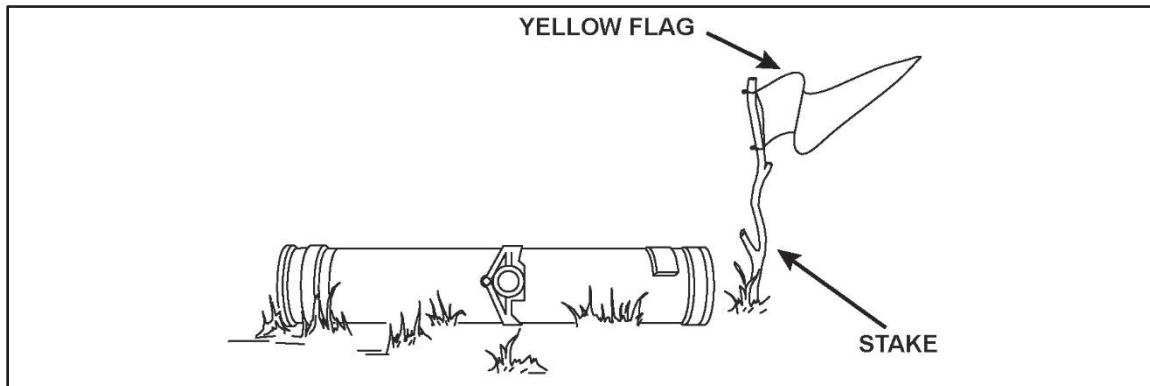
- d. Hold the misfired TOW missile by edges of rear flange. (See figure 3-147, page 3-410.)
- e. Pull the misfired TOW missile straight out of TOW launcher just under halfway.

**Note:** If TOW missile does not come out, notify chain of command of stuck TOW missile.



**Figure 3-147. Removal of TOW missile**

- f. Adjust hands, as required to hold the missile when fully removed.
- g. Pull the missile all the way out.
3. Keep the missile facing a safe direction.
4. Hand the missile to the assisting crewmember.
5. Direct the assisting crewmember to place the missile to a safe location.
  - a. Ensure the missile is at least 650 feet (200 meters) from vehicles, buildings, personnel, and equipment, while keeping the missile facing a safe direction.
  - b. Ensure the position of the missile so if the TOW missile fires, neither backblast nor TOW missile will strike vehicles, buildings, personnel, or equipment.
  - c. Ensure that a clearly visible yellow flag is at the location of the missile. (See figure 3-148.)



**Figure 3-148. Marking position of misfired TOW missile**

6. Notify the chain of command of existence and location of the misfired missile.

Performance Measures	GO	NO-GO
1. Prepared the BFV for misfired TOW removal.	_____	_____
2. Removed the misfired TOW missile from the TOW missile launcher.	_____	_____
3. Kept the missile facing a safe direction.	_____	_____
4. Handed the missile to the assisting crewmember.	_____	_____
5. Directed the assisting crewmember to place the missile to a safe location.	_____	_____
6. Notified chain of command of existence and location of the misfired missile.	_____	_____

References Required	Primary
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

**171-300-0061**

**Drive an Up-Armored High Mobility Multipurpose Wheeled Vehicle**

**WARNING**

**This vehicle has been designed to operate safely and efficiently within the limits specified in TM 9-2320-387-10. Operation beyond these limits is prohibited in accordance with AR 750-1 without written approval from the Commander, U.S. Army Tank Automotive and Armament Command, ATTN: AMSTA-CM-S, Warren, MI 48397-5000.**

**Conditions:** You are a driver of an up-armored high mobility multipurpose wheeled vehicle (HMMWV) with basic issue items and a requirement to drive the vehicle across varying terrain in various weather conditions. All before-operation checks and services have been performed. All auxiliary equipment and tools are stored for travel. The parking brake is set.

**Standards:** Drive the up-armored HMMWV across varying terrain and in various weather conditions. Observe all warnings and cautions to avoid injury to personnel or damage to equipment.

**Note:** The transmission range shift lever positions and the operating conditions under which they are normally used are—

- R (reverse)—clear of traffic and obstruction, using ground guide.
- N (neutral)—vehicle stopped with parking brake applied.
- D (drive)—normal driving and fording.
- 2 (second)—hill climbing and "engine braking" to slow vehicle when descending steep hills.
- 1 (first)—maximum "engine braking" when descending very steep hills, climbing steep hills, or driving through deep mud, sand, or snow.

The transfer case range shift lever positions and the operating conditions under which they would normally be used are—

- H (high range)—this drive range is selected whenever possible. High range should be used when operating on all primary, secondary, and off-road surfaces, where little or no wheel slippage exists, and when encountering sharp, continuous turns on high-traction surfaces.
- H / L (high lock range)—this drive range is selected for off-highway, hilly terrain, or when continuous wheel slippage is evident (for example, when operating in mud, snow, loose sand, or on ice) and increased control or additional traction is required.
- L (low range)—this drive range is selected only when high ranges do not provide sufficient power to negotiate steep hills or downgrades. This range is also used when the vehicle is mired and cannot be extracted using the high lock range.
- N (neutral)—this drive range is selected when vehicle is disabled and must be towed.

**Performance Steps**

1. Adjust the driver's seat.
2. Adjust the left and right rearview mirrors.

3. Ensure all windows are clean.

**WARNING**

**Two-point seat belts retract, but do not lock in any position.  
Three-point seat belts retract and will lock only during sudden  
stops or impact. Injury to personnel will result if an accident  
occurs and all slack from the seat belt adjusting strap has not  
been removed.**

4. Fasten and adjust the seat belt.

**Note:** Fasten unused seat belts to protect the belt ends from damage or dirt contamination.

5. Start the engine.

- a. Place the transmission shift lever in P (park) and the transfer case shift lever in the desired range.

**CAUTION**

Do not leave the rotary switch in RUN once the WAIT-TO-START lamp assembly goes out. Damage to the glow plugs and protective control box will result.

If the ambient temperature is above 0 degrees Fahrenheit (-18 degrees Celsius), do not operate the starter continuously for more than 20 seconds; wait 10 to 15 seconds between periods of starter operation. Failure to do this will result in damage to the starter. If any instrument reading is not normal, stop the engine. Failure to do this will result in damage to the engine.

- b. Place the rotary switch to RUN and wait until the WAIT-TO-START lamp assembly goes out.
  - c. Place the rotary switch to START and release the lever after the engine starts.

**Note:** The lever will return automatically to RUN.

**Note:** Before the engine reaches operating temperature, the WAIT-TO-START lamp may flicker and a clicking noise may be heard. This is due to glow plug relay cycling and is a normal condition.

- d. Check gauges while allowing the engine to warm up for approximately 1 minute.
- e. Stop the engine if any of the following conditions occur:
  - (1) Excessive engine vibration.
  - (2) Oil pressure does not register or suddenly drops to or less than approximately 6 pounds per square inch (psi) or 41 kilopascals with the engine at idle.
  - (3) Air restriction gauge is within the red zone.

- (4) Engine overheating occurs.
  - f. Notify unit maintenance if any of the above conditions occur.
  - g. Set the vehicle light switch to the desired position.

**Note:** If the warning lamp is covered with tape, put a pinhole in the tape in order to be able to recognize when the light is on.

**CAUTION**

The vehicle must be stopped and the transmission shift lever placed in N (neutral) before the transfer case can be shifted. Failure to do this will result in damage to the drive train. Do not place the transfer case shift lever in H / L (high lock range) or L (low range) on a high-traction surface where little or no wheel slippage is evident, particularly when encountering sharp, continuous turns. Failure to operate the vehicle with the transfer case in H (high range) on high-traction surface, particularly when encountering sharp, continuous turns, can damage the drive train. Ensure the parking brake is released completely before operating the vehicle. Failure to do so may cause damage to the equipment.

6. Drive the vehicle under normal conditions.
  - a. Depress the service brake pedal and release the parking brake lever.

**Note:** The brake warning lamp assembly should go out.

- b. Place the transmission shift lever in D (drive) for normal driving.
- c. Release the service brake pedal and depress the accelerator pedal.
- d. Accelerate at a safe, steady speed.
- e. Upshift or downshift the transmission lever when road or traffic conditions change.

7. Drive the vehicle under unusual conditions.

**Note:** Except where noted, all normal operating procedures apply in addition to special instructions for unusual operating conditions.

**CAUTION**

Do not shift into any lower gear than is necessary to maintain headway. Attempt to maintain a constant engine speed. Over-revving the engine will cause the wheels to slip and traction will be lost. Before ascending or descending steep hills, stop the vehicle, place the transmission in neutral, and shift the transfer case to L (low range). Failure to shift the transfer case to L (low range) before ascending or descending steep hills may result in damage to the drive train.

- a. Hills, steep grades, and slopes.

**CAUTION**

If the L (low range) is used for "engine braking" when descending steep grades, avoid sharp continuous turns. Failure to avoid sharp continuous turns while operating the transfer case in locked range may cause damage to the drive train.

- (1) Shift the transfer case into L (low range) and the automatic transmission into 1 (first) before climbing a steep hill.

**Note:** If the wheels start to slip, "walk" the vehicle the last few remaining feet of a hill by swinging the front wheels sharply left and right if situation permits. This action will provide fresh "bite" into the surface and will usually result in enough traction to complete the climb.

- (2) Proceed down a steep grade by shifting the transfer case into L (low range) and the transmission into 2 (second) or 1 (first).

**WARNING**

**Do not travel diagonally across a hill unless it is absolutely necessary; injury to personnel or damage to equipment may result. The path with the least amount of angle is best when moving across a slope.**

- (3) Drive the vehicle slowly down the hill with all four wheels turning against engine compression.
- (4) Avoid making quick turns.
- (5) Back up the vehicle for a distance of approximately 5 feet (1.5 meters) once a steep grade has been negotiated before proceeding on a level surface if drive train torque buildup occurred.

**Note:** If it is difficult to shift out of locked range if drive train torque buildup has occurred.

**DANGER**

**Vehicle operation in snow is a hazardous condition. The operator must travel at reduced speeds and be prepared to meet sudden changes in road conditions. Failure to maintain safe stopping distance may cause damage to the vehicle, injury, or death. Brakes should be gradually pumped when stopping the vehicle on ice or snow. Sudden braking will cause the wheels to lock and the vehicle to slide out of control, causing damage to the vehicle, injury, or death.**

- b. Extreme cold on ice or snow.

- (1) Place the transmission shift lever in D (drive) and the transfer case shift lever in H / L (high lock range).
  - (2) Place the vehicle in motion slowly to prevent the wheels from spinning.
  - (3) If additional power is needed to extract the vehicle when mired in snow, place the transmission in 1 (first) and place the transfer case in L (low range).
  - (4) After the vehicle is extracted from the mired condition, immediately return the transmission shift lever to D (drive) and the transfer case to H / L (high lock range) position.
  - (5) If rear skidding occurs—
    - (a) Let up on the accelerator pedal.
    - (b) Turn the steering wheel in the direction of the skid until control has been regained.
    - (c) Apply the brake pedal in a gradual pumping manner.
- c. Dusty, sandy areas.
- (1) Reduce tire inflation to 12 psi for the front and 16 psi for the rear to increase traction when operating in sand.
  - (2) Place the transfer case shift lever in H / L (high lock range) position and the transmission shift lever in D (drive).
    - (a) If additional power is needed to extract the vehicle when mired in sand, place the transmission in "1 first".
    - (b) Place the transfer case in L (low range).
    - (c) After the vehicle is extracted from the mired condition, immediately return the transfer case to H / L (high lock range) position.
    - (d) Check the air restriction gauge to determine if the indicator shows red.

**Note:** Air cleaner servicing should be done after parking the vehicle and the engine is shut off if the air restriction gauge shows red.

- (3) Accelerate slowly so wheels will not spin and dig into sand.
- (4) If engine overheating occurs:
  - (a) Park the vehicle.
  - (b) Allow the engine to idle.

**CAUTION**

If the coolant temperature gauge suddenly increases beyond approximately 230 degrees Fahrenheit (110 degrees Celsius), stop the engine. Otherwise, engine damage could occur.

- (c) Observe the coolant temperature gauge for steady cooling.
  - (d) If the coolant temperature continues to increase or does not decrease, shut down the engine.
- d. Mud.

**CAUTION**

Do not repeatedly shift the transmission or over speed the engine during operation in deep mud. Damage to the drive train may result.

A wrecker or a second vehicle equipped with a winch should be used to recover vehicles mired in deep mud. Do not attempt to "rock" vehicles out of deep mud with quick transmission shift changes. Damage to the transmission will occur.

- (1) Place the transfer case shift lever in H / L (high lock range) and the transmission shift lever in D (drive).
  - (a) If additional power is needed to extract the vehicle when mired in mud, place the transmission in 1 (first).
  - (b) Place the transfer case in L (low range).
  - (c) If rear end skidding occurs, immediately turn the wheels in the direction of the skid.
- (2) Immediately return the transfer case to H / L (high lock range) position once the vehicle is extracted from a mired condition.

**CAUTION**

Continuous vehicle operation at high speeds and long, hard pulls on steep grades with the transfer case shift lever in "L" (low range) position should be avoided. Damage to the transfer case will result.

- e. Extreme heat (95 degrees Fahrenheit [35 degrees Celsius] or higher).

- (1) Frequently check the coolant temperature gauge and oil pressure gauge.

**Note:** The engine is overheating if one or more of the following conditions exist: (1) engine coolant temperature is more than approximately 230 degrees Fahrenheit (110 degrees Celsius) as indicated by the temperature gauge; (2) engine oil pressure drops below approximately 15 psi with the engine under a load; and (3) engine oil pressure drops below approximately 6 psi with the engine at idle.

- (2) If engine overheating occurs—

- (a) Park the vehicle.
- (b) Allow the engine to idle.
- (c) Observe the temperature gauge for steady cooling.

**CAUTION**

Damage to the engine could result if the engine is not stopped when the temperature gauge reads 230 degrees Fahrenheit (110 degrees Celsius).

- (d) Stop the engine if the coolant temperature gauge suddenly increases beyond approximately 230 degrees Fahrenheit (110 degrees Celsius).
- (e) Shut down the engine if the engine coolant temperature continues to increase or does not decrease.
- f. Rainy and humid conditions.
  - (1) Place the transfer case shift lever in H / L (high lock range) to obtain a start without spinning the wheels.
  - (2) Do not spin the wheels when placing the vehicle in motion in heavy rain conditions.
  - (3) Drain the fuel filter frequently because of high condensation in the fuel system.

**CAUTION**

Prior to operating the vehicle in water, ensure the vehicle has been prepared for the type of fording operation being performed. Never attempt shallow water fording unless water depth is known to be 30 inches (76 centimeters) or less, and the bottom is known to be hard. Never attempt deep water fording unless water depth is known to be 60 inches (152 centimeters) or less, and bottom is known to be hard. Do not exceed 5 miles per hour (8 kilometers per hour) during fording operations. Damage to the vehicle will result.

- g. Water.

- (1) Enter water slowly in an area with a gentle slope.
  - (2) Maintain even vehicle speed while fording.
  - (3) Exit water in an area with a gentle slope.

**DANGER**

**Do not rely on the service brakes after fording until the brakes dry out. Failure to do this may cause damage to the vehicle, injury, or death to personnel.**

- (4) Apply brakes until uneven braking ceases.

8. Stop the vehicle and engine.
  - a. Release the accelerator pedal.
  - b. Depress the service brake pedal to bring the vehicle to a gradual stop.
  - c. Apply the parking brake lever once the vehicle is completely stopped.
  - d. Move the transmission shift lever to P (park).
  - e. Turn the light switch to OFF.
  - f. Place the rotary switch to ENG STOP.
  - g. Lock the steering wheel with a cable.
  - h. Chock the wheels if the tactical situation permits.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Adjusted the driver's seat.	_____	_____
2. Adjusted the left and right rearview mirrors.	_____	_____
3. Ensured all windows were clean.	_____	_____
4. Fastened and adjusted the seat belt.	_____	_____
5. Started the engine.	_____	_____
6. Drove the vehicle under normal conditions.	_____	_____
7. Drove the vehicle under unusual conditions.	_____	_____
8. Stopped the vehicle and engine.	_____	_____

<b>References Required</b>	<b>Primary</b>
AR 750-1 Army Materiel Maintenance Policy	TM 9-2320-387-10/TO 36A12-1A-3061-1/TM 11033-OR Operator's Manual for Truck, Utility: S250 Shelter Carrier, 4X4, M1113 NSN 2320-01-412-0143 (EIC B6B) Truck, Utility: Up-Armored Carrier, 4X4, M1114 NSN 2320-01-413-3739 (EIC B6C) Truck, Utility: Expanded Capacity, Armament Carrier, M1151 NSN 2320-01-518-7330 (EIC BA5) Truck, Utility: Expanded Capacity, Armament Carrier, IAP/Armor Ready, M1151A1 NSN 2320-01-540-2038 (EIC BEG) Truck, Utility: Expanded Capacity, Enhanced, M1152 NSN 2320-01-518-7332 (EIC BA6) Truck, Utility: Expanded Capacity,
ATP 3-90.97 Mountain Warfare and Cold Weather Operations	
TM 4-33.31 Cold Weather Maintenance Operations	

**References  
Required**

**Primary**

Enhanced, IAP/Armor Ready, M1152A1 NSN 2320-01-540-2007 (EIC BEH) Truck, Utility: Command and Control/General Purpose Vehicle, M1165 NSN 2320-01-540-1993 (EIC BEK) Truck, Utility: Command and Control/General Purpose Vehicle, IAP/Armor Ready, M1165A1 NSN 2320-01-540-2017 (EIC BEJ) Truck, Utility: Expanded Capacity, TOW ITAS Carrier, M1167 NSN 2320-01-544-9638 (EIC BF9) Truck, Ambulance, 4-Litter, 4X4, M997A3 NSN 2310-01-595-3986

**071-025-0011**  
**Mount an M240B or M240L Machine Gun on a Vehicle**

**Conditions:** You are a member squad or team preparing a vehicle for a mission and you have been directed to mount an M240B or M240L machine gun on the vehicle. You have an M197 machine gun mount.

**Standards:** Clear the M240 machine gun, lock the ring brake assembly on the vehicle, mount the selected M197 machine gun mount, and install the M240 into M197 machine gun mount on the vehicle. The weapon must be securely mounted and move freely, without resistance.

**Performance Steps**

1. Clear the machine gun.
2. Lock the ring brake assembly on the vehicle (if equipped).

**Note:** This is done if installing on a ring, to prevent the ring from traversing.

3. Mount the M197 machine gun mount into the pintle socket on the vehicle.

**Note:** The M197 is designed to mount the M240B or M240L, M249, and M60 into a pintle socket of an M6 or M7 pedestal mount, a ring mount, or cupola mount located on a vehicle. The M197 mount consists of a travel lock assembly, travel lock bracket assembly, pintle adapter assembly, and a pintle.

- a. Prepare the pintle socket, based on type of mount.

**Note:** There are three locking mechanism types. You will do one of the following steps based on which type is mounted to your vehicle:

- (1) Loosen the four lock screws.
  - (a) Use a 3/8-inch open-end box wrench.
  - (b) Turn counterclockwise.
  - (c) Ensure threaded ends are flush with pedestal socket's inner wall.
- (2) Remove the pintle locking pin.
- (3) Loosen pintle locking lever.

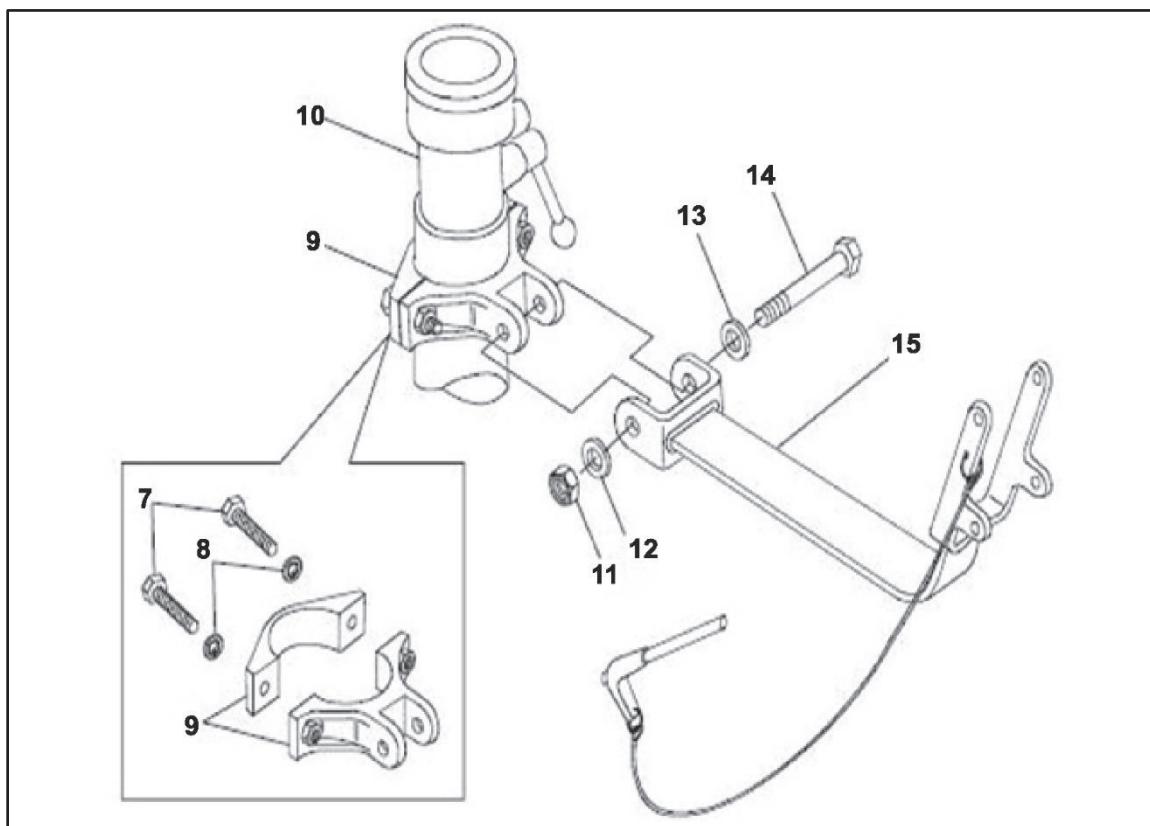
- b. Mount the M197 machine gun mount into the pintle socket.

- (1) Insert the M197 pintle adapter assembly into the pintle socket.
- (2) Secure the weapon mount pintle adapter assembly to the pintle socket.

**Note:** There are three locking mechanism types. You will do one of the following steps based on which type is mounted to your vehicle:

- (a) Tighten the four locking screws until mount will not pull out of socket.
- (b) Insert the pintle locking pin.

- (c) Tighten pintle locking lever.
- (3) Pull up on weapon mount pintle adapter assembly to ensure pintle lock is engaged.
- (4) Install the M197 pintle to the pintle adapter assembly.
  - (a) Remove quick release pin from pintle adapter assembly.
  - (b) Slide pintle mount into pintle adapter assembly.
  - (c) Insert quick release pin.
  - (d) Ensure the M197 is locked into the pintle adapter assembly and rotates freely left and right by twisting and pulling up on the pintle.
- (5) Install the travel lock assembly (see figure 3-149).

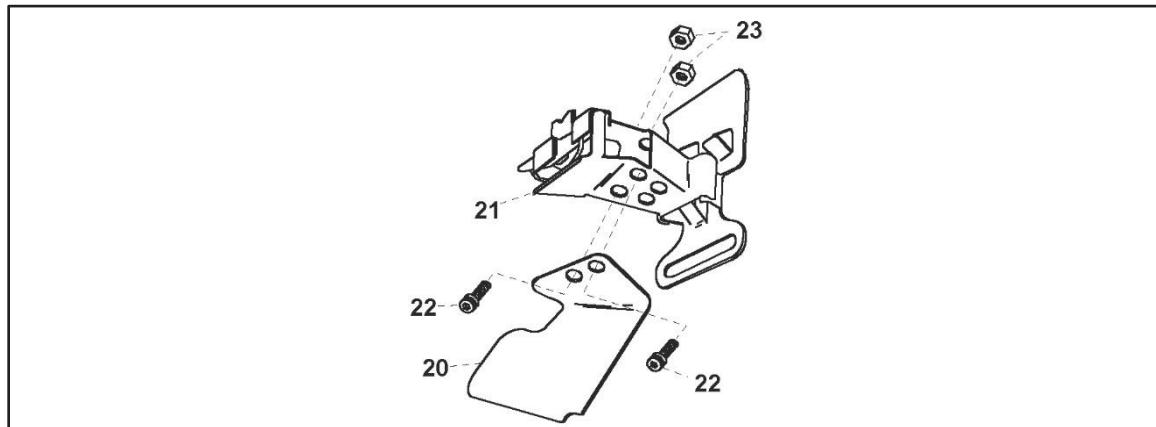


**Figure 3-149. Installation of M197 mount travel lock**

- (a) Separate travel lock bracket assembly into two halves (see figure 3-149, item 9) by removing the two machine bolts (see figure 3-149, item 7) and two lock-washers (see figure 3-149, item 8).
- (b) Install the two halves (see figure 3-149, item 9) of travel lock bracket assembly onto the structural tube of the pintle (see figure 3-149, item 10) with travel lock bracket assembly holes facing the rear of the vehicle.

- (c) Secure by installing two lock washers (see figure 3-149, item 8) and two machine bolts (see figure 3-149, item 7).
  - (d) Remove self-locking nut (see figure 3-149, item 11), two flat washers (see figure 3-149, items 12 and 13), and hexagon head cap screw (see figure 3-149, item 14) from travel lock bracket (see figure 3-149, item 15).
  - (e) Align mounting holes in travel lock bracket (see figure 3-149, item 15) with mounting holes in travel lock bracket assembly (see figure 3-149, item 9).
  - (f) Install two flat washers (see figure 3-149, items 12 and 13), hexagon head cap screw (see figure 3-149, item 14), and self-locking nut (see figure 3-149, item 11).
  - (g) Tighten to secure.
- (6) Install ammo adapter bracket and deflector (see figure 3-150).

**Note:** When used with the M240B machine gun on the (M1151 or M1152 up-armored series), the ammunition adapter bracket assembly must be installed.



**Figure 3-150. Installation of M197 ammunition adapter bracket and deflector**

- (a) Align holes in deflector plate (see figure 3-150, item 20) with holes in ammunition adapter bracket (see figure 3-150, item 21).
- (b) Secure using two cap screws (see figure 3-150, item 22) and two nuts (see figure 3-150, item 23).

**Note:** Nuts (see figure 3-150, item 23) must be held within the ammunition bracket assembly (see figure 3-150, item 21) and deflector plate (see figure 3-150, item 20) weldment while installing cap screws (see figure 3-150, item 22) to secure deflector plate (see figure 3-150, item 20).

4. Install the machine gun into M197 machine gun mount on the vehicle.

- a. Place weapon in pintle, aligning the receivers front mounting points with the holes in the pintle.
- b. Secure with quick release pin, ensuring quick release pin goes through both sides of yoke.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the machine gun.	_____	_____
2. Locked the ring brake assembly on the vehicle (if equipped).	_____	_____
3. Mounted the selected weapon mount into the pintle socket on the vehicle.	_____	_____
4. Installed the machine gun into the M197 machine gun mount on the vehicle.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1005-313-10/T.O. 11W2-6-5-1/TM  
08670A/09712A-10/B/SW360-AH-OPI-010  
Operator's Manual for Machine Gun, 7.62MM,  
M240 (1005-01-025-8095); M240B (1005-01-412-  
3129); M240C (1005-01-085-4758) M240D (1005-  
01-481-6695); M240E1 (1005-01-252-4288) M240H  
(1005-01-518-2410; M240L (1005-01-549-5837)  
M240N (1005-01-493-1666)

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM  
1005-13A&P/1 Operator's, Unit and Direct Support  
Maintenance Manual (Including Repair Parts and  
Special Tools List (RPSTL) for Ground Mounts;  
Machine Gun Mounts; and Combinations for  
Tactical/Armored Vehicles M122 Machine Gun  
Tripod (1005-00-710-5599) (EIC: 4EF) M122A1  
Machine Gun Tripod (1005-00-433-1617) M192  
Machine Gun Tripod (1005-01-503-0141) M3  
Machine Gun Tripod (1005-00-322-9716) (EIC:  
4EA) M142 Machine Gun Mount (1005-00-854-  
4463) 6650, .50 Caliber, Machine Gun Mount (1005-  
00-704-6650) M197 Machine Gun Mount (1005-01-  
413-4098) MK64 Machine Gun Mount MOD 5  
(1010-01-180-9319); MOD 9 (1010-01-412-3159)  
MK93 MOD 0 Machine Gun Mount (USMC ONLY)  
(1005-01-383-2949) MK93 MOD 1 Machine Gun  
Mount 1005-01-383-2757) MK93 MOD 2 Machine  
Gun Mount (1005-01-502-7547)

**551-88M-1361**  
**Operate Vehicle under Adverse Conditions**

**WARNING**

**Wear hearing protection while operating vehicle.**

**Wear seat belts while operating vehicle.**

**Operation in sand and around sand dunes may cause front wheels to be violently jerked to one side or another. As a precaution, vehicle operator should steer the vehicle by placing hands only on outside rim. Placing hands or fingers on a steering wheel spoke when the steering wheel is violently jerked to one side or the other may cause serious personal injury.**

**When operating vehicle over gullies, ravines or ditches, the vehicle operator should grasp steering wheel only by the outside rim. Grasping by a spoke in steering wheel may cause personnel injury when front wheels encounter a large rock, rut, or other obstacle and spins steering wheel.**

**CAUTION**

Road surfaces are especially slick just after the rain or drizzle begins. Loosened grease and oil mixes with raindrops, quickly covering the surface with a slippery film.

**Conditions:** In an operational environment, your unit is moving through an area that is undergoing significant adverse weather conditions that range from extreme heat (desert), extreme cold and/or mountainous terrain (32 degrees [°] Fahrenheit [F] to -24° F), heavy rain, blowing sand, or snow in which vehicle performance is considered to be under "unusual" conditions (as defined in the vehicle technical manual). You are given hearing protection, eye protection, advanced combat helmet, gloves, mission-ready tactical wheeled vehicle with radiator cover, goggles, face mask, seasonal uniform, and mission requirement to travel under these conditions as part of a convoy movement.

**Standards:** Operate the vehicle in adverse conditions in accordance with the vehicle's TM 9-2320-392-10-1/ TO 36A12-1C-1157-1-1 and within applicable environmental, operational, and situational (mission, enemy, terrain and weather, troops and support available, time available, civil considerations) circumstances. Control the vehicle at all times following traffic regulations and rules of the road. If vehicle is so equipped, use the applicable Central Tire Inflation System (known as CTIS) setting to enable safe vehicle operations. All driving maneuvers must be made under these extreme conditions without becoming mired or succumbing to a conditionally-related mechanical failure.

**Special Condition:** Proper conduct of this task implies varied extreme conditions in which most training locations cannot replicate. To this end and for training this task to standard, the unit or institution may use a simulator, such as the Common Driver Trainer (vehicle driver training simulator) to inject the various seasonal / terrain conditions for this task. If the task is conducted under actual adverse conditions using any convoy protection platform series vehicle, extra precautions should be taken with respect to reduced visibility and the use of a gunner (if applicable) to relay route and condition information to the driver. Additionally extra care should be exercised as a precaution against vehicle rollover under adverse weather and terrain conditions.

**Special Standards:** If a Reconfigurable Vehicle Tactical Trainer simulator is used for this task, the standard will have been met when the simulation indicates successful navigation through the obstacles/conditions without becoming mired or involved in a vehicle accident.

**Performance Steps**

**CAUTION**

Road surfaces are especially slick just after a rain or drizzle begins. Loosened grease and oil mixes with raindrops, quickly covering the surface with a slippery film.

1. Operate vehicle in heavy rain.
  - a. If CTIS equipped, select mode for this type of weather or terrain (as necessary). Watch for indicator lamp showing correct mode selection on CTIS panel and adhere to speed restrictions.

**Note:** Recognize that the M1078- or M1083-series vehicle CTIS starts automatically when engine is started and adjusts pressure to highway mode.

- b. Accelerate moderately.
- c. Reduce speed as necessary for conditions.
- d. Moderately apply the brakes when slowing down.
- e. Make no quick turns.
- f. Allow at least twice the normal following distance.
- g. Do not pump the brakes (antilock braking system [known as ABS] only).
- h. Hold the brake pedal down and let the ABS system work.
- i. During emergencies, steer and brake at the same time (ABS only).
- j. Release enough pressure on the brakes to get the vehicle rolling again to regain steering (front ABS only).
- k. Recover from skid by—
  - (1) Staying off the brakes.
  - (2) Turning quickly. Turn the steering wheel in the direction you want the vehicle to go. This lines the front of the vehicle up with the back.
  - (3) Countersteering. Turn back the other way. As soon as the vehicle begins to straighten out, turn the wheel back the other way so that the vehicle will not turn too far.
  - (4) Continuing to correct your steering left and right until you recover from the skid.
  - (5) Turning back to straight ahead.

2. Operate vehicle in extremely hot, dusty, desert environment.

**Note:** As a general rule, vehicles in a convoy should not follow directly behind one another due to high concentrations of dust in the air. Visibility may be reduced to zero facilitating a vehicle accident.

- a. Don protective eyepro and other facial protection if available.
  - b. If CTIS-equipped, select mode for this type of terrain, watch for indicator showing correct mode selection on CTIS panel, and adhere to speed restrictions.
  - c. Select a gear or range that will start you without any or minimum of any gear slipping or wheel spinning.
  - d. Use rear wheel drive if possible due to the front wheels' tendency to dig into the sand.
  - e. Accelerate slowly.
  - f. Check instrument panel gauges more frequently while operating vehicle to prevent a mechanical failure due to extremely hot temperatures.
  - g. Maintain a steady and even rate of movement.
  - h. Anticipate difficult spots and bypass if possible.
  - i. Approach a dune from the windward side slope at a 90° angle.
  - j. Follow the track of preceding vehicle or break a new path depending on conditions.
  - k. Make wide turns.
  - l. Let your vehicle roll to a halt as practicable.
  - m. Attempt to stop on a downhill slope.
3. Operate vehicle through streams.

**Note:** Use caution while fording (water flow formula) and DO NOT engage engine retarder while fording.

- a. If CTIS equipped, select mode for this type of terrain, watch for indicator showing correct mode selection on CTIS panel, and adhere to speed restrictions.
  - b. Follow the applicable steps provided in the vehicle technical manual for fording streams.
  - c. Check the bottom to see how firm a support can be expected.
  - d. Keep the cab door open when crossing frozen streams.
  - e. After reaching dry land, test brakes at a reduced speed by—
    - (1) Lightly applying and releasing brakes until normal braking is restored (Non ABS only).
    - (2) Apply light steady pressure on brakes until normal braking is restored (ABS only).
4. Operate vehicle in extreme cold weather (32° F to -24° F) and blowing snow.

- a. Start the vehicle using cold weather starting procedures referenced in the applicable vehicle technical manual.
  - b. Turn on vehicle cab heater and adjust to defrost position to clear windows while engine is warming up.
  - c. Remove ice and snow from windows.
  - d. If CTIS equipped, select mode for this type of terrain, watch for indicator showing correct mode selection on CTIS panel and adhere to speed restrictions.
  - e. Place vehicle into motion by following general operating procedures in the applicable vehicle technical manual under "operation under unusual conditions."
  - f. Use the drive 2 range and gradually apply throttle.
  - g. Avoid quick acceleration.
  - h. Drive at reduced speed for better control and safer stops.
  - i. Display turn signals earlier than usual (if tactical situation permits).
  - j. Maintain at least double the normal following distance from the vehicle ahead.
  - k. Apply steady brake pressure earlier when stopping to warn others of your intentions.
  - l. Descend moderate grades in the gear normally used to climb the same grade.
5. Turn in vehicle dispatch, maintenance worksheets, and load documentation as required to the supervisor or convoy chain of command (as directed).

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Operated vehicle in rain.	_____	_____
2. Operated vehicle in extremely hot, dusty, desert environment.	_____	_____
3. Operated vehicle through streams.	_____	_____
4. Operated vehicle in extreme cold weather (32° F to -24° F) and blowing snow.	_____	_____
5. Turned in vehicle dispatch, maintenance worksheets, and load documentation as required to the supervisor or convoy chain of command.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2320-392-10-3/TO 36A12-1C-1157-1-3 Operator Manual for Medium Tactical Vehicles (MTV) 5 and 10 Ton M1084A1: NSN 2320-01-447- 3887 (EIC BUB) M1084A1/RSV: NSN 2320-01- 495-0110 (EIC BA7) M1086A1: NSN 2320-01-447- 3895 (EIC BUH) M1083A1: NSN 2320-01-447-	TM 9-2320-392-10-1/TO 36A12-1C-1157-1-1 Operator Manual for Medium Tactical Vehicles (MTV) 5 and 10 Ton M1084A1: NSN 2320-01-447- 3887 (EIC BUB) M1084A1/RSV: NSN 2320-01-

<b>References Required</b>	<b>Primary</b>
3884 (EIC BHY), NSN 2320-01-447-3890 (EIC BT9) M1085A1: NSN 2320-01-447-3897 (EIC BUR), NSN 2320-01-447-3891 (EIC BUG) M1096A1: NSN 2320-01-447-3885 (EIC BR6) M1092A1: NSN 2320-01-447-3894 (EIC BRZ) M1090A1: NSN 2320-01-447-6344 (EIC BUP), NSN 2320-01-447-3899 (EIC BUE) M1087A1: NSN 2320-01-530-3843 (EIC B9B) M1093A1: NSN 2320-01-447-6342 (EIC BQR), NSN 2320-01-447-3889 (EIC BUA) M1148: NSN 2320-01-508-8859 (EIC BUL) M1088A1: NSN 2320-01-447-3900 (EIC BUN), NSN 2320-01-447-3893 (EIC BUC) M1089A1: NSN 2320-01-447-3892 (EIC BUD) M1157: NSN 2320-01-522-1859 (EIC BJ3), NSN 2320-01-522-1858 (EIC BJ2)	495-0110 (EIC BA7) M1086A1: NSN 2320-01-447-3895 (EIC BUH) M1083A1
TC 21-305-20/AFMAN 24-306(I) Manual for the Wheeled Vehicle Operator	
TM 9-2320-392-10-2/TO 36A12-1C-1157-1-2 Operator Manual for Medium Tactical Vehicles (MTV) 5 and 10 Ton M1084A1: NSN 2320-01-447-3887 (EIC BUB) M1084A1/RSV: NSN 2320-01-495-0110 (EIC BA7) M1086A1: NSN 2320-01-447-3895 (EIC BUH) M1083A1: NSN 2320-01-447-3884 (EIC BHY), NSN 2320-01-447-3890 (EIC BT9) M1085A1: NSN 2320-01-447-3897 (EIC BUR), NSN 2320-01-447-3891 (EIC BUG) M1096A1: NSN 2320-01-447-3885 (EIC BR6) M1092A1: NSN 2320-01-447-3894 (EIC BRZ) M1090A1: NSN 2320-01-447-6344 (EIC BUP), NSN 2320-01-447-3899 (EIC BUE) M1087A1: NSN 2320-01-530-3843 (EIC B9B) M1093A1: NSN 2320-01-447-6342 (EIC BQR), NSN 2320-01-447-3889 (EIC BUA) M1148: NSN 2320-01-508-8859 (EIC BUL) M1088A1: NSN 2320-01-447-3900 (EIC BUN), NSN 2320-01-447-3893 (EIC BUC) M1089A1: NSN 2320-01-447-3892 (EIC BUD) M1157: NSN 2320-01-522-1859 (EIC BJ3), NSN 2320-01-522-1858 (EIC BJ2)	
FM 90-3 Desert Operations	

**071-217-0001**  
**Drive a Stryker Vehicle**

**DANGER**

Stryker vehicle crew and passengers will not normally exceed nametag defilade (known as NTD) while vehicle is moving. Exceeding NTD may cause serious injury or death to personnel during driving operations. When deemed necessary to exceed NTD when vehicle is moving for aiding driver navigation, vehicle security, manual firing of weapons systems, the unit commander shall conduct a risk assessment prior to allowing NTD to be exceeded for specified activity or activities. Prior to any crew or squad member exceeding NTD, vehicle commander (known as VC) shall inform driver of situation.

**WARNING**

Vehicle must not be operated unless driver's hatch is adjusted correctly, seat belts are applied and adjusted, and seat height is adjusted. Failure to do so may cause injury to personnel during driving operations. To prevent head or neck injury, ensure that the hatch is secured in the closed position before adjusting seat height.

To prevent injury to personnel, ensure that hands, legs and clothing are clear of driver's seat movement before operating the seat controls.

**Conditions:** You are a driver of a Stryker vehicle in a unit conducting operations and the VC has directed you to prepare for movement. All before preventive maintenance checks and services (PMCS) have been completed.

**Standards:** Prepare the driver's position, start the vehicle, and prepare it for movement based on the operational and environmental conditions. Drive the vehicle on route, as directed by the VC. Power down the vehicle when directed by the VC.

**Performance Steps**

1. Prepare the vehicle for operation.
  - a. Adjust driver's seat.
  - b. Adjust accelerator and brake pedals for position and ease of control.
  - c. Adjust steering column.
  - d. Adjust mirrors.

**Note:** In a tactical environment, the mirrors should be folded in to reduce visible signatures from reflections.

- e. Install and adjust driver's windshield, as required.

**Note:** Use of the windshield is based on environmental conditions and tactical situation.

- f. Apply the stay device, as required.

**Note:** The stay device is used to ensure that the driver's hatch stays in position if the hatch spring fails. Stay device is placed in the 10-degree position if ballistic windshield is not installed or 25-degrees position if the windshield is installed.

- g. Engage combat lock on driver's hatch to ensure that latch is locked in position.

### **WARNING**

**Crewmembers must use seatbelts when vehicle is in motion, except while performing operational duties that require personnel to leave seat (for example, to assist driver in navigation.) Failure to use seatbelts may result in injury to personnel.**

- h. Fasten and adjust seat belt.
- i. Connect the combat vehicle crewman (known as CVC) helmet/headset to the intercommunications control set (known as ICS).
  - (1) Connect CVC helmet/headset cable connector to bail-out cord connector.
  - (2) Connect the bail-out cord connector to the ICS.
  - (3) Set switches on the ICS as required.

### **DANGER**

**Ensure that the Automatic Fire Extinguishing System (known as AFES) is operational whenever the vehicle is operating in case of a vehicle fire. Failure to do so may result in serious injury or death to personnel.**

### **WARNING**

**Ensure that communications electrical equipment switches are set to OFF. Starting the engine with Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (known as C4ISR) equipment or lights on can drain the batteries and/or damage the C4ISR equipment. Do not start the engine with C4ISR equipment or lights on. Failure to comply may result in damage to equipment.**

- 2. Start the vehicle.
  - a. Ensure parking brake is applied.

- b. Verify that the communications and electrical systems are turned off, as required.
- c. Ensure all auxiliary equipment is off.
- d. Ensure gear range selector is in neutral (N).
- e. Set AUTO MASTER and AUX MASTER switches to the ON position.

**Note:** If the AFES fails self-test indicated by a red light identifying an extinguisher or sensor is inoperable, notify maintenance.

- f. Set three-position ignition switch to second position.

**Note:** Do not push down or hold accelerator pedal while cranking engine. System will automatically provide correct amount of fuel for engine start-up.

- g. Ensure the engine/diagnostic indicator test check completes after start switch is toggled on.

**Note:** If engine/diagnostic indicator test fails to produce four audible clicks, notified field maintenance.

- h. Ensure that engine preheat light emitting diode (LED) extinguishes.

**CAUTION**

Do not increase engine speed until oil pressure gauge indicates normal condition. If oil pressure is not indicated on gauge within 15 seconds, cease vehicle operation and notify maintenance. Damage to equipment could occur.

- i. Toggle ignition switch to upper position and release when engine starts.

**Note:** If engine fails to reach 100 revolutions per minute, or fires intermittently after 15 seconds of cranking, stop procedure and report to maintenance.

**CAUTION**

To avoid damage to starter, never engage the start switch if engine is running.

At initial engine start-up, you must allow the engine to idle for 30 seconds to ensure sufficient oil circulation to turbocharger bearings.

- j. Allow engine to idle 30 seconds after initial engine start-up.
- k. If power pack interface LED illuminates yellow or red, notify field maintenance.
- l. Allow all fluids and air pressure to reach operating range before driving vehicle.

**DANGER**

**Do not drive up a hill greater than 60-percent grade. Do not drive on side slopes greater than 30 percent. Vehicle can roll over and kill or injure personnel.**

3. Prepare vehicle for movement.

**CAUTION**

When using the driver's vision enhancer (known as DVE) do not exceed 30 miles per hour (mph) on primary/paved roads, 25 mph on secondary/gravel roads, or 15 mph on cross country surfaces under ideal conditions.

Extended use of DVE can cause eye fatigue and headaches. During extended operations, drivers should stop a minimum of every 2 hours to rest eyes for a minimum of 5 minutes.

- a. Place the DVE into operation, as required.
- b. Place the rear-view sensor system into operation, as required.
- c. Adjust the Central Tire Inflation System for driving conditions.
- d. Adjust the height management system, as needed.
- e. Apply service brake.
- f. Disengage transfer case gear lock, if engaged.
- g. Release parking brake.

**CAUTION**

Changing the transfer case while vehicle is moving can cause a catastrophic failure of equipment.

- h. Select appropriate transfer case position, low-speed position or high-speed position, as applicable.
  - i. Select the correct drive (four or eight wheel) for driving conditions.
4. Drive on route directed by the VC.
    - a. Release the service brake.
    - b. Apply gradual pressure on accelerator.
    - c. Follow directions from the VC.

- d. Once moving, within 50 feet (15 meters), apply the service brake to test for response.
  - e. Perform during PMCS during the first scheduled stop.
5. Power down the vehicle.
- a. Apply service brake to stop vehicle.
  - b. Set transmission gear range selector to neutral (N).
  - c. Engage park brake and verify that park brake indicator illuminates.
  - d. Apply transfer case gear lock, if vehicle is on a grade of 30 percent or more.

**DANGER**

**The AFES is active for up to 30 minutes after the AUTO MASTER and AUX MASTER switches are set to the off position. Exercise extreme caution while performing maintenance on or around nozzles of sensors.**

**CAUTION**

Allow the engine to idle for 3 minutes before shutdown to allow the turbocharger to slow down, to prevent damage to the turbocharger due to oil starvation. Electrical equipment could be damaged if master switches are set to off position when the engine is running, unless the batteries are connected to absorb large voltage pulses. Do not set master switches to off position when the engine is running. Failure to comply may result in damage to equipment.

- e. Verify that all communications and electrical equipment is powered down, as required.

**Note:** The vehicle commander or other crewmember will normally power down communications systems since they are in the crew compartment of the vehicle.

- f. Set engine start switch to off position.
- g. If equipped with C7 engine, wait at least 5 seconds.
- h. Set AUX MASTER and AUTO MASTER switches to OFF position.
- i. Chock the wheels.

Performance Measures	GO	NO-GO
1. Prepared the vehicle for operation.	_____	_____
2. Started the vehicle.	_____	_____
3. Prepared the vehicle for movement.	_____	_____
4. Drove on route as directed by the VC.	_____	_____
5. Powered down the vehicle.	_____	_____

References Required	Primary
TM 9-2355-311-10-4-1 Operator's Manual, Volume 1 of 4, Commander's Vehicle (CV) M1130 (2355-01-481-8573) (EIC: AFK) Stryker	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4 Infantry Carrier Vehicle (ICV) M1126 (NSN: 2355-01-481-8575) (EIC: AFF)
TM 9-2355-311-10-3-1 Operator's Manual, Volume 1 of 4, Mortar Carrier Vehicle (MCV) M1129A1 (2355-01-505-0871) (EIC: AFJ) STRYKER	
TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 (2355-01-481-8572) (EIC: AFG) Stryker	
TM 9-2355-311-10-7-1 Operator's Manual, Volume 1 of 4, Antitank Guided Missile Vehicle (ATGM) M1134 (2355-01-481-8576) (EIC: AFP) Stryker	

**071-217-0005**  
**Operate the Video Display Terminal on a Stryker Vehicle**

**Conditions:** You are a crewmember on a Stryker vehicle, conducting operations, and need to use the video display terminal (known as VDT).

**Standards:** Adjust the VDT to desired position and power it up. Adjust the brightness of the display and bezel keys, select the video source, and navigate the menus on the VDT, as needed.

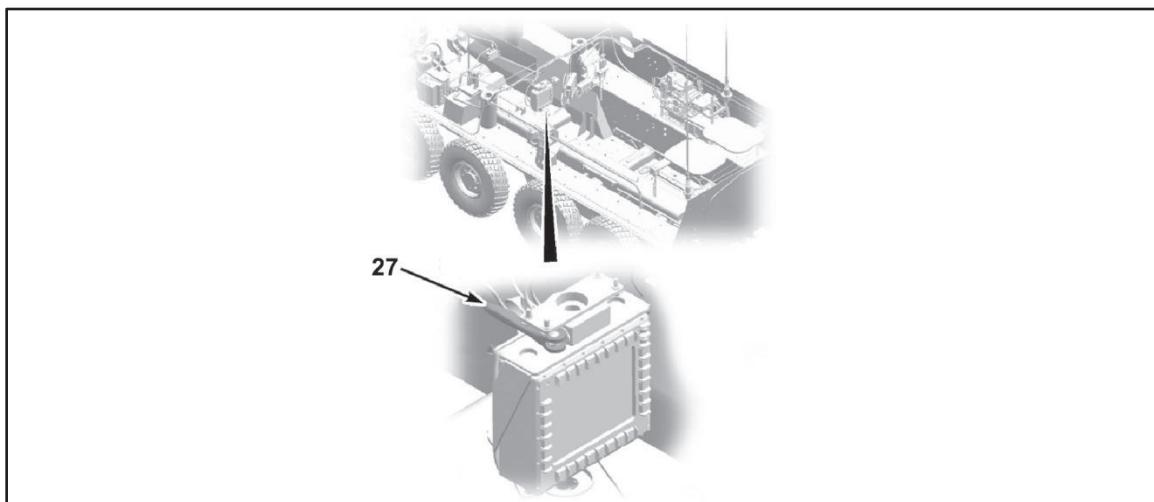
**Note:** The VDT will continue to function even if the rear door, driver's door, right rear or left rear hatches are open in blackout mode.

**Performance Steps**

1. Adjust the VDT by pushing in on the swivel lock lever (see figure 3-151, item 27) and rotating it to desired position.

**Notes:** Ensure that nothing is in contact with display screen during VDT power-up procedure. Resting of a hand or object against the display screen during power-up will give a false VDT failure indication.

The inverters must be turned on to provide power to Ethernet switch. Failure to do so may prevent diagnostic and embedded training systems from communicating with the VDT.

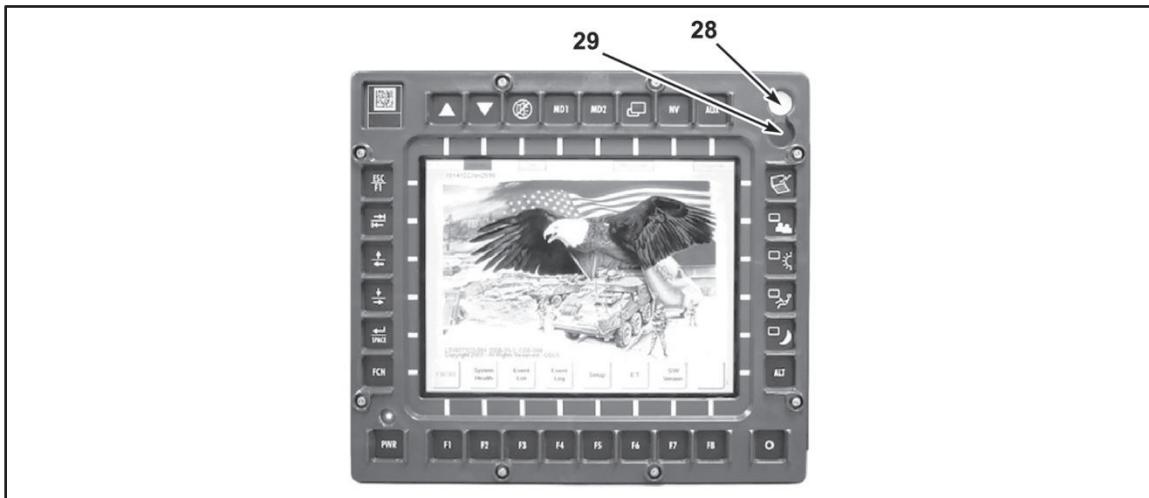


**Figure 3-151. Swivel lock lever**

2. Power up the VDT by setting the vehicle AUX MASTER switch to the on position.

**Note:** During power-up, the VDT will perform a power-up built-in test (known as PBIT). When the PBIT is complete, the main screen will be displayed. The results of the PBIT will be displayed only if a fault exists. The fault will appear in a pop-up message screen at the bottom of the main screen detailing the fault occurrence and corrective action. Fault must be acknowledged prior to performing any other VDT function.

3. Adjust the display and bezel key brightness by pressing upper button (see figure 3-152, item 8) to increase brightness or by pressing lower button (see figure 3-152, item 29) to decrease brightness. (See figure 3-152.)

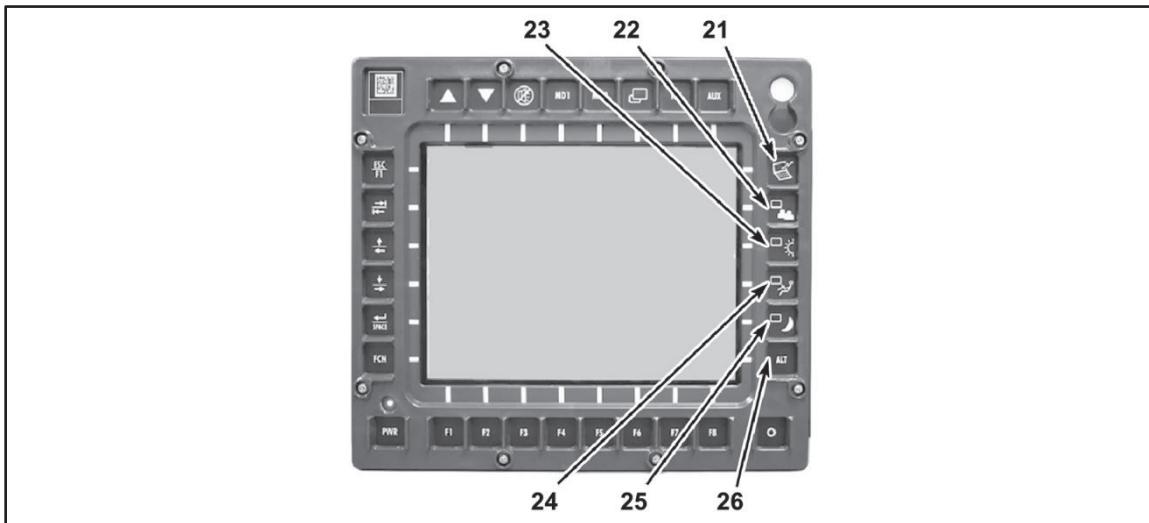


**Figure 3-152. Adjustment for display and bezel keys**

4. Select the video source for display. (See figure 3-153.)

**Notes:** If a video signal is not present, the color test pattern will be displayed.

The main menu key (see figure 3-153, item 21) can be used to return to main menu from any mode or display screen.



**Figure 3-153. Video source keys**

- a. Press the training video key (see figure 3-153, item 22) to display a training video source.
- b. Press the day/night vision video key (see figure 3-153, item 23) to display primary weapon optics.
- c. Press the DVE key (see figure 3-153, item 24) to display the DVE video image.

**Note:** Only antitank guided missile vehicle and mobile gun system vehicle have thermal/night key option.

- d. Press the thermal/night key (see figure 3-153, item 25) to displays the thermal/night sight video image.

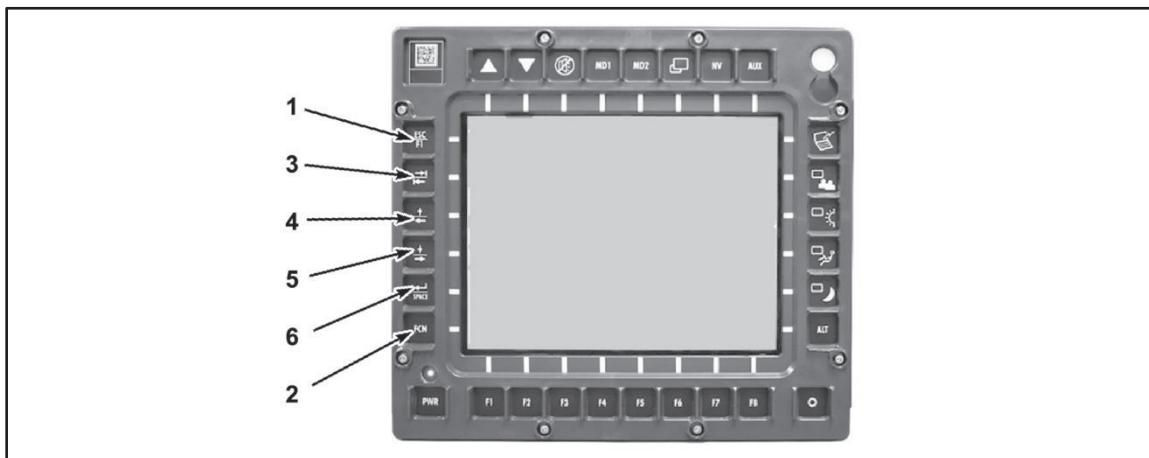
- e. Press the blackout key (see figure 3-153, item 26) to select the blackout mode.
- f. Return to previous screen by pressing the F8 key (see figure 3-154, item 20) or return to main menu by pressing the main menu key (see figure 3-154, item 21).

**Note:** When the up one-level soft key is visible, you can use it to go to previous screen.



**Figure 3-154. F8 and main menu keys**

5. Navigate the menus using the dual function keys. (See figure 3-155.)



**Figure 3-155. Dual-function keys**

- a. (Force XXI Battle Command, brigade and below [FBCB2] only) Escape a menu selection by press the ESC/F1 key (see figure 3-155, item 1).
- b. Tab right by pressing TAB key (see figure 3-155, item 3).
- c. Tab left by pressing and holding the FCN key (see figure 3-155, item 2) and pressing the TAB key (see figure 3-155, item 3).
- d. Move the cursor up by pressing the UP/LEFT key (see figure 3-155, item 4).

- e. Move the cursor left by pressing and holding FCN key (see figure 3-155, item 2) and pressing UP/LEFT key (see figure 3-155, item 4).
- f. Move the cursor down by pressing the DOWN/RIGHT key (see figure 3-155, item 5).
- g. Move the cursor right by pressing and holding FCN key (see figure 3-155, item 2) and pressing DOWN/RIGHT key (see figure 3-155, item 5).
- h. (FBCB2 only) Enter data or select a menu item by pressing key (see figure 3-155, item 6).
- i. (FBCB2 only) Create a text space by pressing and holding the FCN key (see figure 3-155, item 2) and pressing key (see figure 3-155, item 6).

**Note:** Touching the up one level soft key, when up one level soft key is available.

- j. Return to previous screen by pressing the F8 key (see figure 3-155, item 20) or return to main menu by pressing the main menu key (see figure 3-155, item 21).

**Note:** When the up one-level soft key is visible, you can use it to go to the previous screen.

Performance Measures	GO	NO-GO
1. Adjusted the VDT to desired position.	_____	_____
2. Powered up the VDT.	_____	_____
3. Adjusted the display and bezel key brightness.	_____	_____
4. Selected the video source for display.	_____	_____
5. Navigated menus using the dual-function keys.	_____	_____

References Required	Primary
TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4 Infantry Carrier Vehicle (ICV) M1126	

**071-217-0044**  
**Operate the Video Display Electronic Terminal on a Stryker**

**Conditions:** You are a crewmember on a Stryker vehicle and have been instructed to operate the video display electronic terminal (known as VDET). You have the basic issue items and the operator's interactive electronic technical manuals.

**Standards:** Operate the VDET on a Stryker.

**Performance Steps**

1. Power-up VDET.

**Note:** The Main screen is the default screen displayed after the power-on built-in test (known as PBIT) is completed. PBIT results are displayed at the bottom of the main screen in the form of an event pop-up screen. The pop-up screen will display system fault or faults detected by the vehicle diagnostic system during the power-up. The event pop-up message will indicate what system failed, criticality of fault, and corrective actions. The event pop-up must be acknowledged before normal VDET operation can commence.

- a. Ensure nothing is in contact with display screen during VDET power-up procedure.

**Note:** Resting of a hand or object against the display screen during power-up will give a false VDET failure indication.

- b. Push in on VDET swivel lock lever and rotate VDET to desired position.
- c. Place vehicle AUX MASTER switch, located on the power distribution panel (known as PDP), to "ON" position.
- d. Verify the VDET has performed a PBIT and the main screen has been displayed with no fault codes present.
- e. Adjust display and bezel key brightness on VDET.
  - (1) Press top right white button to increase display and bezel key brightness.
  - (2) Press second black button down from top right to decrease display brightness.

2. Select video source.

**Note:** The Training and ALT keys are not being utilized at this time.

- a. Press Main Menu key to select or return to main menu from any mode or display screen.
- b. Press Day/Night Vision Video key to select the primary weapon optics vision video source as the video to be viewed.
- c. Press driver's vision enhancer (known as DVE) key to display DVE video image.
- d. Press Blackout key (bottom right) to select blackout option.

3. Operate VDET set-up screens.

- a. Press F5 or Set Up Soft Key Icon located at the bottom of the main screen to display set up screen.

- b. Make diagnostic filter selections:
    - (1) Press selection touch screen keys located below diagnostic filter selection to suppress desired alarms or faults indications.
    - (2) Ensure a check mark has appeared in each box when selection has been made.
  - c. Enter current date and time if not correct.
  - d. Adjust default display brightness.
  - e. Adjust display contrast.
  - f. Adjust default bezel brightness.
  - g. Select VDET as the primary or secondary Force XXI Battle Command, brigade and below (FBCB2) user, as required.
    - (1) Ensure Internet Protocol addresses of VDET and FBCB2 are present. If not, notify field maintenance.
    - (2) Ensure FBCB2 V4 is out of Ops (map display area).
    - (3) Press Primary or Secondary soft key, as applicable.
    - (4) Select Return soft key icon (left up arrow).
    - (5) Select YES when VDET prompts for Save Changes confirmation.
4. Perform initiated built-in test (known as IBIT).
- Note:** The diagnostic implementation as of the date of this document supports IBIT for the VDET, climate control unit, and height management unit.
- a. Ensure VDET is powered on.
  - b. Ensure Inverter is powered on.
  - c. Acknowledge all Event Pop-ups if faults are present.
  - d. Press F2 or the System Health soft key to display System Health screen.
  - e. Press F5 or IBIT soft key to display the IBIT Set Up screen.
  - f. Perform IBIT on selected vehicle components:
    - (1) Press assigned arrow key located right of component selection box to list components.
    - (2) Touch screen to select on desired component to perform IBIT.
    - (3) Follow on screen pop up instructions located at bottom of the IBIT display screen.
5. Power-down VDET.
- a. Ensure VDET is placed into FBCB2 Role Secondary mode.

- (1) Press Main screen Key to display Main screen.
  - (2) Press Set Up key.
  - (3) Press FBCB2 Role Secondary key.
  - (4) Press Return key.
- b. Record any active faults detected by the diagnostic system.
- (1) Press Event Log key.
  - (2) Record faults that require field maintenance, as applicable.
  - (3) Press Full Details key (if required).
  - (4) Return to Main screen.
- c. Turn vehicle AUX MASTER switch on PDP to off position.

**Note:** Power-on light-emitting diode on VDET lower-left corner extinguishes.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Powered-up VDET.	_____	_____
2. Selected video source.	_____	_____
3. Operated the VDET set-up screens.	_____	_____
4. Performed IBIT.	_____	_____
5. Powered-down VDET.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-2-1 Operator's Manual Volume 1 Of 4 Infantry Carrier Vehicle (ICV) M1126 (NSN: 2355-01-481-8575) (EIC: AFF)	

**171-156-0035****Load the M6 Smoke Grenade Launcher on the Mobile Gun System****DANGER**

Ensure TURRET POWER ON/OFF switch, SALVO 1 FIRE/OFF select switch, and SALVO 2 FIRE/OFF select switch are set to OFF before loading or unloading smoke grenades. Smoke grenades could launch and cause serious injury or death to personnel.

Ammunition or components containing explosives must be handled with appropriate care at all times. The explosive elements in primers and fuses are particularly sensitive to shock and high temperature.

Ammunition must not be dropped, thrown, tumbled, or dragged. Serious injury or death to personnel can occur if ammunition is dropped, thrown, tumbled, or dragged. Refer to TB 43-0250. Smoke grenades can explode and burn. To prevent injury or death to personnel due to accidental firing, handle the smoke grenades with care and never place any part of the body in front of the smoke grenade launcher tubes.

Do not place any part of body in front of launcher while loading or unloading launchers, or checking for misfired M6 grenades. Death or injury to personnel may result if grenades accidentally fire

**WARNING**

COMBAT OVERRIDE/NORMAL switch on the central control panel (known as CCP) should be set to NORMAL when operating turret and firing main gun, coaxial machine gun, or smoke grenades except under emergency conditions in actual combat. Operating turret and firing main gun, coaxial machine gun, or smoke grenades with COMBAT OVERRIDE/NORMAL switch set to COMBAT OVERRIDE may result in damage to equipment and serious injury to personnel.

**Conditions:** You are a crewmember on a mobile gun system in a unit preparing for a mission. The vehicle commander has directed you to load the M6 smoke grenade launcher.

**Standards:** Load the M6 smoke grenade launcher.

**Performance Steps**

1. Power down commander's station and turret (see figure 3-156, page 3-444).

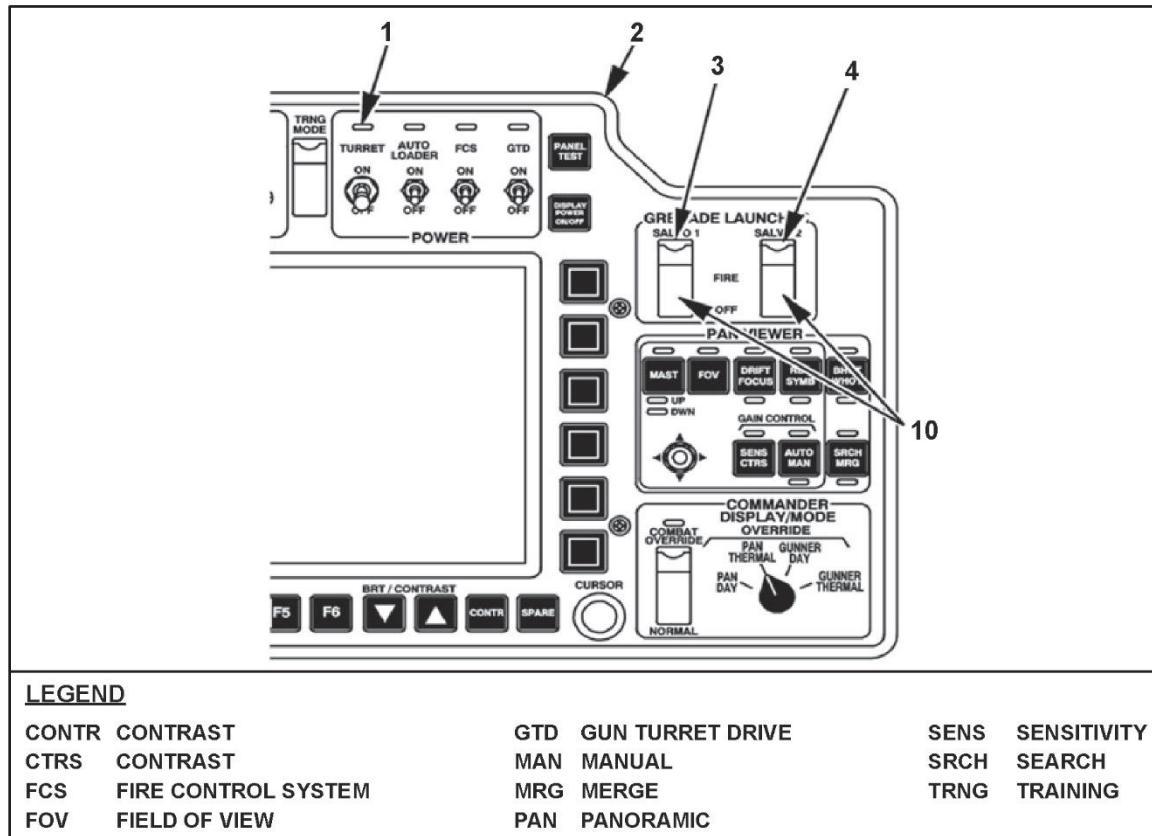
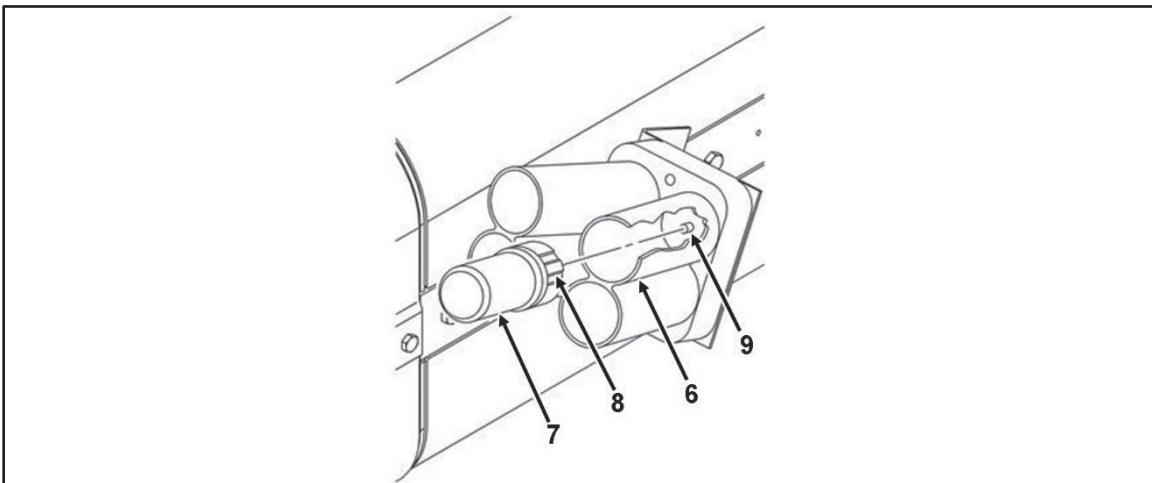


Figure 3-156. Central control panel

2. Ensure the TURRET ON LED (see figure 3-156, item 1) on the CCP (see figure 3-156, item 2) is not illuminated.
3. Ensure the SALVO 1 FIRE/OFF switch (see figure 3-156, item 3) and SALVO 2 FIRE/OFF switch (see figure 3-156, item 4) are set to the OFF position.
4. Lock commander's turret azimuth lock.
5. Remove and stow protective covers from grenade launchers.
6. Inspect the grenade launcher tubes. (See figure 3-157.)

**Note:** If damaged, notify maintenance.



**Figure 3-157. Grenade launcher tubes**

- a. Check that the tubes (see figure 3-157, item 6) are free of debris and contacts are clear.
  - b. Ensure the tubes are not damaged.
7. Load the smoke grenades into the grenade launcher(s). (See figure 3-157.)
- a. Remove a smoke grenade from shipping container.
  - b. Inspect the smoke grenade for damage, paying particular attention to base (see figure 3-157, item 8) of smoke grenade where the firing pin will make contact.
  - c. Insert the smoke grenade into the left- or right-side grenade launcher tubes with the metal end down, starting at bottom tube, farthest away.
  - d. Push the smoke grenade down, base first, so that spring clip at base (see figure 3-157, item 8) of smoke grenade engages the tip plug (see figure 3-157, item 9) at bottom of grenade launcher tube.

**Note:** The clip should click twice.

- e. Turn the smoke grenade one-half turn to ensure a good electrical contact.
- f. Repeat loading process (step 7a through 7e) to load additional smoke grenades, working in from the farthest launcher tube.

Performance Measures	GO	NO-GO
1. Powered down commander's station and turret.	_____	_____
2. Ensured the TURRET ON LED on the CCP was not illuminated.	_____	_____
3. Ensured the SALVO 1 FIRE/OFF switch and SALVO 2 FIRE/OFF switch were set to the OFF position.	_____	_____
4. Locked the commander's turret azimuth lock.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Removed the protective covers from grenade launchers.	_____	_____
6. Inspected the grenade launcher tubes.	_____	_____
7. Loaded the smoke grenades into the grenade launcher(s).	_____	_____

References Required	Primary
TB 43-0250 Ammunition Handling, Storage and Safety	TM 9-2355-321-10-2 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)

**171-156-0050****Unload the M6 Smoke Grenade Launcher on the Mobile Gun System****DANGER**

**Ensure TURRET POWER ON/OFF switch, SALVO 1 FIRE/OFF select switch, and SALVO 2 FIRE/OFF select switch are set to OFF before loading or unloading smoke grenades. Smoke grenades could launch and cause serious injury or death to personnel.**

**Ammunition or components containing explosives must be handled with appropriate care at all times. The explosive elements in primers and fuses are particularly sensitive to shock and high temperature.**

**Ammunition must not be dropped, thrown, tumbled, or dragged. Serious injury or death to personnel can occur if ammunition is dropped, thrown, tumbled, or dragged. Refer to TB 43-0250.**

**Smoke grenades can explode and burn. To prevent injury or death to personnel due to accidental firing, handle the smoke grenades with care and never place any part of the body in front of the smoke grenade launcher tubes.**

**Do not place any part of body in front of launcher while loading or unloading launchers, or checking for misfired M6 grenades. Death or injury to personnel may result if grenades accidentally fire.**

**WARNING**

**COMBAT OVERRIDE/NORMAL switch on the central control panel should be set to NORMAL when operating turret and firing main gun, coaxial machine gun, or smoke grenades except under emergency conditions in actual combat. Operating turret and firing main gun, coaxial machine gun, or smoke grenades with COMBAT OVERRIDE/NORMAL switch set to COMBAT OVERRIDE may result in damage to equipment and serious injury to personnel.**

**Conditions:** You are a crewmember on a mobile gun system conducting tactical operations. You have just completed a mission using the M6 smoke grenades. You have been directed to unload the M6 smoke grenade launcher.

**Standards:** Unload the unfired M6 smoke grenades and properly stow them in the grenade stowage box.

**Performance Steps**

1. Power down commander's station and turret (see figure 3-158, page 3-448).

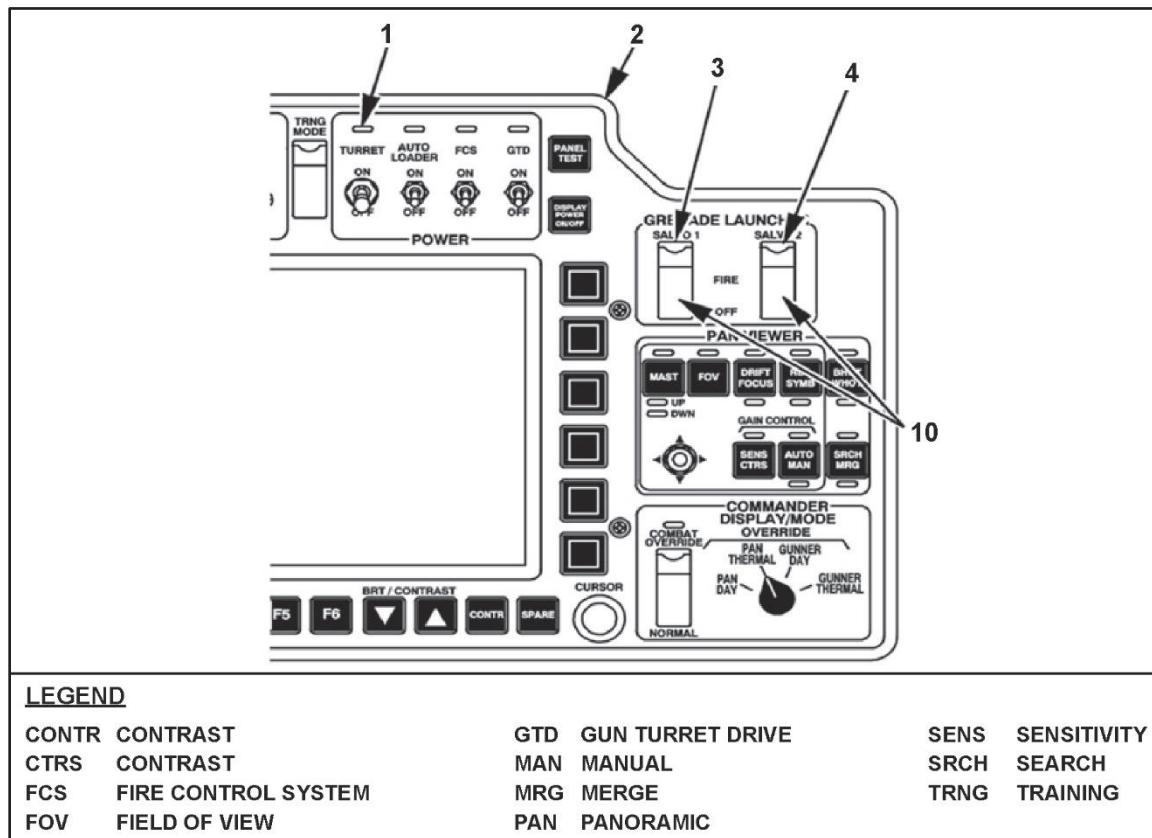


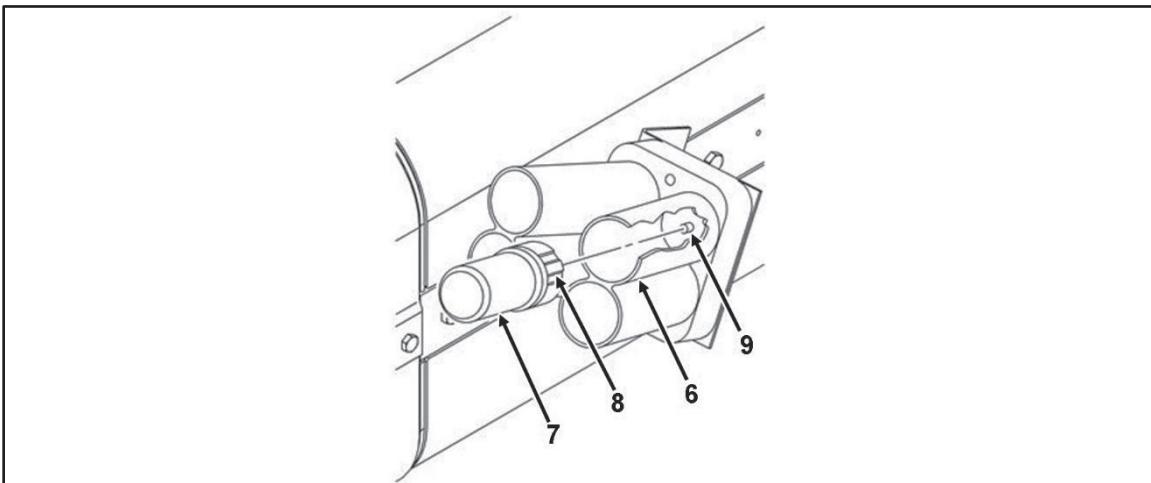
Figure 3-158. Central control panel

2. Ensure the TURRET ON LED (see figure 3-158, item 1) on the CCP (see figure 3-158, item 2) is not illuminated.
3. Ensure SALVO 1 FIRE/OFF switch (see figure 3-158, item 3) and SALVO 2 FIRE/OFF select switch (see figure 3-158, item 4) are set to OFF position.
4. Lock commander's turret azimuth lock.

### DANGER

Always handle smoke grenades from side of grenade body. Never push down or exert pressure on the top of smoke grenades.  
 Always wear gloves when handling grenades. When unloading discharger tubes, always unload nearest tubes first, then proceed to next closest tube until all grenades have been unloaded. Do not place any part of body in front of loaded discharge tubes.  
 Injury or death to personnel may result if grenades accidentally fire.

5. Remove smoke grenades from right and left grenade launcher tubes, as required. (See figure 3-159.)



**Figure 3-159. Grenade launcher tubes**

- a. Remove smoke grenades (see figure 3-159, item 7), starting from nearest grenade launcher tube (see figure 3-159, item 6), while keeping hand or arm from crossing the path of a loaded grenade launcher tube.
  - (1) Grasp the smoke grenade from the side.
  - (2) Carefully pull, twist, and remove the smoke grenade from the grenade launcher tube.
  - (3) Repeat process to remove each smoke grenade.
- b. Stow the smoke grenades in a smoke grenade shipping containers.
6. Perform preventative maintenance checks and services (PMCS) on the smoke grenade launchers.
7. Install protective covers on smoke grenade launchers.

Performance Measures	GO	NO-GO
1. Powered down the commander's station and turret.	<input type="checkbox"/>	<input type="checkbox"/>
2. Ensured the TURRET ON LED on the CCP was not illuminated.	<input type="checkbox"/>	<input type="checkbox"/>
3. Ensured the SALVO 1 FIRE/OFF switch and SALVO 2 FIRE/OFF select switch were set to OFF position.	<input type="checkbox"/>	<input type="checkbox"/>
4. Locked the commander's turret azimuth lock.	<input type="checkbox"/>	<input type="checkbox"/>
5. Removed the smoke grenades from right and left grenade launcher tubes.	<input type="checkbox"/>	<input type="checkbox"/>
6. Performed PMCS on the smoke grenade launchers.	<input type="checkbox"/>	<input type="checkbox"/>
7. Installed the protective covers on smoke grenade launchers.	<input type="checkbox"/>	<input type="checkbox"/>

<b>References Required</b>	<b>Primary</b>
TB 43-0250 Ammunition Handling, Storage and Safety	TM 9-2355-321-10-2 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)

**171-156-0043**  
**Prepare the Mobile Gun System for Operation after Transport**

**Conditions:** You are a crewmember of a mobile gun system (known as MGS) that has just been transported and must prepare the vehicle for operation. You have the necessary tools, basic issue items, equipment, and supplies on hand.

**Standards:** Prepare the MGS for operation by removing the securing devices, performing engine start-up procedures, ensuring the vehicle is in correct height position, unloading the vehicle, filling the fuel tanks, installing the antennas, and reloading all equipment.

**Performance Steps**

1. Remove securing devices.
2. Perform engine start-up procedures.
3. Ensure that the front and rear lower light-emitting diodes (LEDs) on the height management unit (known as HMU) are continuously illuminated, once the HMU is fully operational.
  - a. If the LEDs are continuously illuminated, proceed to step 4.
  - b. If the LEDs start flashing simultaneously, perform the following steps:
    - (1) Ensure MGS is in 4 x 8 mode.
    - (2) Ensure the transfer case is in high range.
    - (3) Ensure engine is running for hydraulic power.
    - (4) Drive MGS forward and rearward approximately 3 feet.
    - (5) Press and release center level button to reinitiate MGS transport position.
    - (6) Check if the LEDs are now continuously illuminated.
      - (a) If continuously illuminated, go to step 4.
      - (b) If not illuminated, repeat process (steps 3b[1] through 3b[6]) up to three times.
      - (c) Notify maintenance if LEDS are still flashing after three attempts.
4. Raise the MGS.
  - c. Toggle both HMU switches to up position.
  - d. Ensure the front and rear lower LEDs on the HMU extinguish.
  - e. Ensure the front and rear nominal LEDs on the HMU start to flash.
  - f. Ensure transfer pump starts to cycle.
  - g. Ensure MGS begins to rise.

**Note:** Once the MGS has stopped rising, the front and rear nominal LEDs on the HMU will stop flashing and remain continuously illuminated.

5. Check the front and rear lower, front and rear nominal, and front and rear upper LEDs to ensure they are continuously illuminated.
  - a. If the LEDs are continuously illuminated, proceed to step 6.
  - b. If the LEDs start flashing simultaneously, perform the following steps:
    - (1) Ensure MGS is in 4 x 89 mode.
    - (2) Ensure that the transfer case is in high.
    - (3) Ensure engine is running hydraulic power.
    - (4) Drive MGS forward and rearward approximately 3 feet.
    - (5) Press and release center level button to reinitiate MGS unload position.
    - (6) Check if the LEDs are continuously illuminated, vehicle is not in position.
      - (a) If continuously illuminated go to step 6.
      - (b) If not illuminated, repeat possess (steps 5b[1] through 5b[6]) up to three times.
      - (c) Notify field maintenance if the vehicle is not in position after three attempts.
6. Unload MGS.
  - a. Release parking brake.
  - b. Drive MGS off the mode of transport.
  - c. Set parking brake.
  - d. Set gear range selector to Neutral (N).
  - e. Perform engine shutdown procedures.
7. Fill fuel tanks.
  - a. Lift fuel filler cover.
  - b. Clean area around fuel filler cap.
  - c. Lift up and rotate locking handle counterclockwise to remove fuel filler cap.
  - d. Insert fuel hose nozzle or fuel can spout into fuel filler neck on fuel tank and add fuel, as required.
  - e. Position fuel filler cap on fuel filler neck ensuring that locking tabs are aligned.
  - f. Rotate locking handle clockwise until fully locked and fold locking handle down.
  - g. Close and secure fuel filler cover.

- h. Repeat steps 7a through 7g for other fuel tank.
- 8. Install antennas.
  - a. Install antenna on base.
  - b. Push circuit breaker 7 on communication power distribution panel unit in to the ON position.
- 9. Reload all equipment on the MGS.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Removed securing devices according to unit standard operating procedure.	_____	_____
2. Performed engine start-up procedures.	_____	_____
3. Ensured that the front and rear lower LEDs on the HMU were continuously illuminated, once the HMU is fully operational.	_____	_____
4. Raised the MGS.	_____	_____
5. Checked the front and rear lower, front and rear nominal, and front and rear upper LEDs to ensure they were continuously illuminated.	_____	_____
6. Unload MGS.	_____	_____
7. Filled fuel tanks.	_____	_____
8. Installed antennas.	_____	_____
9. Reloaded all equipment on the MGS.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-321-10-7 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)	TM 9-2355-321-10-1 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)

**171-159-0010**

**Operate the Chemical Defense System on the Mobile Gun System**

**DANGER**

If the vehicle has been in a nuclear, biological, or chemical warfare environment, the vehicle must be decontaminated by trained personnel. Personnel may be killed or injured if a contaminated M3 heater system is used or inspected before being cleaned by authorized personnel.

**CAUTION**

The nuclear, biological, chemical (NBC) ventilated face mask (known as VFM) indicator will illuminate and a three-tone audible alarm will sound from the annunciator panel when either radiation detector AN/VDR-2 Radiac detects radiation or M22 chemical detector detects a chemical agent.

- For operation of AN/VDR-2 Radiac system, refer to TM 11-6665-251-10.
- For operation of M88 chemical detector system, refer to TM 3-6665-321-12&P.

**Conditions:** You are a crewmember of mobile gun system conducting operations and the vehicle is entering a chemical, biological, radiological, and nuclear (CBRN) environment. You have been directed to mask. You have your combat vehicle crewman (known as CVC) helmet and an M51 protective mask.

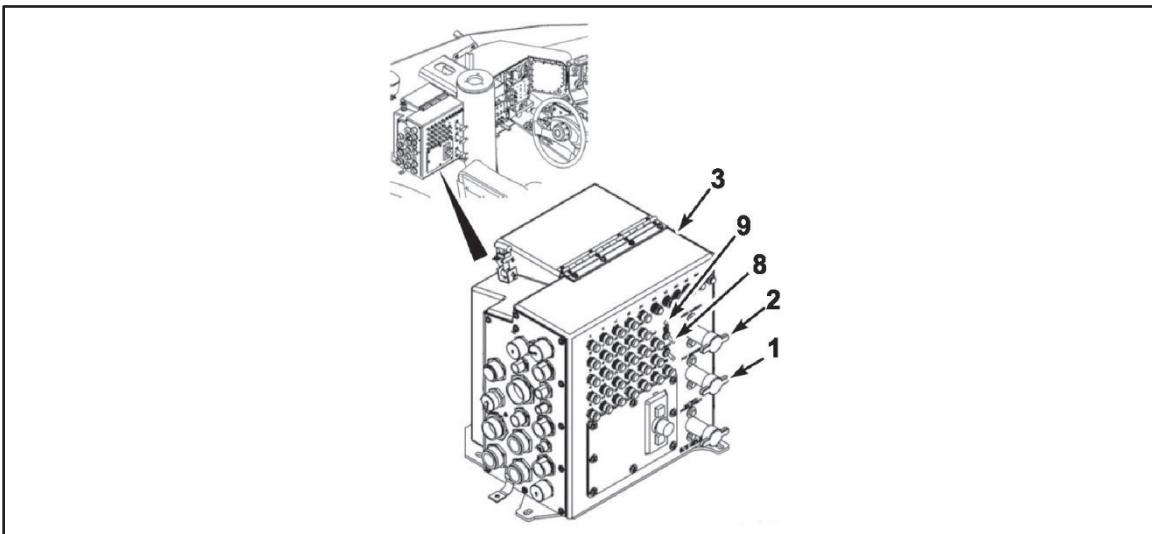
**Standards:** Power up the VFM system and power down the VFM once the CBRN ALL CLEAR command is received. Ensure proper wear of mask is sustained to protect the crew from the CBRN environment.

**Note:** The steps for this task can be applied to either the M42 protective mask or the M51 protective mask.

**Performance Steps**

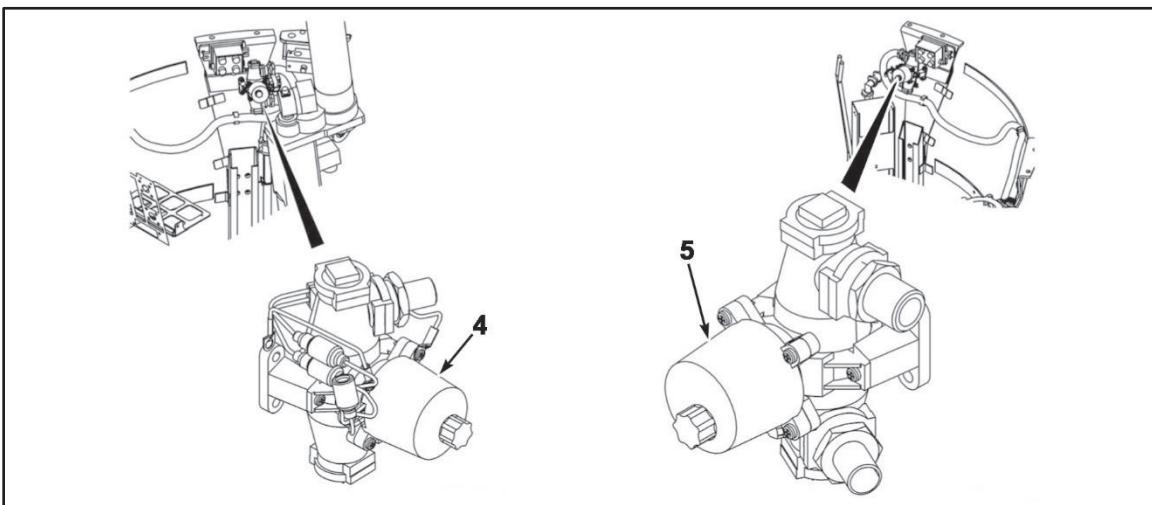
1. Power up the VFM system.
  - a. Set AUX MASTER (see figure 3-160, item 1) and AUTO MASTER switches (see figure 3-160, item 2) on power distribution panel (known as PDP) (see figure 3-160, item 3) to ON position.

**Note:** Commander's station and turret must be powered up to operate turret-mounted M3 heaters.



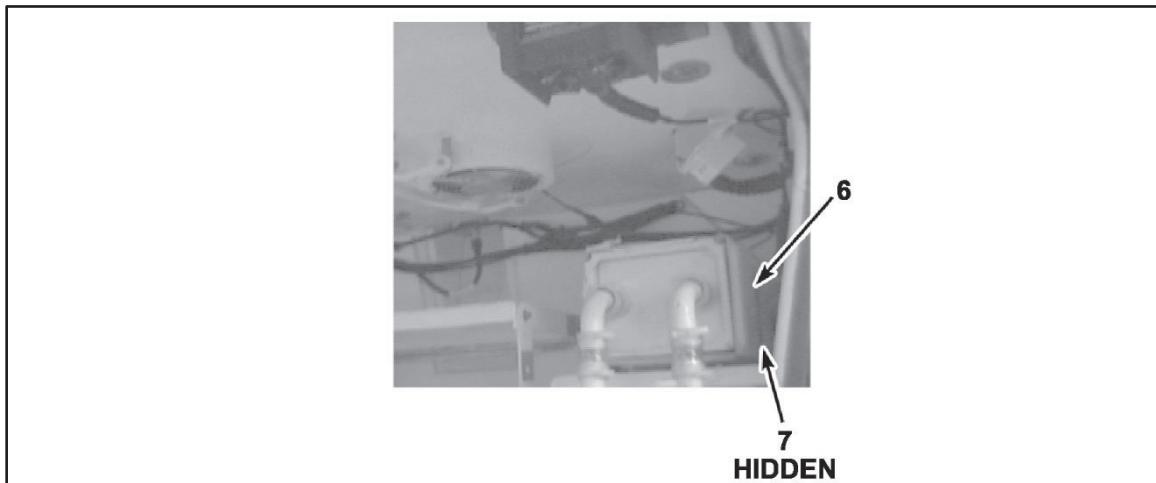
**Figure 3-160. Power distribution panel**

- b. If either the commander's M3 heater (see figure 3-161, item 4) or gunner's M3 heater (see figure 3-161, item 5) is going to be used, power up commander's station and turret.



**Figure 3-161. M3 heaters**

- c. Ensure that spring clip (see figure 3-162, item 6, page 3-456) is lifted so that filter assembly air inlet (see figure 3-162, item 7, page 3-456) is open.

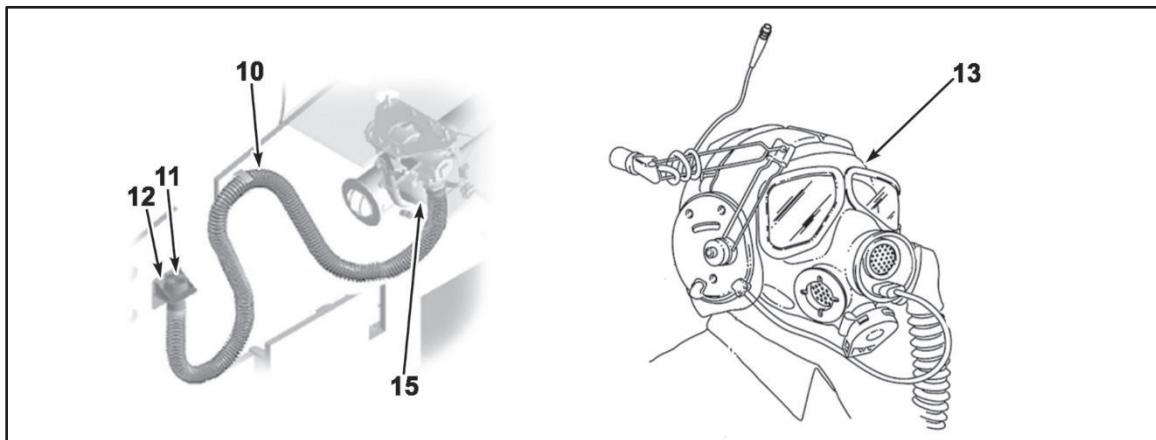


**Figure 3-162. Spring clip and filter assembly**

- d. Set NBC/VFM toggle switch (see figure 3-163, item 8) on the PDP (see figure 3-163, item 3) to ON.

**Note:** NBC/VFM indicator (see figure 3-163, item 9) will illuminate.

- e. Disconnect heater hose (see figure 3-163, item 10) from quick-disconnect coupling (see figure 3-163, item 11) on stowage bracket (see figure 3-163, item 12) and connect heater hose to M51 protective mask.



**Figure 3-163. Heater hose**

- f. Adjust M3 heater control knob on M3 heater until air temperature is comfortable.
  - g. Put on and adjust the CVC helmet.
  - h. Swing boom microphone out of the way.
  - i. Disconnect boom microphone lead from jack on CVC helmet right earpiece.
  - j. Connect M51 protective mask microphone cable to M51 protective mask microphone jack and jack on CVC headset right earpiece.
2. Power down the VFM system.

**Note:** The VFM should only be powered down once the CBRN CLEAR command has been received.

- a. Refer to ATP 3-11.32/MCWP 10-10E.8/NTTP 3-11.37/AFTTP 3-2.46 for decontamination procedures.
- b. Disconnect heater hose (see figure 3-163, item 10) from M51 protective mask and connect to quick-disconnect coupling (see figure 3-163, item 11) on stowage bracket (see figure 3-163, item 12).
- c. Turn M3 heater to off by rotating heater control knob counterclockwise.
- d. Set NBC/VFM toggle switch (see figure 3-163, item 8) on PDP (see figure 3-163, item 3) to OFF.

**Note:** NBC/VFM indicator will extinguish.

- e. Disconnect M51 protective mask microphone cable from M51 microphone jack and from jack on CVC helmet right earpiece.
- f. Connect boom microphone lead to jack on CVC helmet right earpiece.
- g. Remove CVC helmet.
- h. Close spring clip (see figure 3-162, item 6) on filter unit (see figure 3-162, item 7).
- i. Set AUX MASTER (see figure 3-162, item 1) and AUTO MASTER switches (see figure 3-162, item 2) on PDP (see figure 3-161, item 3) to OFF position.

Performance Measures	GO	NO-GO
1. Powered up the VFM system.	_____	_____
2. Powered down the VFM system.	_____	_____

References Required	Primary
ATP 3-11.32/MCWP 10-10E.8/NTTP 3-11.37/AFTTP 3-2.46 Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Passive Defense	TM 9-2355-321-10-2 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)
TM 11-6665-251-10 Radiac Set AN/VDR-2 (NSN 6665-01-222-1425)	

<b>References Required</b>	<b>Primary</b>
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TM 3-6665-321-12&P Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) for Alarm, Chemical Agent, Automatic: M22 (NSN 6665-01-438-6963) (EIC: 5AC) and Auxiliary Equipment Power Supply, Chemical Agent Automatic Alarm: M281 (NSN: 6130-01-438-6960) Mounting Kit, Chemical Agent Automatic Alarm: M281 (NSN 6665-01-438) Alarm Unit, Chemical Agent Automatic Alarm: ABCA-M42 (NSN 6665-00-859-2215)

**071-217-0011****Remove a Caliber .50 M2 Machine Gun from a Stryker Vehicle Remote Weapon Station**

**Conditions:** You are a crewmember of a Stryker vehicle equipped with a .50 caliber M2 machine gun mounted in the remote weapon station (known as RWS). You have been directed to remove and stow the .50 caliber M2 machine gun. You have your unit's standard operating procedures (SOPs) and another Soldier to assist.

**Standards:** Remove the .50 caliber M2 machine gun from the RWS without causing injury to personnel or damage to equipment.

**Performance Steps**

1. Ensure that the RWS AZIMUTH MANUAL MODE RELEASE and the TRANSPORT LOCK are engaged.
2. Ensure that the GUN ARM/SAFE switch is set to SAFE.
3. Confirm that the AUX MASTER, AUTO MASTER, and fire control unit (known as FCU) power switches are in the OFF position.

**DANGER**

The machine gun must be pointed in a safe direction and all personnel and equipment must be clear of the line of fire.

**CAUTION**

If the machine gun is hot, wear heat protective gloves to prevent injuries.

To prevent injuries, the RWS must be powered down prior to exiting from commander's or squad leader's hatches.

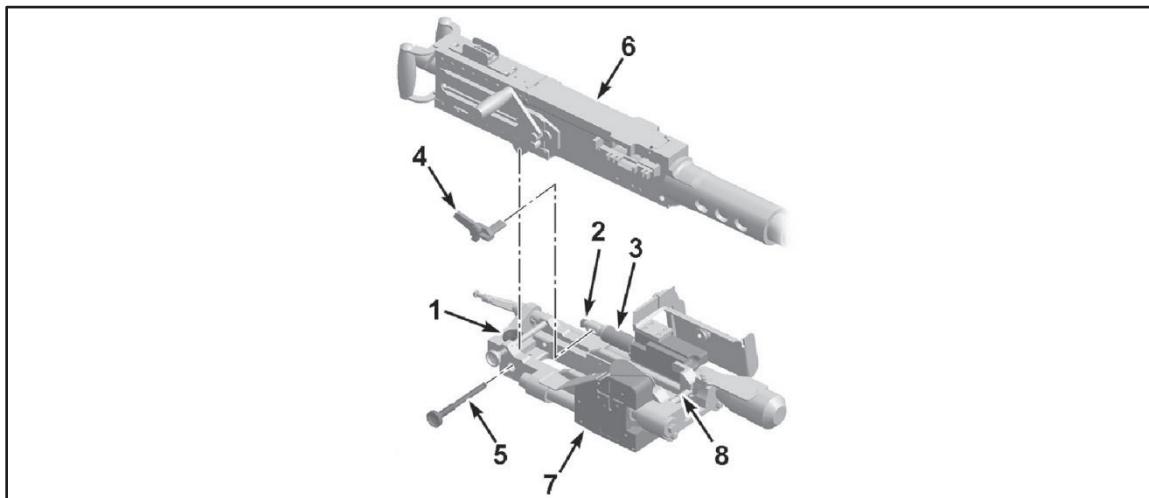
4. Clear the machine gun.
5. Remove the ammunition box.
  - a. Press the spring loaded ammunition box latch to release locking pin, while pulling the ammunition box upward to allow two attachment slots to clear the attachment lugs.
  - b. Remove the ammunition box from ammunition box holder.

**CAUTION**

To prevent damage to equipment, disconnect firing solenoid wiring harness prior to removing primary weapon.

6. Remove the machine gun firing solenoid (if required).

- a. Disconnect firing solenoid wiring harness P1 connector from 4J2 connector on sight servo assembly.
  - b. Remove cotter pin and loosen castle nut on firing solenoid.
  - c. Remove firing solenoid from machine gun.
  - d. Install new cotter pin on castle nut.
  - e. Stow the firing solenoid in the RWS accessories bag.
7. Remove the machine gun from the RWS. (See figure 3-164.)
- a. Remove barrel from receiver.
    - (1) Retract the bolt approximately 3/8 inches for barrel locking lug to center in barrel locking spring hole on right-hand side of the receiver.
    - (2) (M2) Direct assistant to unscrew and remove barrel assembly.
    - (3) (M2A1) Direct assistant to rotate the barrel, using barrel carrying handle, until the barrel alignment pin engages alignment slot and pull the barrel out of the receiver.
  - b. Unscrew straining screw (see figure 3-164, item 1) one full turn counterclockwise.



**Figure 3-164. Removing the M2 from the remote weapon station**

- c. Pull cocking bracket lock (see figure 3-164, item 2) out on rear of cocking actuator (see figure 3-164, item 3).
- d. Move cocking bracket (see figure 3-164, item 4) to the left.
- e. Remove the rear locking pin.
  - (1) Push rear locking pin (see figure 3-164, item 5) in and rotate one-quarter turn counterclockwise.
  - (2) Pull the locking pin (see figure 3-164, item 5) fully out and rotate one quarter turn counterclockwise and remove.

- f. Remove the receiver group (see figure 3-164, item 6) from soft mount (see figure 3-164, item 7) with assistance from another Soldier.
    - (1) Lift on rear of receiver group (see figure 3-164, item 6).
    - (2) Push the receiver group (see figure 3-164, item 6) forward and lift from the front mount (see figure 3-164, item 8).
  - g. Remove the front locking pin (see figure 3-164, item 9) from front mounting hole (see figure 3-164, item 10) in receiver group and stow in RWS accessories bag.
  - h. Replace rear locking pin.
  - i. Hand-tighten straining screw (see figure 3-164, item 1).
  - j. Remove the cocking bracket (see figure 3-164, item 4) from cocking actuator (see figure 3-164, item 3) and stow in RWS accessories bag.
8. Reinstall the ammunition box.
- a. Place the two attachment lugs onto attachment slots on the ammunition box holder.
  - b. Push the ammunition box down until the locking pin on the ammunition box latch clicks.
  - c. Check the security of the ammunition box by pulling up.
9. Stow the machine gun in accordance with the unit SOP.

Performance Measures	GO	NO-GO
1. Ensured that the RWS AZIMUTH MANUAL MODE RELEASE and the TRANSPORT LOCK were engaged.	_____	_____
2. Ensured that the GUN ARM/SAFE switch was set to SAFE.	_____	_____
3. Confirmed that the AUX MASTER, AUTO MASTER, and FCU power switches were in the OFF position.	_____	_____
4. Cleared the machine gun.	_____	_____
5. Removed the ammunition box.	_____	_____
6. Removed the machine gun firing solenoid, if required.	_____	_____
7. Removed the machine gun from the RWS.	_____	_____
8. Reinstalled the ammunition box.	_____	_____
9. Stowed the machine gun in accordance with the unit SOP.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-2355-311-10-2 -1 Operator's Manual Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126

**071-217-0009****Install a Caliber .50 M2-Series Machine Gun on a Stryker Vehicle Remote Weapon Station****DANGER**

**The M2 .50 caliber machine gun must be clear prior to installation.**

**Boresighting must be performed before firing the weapon if the weapon has been removed from the remote weapon station (known as RWS) since the last time boresighting was performed. This applies if the same weapon is reinstalled or if a new weapon is installed. If boresighting is not performed, misalignment may exist between the weapon and the sight system.**

**Conditions:** You are a crewmember on a Stryker vehicle preparing for operations and have been directed install the M2 machine gun in the RWS. You have a headspace and timing gauge and other crewmembers to assist.

**Standards:** Clear and install the M2 machine gun in the RWS of the Stryker. Weapon must be securely mounted and ready to load.

**Performance Steps**

1. Clear the weapon.
2. Prepare the RWS.
  - a. Remove rubber case damper, if required.
    - (1) Remove the screw that secures rubber case damper to soft mount.
    - (2) Stow the screw and rubber case damper in weapon's accessory bag.
  - b. Disengage TRANSPORT LOCK.
  - c. Manually depress soft mount to -20 degrees and engage TRANSPORT LOCK.

**Note:** Cocking bracket is located in weapon's accessory bag.

- d. Install cocking bracket on cocking actuator by pulling out the bolt lock.
- e. Slide the cocking bracket to the left.

**WARNING**

**The mounting pins are spring-loaded. Ensure that the mounting pins are fully inserted into the soft mount assembly before locking the soft mount assembly into position. Failure to do so may result in injury to personnel and damage to equipment.**

- f. Fully retract the straining screw.

**Note:** The rear locking pin has two locking grooves. The MK19 mounting pin is longer than MG M2 mounting pin.

- g. Remove the .50 caliber mounting pin from soft mount by pushing and rotating it one-quarter turn counterclockwise and removing it completely.
  - h. Push in on the cocking bracket releaser and rotate it left.
3. Mount the machine gun.
    - a. Install the anchor pin in front mounting hole on receiver group.
    - b. Install the receiver group, with crewmember's assistance, on the soft mount by inserting the anchor pin in the recess of the soft mount.
    - c. Pull the receiver group back and align the rear mounting hole of the receiver group with the soft mount.
    - d. Insert the machine gun M2 mounting pin through the mounting pin hole in the receiver group and rotate it one-quarter turn clockwise to locked position.
    - e. Position the rear mounting hole of the receiver group on the rear of soft mount by pulling the receiver group backwards.

**CAUTION**

**When tightening straining screw, finger-tighten only. Do not use pliers to tighten. Failure to comply may result in damage to equipment.**

- f. Hand-tighten the straining screw against the bottom plate of receiver group until the machine gun is securely installed.
- g. Pull the retracting slide handle back until hole in the sliding bolt aligns with slot in the receiver group.
- h. Insert the cocking bolt stud into bolt stud hole in the receiver group.
- i. Allow retracting slide handle to move forward under control.
- j. Push in cocking bracket releaser and rotate clockwise to M2 .50 caliber machine gun position.
- k. Push bolt lock in on cocking actuator to lock cocking bracket in position.

**Note:** Cocking bracket allows for cocking actuator to charge weapon.

1. Install the barrel in the machine gun receiver.
- m. Adjust the headspace and timing on the machine gun, if required.
- n. Fully extend the M2 ammunition feed guide on ammunition box holder bracket.
4. Install the machine gun firing solenoid.
  - a. Lock the machine gun bolt to rear.
  - b. Unscrew the castle nut to loosen shoulder bolt.
  - c. Insert the front notch and shoulder bolt in front and rear mounting slots.
  - d. Ensure that front edge on trigger plunger levels with rear edge on sear slide of shoulder bolt.

**Notes:** Trigger plunger will coincide with sear slide.

Minimum of two or three threads should be showing on the end of the shoulder screw once it is fully tightened against receiver. If still unable to view two or three threads or solenoid is not tight against receiver, attempt to reinstall. If second attempt fails, report to maintenance.

- e. Tighten the castle nut on the shoulder bolt to secure the solenoid assembly to the side plate.
- f. Secure the castle nut on shoulder bolt using a cotter pin.
- g. Connect the firing solenoid connector to 4J2 connector on the sight assembly unit.
5. Adjust firing solenoid.
  - a. Perform headspace and timing of M2 .50 caliber machine gun, as required.
  - b. Rotate adjusting knob on firing solenoid counter-clockwise until it stops.
  - c. Place weapon in automatic mode.
  - d. Charge weapon by pressing CHG button on control grip.

**CAUTION**

Do not release the retracting slide handle on the machine gun.

- e. Open feed tray cover.

**Note:** On the RWS, the GUN ARMED LED will not illuminate and FIRING ENABLED will not be displayed until the enable switch on the control grip is engaged and all firing conditions are met.

- f. Raise the extractor and pull retracting slide handle back until front end of barrel extension is approximately  $\frac{1}{4}$ -inch (6 millimeters) from the trunnion block.
- g. Set the GUN ARM/SAFE switch to ARM on the fire control unit (known as FCU).

- h. Verify the GUN ARMED light-emitting diode illuminates.
- i. Place angle of NO FIRE timing gauge on curved portion of barrel.
- j. Slowly release retracting slide handle to allow barrel extension to close on gauge.
- k. Attempt to fire weapon by using trigger on the control grip.

**Note:** Remember to count number of clicks from the first to last firing pin release.

- (1) If weapon does not fire—
    - (a) Replace firing solenoid with a known good firing solenoid.
    - (b) If weapon still does not fire, replace sear slide in bolt assembly on M2 .50 caliber machine gun, and install initial firing solenoid.
  - (2) If weapon fires—
    - (a) Rotate adjusting knob on electrical firing solenoid clockwise until it stops.
    - (b) Remove NO FIRE timing gauge from between barrel extension and trunnion block.
- l. Charge weapon by pressing GUN CHG button on FCU.
  - m. Insert FIRE timing gauge between barrel extension and trunnion block.
  - n. Attempt to fire using trigger on the control grip.

**Note:** Remember to count number of clicks from the first to last firing pin release.

- (1) If weapon does not fire—
    - (a) Rotate adjusting knob on firing solenoid counterclockwise one click at a time.
    - (b) Attempt to fire.
    - (c) Continue advancing firing solenoid one click at a time until firing pin falls.
  - (2) If weapon fires—
    - (a) Remove FIRE timing gauge.
    - (b) Close feed tray cover.
- o. Charge weapon by pressing GUN CHG button on FCU.
  - (1) Open feed tray cover.
  - (2) Insert NO FIRE timing gauge between barrel extension and trunnion block.
- p. Attempt to fire using trigger on the control grip.

**Note:** Weapon should not fire.

- (1) Rotate (advance) adjusting knob on firing solenoid counterclockwise one click at a time.
  - (2) Attempt to fire.
  - (3) Continue advancing firing solenoid one click at a time until firing pin falls.
  - (4) Remove NO FIRE timing gauge.
  - (5) Close feed tray cover.
- q. Rotate adjusting knob on solenoid clockwise (opposite direction of arrow) by half the number of clicks it was turned counterclockwise.

**Note:** Round number of clicks down if number has a decimal point (for example 9.5 would be rounded to 9).

- r. Verify adjustment of firing solenoid.
  - (1) Charge weapon by pressing GUN CHG button on FCU.
  - (2) Open feed tray cover.
  - (3) Insert FIRE timing gauge between barrel extension and trunnion block.
  - (4) Attempt to fire using trigger on the control grip.

**Note:** Weapon should fire.

- (a) If weapon fires, continue to next step.
  - (b) If weapon does not fire, repeat timing adjustment process.
- (5) Remove FIRE timing gauge.
  - (6) Close feed tray cover.
  - (7) Charge weapon by pressing GUN CHG button on FCU.
  - (8) Open feed tray cover.
  - (9) Insert NO FIRE timing gauge between barrel extension and trunnion block.
  - (10) Attempt to fire weapon using trigger on the control grip.

**Note:** Weapon should not fire.

- (a) If weapon does not fire, continue to next step.
  - (b) If weapon does fire, repeat timing adjustment process.
- (11) Remove NO FIRE timing gauge.
  - (12) Close feed tray cover.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the weapon.	_____	_____
2. Prepared the RWS.	_____	_____
3. Mounted the machine gun.	_____	_____
4. Installed the machine gun firing solenoid.	_____	_____
5. Adjusted firing solenoid.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0017****Engage Targets with a Machine Gun Mounted on a Stryker Vehicle Remote Weapon Station****DANGER**

**Do not rely only on software to detect traverse and firing inhibit zones.**

**Always visually verify that personnel and equipment are clear before firing weapon systems or moving the remote weapon station (known as RWS).**

**Ensure that the primary weapon is aimed in a safe direction, no personnel or equipment are in line of fire, and that all firing range safety procedures are followed. Failure to do so may result in injury or death to personnel. The infrared (IR) aiming laser and visible aiming laser are not eye-safe in high-power mode within 49 feet (15 meters) or farther if personnel are using magnifying optics. To prevent serious eye injury to personnel, use caution when operating the Small Tactical Optical Rifle Mounted (known as STORM) laser range finder (LRF) in high-power mode. Failure to do so may result in injury to personnel.**

**WARNING**

**Commander's battle override should only be utilized under combat conditions; injury to personnel and damage to equipment could result from utilizing battle override in a noncombat situation.**

**Conditions:** You are a crewmember on a Stryker vehicle with a loaded caliber .50 M2 heavy barrel machine gun (known as HB MG) or a 40-millimeter MK19 grenade machine gun (known as GMG) mounted on the RWS. You are under attack and have been directed to engage enemy targets using the RWS. The day sight and night sight are operational.

**Standards:** Use the appropriate procedures to engage stationary and moving enemy targets from the Stryker vehicle using either the caliber .50 M2 HB MG or the MK19 GMG mounted on the RWS.

**Performance Steps**

1. Ensure that the STORM LRF is set to high power.
  - a. Press MENU ON/OFF button on the fire control unit (known as FCU).
  - b. Use the MENU U (Up), R (Right), D (Down) and L (Left) buttons to select STORM.
  - c. Press the MENU SEL/ZERO button.
  - d. Use the MENU U, R, D and L buttons to select aim laser power.
  - e. Press MENU SEL/ZERO button.

f. Enter MIN/MAX range.

g. Press ENTER.

**Note:** Follow on-screen text message: Enable High Power aiming lasers?

h. Press SEL/ZERO to confirm or MENU ON/OFF to abort.

**Note:** A second confirmation is required once operator presses MENU SEL/ZERO button. The second message: **WARNING:** High Power aiming lasers are not eye safe!

i. Press SEL/ZERO to confirm high-power aiming lasers or MENU ON/OFF to disable the high-power aiming lasers.

**Note:** Once the STORM visible aim laser is in high-power mode, “High Power Laser” will be displayed in the status field on FCU.

j. Place LRF in low power (from high-power mode), if required.

(1) Press MENU ON/OFF button on FCU.

(2) Use the MENU U, R, D and L buttons (4) to select STORM.

(3) Press the MENU SEL/ZERO button.

(4) Use the MENU U, R, D and L buttons to select Aim Laser Power.

(5) Press the MENU SEL/ZERO button.

(6) Follow on-screen text message: Enable Low.

2. Select either visual imaging module (known as VIM) or thermal imaging module (known as TIM) by pressing DAY/NT button while engaging enable switch on control grip.

3. (If TIM is selected) Press the SIGHT CAL button on the FCU to calibrate the IR image.

**WARNING**

**RWS platform stabilization may be degraded due to increased elevation angles, uneven road conditions, and vehicle speed. Injury could occur due to the increase in frequency and the severity of roll movement that the stabilization system cannot overcome. Exercise care when tracking targets while vehicle is traveling on rough roads or at higher speeds. Failure to do so may result in injury to personnel and damage to equipment.**

4. Activate weapon station stabilization.

a. Press STAB ON/OFF button on control grip to activate standby mode for stabilization system.

b. Verify that Stab On is displayed in the stabilization field on the FCU.

- c. Once stabilization is initialized in standby mode, perform drift nulling.
  - (1) Ensure that vehicle and weapon station are completely still.
  - (2) Press NULL button on control grip to activate drift nulling.
  - (3) Verify that drift nulling warning message appears on FCU.

**Note:** The drift nulling warning message will begin a countdown timer starting at 20 seconds for the time remaining for drift nulling operation. Drift nulling will be completed when the timer reaches 0 seconds. If NULL button on control grip is pressed during drift nulling operation, the countdown timer will restart at 20 seconds and begin drift nulling operation again. If enable switch on control grip is pressed during drift nulling operation, the drift nulling procedure will be aborted.

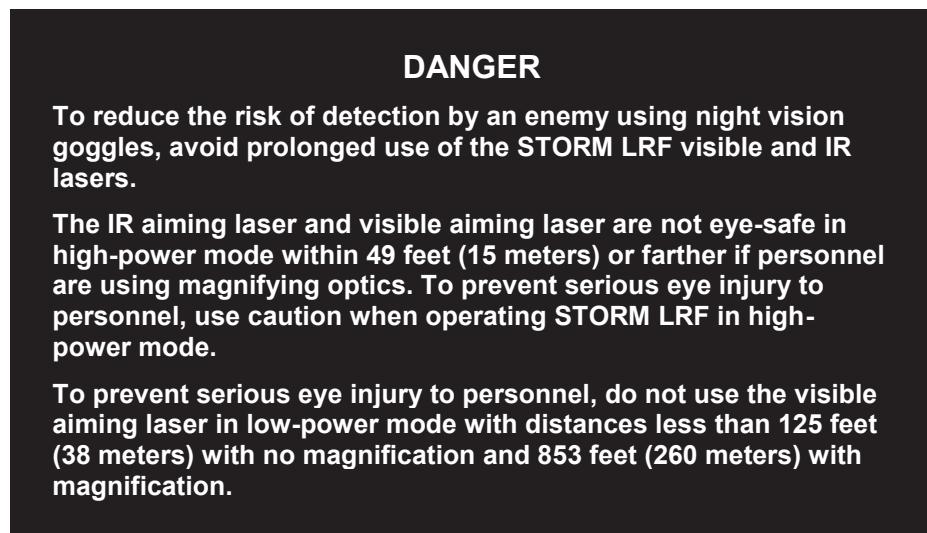
- d. Engage enable switch on control grip to enable weapon platform stabilization.

**Note:** Stabilization is operating correctly when Stab AZ/EL is displayed in the stabilization field on the FCU. Stabilization field will display the status of the azimuth gyro and elevation gyro when stabilization has been activated on the control grip. The stabilization field will display one of four outcomes depending on operational status of azimuth and elevation gyros.

- e. Remove stabilization by pressing the STAB ON/OFF button on control grip.

**Note:** There should be no text present in the stabilization field on the FCU.

5. Engage the enable switch and use the control grip to lay the reticle on center of target.
6. Adjust view for optimal target clarity.
  - a. Press the MAG button and FOCUS button on the control grip while engaging enable switch to adjust for target clarity.
  - b. Use the SIGHT GAIN ± buttons and SIGHT LEVEL ± buttons on the FCU to adjust for target clarity.



7. Engage the enable switch and press the LRF button on the control grip to determine range to target.

**Note:** Target range must be determined by using the STORM LRF prior to activating the IR laser. Targets ranged using the STORM LRF that exceed 6,561 feet (2,000 meters) in ideal conditions cannot be engaged by IR laser. Target distance exceeds IR laser capabilities.

8. Use IR laser to engage target, if applicable.
  - a. If required, press DAY/NT button and enable switch on control grip to select TIM.
  - b. Press and hold IR AIM button and enable switch on control grip to activate IR laser.
  - c. Lay IR laser on target using control grip.

**Note:** If the switch guard is lowered, the GUN ARM/SAFE switch will return to SAFE.

- d. If target can be engaged and is within IR laser range, lift the GUN switch guard on the FCU and set the GUN ARM/SAFE switch to ARM.

**Notes:** FCU displays ARMED if weapon is outside firing inhibit zone.

FCU displays FIRING INHIBIT if weapon is inside firing inhibit zone.

The GUN ARMED LED will not illuminate and FIRING ENABLED will not be displayed on the FCU until the enable switch on the control grip is engaged and all firing conditions are met.

9. Alert crew that primary weapon is to be fired.
10. Engage enable switch on control grip.

**Note:** FCU will display FIRING ENABLED and GUN ARMED LED will illuminate on the FCU.

11. Engage target by lifting the trigger guard and depressing the trigger on control grip.

**Notes:** If the weapon stops firing or fails to fire, perform immediate action.

The GUN ARMED LED will extinguish when the enable switch on the control grip is released.

12. Close GUN switch guard on FCU after engagement is complete.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured that the STORM LRF was set to high power.	_____	_____
2. Selected either VIM or TIM.	_____	_____
3. Pressed the SIGHT CAL button on the FCU to calibrate the IR image, if TIM was selected.	_____	_____
4. Activated weapon station stabilization.	_____	_____
5. Laid the reticle on the center of the target.	_____	_____
6. Adjusted view for optimal target clarity.	_____	_____

Performance Measures	GO	NO-GO
7. Engaged the enable switch and press the LRF button on control grip to determine range to target.	_____	_____
8. Used the IR laser to engage target, if applicable.	_____	_____
9. Alerted crew that primary weapon was to be fired.	_____	_____
10. Engaged the enable switch on control grip.	_____	_____
11. Engaged the target by lifting the trigger guard and depressing the trigger on the control grip.	_____	_____
12. Closed the GUN switch guard on FCU after engagement was complete.	_____	_____

References Required	Primary
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TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN 2355-01-481-8575 (EIC: AFF)

**071-217-0010**

**Load an M2 .50 Caliber Machine Gun on a Stryker Vehicle Remote Weapon Station**

**DANGER**

**Ammunition or components containing explosives must be handled with appropriate care at all times. The explosive elements in primers and fuses are particularly sensitive to shock and high temperature. Ammunition must not be dropped, thrown, tumbled, or dragged.**

**Before troubleshooting, loading, or unloading the primary weapon, ensure that the GUN ARM/SAFE switch is set to SAFE, the fire control unit (known as FCU) POWER is off, the gun is pointed in a safe direction and personnel and equipment are clear of the line of fire.**

**WARNING**

**Ensure that main gun is clear before loading ammunition.**

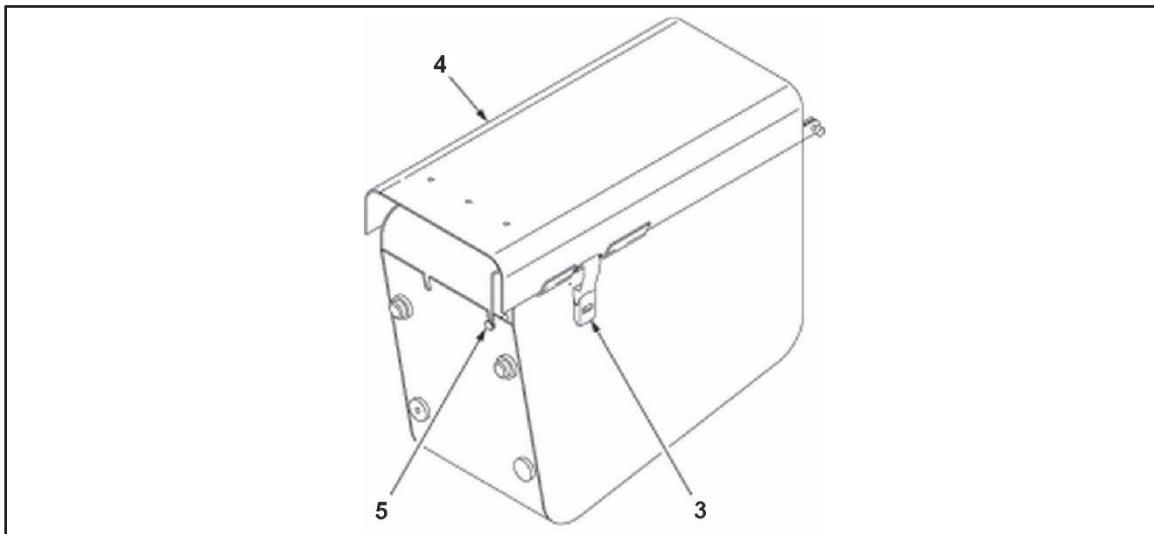
**To prevent injury to personnel, ensure that AZIMUTH TRAVEL LOCK and TRANSPORT LOCK are engaged in locked position prior to loading or unloading primary weapon.**

**Conditions:** You are a crewmember of a Stryker with an M2 .50 caliber machine gun mounted in the remote weapon station (known as RWS). You have been given linked .50 caliber ammunition and have been directed to load the M2 machine gun in preparation for a mission.

**Standards:** Load ammunition in the M2 machine gun in preparation for use.

**Performance Steps**

1. Verify that the GUN ARM/SAFE switch guard is closed on FCU.
2. Ensure the FCU Power is off.
3. Ensure the machine gun is pointed in a safe direction.
4. Clear the machine gun.
5. Release two ammunition box cover locks. (See figure 3-165, item 3.)



**Figure 3-165. Ammunition box**

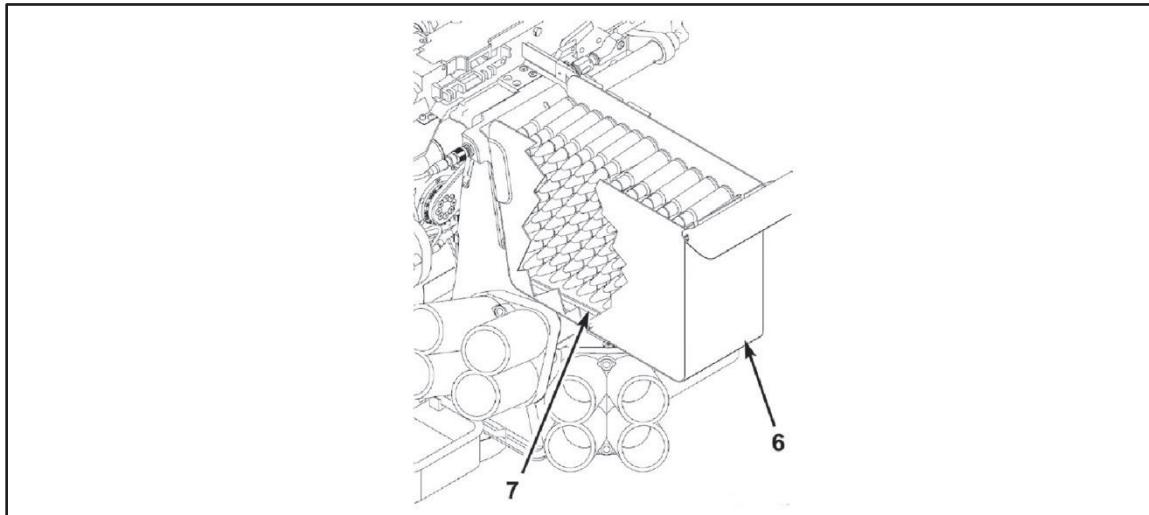
6. Open the ammunition box cover. (See figure 3-165, item 4.)
7. Place the ammunition box guide wall in the in .50 caliber position. (See figure 3-165, item 5.)
8. Inspect ammunition prior to loading.
  - a. Ensure ammunition is correct type.
  - b. Ensure rounds are in good condition.
  - c. Ensure rounds are properly linked and metallic links are clean.

**CAUTION**

Do not overload ammunition box. Ensure there is enough clearance between loaded ammunition and ammunition box cover to permit free movement of ammunition to receiver. Overloading ammunition box can damage or jam equipment.

9. Load the ammunition box. (See figure 3-166, page 3-476.)

**Note:** Ammunition box hold 200 rounds of ammunition.



**Figure 3-166. Loading the ammunition box**

- a. Place ammunition on low ammunition actuator (see figure 3-166, item 7), single link first, and layer ammunition in box so rounds point toward front of weapon.
- b. Leave approximately 10 to 15 rounds of ammunition outside of ammunition box.
10. Load ammunition into the .50 caliber receiver.
  - a. Ensure the bolt is forward.
  - b. Ensure weapon is on S (Safe) with cover closed.
  - c. Ensure single shot mode or automatic fire is selected.
  - d. Insert the double loop end of ammunition in feedway until first cartridge is held by belt holding pawls.
11. Close the ammunition box cover.
12. Secure two ammunition box cover locks.

**DANGER**

**When BATTLE OVERRIDE is used, all firing inhibit zones, except for elevation are overridden. Only use BATTLE OVERRIDE in combat situations. Failure to do so may result in injury or death to personnel.**

13. Confirm all hatches are closed.

**Notes:** If hatches are left open, the FCU will complete power-up, but firing and traversing will be inhibited.

During a combat situation, BATTLE OVERRIDE may be activated to overcome traverse and firing inhibit message.

**WARNING**

**Before elevating or depressing gun or traversing the RWS, alert personnel and ensure area is clear. Moving RWS can cause injury to personnel and damage to equipment.**

14. Power up the RWS.
15. Chamber a round.
  - a. Chamber round using the FCU.
    - (1) Press the CHARGE once to half load the weapon.
    - (2) Press the CHARGE button on the FCU again to fully load the weapon.
  - b. Chamber round using the control grip.
    - (1) Engage the enable switch.
    - (2) Lift trigger guard and press trigger.
16. Ensure the GUN ARM/SAFE switch is set to SAFE until ready to fire.

Performance Measures	GO	NO-GO
1. Verified that the GUN ARM/SAFE switch guard was closed on the FCU.	_____	_____
2. Ensured the FCU Power was off.	_____	_____
3. Ensured the machine gun was pointed in a safe direction.	_____	_____
4. Cleared the machine gun.	_____	_____
5. Released the two ammunition box cover locks.	_____	_____
6. Opened the ammunition box cover.	_____	_____
7. Placed the ammunition box guide wall in the in .50 caliber position.	_____	_____
8. Inspected ammunition prior to loading.	_____	_____
9. Loaded the ammunition box.	_____	_____
10. Loaded ammunition into the .50 caliber receiver.	_____	_____
11. Closed the ammunition box cover.	_____	_____
12. Secured two ammunition box cover locks.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
13. Confirmed all hatches were closed.	_____	_____
14. Powered up the RWS.	_____	_____
15. Chambered a round.	_____	_____
16. Ensured the GUN ARM/SAFE switch was set to SAFE until ready to fire.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-2355-311-10-2 -1 Operator's Manual Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN 2355-01-481-8575 (EIC: AFF) Stryker

**071-217-0016****Zero the Primary Weapon on a Stryker Vehicle Remote Weapon Station**

**Conditions:** You are a crewmember of a Stryker vehicle and have been directed to zero the M2 .50 caliber machine gun or MK19 40-millimeter (mm) grenade machine gun mounted in the remote weapon station (known as RWS). The weapon has been boresighted and loaded (M2 with 50 rounds, MK19 with 10 rounds). The vehicle is parked on level ground and the weapon system is positioned over the front slope and pointed toward the zero target.

**Standards:** Zero the M2 machine gun or MK19 grenade machine gun. Clear the weapon once zeroing is complete. To be zeroed, M2 .50 caliber machine gun rounds must hit the target or MK19 grenade machine gun rounds must hit within 5 meters of the target.

**Performance Steps**

1. Select the visual imaging module (known as VIM) by pressing the DAY/NT button and enable switch on control grip (known as CG).
2. Press the SIGHT RTCL SEL button until the desired reticle appears.
3. Press the laser range finder (LRF) button and enable switch on CG to fire STORM LRF at zeroing target.
4. Lay the aiming point of the sight reticle on center of zeroing target using the CG.

**Note:** The ZOOM IN/OUT button on the fire control unit (known as FCU) can be used as an alternative to the MAG button.

5. Press the MAG button and the enable switch on the CG to zoom in or out on the zeroing target.

**Note:** The FOCUS FAR/NEAR button on the FCU can be used as an alternative to the FOCUS button.

6. Press the FOCUS button and enable switch on the CG to focus the image.
7. Lift the GUN ARM/SAFE switch guard and toggle the GUN ARM/SAFE switch to ARM.

**Note:** ARMED will be displayed on FCU screen.

8. Press the GUN CHG button and enable switch on the CG to charge the weapon.

**Note:** The GUN CHG button on the FCU can be used as an alternative to the CHG button.

9. Alert the crew by announcing CALIBER FIFTY or MARK NINETEEN.

- a. Lift the trigger guard while squeezing the enable switch on the CG.

- b. Fire the machine gun.

- (1) If using the M2 machine gun, fire a 6- to 10-round burst.

- (2) If using MK19 40-mm grenade machine gun, fire a 1- to 2-round burst.

**Note:** The M2 is zeroed if the rounds are hit the target. The MK19 is zeroed if the rounds hits within 5 meters of the target.

10. Engage the zero target.
  - a. Lay the aiming point of sight reticle on center of the zero target beaten zone using CG.
  - b. Press MENU ON/OFF button once.
  - c. Select the zeroing function in SETTING submenu using MENU U (Up), R (Right), D (Down), and L (Left) buttons.
  - d. Press the MENU SEL/ZERO button.

**Notes:** ZEROING will be displayed in the status field, and Z will be displayed in the zeroing field.

The FCU will display: Move reticle to point of impact, then press SEL/ZERO. On the RWS, if the GUN ARMED LED is illuminated prior to selecting Zeroing function under SETTING submenu, the FCU will disable firing, extinguish the GUN ARMED LED, and display Firing Inhibited in the status field when Zeroing is selected.

- e. Use the CG to move the reticle to center of the zero target beaten zone.
- f. Press the MENU SEL/ZERO button.

**Note:** The GUN ARMED LED will extinguish when the enable switch on the CG is released.

- g. Re-engage the zero target.
  - (1) If .50 caliber rounds hit target or MK19 round hits within 5 meters of target, zeroing is complete.
  - (2) If .50 caliber rounds do not hit target or MK19 round does not hit within 5 meters of target, adjust reticle aim point again.

**Note:** If after two attempts the weapon is not zeroed, notify maintenance.

11. Adjust reticle aiming point, if required.
12. Close the GUN ARM/SAFE switch guard.

**Note:** GUN ARMED LED should extinguish.

13. Clear the weapon.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Selected the VIM by pressing the DAY/NT button and enable switch on CG.	_____	_____
2. Pressed the SIGHT RTCL SEL button until the desired reticle appeared.	_____	_____
3. Pressed the LRF button and enable switch on CG to fire the STORM LRF at zeroing target.	_____	_____
4. Laid the aiming point of the sight reticle on center of zeroing target using the CG.	_____	_____

Performance Measures	GO	NO-GO
5. Pressed the MAG button and the enable switch on the CG to zoom in or out on the zeroing target.	_____	_____
6. Pressed the FOCUS button and enable switch on the CG to focus the image.	_____	_____
7. Lifted the GUN ARM/SAFE switch guard and toggled the GUN ARM/SAFE switch to ARM.	_____	_____
8. Pressed the GUN CHG button and enable switch on the CG to charge the weapon.	_____	_____
9. Alerted the crew by announcing CALIBER FIFTY or MARK NINETEEN.	_____	_____
10. Engaged the zero target.	_____	_____
11. Adjusted the reticle aiming point, if required.	_____	_____
12. Closed the GUN ARM/SAFE switch guard.	_____	_____
13. Cleared the weapon.	_____	_____

References Required	Primary
DA Pam 350-38 Standards in Weapons Training	TM 9-2355-311-10-2-4 Operator's Manual, Volume 4 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN 2355-01-481-8575 (EIC: AFF) Stryker

**071-217-0058**

**Unload an M2 .50 Caliber Machine Gun mount on the Stryker Remote Weapon Station**

**DANGER**

**When the machine gun has been fired, clear the machine gun before anyone moves in front of the muzzle. Accidental discharge of ammunition can cause injury or death.**

**Never open the cover on a hot weapon if a malfunction occurs. The possibility of a cook off condition exists when the barrel is hot. A cook off can cause injury or death.**

**Conditions:** You are a crewmember on a Stryker vehicle returning from a mission and you have been directed to unload the .50 caliber M2 machine gun. The machine gun is mounted in the remote weapon station (known as RWS).

**Standards:** Unload the M2 machine gun and secure the ammunition.

**Performance Steps**

1. Ensure machine gun is pointed in a safe direction.
2. Place the RWS in safe mode.
  - a. Set the GUN ARM/SAFE switch to SAFE.
  - b. Set the BATTLE OVERRIDE switch to OFF.
  - c. Toggle the UPPER/LOWER GRENADES switch to the center position.

**WARNING**

**To prevent injury to personnel, ensure that AZIMUTH TRAVEL LOCK and TRANSPORT LOCK are engaged in locked position prior to loading or unloading primary weapon.**

- d. Press the POWER ON/OFF key to turn off the power on fire control unit (known as FCU).

**WARNING**

**The commander's hatch must be opened slowly as hot expelled casings and links may enter the vehicle. Injury to personnel could result.**

3. Open the commander's hatch.

4. Unload the M2 machine gun.
  - a. Place safety or trigger block on S (Safe).
  - b. Place weapon in single-shot mode.
  - c. Look away from the cover in a safe direction and away from the weapon.
  - d. Lift the feed tray cover.
  - e. Lift the cartridge extractor and remove the ammunition belt from the feedway.
  - f. Lower cartridge extractor and close cover.
  - g. Pull and lock the bolt to the rear, leaving the retracting slide handle to the rear.
  - h. Raise the cover.
  - i. Ensure the machine gun is clear by visually inspecting the chamber and T-slot for rounds.

**Note:** In darkness, you must feel inside the chamber and T-slot to ensure they are clear.

- j. Depress the bolt latch release and ease the bolt forward with retracting slide handle.
- k. Close the cover.
5. Secure the ammunition.
  - a. Release two ammunition box cover locks.
  - b. Open ammunition box cover.
  - c. Place excess .50 caliber ammunition inside ammunition box.
  - d. Close ammunition box cover.
  - e. Secure two ammunition box cover locks.

Performance Measures	GO	NO-GO
1. Ensured machine gun is pointed in safe direction.	_____	_____
2. Placed the RWS in safe mode.	_____	_____
3. Opened the commander's hatch.	_____	_____
4. Unloaded the M2 .50 machine gun.	_____	_____
5. Secured ammunition.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0060****Unload an MK19 Grenade Machine Gun on the Stryker Vehicle Remote Weapon Station****DANGER**

**Ensure that the primary weapon is aimed in a safe direction, no personnel or equipment are in line of fire, and that all firing range safety procedures are followed.**

**Conditions:** You are a crewmember on a Stryker vehicle that has just completed a mission and you have been instructed to unload the MK19 grenade machine gun. The MK19 is mounted in the remote weapon station (known as RWS).

**Standards:** Unload the MK19 grenade machine gun mounted in the RWS. All ammunition must be removed from the MK19 and stowed in the 40-millimeter (mm) ammunition box.

**Performance Steps**

1. Ensure that the AZIMUTH TRAVEL LOCK and TRANSPORT LOCK are engaged.
2. Ensure that the GRENADES UPPER/LOWER switch on the fire control unit (known as FCU) is set to the center position.
3. Ensure that GUN ARM/SAFE switch guard and BATTLE OVERRIDE switch guard are closed.
4. Power down the RWS.
  - a. Close the GUN switch guard, if required.
  - b. Verify that the GUN ARMED LED on FCU is extinguished.
  - c. Traverse the primary weapon to 0 degrees on azimuth indicator and -20 degrees on elevation the position indicator on the FCU.
  - d. Press the POWER ON/OFF button on the FCU.
  - e. Verify that the POWER LED extinguishes.
- f. Set AUX MASTER and AUTO MASTER switches on the power distribution panel to the OFF position.

**WARNING**

**The commander's hatch must be opened slowly since hot expelled casings and links may enter the vehicle.**

5. Open the commander's hatch.

6. Place the MK19 on S (Safe).

7. Remove case catch bag (if applicable).
8. Remove ammunition from the MK19.
  - a. Remove live round or spent case from bolt.
    - (1) Charge the weapon.
    - (2) Return the charging handles to the forward position and rotate on charging handle up.
    - (3) Insert the tip of a cleaning rod through the receiver rail as close to the bolt face as possible.
    - (4) Raise up on the cleaning rod, to force the live round or case off the bolt face and out the bottom of the gun, and catch the round as it falls out.
  - b. Remove linked rounds from the feeder, if present.
    - (1) Open top cover.
    - (2) Check for linked rounds in the feeder.
    - (3) Remove linked rounds, if present.
      - (a) Reach beneath the feeder with one hand, press and hold the primary and secondary positioning pawls simultaneously.
      - (b) Slide the linked rounds out of the feeder and the feed throat.
    - c. Return the bolt to the forward position.
  9. Place ammunition in the 40-mm ammunition box.
    - a. Release two ammunition box cover locks.
    - b. Open ammunition box cover.
    - c. Place excess 40-mm ammunition inside ammunition box.
    - d. Close the ammunition box cover.
    - e. Secure two ammunition box cover locks.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured that the AZIMUTH TRAVEL LOCK and TRANSPORT LOCK were engaged.	_____	_____
2. Ensured that the GRENADES UPPER/LOWER switch on the FCU was set to the center position.	_____	_____

Performance Measures	GO	NO-GO
3. Ensured that GUN ARM/SAFE switch guard and BATTLE OVERRIDE switch guard were closed.	_____	_____
4. Powered down the RWS.	_____	_____
5. Opened the commander's hatch.	_____	_____
6. Placed the MK19 on SAFE.	_____	_____
7. Removed the case catch bag, if applicable.	_____	_____
8. Removed ammunition from the MK19.	_____	_____
9. Placed ammunition in the 40-mm ammunition box.	_____	_____

References Required	Primary
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN 2355-01-481-8575 (EIC: AFF)

**071-217-0069**

**Load the M6 Smoke Grenade Launchers on a Stryker Remote Weapon Station**

**DANGER**

Always handle smoke grenades from the side of grenade body. Never push down or exert pressure on the top of the smoke grenades. Always wear gloves when handling the grenades. When loading tubes always load farthest tubes first, then proceed to next closest tube until all the grenades have been loaded. Do not place any part of body in front of loaded tubes. Injury or death to personnel may result if grenades accidentally fire.

Electrical faults could cause smoke grenades to launch and kill or injured personnel.

**WARNING**

Electrical faults could cause the smoke grenades to launch. Ensure that the GRENADES switch guard on the fire control unit (known as FCU) is closed prior to loading or unloading the smoke grenades. Failure to do so may result in injury or death to personnel.

Ammunition or components containing explosives must be handled with appropriate care at all times. The explosive elements in primers and fuses are particularly sensitive to shock and high temperature. Do not drop, throw or drag ammunition containers. Do not take ammunition apart. Refer to TB 43-0250. Failure to comply may result in serious injury or death to personnel.

Smoke grenades can explode and burn. Handle the smoke grenades with care and never place any part of the body in front of the smoke grenade launcher tubes in case of accidental firing. Failure to comply may result in injury or death to personnel.

The remote weapon station (known as RWS) can strike obstacles during power-up. Ensure that the RWS is clear of obstacles before powering up. Failure to do so may result in injury to personnel and damage to equipment.

To prevent injuries caused by unexpected RWS movement, power down RWS prior to exiting from commander's or squad leader's hatches. Failure to do so may result in injury to personnel and damage to equipment.

**Conditions:** You are a crewmember of an M1126 Infantry Carrier Vehicle (known as ICV) or M1130 Stryker Command Vehicle and have been directed to load the smoke grenade launcher. You have basic issue items and L8A3 smoke or dummy grenades. The primary weapon is unloaded and cleared.

**Standards:** Load an M6 smoke grenade launcher on the ICV or Command Vehicle.

## Performance Steps

1. On the FCU, ensure that GRENADES UPPER/LOWER switch is set to center position.
2. Verify that GRENADES switch guard is closed and that GRENADES ENABLED LED is extinguished.
3. On FCU, press POWER ON/OFF button. Verify that POWER LED extinguished.
4. Set AUX MASTER and AUTO MASTER switches to OFF position.
5. Remove protective covers from grenade launchers.

### **WARNING**

**To prevent an accidental discharge, do not use damaged grenades. If grenades are damaged, return them to shipping containers and notify personnel at the local ammunition supply point. Failure to comply may result in injury to personnel.**

**To prevent smoke grenades from firing accidentally, always handle smoke grenades from side of grenade body. Never push down or exert pressure on the top of smoke grenades. Always wear gloves when handling smoke grenades. When unloading discharger tubes, always unload nearest tubes first, then proceed to next closest tube until all smoke grenades have been unloaded. Failure to comply may result in injury or death to personnel.**

6. Check that each grenade launcher tube is free of damage and contacts are clear.
7. Remove the smoke grenades from the smoke grenade stowage bin or containers.

### **DANGER**

**Damaged smoke grenades should not be used, as they may cause injury or death to individuals.**

8. Inspect the grenades for damage. Pay particular attention to the base of the grenade where the firing pin makes contact.
9. Load grenades into the launcher tubes.

**Note:** Smoke grenades are loaded into the front, left, then the right launcher tubes. When loading left or right launcher tubes, start with launchers closest to front of vehicle.

- a. Insert the smoke grenade starting at bottom tube, furthest away from you with metal ends down.
- b. Push the smoke grenade down, base first, so that spring clip at base of the smoke grenade engages tip plug at bottom of the tube.

**Note:** The spring clip should click twice.

- c. Turn the smoke grenade one-half turn to ensure there is a good electrical contact.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured that GRENADES UPPER/LOWER switch is set to center position.	_____	_____
2. Verified that GRENADES switch guard is closed and that GRENADES ENABLED LED is extinguished.	_____	_____
3. Pressed POWER ON/OFF button. Verified that POWER LED extinguished.	_____	_____
4. Set AUX MASTER and AUTO MASTER switches to OFF position.	_____	_____
5. Removed protective covers from grenade launchers.	_____	_____
6. Checked that each grenade launcher tube was free of damage and the contacts were clear.	_____	_____
7. Removed the smoke grenades from the smoke grenade stowage bin or containers.	_____	_____
8. Inspected the grenades for damage. Paid particular attention to the base of the grenade where the firing pin makes contact.	_____	_____
9. Loaded grenades into the launcher tubes.	_____	_____

<b>References Required</b>	<b>Primary</b>
TB 43-0250 Ammunition Handling, Storage and Safety	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0012****Install an MK19 Grenade Machine Gun on a Stryker Vehicle Remote Weapon Station**

**Conditions:** You are a crewmember on a Stryker vehicle and have been directed to install the MK19 grenade machine gun (known as GMG) into the remote weapon station (known as RWS) in preparation for a mission. You have another crewmember to assist.

**Standards:** Install the MK19 on the Stryker vehicle RWS.

**Performance Steps**

1. Confirm the fire control unit (known as FCU) power switch is in the OFF position.

**DANGER**

**The GMG must be clear prior to installing or uninstalling it from the vehicle. Accidental firing of the grenade machine gun could kill or injure Soldiers.**

2. Clear the MK19.
3. Prepare for installation of MK19 in the RWS.
  - a. Remove the left-hand charging handle.
    - (1) Rotate the charging handle up.
    - (2) Use your fingers or a spent case to pry out on lip of lock plunger.
    - (3) Lift up on the lock plunger to retract it and slide the charger assembly all the way rearward.
    - (4) Pull the charger assembly away from receiver.
  - b. Place soft mount in the -20 degrees position.
  - c. Engage the transport lock and azimuth travel lock.
  - d. Ensure that lens caps are installed on visual imaging module and thermal imaging module.
  - e. Remove two screws that secure link guide to soft mount.
  - f. Insert the cocking bracket into the right side of the adapter groove of cocking actuator, until the adapter lock snaps into locking groove on cocking bracket.
  - g. Pull and rotate charger hook to 90 degrees on cocking bracket.
  - h. Unscrew straining screw fully counterclockwise.
  - i. Position cocking bracket releaser in MK19 40-millimeter (mm) GMG position.
  - j. Remove screw and rubber case deflector from weapon's accessory bag.

- k. Install screw to secure rubber case deflector to soft mount.
  - l. Remove the rear locking pin from soft mount by rotating the pin one-quarter turn counterclockwise and pulling, then rotating it one-quarter turn counterclockwise to remove.
- Note:** If the M2 .50 caliber locking pin is installed, it must be switched with an MK19 rear locking pin.
- m. Ensure the MK19 40-mm grenade rear locking pin is installed.
4. Install the electrical firing solenoid.
    - a. With assistance of second person, turn the MK19 upside down.
    - b. Remove the sear housing cap from sear housing by rotating it 90 degrees and lifting up.
    - c. Line up the cut-out on solenoid bracket with cut-out on the MK19.
    - d. Push in on solenoid and rotate it to 90 degrees so that notch in solenoid is aligned with locking pin hole.
  5. Install MK19 receiver on the RWS.
    - a. With assistance, position the MK19 on the soft mount, aligning the receiver locking channels with the forward mounting pins on the mount.
    - b. Swing the rear of the weapon down and align the rear mounting hole on the soft mount with the rear mounting hole of the MK19.
    - c. Insert the rear locking pin in rear mounting hole and lock by rotating one-quarter turn counterclockwise.
    - d. Pull and rotate the charger hook 90 degrees to the charging position by aligning the charger hook through the receiver rail with cocking slot on bolt.
    - e. Retract the M2 ammunition feed deflector on the ammunition box bracket.
    - f. Connect the P1 connector of firing solenoid to the 4J2 connector on sight assembly unit.
    - g. Install two screws to secure link guide to soft mount.
  6. Install the ammunition box.
    - a. Place the two attachment lugs onto attachment slots on ammunition box holder.
    - b. Push ammunition box down until locking pin on ammunition box latch clicks.
    - c. Check security of ammunition box by pulling up.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Confirmed that the FCU power switch was in the OFF position.	_____	_____
2. Cleared the MK19.	_____	_____

Performance Measures	GO	NO-GO
3. Prepared for installation of the MK19 in the RWS.	_____	_____
4. Installed the electrical firing solenoid.	_____	_____
5. Installed the MK19 receiver.	_____	_____
6. Installed the ammunition box.	_____	_____

References Required	Primary
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0013**

**Load an MK19 Grenade Machine Gun on a Stryker Vehicle Remote Weapon Station**

**DANGER**

**Before loading, ensure that the primary weapon is clear of ammunition and that it is aimed in a safe direction.**

**Before troubleshooting, loading or unloading the primary weapon, ensure that the GUN ARM/SAFE switch is set to SAFE, and the fire control unit (known as FCU) POWER is off.**

**WARNING**

**The remote weapon station (known as RWS) can strike obstacles during power up; make sure area is clear.**

**To prevent unexpected RWS movement, ensure that AZIMUTH TRAVEL LOCK and TRANSPORT LOCK are engaged in the locked position prior to loading or unloading the primary weapon.**

**Conditions:** You are a crewmember on a Stryker vehicle that has an MK19 grenade machine gun (known as GMG) mounted in the RWS. You have been directed to load the MK19 GMG in preparation for a mission.

**Standards:** Load the MK19 GMG mounted in the RWS.

**Performance Steps**

1. Ensure that AZIMUTH TRAVEL LOCK and TRANSPORT LOCK are engaged in the locked position.
2. Verify that the GUN ARM/SAFE switch guard is closed on the FCU.
3. Clear the MK19.
4. Open the ammunition box cover.
  - a. Release two ammunition box cover locks.
  - b. Open ammunition box cover.
5. Place ammunition guide wall in ammunition box in the MK19 40-millimeter (mm) caliber position.
6. Inspect ammunition prior to loading.
  - a. Ensure ammunition is correct type.
  - b. Ensure rounds are in good condition.
  - c. Ensure rounds are properly linked and metallic links are clean.

**CAUTION**

Overloading the ammunition box can jam or damage equipment. Do not overload the ammunition box, and ensure that there is enough clearance between loaded ammunition and the ammunition box cover to permit free movement of ammunition to receiver.

7. Load the ammunition box.

**Note:** Ammunition box hold 48 rounds of ammunition.

- a. Insert ammunition into ammunition box, ensuring that first round is placed against the ammunition box and the rounds are pointing toward the front of weapon with a female link as the last round.
- b. Ensure there is enough clearance between loaded ammunition and ammunition box cover to permit free movement of ammunition to receiver.
- c. Leave approximately 4 to 5 rounds of ammunition outside of ammunition box.

8. Load ammunition into the MK19 receiver.

**Note:** For firing, the MK19 charger handles must be forward and up.

- a. Open feedtray cover.
- b. Insert the first round into the feeder with the female link first.
- c. Push the round across the secondary feed pawl and close the cover.
- d. Ensure the charger handles are forward and up.

9. Close the ammunition box.

- a. Close the cover on the ammunition box.
- b. Secure two ammunition box cover locks.

10. Set the safety switch on the MK19 to F (Fire).

11. Close all of the hatches.

**Note:** If hatches are open, the FCU will complete power-up, but firing and traversing will be inhibited. During a combat situation, BATTLE OVERRIDE may be activated.

12. Power up the RWS.

**Note:** The GUN ARMED LED on the RWS will not illuminate until the enable switch on the control grip is engaged. When the GUN ARMED LED illuminates, FIRING ENABLED will appear on the FCU display.

13. Press the GUN CHG button on control grip.

**Note:** During charging, firing circuits are disabled. The CHG button on the FCU may be used as an alternative to the GUN CHG button on the control grip.

14. Engage the enable switch on the control grip, lift trigger guard, and press trigger.

**Note:** The bolt will spring forward.

15. Press GUN CHG button on the control grip once to charge the MK19.

**Note:** The weapon is now loaded.

16. Place the GUN ARM/SAFE switch to SAFE, until ready to fire.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the AZIMUTH TRAVEL LOCK and TRANSPORT LOCK were engaged in the locked position.	_____	_____
2. Verified that the GUN ARM/SAFE switch guard is closed on FCU.	_____	_____
3. Cleared the MK19.	_____	_____
4. Opened the ammunition box.	_____	_____
5. Placed ammunition guide wall in ammunition box in the MK19 40-mm caliber position.	_____	_____
6. Inspected ammunition prior to loading.	_____	_____
7. Loaded the ammunition box.	_____	_____
8. Loaded ammunition into the MK19 receiver.	_____	_____
9. Closed the ammunition box.	_____	_____
10. Set the safety switch on the MK19 to F (Fire).	_____	_____
11. Closed all of the hatches.	_____	_____
12. Powered up the RWS.	_____	_____
13. Pressed GUN CHG button on control grip.	_____	_____
14. Engaged the enable switch on the control grip, lifted trigger guard, and pressed the trigger.	_____	_____
15. Pressed the GUN CHG button on the control grip once to charge the MK19.	_____	_____
16. Placed the GUN ARM/SAFE switch is to SAFE.	_____	_____

References Required	Primary
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0007**

## **Operate the Remote Weapon Station on a Stryker Vehicle**

### **DANGER**

If the hatches are open and an incorrect hatch interrupt unit (known as HIU) was installed, the remote weapon station (known as RWS) will not recognize the correct inhibit zones and the weapon will be allowed to traverse and fire over an open hatch. During initial power-up sequence, ensure that the maintainer and operator verify that the correct HIU was installed. Accidental operation of the RWS in BATTLE OVRD mode may cause injury or death. If the BATTLE OVRD LED is illuminated or BATTLE OVERRIDE appears on the fire control unit (known as FCU) display when the BATTLE OVRD switch is set to SAFE, the BATTLE OVRD function has failed and the RWS is probably in BATTLE OVRD mode. Power down the RWS immediately and report the RWS deadline for maintenance action.

### **WARNING**

The RWS can strike obstacles during power up. Ensure that the RWS is clear of obstacles before powering up. Failure to do so may result in injury to personnel and damage to equipment.

### **CAUTION**

Do not operate any RWS controls until power-up is complete. Failure to comply may result in damage to equipment.

**Conditions:** You are a gunner on a Stryker vehicle conducting a tactical mission and must operate the RWS. The vehicle is fully operational and a crew-served weapon is mounted in the RWS.

**Standards:** Power up the RWS on the Stryker vehicle. Operate the RWS using the traverse and elevation controls. Use the visual imaging module (known as VIM), the thermal imaging module (known as TIM), and the Small Tactical Optical Rifle Mounted (known as STORM) laser range finder (LRF) on the RWS, as needed to support mission. Power down the RWS once mission is complete.

**Note:** If situation permits, vehicle engine should be running to maintain battery charge.

### **Performance Steps**

1. Power up the RWS.
  - a. Unlock AZIMUTH TRAVEL LOCK and elevation TRANSPORT LOCK on RWS.
  - b. Confirm that ELEVATION MAUAL MODE RELEASE lever and AZIMUTH MANUAL MODE RELEASE lever are engaged in locked position.
  - c. Ensure that the sight clamp is removed from the RWS.

- d. Ensure that the STORM LRF rotary switch on the LRF is in proper position for required mission.

**Note:** The laser mode rotary switch is set to SW (high-power mode) when the RWS is powered up, the STORM visible aim laser will only fire in low-power mode until operator changes laser power on FCU. No text message is displayed in the FCU status field to indicate that the STORM visible aim laser is in low-power mode. Two blue safety screws must be removed by maintenance before the laser mode rotary switch can be set to SW.

- e. Remove STORM LRF lens cover and put into stowed position.
- f. Remove the TIM and VIM lens covers and put into stowed positions.
- g. Verify that the GUN ARM/SAFE switch guard is closed on the FCU.
- h. Verify that the GRENADES FIRE switch guard is closed on the FCU.
- i. Verify that BATTLE OVERRIDE switch guard on the FCU is closed and the BATTLE OVERRIDE OVRD LED is not on.

**Note:** If LED is on, notify maintenance.

- j. If required, toggle MODE switch to NORM.

**Notes:** After RWS power-up, wait for system to run an internal power-up test to check status of all peripheral devices. The status will appear on the FCU display.

Automatic adjustment of the servo system will also be performed during the power-up sequence.

Each type of vehicle has a unique vehicle identification called Vehicle ID. If Vehicle ID is unknown, the system will not power-up.

Each weapon has a unique Weapon ID, which is used to identify vehicle no-fire zones. If Weapon ID is unknown, the firing system will not go into Firing Enabled position.

- k. Press POWER ON/OFF button.

**Note:** The POWER LED should illuminate.

- l. Verify that the POWER LED illuminates.

**Note:** Calibrating Sight will appear at bottom of the FCU.

- m. Verify that the power-up built-in test system checkout is successful and follow-on instructions are displayed.

- n. Ensure that no faults are indicated on FCU display.

**Note:** If faults are indicated on the FCU, refer to troubleshooting in the technical manual for the vehicle.

- o. Press LAMP TEST button and ensure that all the LEDs illuminate.

**Note:** If an LED fails to illuminate, refer to operator troubleshooting in the technical manual at the earliest opportunity.

- p. Adjust liquid crystal display brightness by pressing the BRIGHTNESS ± button.

- q. Verify that reticle center is correct for both VIM and TIM.
- r. Perform drift nulling.
- s. If primary weapon is installed, perform distant boresighting procedures.

**Note:** Ammunition type can only be selected if primary weapon and solenoid are installed.

- t. Select ammunition type.
  - (1) Press MENU ON/OFF button.
  - (2) Select correct ammunition type for weapon to be used under AMMO submenu.
  - (3) Press MENU SEL/ZERO button to select ammunition type.

**Note:** Weapon platform stabilization is disabled at power down and will need to be reactivated at power up.

2. Use the traverse and elevation controls.

- a. Ensure that ELEVATION MANUAL MODE RELEASE lever and AZIMUTH MANUAL MODE RELEASE lever are in locked position.
- b. Eliminate any drift in the weapon station platform by pressing and holding the palm switch and pressing the zero button on control grip (known as CG) to zero the reference point.

**Note:** The thumb joystick is very sensitive. Speed of movement and joystick sensitivity have to be set very carefully.

- c. Continuously scan an area by pressing and holding the enable switch on the CG while operating the thumb joystick.
- d. Adjust the elevation and traverse speed of the RWS by using SPEED ± button.

**Note:** When the SPEED ± button is pressed, speed of platform will increase or decrease accordingly.

- e. Perform fine control of the RWS movement by releasing the enable switch on the CG and laying the reticle on the target by operating the thumb joystick.

3. Operate the VIM.

**Note:** Day sight is default when FCU is powered up.

- a. Acquire a target at approximately 6,562 feet (2,000 meters).
- b. Operate VIM using FCU interface buttons.
  - (1) Ensure that a clear image can be obtained on FCU.
  - (2) Press SIGHT RTCL SEL button until desired reticle is displayed.
  - (3) Press SIGHT ZOOM IN/OUT button to zoom in or out to desired setting.
  - (4) Press SIGHT FOCUS FAR/NEAR button to adjust selected camera focus.

- (5) Press SIGHT GAIN ± button to adjust brightness of selected camera target image.
  - (6) Press SIGHT LEVEL ± button to adjust contrast.
- c. Operate the VIM using the CG interface buttons.
- (1) Select default power up.
  - (2) Press and hold MAG switch and enable switch on CG incrementally upward to zoom in.
  - (3) Press and hold MAG switch and enable switch on the CG continuously downward to zoom out.
  - (4) Press the MAG switch once to move one field of view (FOV) step.

**Note:** FOV angle will be displayed on FCU.

- (5) Activate the VIM auto focus by pressing enable switch and FOCUS switch on CG.

**Note:** Auto-focus sequence will begin until an ideal focus is achieved.

#### 4. Operate the TIM.

**Note:** When TIM is selected, the FOV is adjusted to the value closest to that of the VIM. If the value exceeds the TIM FOV maximum, then TIM FOV will be set at its maximum FOV.

- a. Elevate or traverse RWS use the CG to acquire a target at approximately 6,562 feet (2,000 meters).
- b. Press DAY/NT button and enable switch on control grip to select Thermal.

**Note:** The SIGHT DAY/NIGHT button on the FCU may be used as an alternative to the DAY/NIGHT button on the CG.

- c. Press SIGHT CAL button to calibrate TIM image.
- d. Press SIGHT LEVEL ± buttons to manually adjust TIM temperature level for optimal view.

**Note:** The Gain/Level field changes to reflect the new value.

- e. Press SIGHT CAL buttons twice in 1 second to exit manual calibration mode.
- f. Press SIGHT GAIN ± buttons to adjust TIM video signal gain.

**Note:** The Gain/Level field changes to reflect the new value.

- g. Press SIGHT PLRT button and select either black hot or white hot, depending on mission requirements.
- h. Press MAG button and enable switch on CG to change TIM (FOV).

**Note:** The TIM FOV is fixed in four single steps: 10 degrees, 5 degrees, 3.3 degrees and 1.7 degrees. The SIGHT ZOOM IN/OUT button on the FCU may be used as an alternative to the MAG button on the CG.

- i. Press FOCUS button and enable switch on CG to activate auto focusing.

**Notes:** If more clarity is required, press FOCUS button either left or right to manually adjust TIM focus.

Auto focusing will end if operator focuses manually, changes FOV, or switches cameras. SIGHT FOCUS FAR/NEAR button on FCU may be used as an alternative to the FOCUS button on the control grip.

- j. Press SIGHT RTCL SEL button until desired reticle is displayed.
5. Operate the STORM LRF.
  - a. Determine range to target or object.
    - (1) Lay reticle on target and press LRF button on CG, while engaging palm switch.

**Notes:** If target is within maximum range of primary weapon and selected ammunition, the LRF field will display laser range and the ballistic range field is automatically updated to LRF range.

If multiple targets are found when ranging, the STORM LRF will provide range to nearest (first) and furthest (last) target if the LRF button on CG is pressed within 5 seconds of last LRF button press. The nearest (first) target range will be displayed as LRF: 1,325 meters MLT F. The furthest (last) target range will be displayed as LRF: 1,885m MLT L. If 5 seconds passes before the LRF button on CG is pressed, the target range will be displayed as a new range calculation.

If no targets are found during ranging attempt, the STORM LRF will display LRF: N/T. If no target is found within 3 seconds, the display will change to LRF: N/T RDY m. The ballistic range does not change since no targets were effectively ranged. If a ranged target exceeds the maximum ballistic range of the primary weapon and ammunition, the LRF field will display the range value boxed by a yellow frame and a warning message will be displayed in the warning field on FCU. If a range measurement is attempted before the STORM LRF is ready, the LRF field will display LRF: Wait.

- (2) Read the display on the FCU to determine range.
- b. Adjust the minimum/maximum LRF range.
  - (1) Press MENU ON/OFF button.
  - (2) Select SETTING by pressing MENU SEL/ZERO button.
  - (3) Press MENU D button and select STORM.
  - (4) Press MENU SEL/ZERO button.
  - (5) Press MENU R button to select either Set Min. or Set Max. Range.
  - (6) Press MENU SEL/ZERO button.
  - (7) Press MENU U or D button to increase/decrease the range value by 10 meters.

**Notes:** Pressing continuously will change the range value by 100 meters.

The minimum selectable range is 20 meters. The highest minimum selectable range is 500 meters or less below current maximum range setting, and the maximum selectable range is 9,999 meters.

- (8) Press MENU SEL/ZERO button.

**Note:** The new value will now be stored. The LRF field will display the minimum/maximum range.

6. Operate the ranging graticule.

**Note:** The ranging graticule operation can only be performed on the RWS-041. It is applicable to use the ranging graticule with the VIM or TIM.

- a. Elevate or traverse RWS to acquire a target at approximately 700 meters.
- b. Press SIGHT DAY/NIGHT button to select DAY for VIM or NIGHT for TIM.
- c. Ensure that a clear image can be obtained on FCU.
- d. If using TIM, press SIGHT CAL button to ensure that a clear image can be obtained on FCU.
- e. Press SIGHT RTCL SEL button until desired reticle is displayed.
- f. Press SIGHT FOCUS FAR/NEAR button to adjust camera focus.
- g. Enclose the target in the reticle box by pressing the SIGHT ZOOM IN/OUT button.

**Note:** The range to the target will be updated when the reticle box is enclosed on the target.

- h. Display range on FCU by pressing the range graticule button on CG.
7. Power down the RWS.
  - a. Close the GUN switch guard, if required.
  - b. Verify that the GUNARMED LED on FCU is extinguished.
  - c. Traverse primary weapon to 0 degrees on the azimuth indicator and -20 degrees on the elevation position indicator on FCU.
  - d. Press the POWER button on the FCU.
  - e. Verify that POWER LED extinguishes.
  - f. Set AUX MASTER and AUTO MASTER switches on the power distribution panel to OFF position.
  - g. Unload weapon systems, as required.
  - h. Install TIM, VIM and LRF lens covers, if equipped.
  - i. Engage AZIMUTH TRAVEL LOCK and ELEVATION TRANSPORT LOCK.

Performance Measures	GO	NO-GO
1. Powered up the RWS.	_____	_____
2. Used the traverse and elevation controls.	_____	_____
3. Operated the VIM.	_____	_____
4. Operated the TIM.	_____	_____
5. Operated the STORM LRF.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
6. Operated the ranging graticule.	_____	_____
7. Powered down the RWS.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)	

**071-217-0014****Remove an MK19 Grenade Machine Gun from a Stryker Vehicle Remote Weapon Station**

**Conditions:** You are a crewmember on a Stryker Vehicle and have been directed to remove the MK19 grenade machine gun mounted in the remote weapon station (known as RWS). You have the unit standard operating procedures (SOP) and another crewmember to assist.

**Standards:** Remove the MK19 grenade machine gun from the RWS on the Stryker vehicle.

**Performance Steps**

1. Confirm the fire control unit (known as FCU) power switch is in the OFF position.

**DANGER**

**The machine gun must be cleared before removing it from the vehicle. Accidental firing of the MK19 grenade machine gun could kill or injure Soldiers.**

2. Clear the MK19.
3. Place soft mount in the -20 degree position.
4. Engage elevation TRANSPORT LOCK and AZIMUTH TRAVEL LOCK.
5. Remove the MK19 from the RWS.
  - a. Disconnect P1 connector of firing solenoid from 4J2 connector on the sight servo assembly.
  - b. Remove the charger hook from the cocking slot on bolt by pulling and rotating the hook to a 90-degree position on the cocking bracket.
  - c. Remove charger hook from cocking slot on bolt.
  - d. Push cocking bracket into slot on cocking actuator by pulling cocking bracket lock out.
  - e. Push rear locking pin in and rotate one-quarter turn counterclockwise.
  - f. Pull locking pin fully out and rotate one-quarter turn counterclockwise and remove.
  - g. With the assistance of a second person, lift and pull back the rear of the receiver and remove it from the rear mounting hole.
  - h. Swing the MK19 upward to clear the front mounting pins from the receiver locking channels.
  - i. Remove rubber case deflector and mounting screw from soft mount.
  - j. Place rubber case deflector and mounting screw in RWS accessory bag.
  - k. Remove the firing solenoid.

- (1) With assistance of second person, turn MK19 upside down.
  - (2) Slide the firing solenoid in and rotate it 90 degrees so that notch on firing solenoid aligns with locking pin hole.
  - (3) Mount the sear housing cap on the sear housing.
    - (a) Install the sear housing cap on the sear housing.
    - (b) Rotate the sear housing cap 90 degrees to secure.
1. Secure rear locking pin.
    - (1) Push pin through mounting hole.
    - (2) Rotate pin one-quarter turn counterclockwise to lock it in place.
  - m. Remove cocking bracket from cocking actuator by pulling out on cocking bracket lock.
6. Stow the machine gun and accessories (firing solenoid, cocking bracket) according to the unit SOP.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Confirmed that the FCU power switch was in the OFF position.	_____	_____
2. Cleared the MK19.	_____	_____
3. Placed soft mount in the -20 degree position.	_____	_____
4. Engaged the elevation TRANSPORT LOCK and AZIMUTH TRAVEL LOCK.	_____	_____
5. Removed the MK19 from the RWS.	_____	_____
6. Stowed the machine gun and accessories according to the unit SOP.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0018****Fire the M6 Smoke Grenade Launcher on a Stryker Vehicle Remote Weapon Station****DANGER**

**Ensure that no personnel or obstacles are within a 656 feet (200 meters) radius of the vehicle prior to firing the smoke grenades.**

**Do not fire grenades into deep snow. Pieces of phosphorous will be smothered by the snow, and when the snow melts, these pieces will ignite by themselves.**

**WARNING**

**When firing the smoke grenade launchers, ensure that the hatches are closed and personnel within 492 feet (150 meters) are wearing hearing protection. High-noise levels from vehicle operation and/or weapon firing can cause damage to hearing.**

**Conditions:** You are a gunner on a Stryker vehicle maneuvering in an operational environment. You have been directed to fire the smoke grenade launcher to create a smoke screen. The vehicle is fully operational and the grenade launchers are loaded.

**Standards:** Verify that all hatches are closed, alert the crew the grenade launcher will be fired, point the grenade launcher in the correct direction, and fire the smoke grenades.

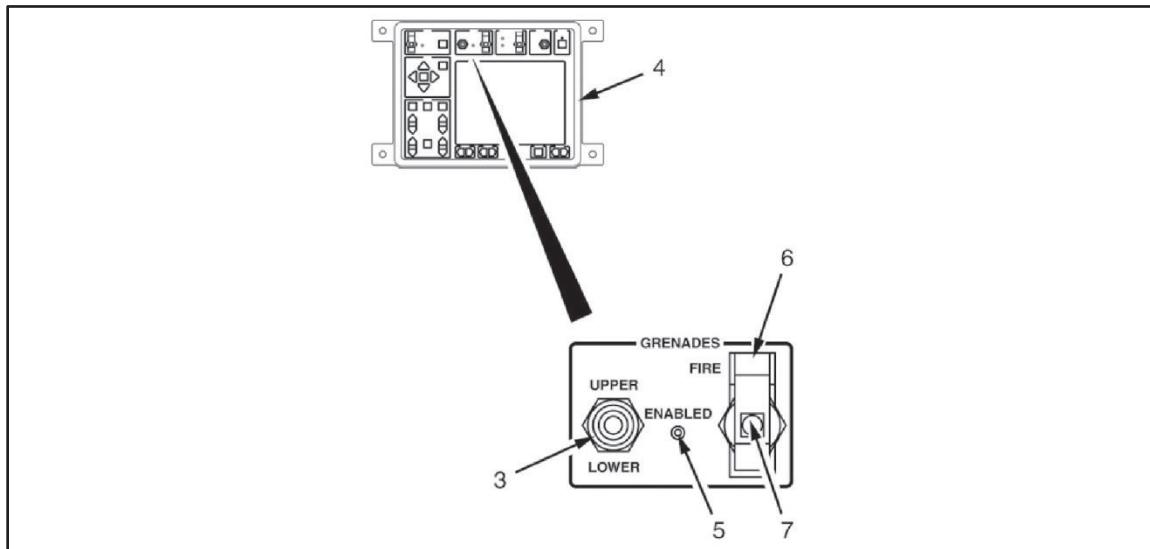
**Performance Steps**

1. Verify that all hatches are closed.

**Note:** If hatches are open, the smoke grenades will not fire.

2. Alert crew that the grenade launcher will be fired.
3. Use the control grip to point the smoke grenade launchers in the direction of the target.
4. Toggle the GRENADES UPPER/LOWER switch (see figure 3-167, item 3, page 3-508) on the fire control unit (known as FCU) (see figure 3-167, item 4, page 3-508) to either UPPER or LOWER.

**Note:** The GRENADES ENABLED LED (see figure 3-167, item 5, page 3-508) will illuminate when either the UPPER or LOWER grenades have been selected.



**Figure 3-167. Fire control unit**

5. Fire the grenade launcher.
  - a. Lift GRENADES switch guard (see figure 3-167, item 6) on the FCU.
  - b. Toggle the GRENADES switch (see figure 3-167, item 7) to FIRE.
  - c. Lower the GRENADES switch guard.
6. Fire additional smoke grenades, if required.
  - a. Toggle the GRENADES UPPER/LOWER switch (see figure 3-167, item 3) to select the grenades that have not been fired.
  - b. Lift the GRENADES switch guard (see figure 3-167, item 6).
  - c. Toggle the GRENADES switch (see figure 3-167, item 7) to FIRE.
  - d. Lower the GRENADES switch guard.
7. Toggle GRENADES UPPER/LOWER switch (see figure 3-167, item 3) to neutral position, once firing is complete.

**DANGER**

**Before loading, unloading, or checking the smoke grenade launchers ensure that: the GUN ARM/SAFE switch is set to SAFE, the RWS AZIMUTH MANUAL MODE RELEASE and TRANSPORT LOCK are engaged, vehicle AUX MASTER and AUTO MASTER switches and RWS power are set to OFF position, the FCU POWER is off, and the gun is pointed in a safe direction.**

**Do not place any part of the body in front of the launcher while loading or unloading the launchers or while checking for misfired grenades.**

8. Check grenade launchers for misfired grenades, when the tactical situation permits.

Performance Measures	GO	NO-GO
1. Verified that all hatches were closed.	_____	_____
2. Alerted crew that the grenade launcher would be fired.	_____	_____
3. Used the control grip to point the smoke grenade launchers in the direction of the target.	_____	_____
4. Toggled the GRENADES UPPER/LOWER switch on the FCU to either UPPER or LOWER.	_____	_____
5. Fired the grenade launcher.	_____	_____
6. Fired additional smoke grenades, if required.	_____	_____
7. Toggled the GRENADES UPPER/LOWER switch to neutral position, once firing was complete.	_____	_____
8. Checked the grenade launchers for misfired grenades, when the tactical situation permitted.	_____	_____

References Required	Primary
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TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

171-157-0012

**Unload an M6 Smoke Grenade Launcher on a Stryker Reconnaissance Vehicle****DANGER**

**Do not place any part of your body in front of the smoke grenade launcher while loading or unloading launchers or checking for misfired smoke grenades.**

**Do not place smoke grenades on hot surfaces. Heat could set off smoke grenades.**

**Ensure that the AUTO MASTER and AUX MASTER switches are set to the OFF position, and the grenades switch guard is closed before loading or unloading the smoke grenades.**

**Conditions:** You are a crewmember of a reconnaissance vehicle (RV) and have been directed to unload the M6 smoke grenade launcher. You have the vehicle basic issue items and smoke grenade shipping containers. The smoke grenade launcher is loaded with L8A3 smoke or dummy grenades. The primary weapon is unloaded and cleared.

**Standards:** Unload the M6 smoke grenade launcher on the RV.

**Performance Steps**

1. Ensure the vehicle AUTO MASTER and AUX MASTER switches are set to the OFF position. (See figure 3-168.)

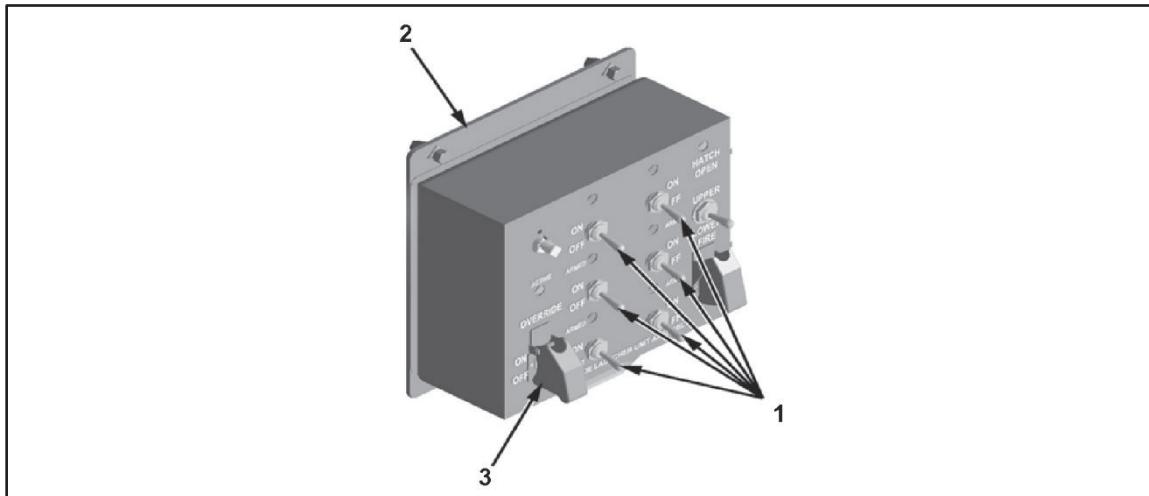


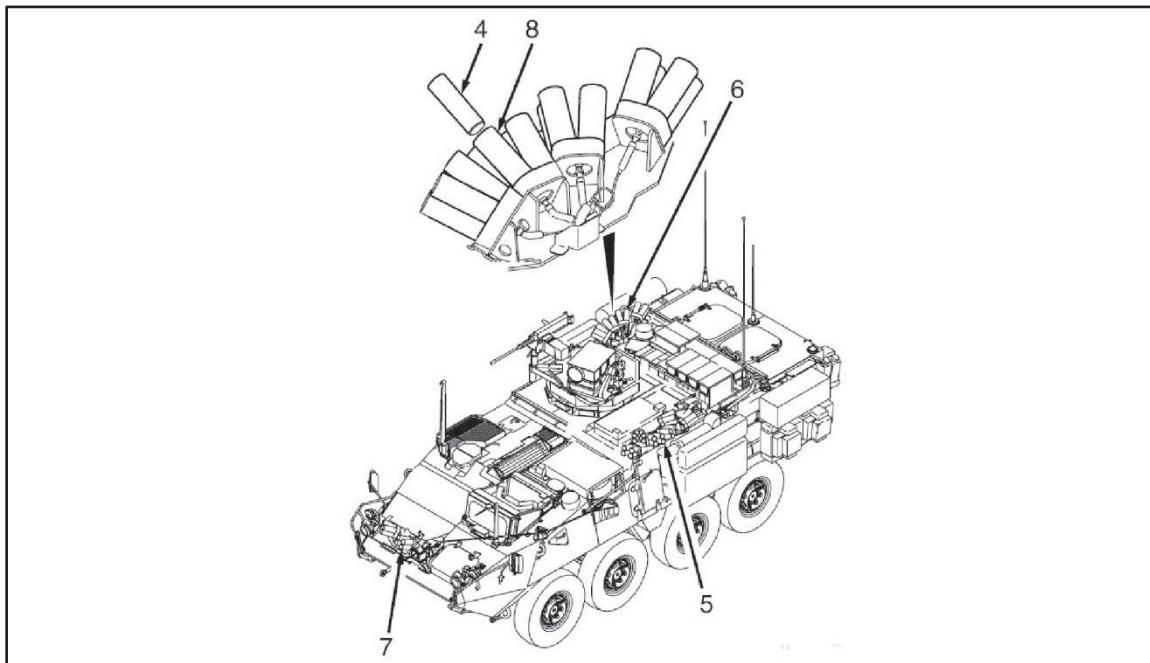
Figure 3-168. Grenade launcher unit

**DANGER**

**Smoke grenades may accidentally fire if handled improperly. Always handle smoke grenades by the side of the grenade body. Always wear gloves when handling smoke grenades. When loading the discharger tubes, always load the farthest tubes first, then proceed to the next closest tube until all smoke grenades have been loaded. Keep all body parts clear of the front of loaded discharger tubes. Failure to do so may result in injury or death to personnel and damage to equipment.**

2. Ensure the six grenade launcher unit (known as GLU) ARMED toggle switches (see figure 3-168, item 1) are set to the OFF position.
3. Ensure the OVERRIDE toggle switch (see figure 3-168, item 3) on the GLU (see figure 3-168, item 2) is set to the OFF position.
4. Remove the smoke grenades (see figure 3-169, item 4) one at a time from left bank (see figure 3-169, item 5), right bank (see figure 3-169, item 6), then front bank of smoke (see figure 3-169, item 7) grenade launcher tubes (see figure 3-169, item 8).

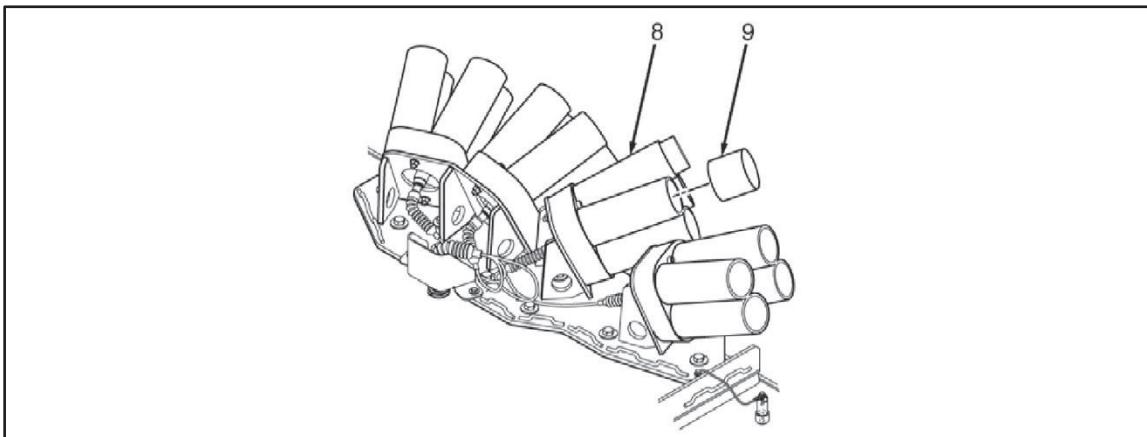
**Note:** When unloading left or right grenade launcher tubes, start with launchers closest to the rear of vehicle. When unloading each bank, start with smoke grenade launcher tube closest to you.



**Figure 3-169. Smoke grenade launchers**

- a. Grasp the smoke grenade (see figure 3-169, item 4) from the side.
- b. Carefully pull, twist and remove the smoke grenade from the tube (see figure 3-169, item 8).
5. Stow the smoke grenades (see figure 3-169, item 4) in the smoke grenade shipping containers.

6. Install the protective covers (see figure 3-170, item 9) on the grenade launcher tubes (see figure 3-170, item 8).



**Figure 3-170. Smoke grenade launchers**

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the vehicle AUTO MASTER and AUX MASTER switches were set to the OFF position.	_____	_____
2. Ensured the six GLU ARMED toggle switches were set to the OFF position.	_____	_____
3. Ensured the OVERRIDE toggle switch on the GLU was set to the OFF position.	_____	_____
4. Removed the smoke grenades one at a time from left bank, right bank, then front bank of smoke grenade launcher tubes.	_____	_____
5. Stowed the smoke grenades in the smoke grenade shipping containers.	_____	_____
6. Installed the protective covers on the smoke grenade launcher tubes.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-9-1 Operator's Manual, Volume 1 of 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 (2355-01-481-8572) (EIC: AFG) Stryker

**071-217-0025****Operate the Ramp from the Driver's Station on a Stryker Vehicle****DANGER**

The area behind the ramp door must be clear of personnel when lowering or raising the ramp. The horn must be sounded twice when lowering or raising the rear ramp to alert crew and personnel in or around area behind the ramp door, based on tactical situation.

Ensure rear Automatic Fire Extinguishing System (known as AFES) discharge hose does not come in contact with the ramp left rear combat lock handle in the open position and at least  $\frac{1}{2}$ -inch clearance exists. Contact between the discharge hose and handle may cause the handle to rotate to locked position, premature wear of AFES discharge hose, failure of AFES system, and injury or death to personnel.

**CAUTION**

If pintle is installed, do not lower ramp. Pintle will restrict ramp opening operations. Operating the ramp when pintle is installed will cause damage to ramp and/or pintle. Verify that pintle is removed before performing ramp/door operations.

**WARNING**

Ensure that the area between the seats and ramp opening is clear before attempting to close the ramp. Hands, feet, and/or equipment can be pinched against the seats when the ramp closes. This could cause injury to personnel or equipment damage.

**Conditions:** You are a driver of a Stryker Vehicle and have been directed to operate the ramp so Soldiers can mount or dismount the vehicle.

**Standards:** Lower the ramp from the troop station to allow Soldiers to mount or dismount from the vehicle. Once Soldiers have mounted or dismounted the vehicle raise the ramp. Operate the ramp manually, if required.

**Notes:** Releasing ramp switch will freeze ramp in its current position. To continue lowering ramp, toggle down on ramp switch.

Ramp switch will center in OFF position.

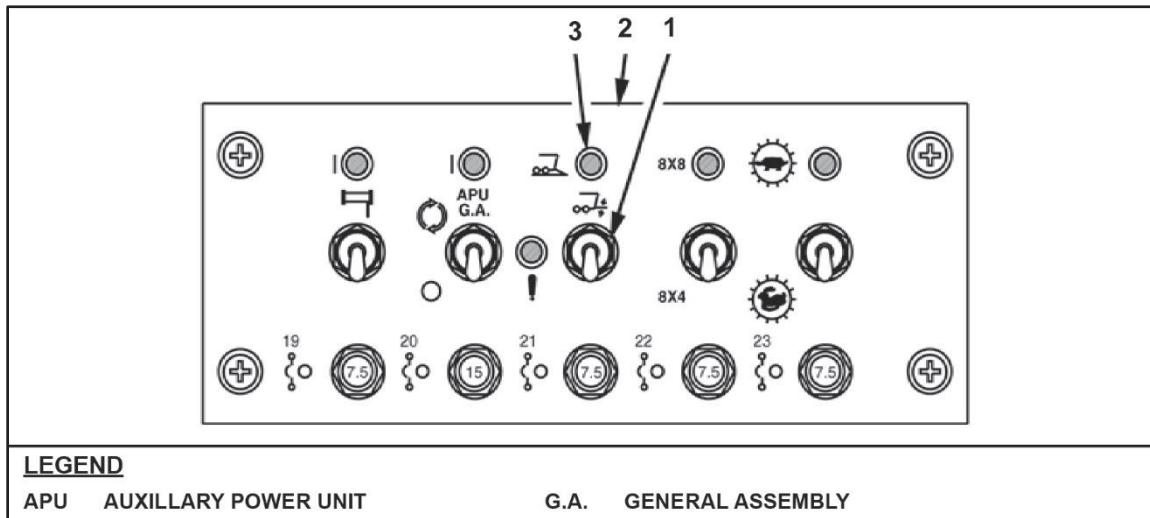
**Performance Steps**

1. Lower the ramp.
  - a. Ensure area behind ramp is clear.

**Note:** The rear-view sensor system can be used, if required.

- b. Ensure that pneumatic system pressure is at or above 85 pounds per square inch (psi) (586 kilopascals [kPa]).
- c. Sound horn twice to alert crew prior to lowering ramp, if tactical situation allows.
- d. Ensure ramp combat locks are disengaged.
- e. Toggle and hold ramp switch (see figure 3-171, item 1) on accessory panel (see figure 3-171, item 2) in down position.

**Note:** The ramp open light-emitting diode (LED) (see figure 3-171, item 3) will illuminate.



**Figure 3-171. Accessory panel**

- f. Verify ramp open LED illuminates, ramp locks disengage, and ramp lowers.
- g. Release ramp switch once ramp has fully lowered.

**Note:** Ramp open LED will remain illuminated.

2. Raise the ramp.

**Note:** Engine must be running to raise ramp.

- a. Ensure area behind vehicle is clear.
- b. Ensure that pneumatic system pressure is at or above 85 psi (586 kPa).
- c. Sound horn twice to alert crew prior to raising ramp, if tactical situation permits.
- d. Ensure ramp combat locks are disengaged.
- e. Toggle up and hold the ramp switch on the accessory panel.
- f. Ensure that the ramp open LED on the accessories panel has extinguished.

- g. Release the ramp switch.

**Note:** Ramp switch will center in OFF position.

- h. Ensure the cam locks fully rotate to the closed position.

**DANGER**

**If the ramp was manually raised, do not attempt to lower the ramp using the driver's or troop ramp switch. The ramp may free fall if the switches are used. Ensure the ramp door is marked stating the ramp has failed and was manually raised. Failure to comply may result in injury or death to personnel.**

3. Operate the ramp manually, if required.

- a. Lower ramp manually.

- (1) Unlock ramp combat locks:
      - (a) Unlock left side, then right side.
      - (b) Remove cam handle from right side of left latching cam cover and insert into tube on cam.
      - (c) Lift handle up until it comes to a stop.
      - (d) Remove handle and repeat this operation for right-side latching cam.
      - (e) Remove handle and return to stowage location.
    - (2) Raise cover on emergency ramp control knob on rear left side of troop compartment.
    - (3) Ensure ramp area is clear before lowering ramp.
    - (4) Sound horn twice prior to lowering ramp, based on tactical situation.
    - (5) Push down on emergency ramp control knob.
    - (6) Ensure the ramp lowers under control.

- b. Raise ramp manually.

- (1) Observe ramp area is clear of personnel and equipment.
    - (2) Ensure ramp locks are in the unlocked position.
    - (3) Raise the ramp manually, with the aid of six assistants.
      - (a) Direct four of the assistants to lift the ramp.
      - (b) Direct the other two assistants to guide the lifting chains, from inside the vehicle, to prevent binding in the door.

- (4) Engage ramp locks.

**Note:** If ramp combat locks are unserviceable or any of the locking mechanisms are suspect, use ramp chains to secure ramp in closed position.

- (a) Remove cam handle from the right side of left latching cam cover and insert into tube on cam.
  - (b) Rotate cam handle down until it comes to a stop.
  - (c) Engage ramp combat lock.
  - (d) Remove cam handle.
  - (e) Repeat process for the right-side latching cam.
- (5) Remove cam handle and return to stowage location.
  - (6) Secure ramp outside of vehicle with tow rope, or other applicable rope, to suitable attachment points.
  - (7) Upon arrival at destination, annotate all actions taken on DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*) and notify field maintenance.
  - (8) Mark vehicle with "FREE FALLING RAMP" to warn personnel ramp is inoperable and could fall and injure personnel.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Lowered ramp from driver's station.	_____	_____
2. Raised ramp from driver's station.	_____	_____
3. Operated the ramp manually, if required.	_____	_____

<b>References Required</b>	<b>Primary</b>
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**071-217-0061****Operate the Fuel Distribution Assembly on a Stryker Vehicle****WARNING**

**Diesel fuel is a health hazard. Personnel that are exposed to diesel fuel must wear protective clothing and equipment. Diesel fuel is toxic and can irritate skin and eyes. Ensure that work area is properly ventilated to eliminate diesel fumes.**

**Diesel fuel is flammable and may cause serious injury to personnel if ignited. Observe all no smoking regulations. Keep away from flame and have a fire extinguisher available.**

**CAUTION**

Do not operate the engine when the SUPPLY valve is set to MAINTENANCE. Operating the engine may result in damage to equipment.

When transferring fuel, there is no automatic fuel transfer shut-off. To prevent spillage of fuel, closely monitor fuel level at the fuel filler opening.

**Conditions:** You are a crewmember on a Stryker vehicle that has a damaged fuel tank. You have been directed to transfer fuel from the damaged fuel tank. You have the vehicle's basic issue items and DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*).

**Standards:** Prepare the Stryker vehicle for fuel transfer, transfer the fuel from damaged fuel tank to a good fuel tank, and return vehicle to operational condition. Report fuel tank faults to maintenance using DA Form 5988-E.

**Note:** The Command Vehicle may have minor variations to access panel for the fuel distribution assembly.

**Performance Steps**

1. Prepare the Stryker for fuel transfer.
  - a. Remove the angled cover plate from the center floor plate by removing the two bolts and washers.
  - b. Remove the center floor plate from the hull by removing the six screws and washers.
  - c. Inspect the floor plate and plain square nuts for damage.
  - d. Ensure that the engine and personnel and engine coolant circulation heater are off.
  - e. Remove the fuel transfer hose from stowage.
  - f. Ensure that the fuel transfer hose connections are clean.
  - g. Ensure that the valve on fuel transfer hose is closed.

**Note:** Valve on fuel transfer hose is closed when valve handle is perpendicular to hose. Valve is open when valve handle is parallel to hose.

- h. Remove the dust plug from quick-disconnect fitting on the fuel transfer hose.
  - i. Remove the protective dust cap from the fuel transfer fitting on the fuel distribution assembly.
  - j. Connect the quick-disconnect fitting on the fuel transfer hose to the fuel transfer fitting on the fuel distribution assembly.
2. Transfer fuel.
    - a. Transfer fuel from right fuel tank to left fuel tank.
      - (1) Rotate SUPPLY valve on fuel distribution assembly to right (R).
      - (2) Rotate RETURN/CROSSOVER valve on fuel distribution assembly to left (L).
      - (3) Clean area around fuel filler cap to ensure that dirt does not enter and contaminate left fuel tank.
      - (4) Remove the fuel filler cap from the left tank and insert the fuel transfer hose.
      - (5) Set AUTO MASTER switch to ON position.
      - (6) Set engine start switch to ON position.
      - (7) Open valve on fuel transfer hose to transfer fuel.
      - (8) Monitor fuel level in left fuel tank to prevent overfilling or spills.
      - (9) Once fuel transfer is complete, close valve on fuel transfer hose.
      - (10) Rotate SUPPLY valve on fuel distribution assembly to L to isolate the right fuel tank.
      - (11) Set engine start switch to the OFF position.
      - (12) Set AUTO MASTER switch to OFF position.
    - b. Transfer fuel from left fuel tank to right fuel tank.
      - (1) Rotate SUPPLY valve on fuel distribution assembly to L.
      - (2) Rotate RETURN/CROSSOVER valve on fuel distribution assembly to R.
      - (3) Clean area around fuel filler cap to ensure that dirt does not enter and contaminate right fuel tank.
      - (4) Remove fuel filler cap and insert fuel transfer hose into right fuel.
      - (5) Set AUTO MASTER switch to ON position.
      - (6) Set engine start switch to ON position.
      - (7) Open the valve on the fuel transfer hose to transfer fuel.
      - (8) Monitor fuel level in right fuel tank to prevent overfilling and/or spills.

- (9) Once fuel transfer is complete, close the valve on the fuel transfer hose.
  - (10) Isolate the left fuel tank by rotating the SUPPLY valve on fuel distribution assembly to R.
  - (11) Set the engine start switch to the OFF position.
  - (12) Set AUTO MASTER switch to OFF position.
3. Return Stryker to operational condition.
- a. Remove fuel transfer hose from applicable fuel tank and close fuel filler cap.
  - b. Disconnect quick-disconnect fitting on fuel transfer hose from fuel transfer fitting on fuel distribution assembly.
  - c. Open valve on fuel transfer hose to ensure that all fuel is emptied from fuel transfer hose, then close valve.
  - d. Install protective dust cap on fuel transfer fitting on fuel distribution assembly.
  - e. Install dust plug on quick-disconnect fitting on fuel transfer hose.
  - f. Return fuel transfer hose to stowage.
  - g. Reinstall the center floor plate using the six screws (with washers).
  - h. Reinstall the angled cover plate using the two bolts (with washers).
4. Report fuel tank faults to maintenance using DA Form 5988-E.

**Note:** Unit maintenance must apply sealing compound and correct torque to floorplate bolts.

Performance Measures	GO	NO-GO
1. Prepared the Stryker for fuel transfer.	_____	_____
2. Transferred fuel.	_____	_____
3. Returned Stryker to operational condition.	_____	_____
4. Reported the fuel tank faults to maintenance using DA Form 5988-E.	_____	_____

References Required	Primary
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0063**  
**Slave Start a Stryker Vehicle**

**WARNING**

**Do not attempt to slave start the engine of a vehicle that has frozen batteries.**

**Conditions:** You are a crewmember on an operational Stryker vehicle and have been directed to slave start another Stryker vehicle. You have your basic issue items, North Atlantic Treaty Organization (NATO) slave cables, and other crewmembers to assist as needed.

**Standards:** Slave start the disabled Stryker vehicle.

**Note:** All Stryker vehicles have two NATO slave cable receptacles: internally in the driver's compartment or externally in the power entry panel (known as PEP). The vehicles can use either during slave start procedures. This task will describe use of the external, PEP, slave cable receptacle.

**Performance Steps**

1. Prepare disabled vehicle for slave start.
  - a. Ensure that 300 amp circuit breaker, located on the power distribution panel, is not tripped.
  - b. Shift to neutral (N).
  - c. Apply parking brake.
  - d. Place a chock block against the wheel to prevent the vehicle from rolling.
  - e. Ensure that all communications and electrical equipment are turned off.
  - f. Set AUX MASTER and AUTO MASTER switches to OFF position in disabled vehicle.
  - g. Unstow slave cable.
  - h. Remove the slave cable protective caps.
2. Prepare the operational vehicle.
  - a. Move the vehicle along the side of the disabled vehicle.
  - b. Place the gear range selector lever in the neutral (N) position.
  - c. Apply the parking brake.
  - d. Place a chock block against the wheel to prevent the vehicle from rolling.
  - e. Engage high-idle.
3. Connect the slave cable to the vehicles.
  - a. Open PEP hatch on both vehicles.

- (1) Rotate the handle counterclockwise to the open position.
  - (2) Pull up and hold the hatch open.
  - (3) Raise the stay device on the left side of the PEP hatch and align with the detent on the hatch.
  - (4) Slowly lower the PEP hatch until the stay device is secured in the detent.
- b. Remove the slave cable receptacle cover on both vehicles.
  - c. Connect slave cable to slave cable receptacle on disabled vehicle.
  - d. Connect the slave cable to the operational vehicle slave cable receptacle.
  - e. Ensure that AUX MASTER and AUTO MASTER switches are set to ON position in disabled vehicle.
  - f. Ensure high-idle is engaged on operational vehicle.
  - g. Wait at least 5 minutes to allow batteries to become partly charged.

**Note:** If batteries are severely discharged (voltmeter indication), ensure voltmeter shows signs (slight increase on voltmeter) of accepting a charge before attempting to start. Charging time should be increased in cold weather. The colder the temperature, the longer the charging time.

4. Perform the engine-start procedure on the disabled vehicle.

**Note:** Use cold-start procedure if required.

5. Disconnect the slave cable from the vehicles.
  - a. Disconnect the slave cable from the disabled vehicle, approximately 10 seconds after it starts.

**Note:** This allows for alternator delay and for recharge cycle to begin.

- b. Disconnect the slave cable from the serviceable vehicle.
  - c. Replace the slave cable receptacle cover on both vehicles.
    - (1) Raise the PEP hatch slightly.
    - (2) Remove the stay device from the detent on the hatch.
    - (3) Lower stay device.
    - (4) Lower the PEP hatch.
    - (5) Rotate the handle clockwise to the closed position.
  - d. Close the PEP hatch on both vehicles.
  - e. Replace the slave cable protective caps.
  - f. Stow the slave cables.
6. Disengage high-idle on the operational vehicle.

7. Ensure slave started vehicle's voltmeter gauge is indicating that batteries are charging.

**Note:** Voltmeter indicator should read between 23 and 28 volts direct current. If after a few minutes the voltmeter gauge still does not indicate any sign of increase, notify maintenance.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared disabled vehicle for slave start.	_____	_____
2. Prepared the operational vehicle.	_____	_____
3. Connected the slave cable to the vehicles.	_____	_____
4. Performed the engine-start procedure on the disabled vehicle.	_____	_____
5. Disconnected the slave cable from the vehicles.	_____	_____
6. Disengaged high-idle on the operational vehicle.	_____	_____
7. Ensured slave started vehicle's voltmeter gauge was indicating that the batteries were charging.	_____	_____

<b>References Required</b>	<b>Primary</b>
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171-157-0010

**Load an M6 Smoke Grenade Launcher on a Stryker Reconnaissance Vehicle****WARNING**

**Electrical faults could cause the smoke grenades to launch.**  
**Ensure that the GRENADES switch guard on the fire control unit (known as FCU) is closed prior to loading or unloading the smoke grenades. Failure to do so may result in injury or death to personnel.**

**Smoke grenades can explode and burn. Handle the smoke grenades with care and never place any part of the body in front of the smoke grenade launcher tubes in case of accidental firing. Failure to comply may result in injury or death to personnel.**

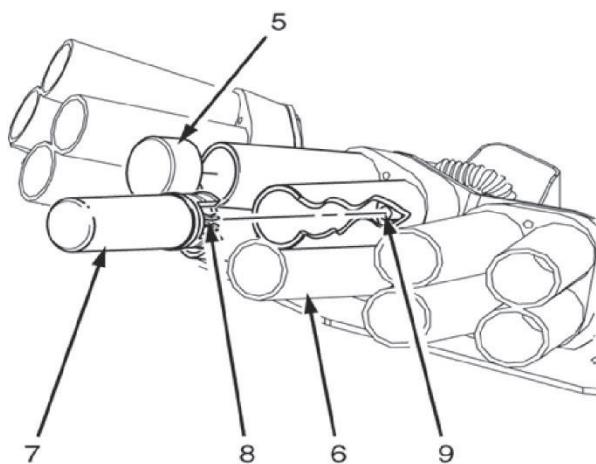
**Do not place any part of the body in front of the smoke grenade launcher while loading or unloading the launchers or while checking for misfired M6 grenades, as grenades could accidentally fire. Failure to comply may result in injury or death to personnel.**

**Conditions:** You are a crewmember of a reconnaissance vehicle (known as RV) and have been directed to load the smoke grenade launcher. You have basic issue items and L8A3 smoke or dummy grenades. The primary weapon is unloaded and cleared.

**Standards:** Load an M6 smoke grenade launcher on the RV.

**Performance Steps**

1. Ensure the vehicle AUTO and AUX MASTER switches are set to the OFF position.
2. Ensure the GRENADES switch guard is closed before loading.
3. Ensure the six ARMED toggle switches (see figure 3-172, item 1) on the grenade launcher unit (known as GLU) (see figure 3-172, item 2) are set to OFF.



**Figure 3-172. Grenade launcher unit**

4. Verify that the green ARMED light-emitting diodes (LEDs) (see figure 3-172, item 3, page 3-523) on GLU (see figure 3-172, item 2, page 3-523) are extinguished.
5. Ensure the OVERRIDE toggle switch (see figure 3-172, item 4, page 3-523) on the GLU (see figure 3-172, item 2, page 3-523) is set to the OFF position.
6. Remove the protective covers (see figure 3-172, item 5, page 3-523) from the grenade launcher tubes (see figure 3-172, item 6, page 3-523).
7. Check that each grenade launcher tube (see figure 3-172, item 6, page 3-523) is free of damage and contacts are clear.

**WARNING**

**Smoke grenades may accidentally fire if handled improperly.  
Always handle smoke grenades by the side of the grenade body.  
Always wear gloves when handling smoke grenades. When  
loading the discharger tubes, always load the farthest tubes first,  
then proceed to the next closest tube until all smoke grenades  
have been loaded. Keep all parts clear of the front of loaded  
discharger tubes. Failure to do so may result in injury or death to  
personnel and damage to equipment.**

8. Remove the smoke grenades (see figure 3-172, item 7, page 3-523) from the smoke grenade stowage bin or containers.

**DANGER**

**Damaged smoke grenades should not be used, as they may  
cause injury or death to individuals.**

9. Inspect the grenades for damage.
10. Load smoke grenades (see figure 3-172, item 7, page 3-523) into the launcher tubes (see figure 3-172, item 6, page 3-523).

**Note:** Smoke grenades are loaded into the front, left, then the right launcher tubes. When loading left or right launcher tubes, start with launchers closest to front of vehicle.

- a. Insert the smoke grenade starting at bottom tube, furthest away from you with metal ends down.
- b. Push the smoke grenade (see figure 3-172, item 7, page 3-523) down, base first, so that spring clip (see figure 3-172, item 8, page 3-523) at base of the smoke grenade engages tip plug (see figure 3-172, item 9, page 3-523) at bottom of the tube.

**Note:** The spring clip should click twice.

- c. Turn the smoke grenade (see figure 3-172, item 7, page 3-523) one-half turn to ensure there is a good electrical contact.

Performance Measures	GO	NO-GO
1. Ensured the vehicle AUTO and AUX MASTER switches were set to the OFF position.	_____	_____
2. Ensured the GRENADES switch guard was closed before loading.	_____	_____
3. Ensure the six ARMED toggle switches on the GLU are set to OFF.	_____	_____
4. Verified that the green ARMED LEDs on GLU was extinguished.	_____	_____
5. Ensured the OVERRIDE toggle switch on the GLU was set to the OFF position.	_____	_____
6. Removed the protective covers from the grenade launcher tubes.	_____	_____
7. Checked that each grenade launcher tube was free of damage and contacts were clear.	_____	_____
8. Removed the smoke grenades from the smoke grenade stowage bin or containers.	_____	_____
9. Inspected the grenades for damage.	_____	_____
10. Loaded grenades into the launcher tubes.	_____	_____

References Required	Primary
TM 9-2355-311-10-9-1 Operator's Manual, Volume 1 of 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 (2355-01-481-8572) (EIC: AFG) Stryker

**171-157-0004**  
**Operate the Cupola on a Reconnaissance Vehicle**

**DANGER**

Crewmembers standing in open hatches are subject to serious injury or death caused by rollovers, low hanging objects such as tree limbs, and enemy fire. Maintain a name tag defilade at all times when standing in an open hatch during operation of the vehicle. This will minimize the amount of crewman exposure outside the vehicle and still allow observation/coverage of crew sectors of responsibility. For the fire support, reconnaissance, and antitank guided missile vehicles, the vehicle commander may be above the name tag defilade to fire the pintle mounted machine gun.

To prevent injury or death to personnel, ensure the traverse area of the weapon is clear of personnel or equipment before operating the cupola.

**Conditions:** You are a crewmember of a reconnaissance vehicle (known as RV) conducting operations. You are required to operate the vehicle's cupola to engage targets with the weapon system and position the long range advanced scout surveillance system (known as LRAS3) for reconnaissance. The AUTO and AUX MASTER switches are set to the ON position. The vehicle commander's station has been prepared for operation.

**Standards:** Power up and traverse the cupola in order to engage targets or position the LRAS3. When required, place the cupola in travel mode, power down the cupola, and operate the cupola manually.

**Performance Steps**

1. Power up the cupola.

**CAUTION**

Do not attempt to adjust the power assist assembly (known as PAA) drive lever handle, it is factory set. Any adjustment may render the PAA inoperable on slopes.

- a. Push the PAA drive lever handle down to ensure the drive motor is engaged.
- b. Lock the cupola by pushing down on the cupola lock handle.
- c. Toggle the power switch up on the PAA.

**Note:** The power switch also acts as a circuit breaker for the PAA. If the light-emitting diodes (LEDs) on the PAA do not illuminate, the dome light override switch may be active.

- d. Verify the POWER-BIT LED is illuminated.

**WARNING**

**Before traversing the cupola, alert personnel and ensure the area is clear. Moving the cupola can cause injury to personnel and damage to equipment.**

2. Traverse the cupola, as needed to engage targets or position the LRAS3.
  - a. Ensure area around vehicle is clear before traversing the cupola.
  - b. Grasp the PAA force stick.

**WARNING**

**Do not release the cupola lock when the vehicle is in motion, on a slope, or when stationary without having the PAA on and a hand on the force stick to counteract any sudden or unexpected rotation of the cupola. Failure to activate the PAA using the force stick could cause injury to personnel and/or damage to equipment. Move the vehicle to a flat area and stop the vehicle before manually rotating the cupola, as sudden or unexpected rotation of the cupola could occur when releasing the cupola lock. Ensure the cupola lock is engaged before placing the vehicle in motion. Failure to do so could result in injury to personnel and/or damage to the equipment. To prevent injury or death to personnel, ensure the traverse area of the weapon is clear of personnel or equipment before operating the cupola.**

- c. Unlock the cupola by lifting the cupola lock handle.

**Note:** The CUPOLA UNLOCKED LED will illuminate.

- d. Grasp the left- or right-side fixed handgrip.
- e. Depress the thumb switch on the force stick and apply force in either the clockwise or counterclockwise direction to achieve the desired rotation of the cupola.
- f. Stop rotation of the cupola by relaxing pressure on the force stick and releasing the thumb switch.

**WARNING**

**One hand must remain on the force stick to counteract movement until the cupola lock is engaged after rotating to desired position. Failure to activate the PAA using the force stick to counteract movement of the cupola could result in injury to personnel or damage to equipment.**

3. Place the cupola in travel mode.
  - a. Ensure the primary weapon is safe for travel.
  - b. Ensure the pintle azimuth and elevation locks are engaged.
  - c. Traverse the cupola to position the primary weapon over the front of the RV.
  - d. Push down on the cupola lock handle to lock the cupola and verify the CUPOLA UNLOCKED LED is extinguished.
  - e. Rotate the LRAS3 so that the sensor window is facing the rear of the vehicle.
  - f. Lock the yoke by engaging the azimuth and elevation spring locks.
  - g. Ensure the primary weapon is prepared for travel.
4. Power down the cupola.
  - a. Push down on the cupola lock handle to lock the cupola.
  - b. Verify the CUPOLA UNLOCKED LED extinguishes.
  - c. Toggle the POWER switch down on the PAA.
  - d. Verify the POWER-BIT LED extinguishes.

**WARNING**

**Move the vehicle to a flat area and stop the vehicle before manually rotating the cupola, as sudden or unexpected rotation of the cupola could occur when releasing the cupola lock. Failure to do so could result in injury to personnel and/or damage to the equipment.**

5. Operate the cupola manually.
  - a. Lift the PAA drive lever handle up to disengage the drive motor.
  - b. Lift the cupola lock handle to unlock the cupola.
  - c. Grasp the PAA force stick with either the right or left hand.

- d. Grasp either the left or right side fixed handgrip.
- e. Firmly plant your feet on the seat and rotate the cupola in the desired direction.
- f. Push down on the cupola lock once the cupola is in the desired position.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Powered up the cupola.	_____	_____
2. Traversed the cupola, as needed to engage targets or position the LRAS3.	_____	_____
3. Placed the cupola in travel mode.	_____	_____
4. Powered down the cupola.	_____	_____
5. Operated the cupola manually.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-5-2 Operator's Manual, Volume 2 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 of 3 Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	

**171-157-0005**

**Install a Primary Weapon on a Reconnaissance Vehicle or Fire Support Vehicle**

**WARNING**

**Before elevating or depressing the gun or traversing the cupola, alert personnel and ensure the area is clear. Moving the cupola can cause injury to personnel and damage to equipment.**

**The cupola lock should be set to the locked position, vehicle AUTO and AUX MASTER switches should be set to OFF, and cupola power should be OFF prior to performing any maintenance on the cupola. Moving the cupola can cause injury to personnel and damage to equipment.**

**All safety precautions should be followed to prevent injury to personnel or damage to equipment.**

**Always handle weapons as if they are loaded.**

**Conditions:** You are a crewmember of a reconnaissance vehicle (known as RV) or fire support vehicle (known as FSV), with an MK93 MOD 3 pintle mount, basic issue items, an M2 .50 caliber machine gun (known as MG) or an MK19 40-millimeter (mm) grenade machine gun (known as GMG) and one assistant. Smoke grenade launchers are unloaded. Before-operations preventive maintenance checks and services (PMCS) have been completed on the cupola. Your crew has previously qualified with the M2 .50 caliber MG or MK19 40-mm GMG in a ground or vehicle mount.

**Standards:** Install the MK93 MOD 3 MG mount, M2 .50 caliber MG or MK19 40-mm GMG, and ammunition and box on an RV or FSV.

**Performance Steps**

1. Ensure the vehicle AUTO, AUX MASTER, and cupola power switches is off.
2. Lock the cupola.
3. Install an MK93 MOD 3 MG mount.
  - a. Loosen the adapter bolts on the cupola.
  - b. Mount the universal pintle adapter on the cupola adapter and tighten the manual control handle.
  - c. Install the pintle mount into the universal pintle adapter.
  - d. Install a quick-release pin to secure the universal pintle adapter and mount pintle.
  - e. Align the thumbscrew on the ammunition holder assembly with the corresponding bottom slot in the side plate of the carriage assembly.
  - f. Push up and align studs with the corresponding holes in the side plate until the studs stop and then tighten the thumbscrews.
  - g. Turn the shock absorber assemblies to the upright position.

- h. M2 .50 caliber MG only—ensure the rear slider assembly is in the UP position.
- i. MK19 40-mm GMG only—ensure the rear slider assembly is down.

**Note:** The rear M2 .50 caliber MG pin assembly is installed through the bushing and stowage bracket. Detent balls are secured and clearly visible (MK19 40-mm GMG).

- j. Install the catch bag assembly from the right side while pushing the catch bag frame forward into the carriage assembly.
  - k. Align the catch bag assembly with the holes in the carriage assembly.
  - l. Install the quick-release pin and seal with hook-and-loop fastener.
  - m. Install the elevation mechanism by placing the quick-release pin through the corresponding holes beneath the carriage assembly.
  - n. Pull the lever down to lock the elevation mechanism on the azimuth indicator.
4. Install an M2 .50 caliber MG.
    - a. Ensure the weapon is clear.
    - b. Lift the M2 .50 caliber MG up to the cupola with an assistant.
    - c. Align the front mounting holes of the M2 .50 caliber MG with the corresponding holes in the front assemblies.
    - d. Lower the M2 .50 caliber MG onto the mount.
    - e. Install the front M2 quick-release pin.
    - f. Install the rear M2 quick-release pin through the weapon and rear slider assembly.
  5. Install an MK19 40-mm GMG.
    - a. Ensure the weapon is clear.
    - b. Lift the MK19 40-mm GMG up to the cupola with an assistant.
    - c. Slide the MK19 40-mm GMG into the locking channels on the forward mounting pins on the carriage assembly.
    - d. Ensure the sear assembly aligns with the upper rear holes in the carriage assembly.
    - e. Lower the MK19 40-mm GMG onto the mount.
    - f. Install the rear quick-release pin through the carriage assembly and sear.
  6. Install ammunition and box.
    - a. Remove the cover from the ammunition box.
    - b. Lift and rotate the pressure straps.

- c. Place the ammunition and box into the tray.
- d. Lower the pressure traps to hold the ammunition in the ammunition box.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the vehicle AUTO, AUX MASTER, and cupola power switches are off.	_____	_____
2. Locked the cupola.	_____	_____
3. Installed an MK93 MOD 3 MG mount.	_____	_____
4. Installed an M2 .50 caliber MG.	_____	_____
5. Installed an MK19 40-m GMG.	_____	_____
6. Installed ammunition and box.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	
TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-5-2 Operator's Manual, Volume 2 OF 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 OF 3 Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	
TM 9-2355-311-10-9-1 Operator's Manual, Volume 1 OF 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	
TM 9-2355-311-10-9-2 Operator's Manual, Volume 2 OF 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	
TM 9-2355-311-10-9-3 Operator's Manual, Volume 3 OF 4, Fire Support Vehicle (FSV) M1131A1 (2355-01-528-1274) (EIC: AFT) Stryker Support Sensor System (FSV/FS3) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	

**071-217-0026**

### **Operate the Ramp from the Troop Station on a Stryker Vehicle**

**Conditions:** You are a dismounted squad member on a Stryker vehicle and must use the ramp to mount our dismount Soldiers. The vehicle engine is running.

**Standards:** Lower the ramp from the troop station to allow Soldiers to mount or dismount from the vehicle. Once Soldiers have mounted or dismounted the vehicle, raise the ramp. Perform an emergency stop of ramp, if required.

#### **Performance Steps**

##### **WARNING**

**Ensure that the area behind the vehicle is clear before attempting to lower the ramp. Personnel can be injured and equipment damaged when the ramp opens. Ensure ramp door is in closed and locked position.**

##### **CAUTION**

If pintle is installed, do not lower ramp. Pintle will restrict ramp opening operations. Operating the ramp when pintle is installed will cause damage to ramp and/or pintle. Verify that pintle is removed before performing ramp/door operations.

1. Lower ramp from troop station.
  - a. Ensure area behind vehicle is clear.
  - b. Ensure that pneumatic system pressure is at or above 85 pounds per square inch (psi).

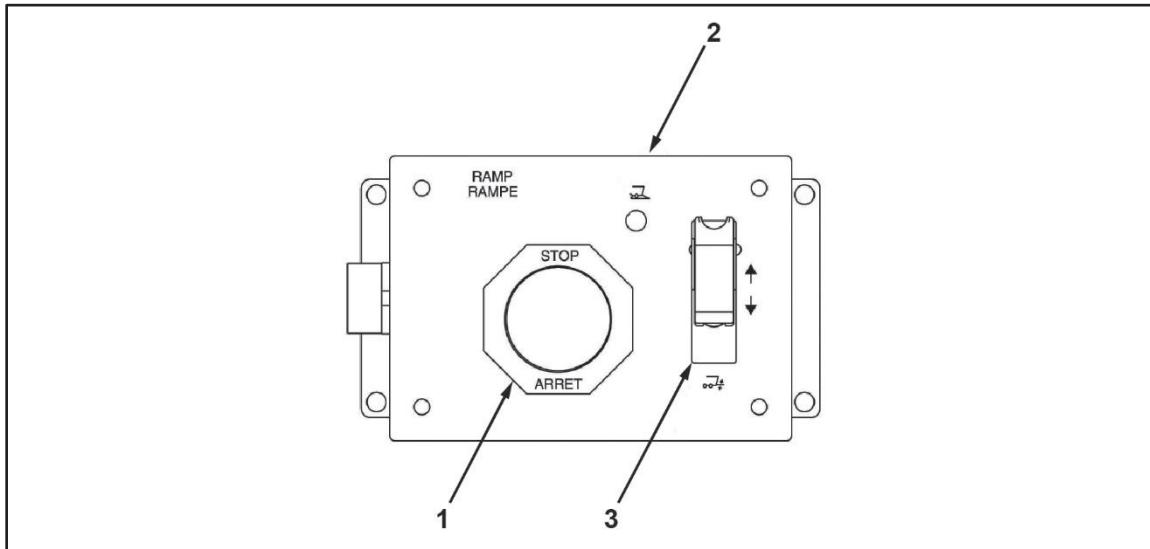
##### **DANGER**

**If tactical situation permits, the horn must be sounded twice to alert crew and personnel in or around area behind ramp door. Serious injury or death to personnel can occur if area behind ramp door is not clear of personnel when lowering ramp. Ensure the rear Automatic Fire Extinguishing System (known as AFES) discharge hose does not come in contact with the ramp left rear combat lock handle in open position and at least ½-inch clearance exists. Contact between the discharge hose and handle may result in handle rotating to the locked position, premature wear of AFES discharge hose, failure of AFES system, and injury or death to personnel.**

- c. Alert crew before lowering the ramp, if tactical situation allows.
- d. Ensure ramp combat locks are disengaged.

- e. Toggle down and hold the ramp switch (see figure 3-173, item 3) on the troop ramp-control box (see figure 3-173, item 2).

**Note:** Releasing the ramp switch freezes the ramp in its current position. To continue lowering the ramp, toggle down the ramp switch. The OPEN light-emitting diode (LED) will light up, and the ramp will lower.



**Figure 3-173. Ramp control box**

- f. Release the ramp switch once ramp has fully lowered.

**Note:** When released, the ramp switch centers in the OFF position. The OPEN LED stays lit while the ramp is down.

### **WARNING**

**Ensure that the area between the seats and ramp opening is clear before attempting to close the ramp. Hands, feet, and/or equipment can be pinched against the seats when the ramp closes. This could cause injury or equipment damage.**

2. Raise ramp from troop station.
    - a. Ensure area behind vehicle is clear.
- Note:** Engine must be running for ramp to raise.
- b. Ensure that pneumatic system pressure is at or above 85 psi.
  - c. Alert the crew before raising the ramp, if tactical situation allows.
  - d. Ensure that ramp combat locks are disengaged.
  - e. Toggle up and hold the ramp switch on the troop ramp-control box.

**Note:** The ramp raises, ramp locks engage, and the OPEN LED light goes out.

- f. Release the ramp switch.

**Note:** When released, the ramp switch centers in the OFF position.

3. Perform a ramp emergency stop, if necessary.

**Note:** Any time the ramp is lowered or raised from the troop or driver's station, pushing in on the emergency stop button on the troop ramp-control box freezes the ramp in its current position.

- a. Operate the ramp.
- b. Press the emergency stop button (see figure 3-173, item 1, page 3-535) on the ramp control box while the ramp is moving.
- c. Observe that the ramp has stopped moving.
- d. Pull out on the emergency stop button and continue operating the ramp.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Lowered ramp from troop station.	_____	_____
2. Raised ramp from troop station.	_____	_____
3. Performed ramp emergency stop.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)	

**071-217-0062****Operate the Personnel and Engine Coolant Circulation Heater on a Stryker Vehicle****DANGER**

**Carbon monoxide is a colorless, odorless, deadly poisonous gas which, when inhaled, deprives the body of oxygen and causes suffocation. Exposure to air contaminated by carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from prolonged exposure.**

**Carbon monoxide gas occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines and becomes dangerously concentrated under conditions of inadequate ventilation.**

**Be alert at all times for carbon monoxide exposure symptoms and exhaust odors. If either is observed, immediately ventilate driver's compartment and troop compartment. If symptoms persist, remove affected personnel to fresh air, keep warm, do not permit physical exercise, and if necessary, administer artificial respiration. Notify unit maintenance immediately if fumes are experienced when operating the vehicles.**

**The best defense against carbon monoxide poisoning is adequate ventilation. Whenever the personnel heater or engine is operated for maintenance purposes or tactical use, observe the following:**

- Do not operate personnel heater or engine in an enclosed area unless adequate ventilation is provided with vented exhaust lines and all hatches open.**
- Do not idle vehicle for long periods without maintaining adequate ventilation.**
- Do not drive vehicle with engine bulkhead panels removed, except for necessary maintenance purposes.**

**CAUTION**

Starting the personnel heater with the heater exhaust covered could cause damage to the heater or start a fire. Ensure that all debris or covers are removed from the heater exhaust before starting heater.

Leaving both diverter valves in the OFF position and starting the heater will deadhead the circulation pump. Do not leave both diverter valves in the OFF position and start the heater.

**Conditions:** You are a crewmember on a Stryker vehicle that is operating in cold weather conditions. The vehicle commander has directed you to warm up the driver and crew compartments. The vehicle is running.

**Standards:** Use the personnel and engine coolant circulation heater (known as PECCH) to warm-up the driver and crew compartment. Turn off the PECCH when no longer needed.

**Note:** Either the crew/driver diverter valve or the engine preheat valve must be open for the heater to safely operate.

### **Performance Steps**

1. Set the AUX and AUTO MASTER switches to the ON positions.
2. Ensure that fuel shutoff valve is in the OPEN position.
3. Set the ENGINE PREHEAT valve to CLOSED.

**Note:** The ENGINE PREHEAT valve is only opened when preheating the engine and battery box during cold start procedures.

4. Set the CREW/DRIVER HEATER valve to OPEN.

**Note:** The vehicle interior will be heated when the CREW/DRIVER HEATER valve is open.

5. Set heater control toggle switch, located on climate control module, down to the heating position.

**Note:** The heater on the light-emitting diode (LED) will illuminate green. A continuously illuminated LED indicates that the heating system is active and functioning properly. A flashing LED indicates a malfunction in the heater controller. Check to make sure the troop heater fan switch set to ON. If not, no heat will come out of the heater when the fans are turned on.

6. Operate heater for 1 minute to allow coolant to circulate through coolant pump.

7. Set heat exchanger blower toggle switches to low (down), high (up) or off (center) position.

**Note:** The squad leader's and troop heat exchangers also have an ON/OFF switch located on the front of the heat exchanger to control heat to their stations.

8. Shut down heater by setting the heater control toggle switch on climate control module up to OFF position.

**Note:** The heater runs a purging cycle, approximately 3 minutes, if shut off during full output operation.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Set the AUX and AUTO MASTER switches to the ON positions.	_____	_____
2. Ensured that fuel shutoff valve was in the OPEN position.	_____	_____
3. Set the ENGINE PREHEAT valve to CLOSED.	_____	_____
4. Set the CREW/DRIVER HEATER valve to OPEN.	_____	_____
5. Set heater control toggle switch to the heating position.	_____	_____
6. Waited for 1 minute to allow coolant to circulate through coolant pump.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
7. Set heat exchanger blower toggle switches to low, high, or off position.	_____	_____
8. Shut down the heater by setting the heater control toggle switch to OFF position.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)	

**071-217-0027**

**Operate the Driver's Vision Enhancer and the Rear-View Sensor System on a Stryker Vehicle**

**DANGER**

The rear-view sensor system (known as RVSS) shall not be used as an aid to driving the vehicle and should not be used as a substitute for ground guides. Ground guides should be used when the vehicle is moving in reverse in any area where personnel and equipment are in close proximity whenever possible.

**CAUTION**

Never connect or disconnect the sensor or display control module (known as DCM) cables while the DCM switch is in the power ON position. Damage to the sensor or DCM could result.

**WARNING**

Exceeding vehicle speed restrictions may result in injury to personnel. Do not exceed 30 miles per hour (mph) (48 kilometers per hour [kph]) on primary/paved roads, 25 mph (40 kph) on secondary/gravel roads or 15 mph (24 kph) on cross-country surfaces under ideal conditions when operating with the driver's vision enhancer (known as DVE). Commanders must impose more restrictive speed restrictions in accordance with AR 600-55 when required.

Extended use of the DVE can cause eye fatigue and headaches. During extended operations, ensure that drivers stops every 2 hours to rest their eyes for a minimum of 5 minutes. Ensure that the vehicle commander queries the driver frequently about eye fatigue and headaches during extended use of the DVE. Failure to do so may result in injury to personnel.

Always wear helmets when driving with the DVE installed. The DCM should be removed from its mount when not in use for extended driving operations to minimize the risk of head strike injuries.

Soldiers should not touch or inhale particles of a broken DVE window. The window contains germanium, which is toxic.

Soldiers should be careful when removing the DVE. The DVE weighs 17 pounds (7.7 kilograms) and can cause personal injury or equipment damage if dropped.

**Conditions:** You are a driver of a Stryker vehicle and have a requirement to use the DVE and the RVSS. The DVE is already installed and the driver's station has been prepared for operation.

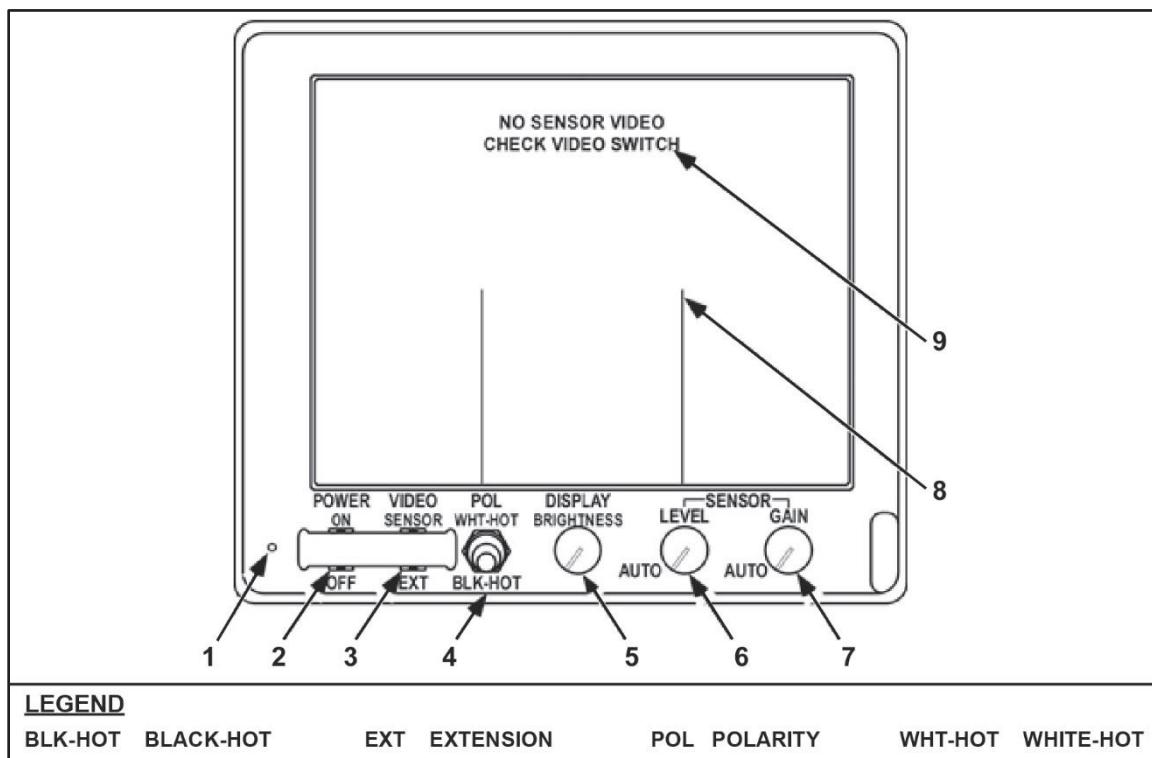
**Standards:** Conduct initial setup of the DVE. Place the DVE and the RVSS into operation. Power down the DVE and RVSS when no longer required.

### Performance Steps

1. Prepare the DVE for operation. (See figure 3-174.)

**Note:** Initial setup must be done before power is applied to the DVE.

- a. Set the sensor assembly azimuth and elevation to straight-ahead and level 0-degrees ( $^{\circ}$ ) detent positions.
- b. Set DVE POWER switch (see figure 3-174, item 2) to OFF position.
- c. Set the VIDEO switch (see figure 3-174, item 3) to SENSOR (UP position).
- d. Set the POLARITY switch (see figure 3-174, item 4) to WHT-HOT (UP position).
- e. Set the DISPLAY BRIGHTNESS control (see figure 3-174, item 5) fully counterclockwise and rotate the knob approximately one-quarter turn clockwise.
- f. Set SENSOR LEVEL control (see figure 3-174, item 6) and GAIN control (see figure 3-174, item 7) to full counterclockwise (AUTO) detent position.



**Figure 3-174. Driver's vision enhancer display control module**

2. Place the DVE into operation. (See figure 3-174.)

- a. Turn the AUX MASTER switch to ON.

- b. Turn the DVE POWER switch (see figure 3-174, item 2, page 3-541) to ON.
- c. Wait 5 minutes for system electronics to stabilize for maximum image clarity.
- d. Leave the VIDEO switch (see figure 3-174, item 3, page 3-541) to the SENSOR (up) position for sensing input from the DVE to the display.
- e. Adjust the seat height to view the display module.
- f. Adjust the display module, as needed, using the two tilt adjustment knobs on both sides of the module.
- g. Adjust the DISPLAY BRIGHTNESS control (see figure 3-174, item 5, page 3-541) until the scene brightness is comfortable for viewing.
- h. Set the SENSOR LEVEL control (see figure 3-174, item 6, page 3-541) to AUTO LEVEL or manually adjust, as needed.

**Notes:** The AUTO LEVEL mode should normally be used while driving the vehicle. It provides the best image for most driving conditions.

Manual operation should only be used when the vehicle is stationary. In some viewing conditions, it may be helpful to adjust the SENSOR LEVEL control.

- (1) Place in AUTO LEVEL mode by turning the control knob fully counterclockwise to detent position (AUTO position).
  - (2) Use manual LEVEL adjustments by turning the control knob counterclockwise out of detent position and adjust as needed to obtain best image.
- i. Set the SENSOR GAIN control (see figure 3-174, item 7, page 3-541) to AUTO GAIN or manually adjust, as needed.

**Note:** The AUTO GAIN mode should normally be used while driving the vehicle. It provides the best image for most driving conditions. The manual operation should only be used when the vehicle is stationary. When the vehicle is stationary, in some viewing conditions, it may be helpful to adjust the SENSOR GAIN control.

- (1) Place in AUTO GAIN mode by turning the control knob fully counterclockwise to detent position (AUTO position).
  - (2) Use manual LEVEL adjustments by turning the control knob counterclockwise out of detent position and adjust as needed.
- j. Set the POLARITY switch to select scene polarity preference.

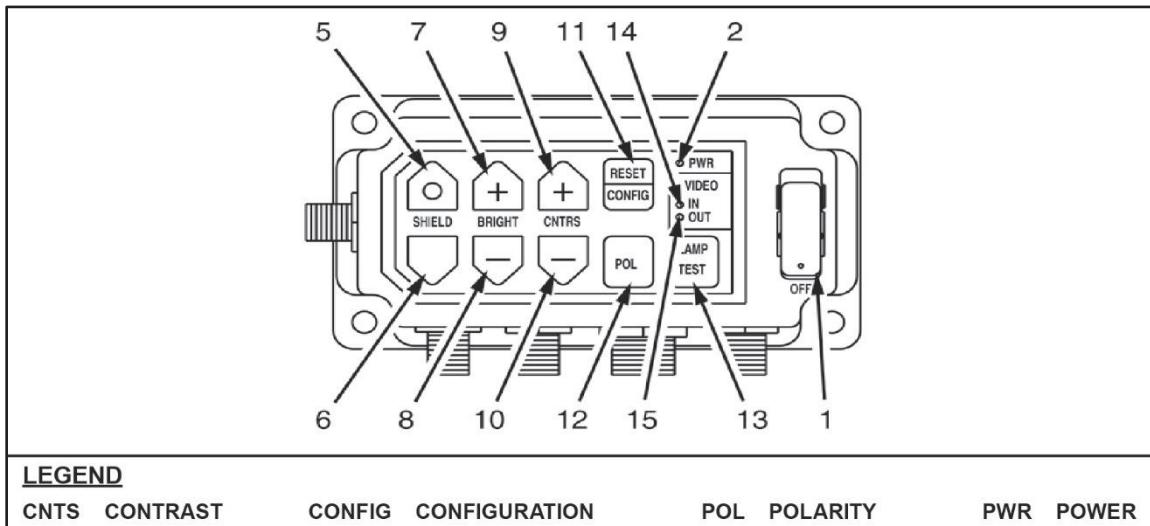
**Note:** With the switch In the WHT-HOT (UP position), hot objects in the scene appear lighter on a darker background. With the switch in BLK-HOT (DOWN position), hot objects in the scene appear darker on a lighter background. A small rectangle in the lower left corner of the display indicates the switch position. A dark rectangle indicates the BLK-HOT switch position; a white rectangle indicates the WHT-HOT switch position.

- k. Adjust the sensor assembly azimuth and elevation, as needed.

**CAUTION**

Do not manually open or close the debris shield on the rear-view camera.

3. Place the RVSS into operation (see figure 3-175).



**Figure 3-175. Rear-view sensor system camera control unit**

- a. Place the sensor input switch on the DVE to EXT (down) position. (see figure 3-174, item 3, page 3-541)
- b. Turn brightness control knob (see figure 3-175, item 5) fully clockwise on DVE.

**Note:** The RVSS is operated by using the controls on the camera control unit.

- c. Set the camera control unit power switch (see figure 3-175, item 1) to ON to power up the RVSS.
- d. Open the debris shield on the rear-view camera taillight by depress the SHIELD open push-button control (see figure 3-175, item 5).
- e. Depress the LAMP TEST push-button control (see figure 3-175, item 13) to test that the VIDEO IN (see figure 3-175, item 14) and VIDEO OUT (see figure 3-175, item 15) LEDs are functional.

**Notes:** If the VIDEO IN LED and/or VIDEO OUT LED do not illuminate when the LAMP TEST push-button control is pushed, notify maintenance.

The VIDEO IN LED (see figure 3-175, item 14) will illuminate during operation if the rear-view taillight camera is not receiving an image. If the VIDEO IN LED is illuminated, notify maintenance.

The VIDEO OUT LED (see figure 3-175, item 15) will illuminate during operation, if the RVSS is not sending the taillight image to the DVE. If the VIDEO OUT LED is illuminated and/or there is no video signal to DVE, notify maintenance.

- f. Adjust the brightness of the camera video signal. (See figure 3-175.)

- (1) To increase the brightness of the camera video signal to the DVE, depress the BRIGHT + push-button control (see figure 3-175, item 7, page 3-543).
  - (2) To decrease the brightness of the camera video signal to the DVE, depress the BRIGHT - push-button control (see figure 3-175, item 8, page 3-543).
  - g. Adjust the contrast of the camera video signal. (See figure 3-175, page 3-543.)
    - (1) To increase the contrast of the camera video signal to the DVE, depress the CNTRS + push-button control (see figure 3-175, item 9, page 3-543).
    - (2) To decrease the contrast of the camera video signal to the DVE, depress the CNTRS - push-button control (see figure 3-175, item 10, page 3-543).
  - h. Reset any brightness and contrast changes back to factory presets, if necessary, by depressing the RESET/CONFIG push-button control (see figure 3-175, item 11, page 3-543).
  - i. Change the camera polarity of the thermal imaging signal sent to the DVE between white hot to black hot by depressing the POL push-button control (see figure 3-175, item 12, page 3-543).
4. Power down the RVSS.
    - a. Set the camera control unit power switch to OFF.
    - b. Set DVE display screen sensor input switch to UP position.
    - c. Close the debris shield.
  5. Power down the DVE.
    - a. Set the sensor assembly azimuth and elevation controls to the locked azimuth straight ahead position and 0° elevation position.
    - b. Set SENSOR LEVEL and SENSOR GAIN controls to full counterclockwise (AUTO) detent position.
    - c. Set the DISPLAY BRIGHTNESS control as follows:
      - (1) Turn fully counterclockwise.
      - (2) Rotate the knob approximately one-quarter turn clockwise.
    - d. Set POL switch to WHT-HOT (UP position).
    - e. Set VIDEO switch to SENSOR (UP position).
    - f. Set POWER switch to OFF (DOWN position).

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the DVE for operation.	_____	_____
2. Placed the DVE into operation.	_____	_____

Performance Measures	GO	NO-GO
3. Placed the RVSS into operation.	_____	_____
4. Powered down the RVSS.	_____	_____
5. Powered down the DVE.	_____	_____

**References  
Required**

TM 11-5855-311-12&P-2/TM 8H667-12&P-2 Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) for Driver's Vision Enhancer (DVE) AN/VAS-5A(V)2 (NSN 855-01-475-9444) (EIC: N/A) for Generator, Smoke, M56 AN/VAS-5A(V)11 (NSN 5855-01-504-6079) (EIC: N/A) for Family of Medium Tactical Vehicles AN/VAS-5A(V)12 (NSN 5855-01-504-9801) (EIC: N/A) for Heavy Expanded Mobile Tactical Truck AN/VAS-5A(V)13 (NSN 5855-01-504-6080) (EIC: N/A) For Maxi-Ambulance HMMWV AN/VAS-5A(V)14 (NSN 5855-01-505-2208) (EIC: N/A) for TOW HMMWV AN/VAS-5A(V)15 (NSN 5855-01-505-2210) (EIC: N/A) for Hard Top HMMWV AN/VAS-5A(V)16 (NSN 5855-01-505-2209) (EIC: N/A) for Prophet/Soft-Top HMMWV AN/VAS-5A(V)17 (NSN 5855-01-555-9600) (EIC: N/A) for Armored HMMWV AN/VAS-5A(V)18 (NSN 5855-01-563-8040) (EIC: N/A) for Mine Resistant Ambush Protected Vehicles

AR 600-55 The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing)

**Primary**

TM 9-2355-311-10-2-1 Operator's Manual, Volume 1 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)

**071-217-0031**

## **Perform Operator Preventive Maintenance Checks and Services on a Stryker Vehicle**

**Conditions:** You are a crewmember on a Stryker vehicle and you have been directed to perform operator's maintenance on the vehicle. You have the basic issue items, the appropriate technical manual or the Ruggedized Maintenance Digital Assistant (known as RMDA) with an electronic technical manual, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), and cleaning equipment. There are other crewmembers to assist.

**Standards:** Prepare the vehicle for operator maintenance and perform preventative maintenance checks and services (PMCS) on the vehicle in accordance with the technical manual. Correct all operator-level deficiencies and record results of PMCS on DA Form 2404 or DA Form 5988-E or enter results in the RMDA. Submit results of PMCS to the chain of command.

### **Performance Steps**

1. Prepare the vehicle for maintenance, as required.
  - a. Park the vehicle on level ground.
  - b. Place the gear range selector in Neutral (N).
  - c. Apply parking brake.
  - d. Align front tires in straight-ahead position.
  - e. Place out wheel chock blocks, one in front of and one behind a rear wheel.
  - f. Ensure all weapons are cleared.
  - g. Verify that the weapon systems are locked in position, as required.
2. Conduct operator-level PMCS in accordance with the technical manual.

**Note:** There are five types of PMCS; named after the interval period for which they are performed: before, during, after, weekly, and monthly PMCS.

3. Correct all operator-level deficiencies, if found.
  - a. Use the troubleshooting procedures in technical manuals to further identify any faults, as necessary.
  - b. Perform repairs and/or replace parts, as authorized.
4. Record results of PMCS on DA Form 2404 or DA Form 5988-E or into the RMDA.

**Note:** Any corrective action taken, repairs, parts replaced, and/or any uncorrected deficiencies should be recorded.

5. Submit results of PMCS to your chain of command.

**Note:** The PMCS results can be submitted on the DA Form 2404 or DA Form 5988-E or transferred from the RMDA into the Platoon Sergeant's ToughBook laptop computer.

Performance Measures	GO	NO-GO
1. Prepared the vehicle for maintenance.	_____	_____
2. Conducted operator-level PMCS in accordance with the technical manual.	_____	_____
3. Corrected all operator-level deficiencies.	_____	_____
4. Recorded the results of PMCS on DA Form 2404 or DA Form 5988-E or entered them into the RMDA.	_____	_____
5. Submitted results of PMCS to your chain of command.	_____	_____

References Required	Primary
TM 9-2355-311-10-7-4 Operator's Manual, Volume 4 of 4, Antitank Guided Missile Vehicle (ATGM) M1134 NSN 2355-01-481-8576 (EIC: AFP) Stryker	TM 9-2355-311-10-2-4 Operator's Manual, Volume 4 of 4, Infantry Carrier Vehicle (ICV) M1126 NSN 2355-01-481-8575 (EIC: AFF) Stryker
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	
DA Form 2404 Equipment Inspection and Maintenance Worksheet	
TM 9-2355-311-10-4-4 Operator's Manual, Volume 4 of 4, Commander's Vehicle (CV) M1130 NSN 2355-01-481-8573 (EIC: AFK) Stryker	
TM 9-2355-311-10-5-4 Operator's Manual, Volume 4 OF 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	
TM 9-2355-321-10-7 Operator Manual for Stryker Mobile Gun System (MGS) M1128 NSN 2355-01-481-8577 (EIC AFH)	

171-136-0007

**Mount the Joint Combat Identification Marking System on a Stryker****DANGER**

HIGH VOLTAGE is used in operation of this equipment. DEATH ON CONTACT may result if personnel fail to observe safety precautions. Never work on electronic equipment or vehicle platforms equipped with electronic equipment unless there is another person nearby who is familiar with operation and hazards of the equipment and who is competent in administering first aid. When operators aid the technician, the technician must warn operators about dangerous areas. When possible, shut off power supply to equipment before beginning work on equipment or vehicles. Take particular care to ground every capacitor that could potentially store a dangerous electrical charge. Turn off power when working inside equipment. Always ground every part of equipment before touching it. Be careful to not contact high-voltage connections or 115 volts AC input connections when installing or operating equipment. Whenever the nature of operation permits, keep one hand away from equipment to reduce hazard of current flowing through the body. Do not be misled by the term "low voltage." Under adverse conditions, potentials as low as 50 volts may cause death. Ensure all power to the vehicle is disconnected before starting this installation. Failure to comply may result in damage to equipment or injury or DEATH to personnel. Do not install kit components over any portion of the platform that would compromise vehicle capabilities and/or create a hazardous situation for the crew.

**Conditions:** You are a crewmember on a Stryker vehicle in a field environment and have been directed to mount the Joint Combat Identification Marking System (known as JCIMS) on the vehicle. You have the vehicle's basic issue items, TB 11-2590-428-23-19, and a Stryker JCIMS installation kit. All tools and materiel required for installation are on hand.

**Standards:** Mount the JCIMS on the Stryker vehicle in accordance with TB 11-2590-428-23-19. Ensure all panels are safely and securely mounted and offer maximum protection without interfering with vehicle operation.

**Performance Steps**

1. Inventory the installation kit, MK-3379/V.
  - a. Position the kit in the front of the Stryker vehicle and check inventory.
  - b. Identify two side panel assemblies.
  - c. Identify the front panel.
  - d. Identify the thermal identification panels (known as TIP)-21.
  - e. Identify infrared transmitter.

2. Mount the front panel.

- a. Mount the front panel on a Stryker vehicle without slat or Stryker reactive armor tiles (known as SRAT) armor.
  - (1) Remove the top two bolts above the skid plate just next to the headlights on the left and right sides.
  - (2) Mount the two nose brackets.

**Note:** Snug bracket bolts, but do not fully tighten until adjustments are made after the panel is installed to achieve optimum bracket post-to-panel hole alignment.

- (a) Position the two nose brackets on the Stryker nose.
  - (b) Align the front panel holes with the hitch pin posts on the brackets.
  - (c) Reinstall the existing bolts/hardware to secure the two nose brackets to the front nose of the vehicle.

**Note:** Snug bracket bolts, but do not fully tighten until adjustments are made after the panel is installed to achieve optimum bracket post-to-panel hole alignment.

- b. Mount the front panel on a Stryker vehicle with slat armor.
  - (1) Position the front panel.
    - (a) Align the panel holes with the threaded studs on the front of the slat armor, with the thermal tape facing out.
    - (b) Hang the panel on the threaded studs of the slat armor just below the headlights.
  - (2) Install four flat washers and wing nuts on each of the four threaded studs and tighten by hand only.
- c. Mount the front panel on Stryker vehicle equipped with SRAT.

**Note:** On some Stryker's, a 2-foot by 2-foot TIP-21 panel is mounted across the front nose of a Stryker vehicle that is equipped with SRAT.

- (1) Position a TIP at the highest point on the nose of the vehicle.
  - (2) Secure the TIP, at a slight angle, with either straps or bungee cords.

**CAUTION**

Do not cover any portion of the platform that would create a hazardous situation for the crew, platform, or any of its capabilities.

3. Mount the left-side panel.

**Note:** On older Strykers, a JCIMS is mounted across the left side of the vehicle on the bustle rack.

- a. Locate bustle rack holes at the bottom of the bustle rack from the front to the rear of the vehicle.

- b. On the inside of the left bustle rack, install one inner (threaded stud) disk plate in the first hole from the front of the bustle rack.

**Note:** Placing a wedge/wood block or similar object behind the inner disk plates or (between the inner disk plates and the inside of the rack) will help keep the inner disk plates against the inside surface of bustle rack during disk plate/bracket installation to the rack.

- c. Install another inner disk plate in the seventh hole from the front of the bustle rack.
  - d. Install two outer (center hole) disk plates on the threaded studs of both inner disk plates installed against the inner surface of the bustle rack in the previous step.
  - e. Slide the top of the left front panel bracket under the strap loop directly above the first (leading) bustle rack hole and insert the bottom hole of the bracket into the disk plate threaded stud.
  - f. Slide the top of the left rear panel bracket under the strap loop directly above the seventh bustle rack hole and insert the bottom hole of the bracket into the disk plate threaded stud that is on the seventh bustle rack hole from the front of the vehicle.
  - g. Install a flat washer and a flanged nut on each of the two left-side inner disk plate studs and loosely secure.
  - h. Apply pressure to each of the panel brackets from the bottom up to ensure a tight fit into both strap loop holes. If the fit is tight with minimal top end play, fully tighten the flange nuts on the inner disk plate threaded studs with a  $\frac{3}{4}$ -inch wrench.
  - i. Install two bolts through the panel brackets holes from the inside of the brackets and insert the bolts through the panel holes.
  - j. Install two flat washers and one lock washer on each of the bolts and secure the panel to the brackets with two wing nuts.
  - k. Install panel in the OFF or ON position, as required.
4. Mount the right-side panel.
    - a. Locate bustle rack holes at the bottom of the bustle rack from the front to the rear of the vehicle.
    - b. On the inside of the right bustle rack, install one inner (threaded stud) disk plate in the second hole from the front of the bustle rack.
    - c. Install another inner disk plate in the eighth hole from the front of the bustle rack.

**Note:** Placing a wedge/wood block or similar object behind the inner disk plates or (between the inner disk plates and the inside of the rack) will help keep the inner disk plates against the inside surface of bustle rack during disk plate/bracket installation to the rack.

- d. Install two outer (center hole) disk plates on the threaded studs of both inner disk plates installed against the inner surface of the bustle rack in the previous step.
- e. Slide the top of the right front panel bracket under the strap loop directly above the second bustle rack hole and insert the bottom hole of the bracket into the disk plate threaded stud.
- f. Slide the top of the right rear panel bracket under the strap loop directly above the eighth bustle rack hole.

- g. Insert the bottom hole of the bracket into the disk plate threaded stud that is on the eighth bustle rack hole from the front of the vehicle.
  - h. Install a flat washer and a flanged nut on each of the two right-side inner disk plate studs and loosely secure.
  - i. Apply pressure to the panel brackets from the bottom up to ensure a tight fit into the strap loop holes. If the fit is tight with minimal top end play, fully tighten the flange nuts on the inner disk plate threaded studs with a  $\frac{3}{4}$ -inch wrench.
  - j. Install two bolts through the panel brackets holes from the inside of the brackets and insert the bolts through the panel holes.
  - k. Install two flat washers and one lock washer on each of the bolts and secure the panel to the brackets with two wing nuts.
  - l. Install panel in the OFF or ON position, as required.
5. Mount the rear TIP. (Optional for Stryker vehicles equipped with slat armor only.)

**Note:** The 2-foot by 2-foot TIP-21 is mounted across the rear of the vehicle and secured to the slat armor.

- a. PLACE the TIP at the highest point possible on the slat armor to increase visibility.
- b. Secure the panel with straps or bungee cords.

Performance Measures	GO	NO-GO
1. Inventoried the installation kit, MK-3379/V.	_____	_____
2. Mounted the front panel.	_____	_____
3. Mounted the left-side panel.	_____	_____
4. Mounted the right-side panel.	_____	_____
5. Mounted the rear TIP, if required.	_____	_____

References Required	Primary
TB 11-2590-428-23-19 Installation Instructions for Joint Combat Identification Marking System (JCIMS) Installation Kit MK-3385/V (NSN 2590-01-507-2544) (EIC N/A) Installed on Stryker Common (NO. 2) Vehicle Platform used on M1129 MCV, M1122 MEV, AND M1135 NBCRV Stryker Vehicles	

**171-157-0006**  
**Remove a Primary Weapon from Reconnaissance Vehicle**

**DANGER**

**DO NOT attempt to mount, dismount, inspect, or repair a mounted machine gun without first clearing the machine gun chamber and feed trays of ammunition.**

**WARNING**

**Before elevating or depressing the gun or traversing the cupola, alert personnel and ensure the area is clear. Moving the cupola can cause injury to personnel and damage to equipment.**

**The cupola lock should be set to the locked position and the vehicle AUTO, AUX MASTER, and cupola power switches to OFF prior to removing the weapon system. Failure to do so may cause injury to personnel and damage to equipment.**

**Conditions:** You are a crewmember on a reconnaissance vehicle (known as RV) and have been directed to remove the primary weapon. The vehicle has an MK93 MOD 3 pintle mount with an M2 .50 caliber machine gun or an MK19 40-millimeter (mm) grenade machine gun mounted. You have another Soldier to assist.

**Standards:** Remove the M2 .50 caliber machine gun or the MK19 40-mm grenade machine gun and pintle mount MK93 MOD 3 from the RV.

**Performance Steps**

1. Ensure the vehicle AUTO, AUX MASTER, and cupola power switches are off.
2. Lock the cupola.
3. Remove the ammunition and box.
  - a. Lift and rotate the pressure straps.
  - b. Remove the ammunition and box from the tray.
  - c. Lower the pressure straps to hold the ammunition in the ammunition box.
  - d. Install the cover from the ammunition box.
4. Remove the weapon system.
  - a. Remove the M2 .50 caliber machine gun.
    - (1) Ensure the weapon has been cleared.
    - (2) Remove the barrel.

- (3) Remove the rear M2 quick-release pin through the M2 .50 caliber machine gun and the rear slider assembly.
- (4) Remove the front M2 quick-release pin.
- (5) Lift the M2 .50 caliber machine gun from the mount with the aid of an assistant.
- b. Remove the MK19 40-mm grenade machine gun.
  - (1) Ensure the weapon has been cleared.
  - (2) Remove the rear quick-release pin through the carriage assembly and sear.
  - (3) Lift the rear of the MK19 40-mm grenade machine gun.
  - (4) Push the weapon forward out of the locking channels on the forward mounting pins on the carriage assembly.
  - (5) Lift the MK19 40-mm grenade machine gun from the mount with the aid of an assistant.
- 5. Remove the MK93 MOD 3 machine gun mount.
  - a. Remove the elevation mechanism.
    - (1) Remove the quick-release pin from the holes beneath the carriage assembly.
    - (2) Lift the lever up to unlock the elevation mechanism on the azimuth indicator.
  - b. Remove the catch bag.
    - (1) Release the hook-and-loop fastener.
    - (2) Remove the quick-release pin.
    - (3) Remove the catch bag assembly from the right side while pulling the catch bag frame rearward away from the carriage assembly.
  - c. Turn the shock absorber assemblies to the downward position.
  - d. Loosen the cupola adapter bolts.
  - e. Remove the pintle mount from the cupola.

Performance Measures	GO	NO-GO
1. Ensured the vehicle AUTO, AUX MASTER, and cupola power switches were off.	_____	_____
2. Locked the cupola.	_____	_____
3. Removed the ammunition and box.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
4. Removed the weapon system.	_____	_____
5. Removed the MK93 MOD 3 machine gun mount.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)	
TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker		
TM 9-1005-347-23&P/TO 11W2-6-3-182 Field Maintenance Manual (Including Repair Parts and Special Tools List) for Machine Gun, Caliber .50; M2A1 W/Fixed Headspace and Timing NSN 1005-01-511-1250 (EIC 4AZ)		
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513		
TM 9-2355-311-10-5-2 Operator's Manual, Volume 2 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker		
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 of 3 Reconnaissance/Scout Vehicle (RV) M1127 (NSN: 2355-01-481-8572) (EIC: AFG) Stryker		
TM 9-2355-311-10-9-1 Operator's Manual, Volume 1 OF 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker		

References Required	Primary
TM 9-2355-311-10-9-2 Operator's Manual, Volume 2 of 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker	
TM 9-2355-311-10-9-3 Operator's Manual, Volume 3 OF 4, Fire Support Vehicle (FSV) M1131A1 NSN 2355-01-528-1274 (EIC: AFT) Stryker Support Sensor System (FSV/FS3) M1131A1 (NSN: 2355-01-528-1274) (EIC: AFT) Stryker	

**171-159-0019**

**Operate the Chemical Defense System on the Command Vehicle and Reconnaissance Vehicle**

**Conditions:** You are a crewmember on a Command Vehicle or reconnaissance vehicle conducting operations in a chemical, biological, radiological and nuclear environment. You have on your Joint Service Lightweight Integrated Suit Technology and M51 mask.

**Standards:** Power up the ventilated face mask (known as VFM) system, attach the heater hose to the M51 mask, and connect the M51 protective mask microphone to the combat vehicle crewman (known as CVC) helmet. Once the ALL CLEAR is received, reattach the boom microphone to the CVC helmet, remove the heater hose from the M51 protective mask, and power down the VFM.

**Note:** This task can be used with the M42 chemical biological mask or the M51 chemical biological mask.

**Performance Steps**

1. Power up the VFM system.
  - a. Set AUX MASTER switch to ON position.
  - b. Ensure that spring clips are lifted so that filter assembly air inlets are open on two filter units.
  - c. Set nuclear, biological, and chemical (NBC)/VFM toggle switch to on position.
- Note:** The NBC/VFM LED will illuminate green.
2. Attach the heater hose to the M51 protective mask.
  - a. Disconnect heater hose from quick-disconnect coupling on stowage bracket.
  - b. Connect heater hose to M51 protective mask.
  - c. Adjust heater control knob on M3 heater until air temperature is comfortable.
3. Connect the M51 protective mask microphone to the CVC helmet.
  - a. Put on and adjust CVC helmet.
  - b. Swing CVC helmet boom microphone out of the way.
  - c. Disconnect the boom microphone lead from CVC helmet.
  - d. Connect the M51 protective mask microphone cable to M51 protective mask microphone jack.
  - e. Connect the other end of the microphone cable to the CVC helmet.
4. Remove the heater hose from the protective mask.

**DANGER**

**If vehicle has been in an NBC-warfare environment, vehicle must be decontaminated by trained personnel. Personnel may be killed or injured if contaminated chemical defense system is used or inspected before being cleaned by authorized persons.**

- a. Disconnect the heater hose from M51 protective mask.
- b. Connect the heater hose to the quick-disconnect coupling on stowage bracket.
- c. Turn off the M3 heater by rotating heater control knob counterclockwise to the OFF position.
5. Reconnect the boom microphone to the CVC helmet.
  - a. Disconnect the microphone cable from the M51 protective mask microphone jack and the CVC helmet.
  - b. Connect boom microphone to the CVC helmet.
6. Remove the CVC helmet.
7. Remove the M51 protective mask.
8. Power down the VFM system.
  - a. Set NBC/VFM toggle switch to OFF position.
  - b. Close spring clips on two filter units.
  - c. Set AUX MASTER switch to OFF position.

**Note:** NBC/VFM LED will extinguish.

- b. Close spring clips on two filter units.
- c. Set AUX MASTER switch to OFF position.

Performance Measures	GO	NO-GO
1. Powered up the VFM system.	_____	_____
2. Attached the heater hose to the M51 protective mask.	_____	_____
3. Connected the M51 protective mask microphone to the CVC helmet.	_____	_____
4. Removed the heater hose from the protective mask.	_____	_____
5. Reconnected the boom microphone to the CVC helmet.	_____	_____
6. Removed the CVC helmet.	_____	_____
7. Removed the M51 protective mask.	_____	_____
8. Powered down the VFM system.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2355-311-10-5-2 Operator's Manual, Volume 2 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	TM 9-2355-311-10-4-1 Operator's Manual, Volume 1 of 4, Commander's Vehicle (CV) M1130 NSN 2355-01-481-8573 (EIC: AFK) Stryker
TM 9-2355-311-10-4-2 Operator's Manual, Volume 2 of 4, Commander's Vehicle (CV) M1130 NSN 2355-01-481-8573 (EIC: AFK) Stryker	
TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker	

## Subject Area 8: VEHICLE GUNNER

**071-216-0025**  
**Maintain the Turret on a Bradley Fighting Vehicle**

**Conditions:** You are a Bradley fighting vehicle (known as BFV) gunner and must maintain the turret of the vehicle. You have the basic issue items, technical manuals appropriate for the BFV variant and type of auxiliary equipment in the turret, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), an assisting crewmember, and the appropriate cleaning equipment (lint-free cloth, cleaning solvents and solutions, lens paper, wiping rags, and clean water.).

**Standards:** Perform preventative maintenance checks and services (PMCS) on the BFV's turret and turret auxiliary equipment according to the appropriate technical manual. Inform supervisor of the results of the PMCS and turn in the completed DA Form 5988-E or DA Form 2404 for the BFV turret and auxiliary equipment to unit maintenance.

**Note:** Keep the turret clean at all times. Dirt, grease, oil, and debris get in the way and may cover up a serious problem. For example, spent casings may be caught underneath the turret slowing the turret's rate of traverse.

**Performance Steps**

1. Perform the required PMCS according to the technical manual.

**Note:** There are five types of PMCS, named after the interval period for which they are performed: before, during, after, weekly, or monthly PMCS.

- a. Correct all operator-level deficiencies.
  - (1) Document deficiencies.
  - (2) Document corrective action taken.
  - (3) Document any parts replaced.

2. Perform PMCS on turret auxiliary equipment.

**Note:** Auxiliary equipment includes weapons, radios, vehicle intercommunications set, and vehicle navigation sets, as appropriate.

- a. Correct all operator-level deficiencies.
  - (1) Document deficiencies.
  - (2) Document corrective action taken.
  - (3) Document any parts replaced.

3. Inform supervisor of the results of the PMCS.

4. Submit each completed DA Form 5988-E or DA Form 2404 to unit maintenance through the chain of command.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed the required PMCS according to the technical manual.	_____	_____
2. Performed PMCS on turret auxiliary equipment.	_____	_____
3. Informed supervisor of the results of the PMCS.	_____	_____
4. Submitted each completed DA Form 5988-E or DA Form 2404 to unit maintenance through the chain of command.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) and Fighting Vehicle, Cavalry M3A2 (2350-01-248-7620) (EIC: ALH) Turret
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	
TM 9-2350-252-10-2 Fighting Vehicle, Infantry, M2 (NSN 2350-01-048-5920) (EIC: APA) M2A1 (2350-01-179-1027) (EIC: ALE) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) (EIC: APB) M3A1 (2350-01-179-1028) (EIC: ALF) Turret	
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry M2A2 (2350-01-248-7619) (EIC ALG) and Fighting Vehicle, Cavalry M3A2 NSN 2350-01-248-7620 (EIC ALH) Hull	

**071-024-0005**  
**Maintain the 25-millimeter Gun on a Bradley Fighting Vehicle**

**Conditions:** You are the gunner on a Bradley fighting vehicle (known as BFV) and you have been directed to perform operator maintenance on the 25-millimeter (mm) gun. You have DA Form 2408-4 (*Weapon Record Data*), TM 9-2350-284-10-2, and all required materiel required to perform the maintenance. You have two crewmembers to assist as needed.

**Standards:** Ensure all weapons are clear. Disassemble, clean, inspect, lubricate, and reassemble the 25-mm gun in accordance with TM 9-2350-284-10-2. Perform a function check (dry fire) on the 25-mm gun to ensure it is operating correctly.

**Performance Steps**

1. Ensure all weapons systems are cleared.

**Note:** Clearing the 25-mm gun is achieved by unloading the gun feeder. Additionally, unloading the feeder removes the feeder, which is the first step of disassembling the gun.

2. Update round count information on DA Form 2408-4.

**Note:** Round count determines the replacement of the firing pin and the breech assembly. Firing pin (P/N 12524325) is replaced after 8,000 rounds. Firing pin (P/N 12524512) is replaced after 12,000 rounds. The standard breech is replaced at 25,000 rounds. The enhanced breech has no round count limit for replacement; however, it must be carefully inspected every 2,500 rounds.

3. Disassemble the 25-mm gun.

- a. Remove the feeder, if necessary.

**Note:** The feeder is removed as part of clearing the 25-mm gun; however, it may have been reinstalled.

- b. Remove the 25-mm gun barrel.

- (1) Survey muzzle with appropriate radiation detection instrument, if M919 ammunition was fired.

**Note:** If fixed radioactive residue is present, do not clean barrel; instead remove barrel from service by sealing both ends with tape and disposing of (as low-level radioactive waste) in accordance with AR 385-10.

- (2) Lower the trim vane (A1 version).

- (3) Direct assisting Soldiers to prepare for barrel removal.

- (a) Ensure one Soldier assumes a position on the right side of gun barrel near gun mount.

- (b) Ensure the other Soldier assumes a position on the left side of gun barrel.

- (4) Depress, manually, the 25-mm gun to maximum depression.

- (5) Unlock 25-mm gun barrel.

**Note:** The original M2 or M3 had the barrel release inside the barrel support housing, which was accessed from outside the BFV. All other variants have the barrel release latch inside the turret.

### CAUTION

The 25-mm gun receiver could slide out as soon as you twist it. Use both hands and two helpers to remove the 25-mm gun receiver.

- (a) Pull out and hold 25-mm gun barrel release latch.
- (b) Direct assisting Soldier to hold the 25-mm gun barrel with both hands and rotate the 25-mm gun barrel to the left until ALINE arrow is on top.

### WARNING

25-mm gun receiver is heavy and can cause back injuries if handled improperly.

- (c) Release gun barrel release latch (see figure 3-176).

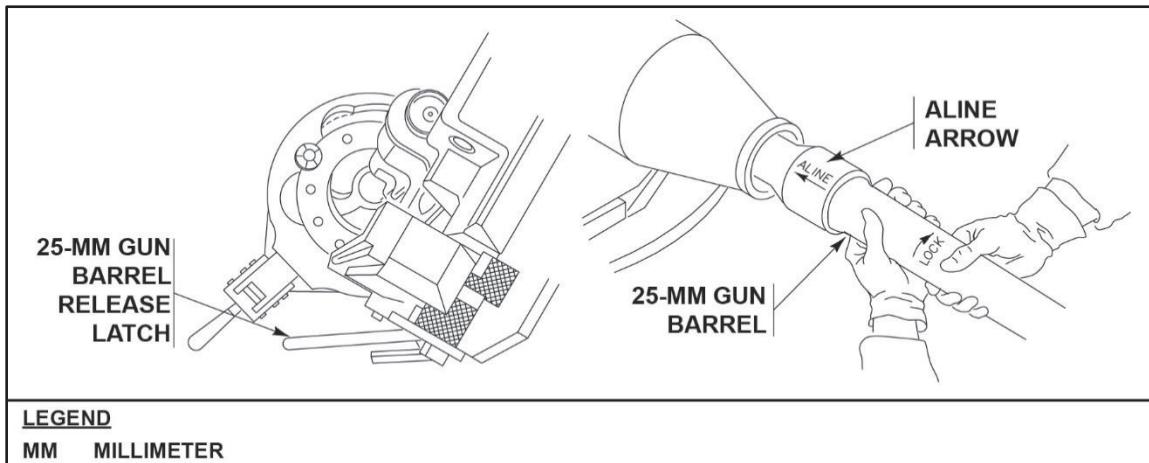
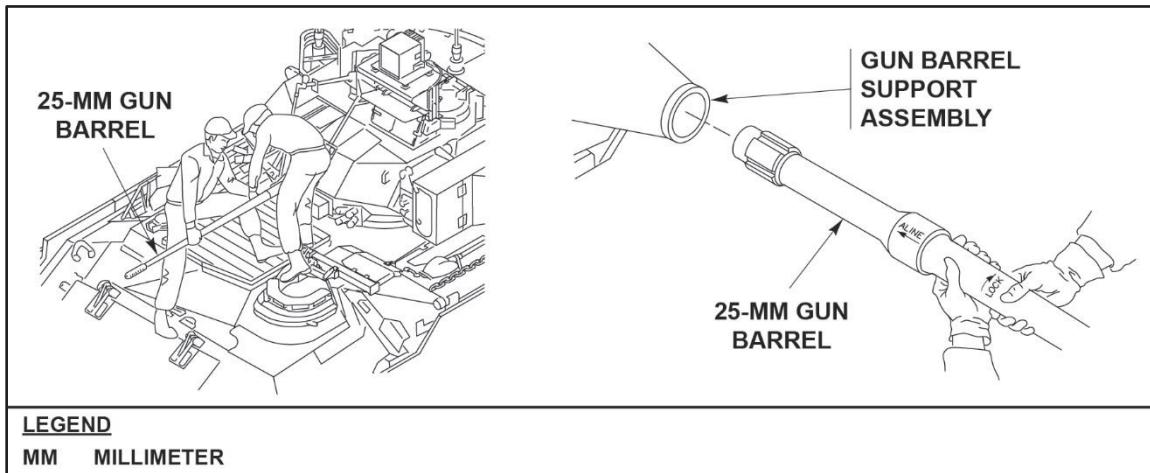


Figure 3-176. Removing gun barrel

- (6) Direct the assisting Soldiers to remove 25-mm gun barrel from gun mount support assembly (see figure 3-177).



**Figure 3-177. Removing barrel from the support assembly**

- (a) Direct one Soldier to move to front of the 25-mm gun barrel to share weight distribution.

**CAUTION**

The 25-mm gun barrel is easily damaged; it must be slid straight out of the rotor extension.

- (d) Direct the Soldiers to slide the 25-mm gun barrel straight out of the gun barrel support assembly.
- (7) Direct the Soldiers to place the 25-mm gun on a clean and clear surface.
- (a) Ensure the 25-mm gun barrel is positioned securely on the front of vehicle.
  - (b) Ensure control of the 25-mm gun barrel is transferred from the assisting Soldier on the BFV to the assisting Soldier on the ground.
  - (c) Ensure the gun barrel is placed on a clean surface.
- c. Remove the 25-mm gun receiver.
- (1) Elevate, manually, 25-mm gun rotor to 200 mils.
  - (2) Unlock the 25-mm gun receiver by pulling anti-rotation latch handle toward you (see figure 3-178, page 3-564).

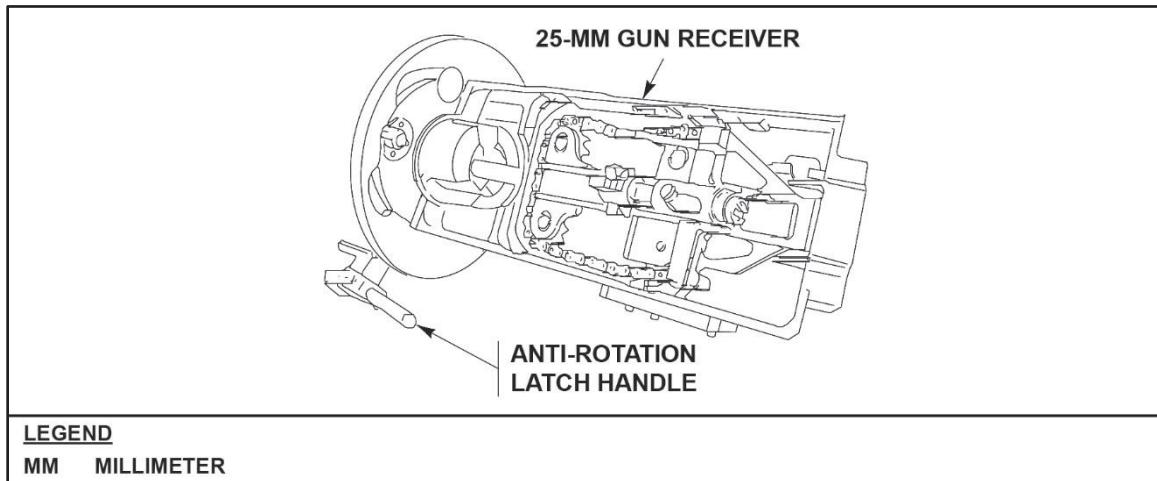


Figure 3-178. Gun receiver

- (3) Remove the 25-mm gun receiver from trunnion using both hands for support and with help from an assistant (see figure 3-179).

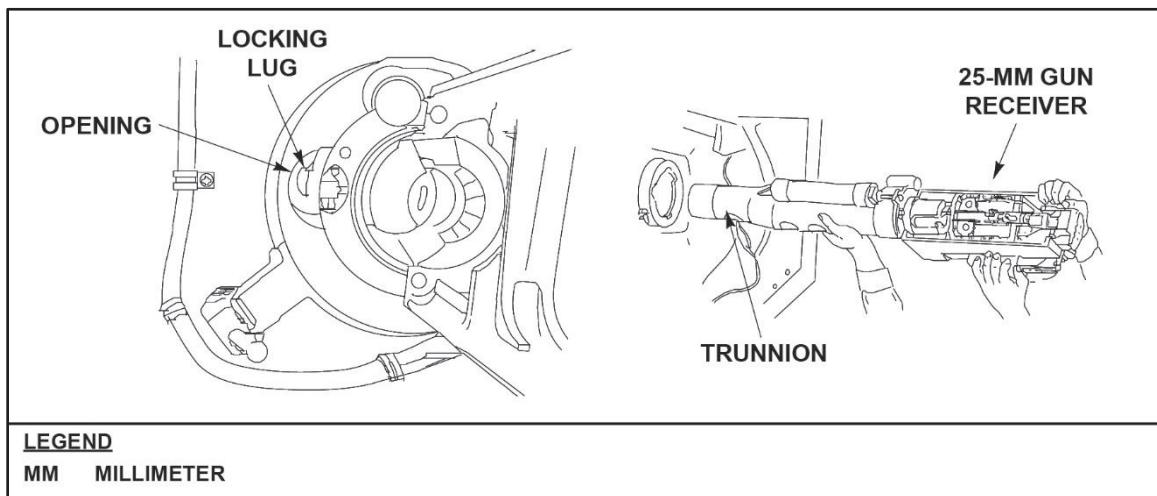
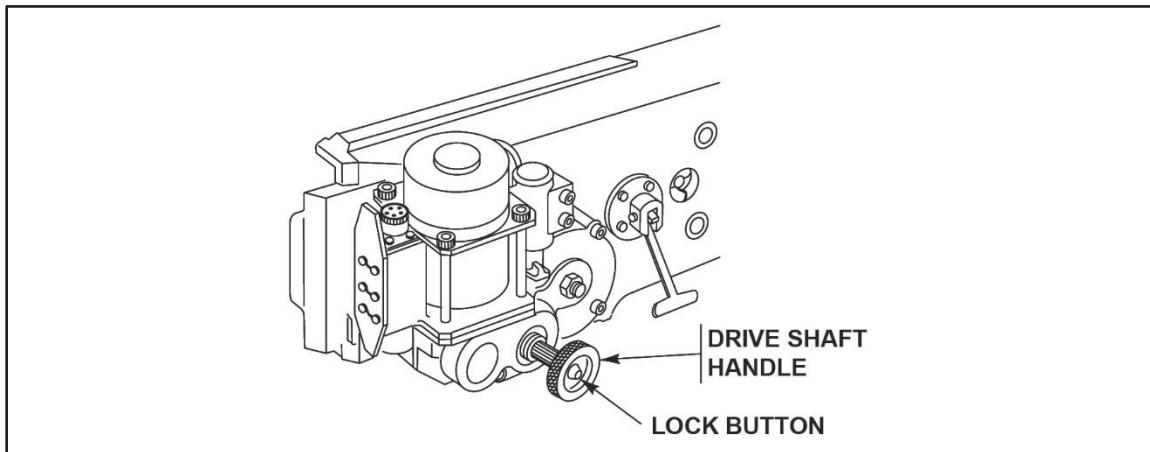


Figure 3-179. Removing the trunnion

- (a) Rotate the 25-mm gun receiver to left as far as possible to align locking lug with opening.
- (b) Pull the 25-mm gun receiver straight out of trunnion using both hands.
- (4) Remove the 25-mm gun receiver from turret with help from an assistant.
  - (a) Ensure assistant supports rear end of the 25-mm gun receiver.
  - (b) Direct assistant to exit turret while keeping hold of the 25-mm gun receiver.
  - (c) Place the 25-mm gun receiver on a clean, level surface.
  - d. Remove track and bolt assembly.

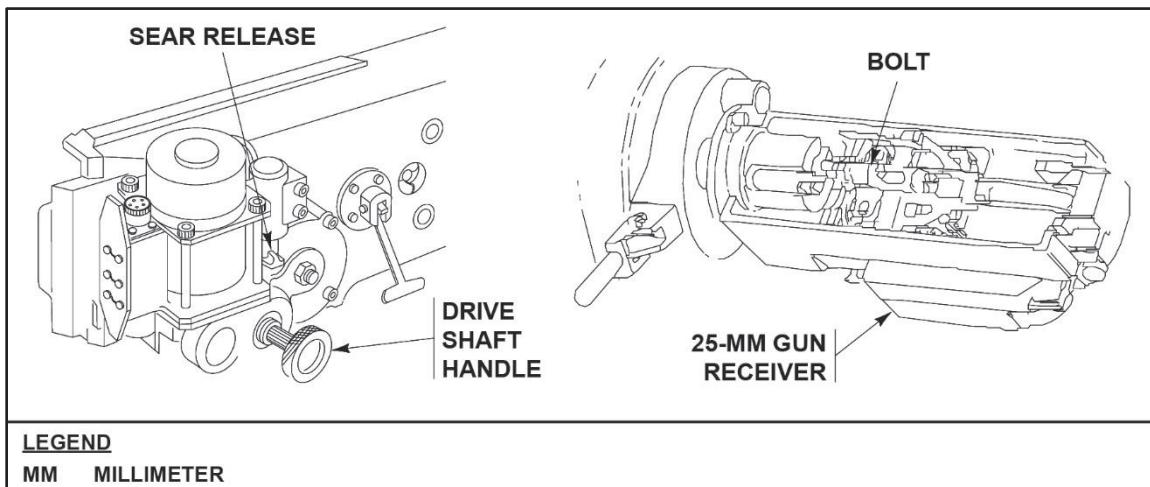
**Note:** Procedure for removing track and bolt assembly from the 25-mm gun receiver in turret or on workbench is the same.

- (1) Pull out drive shaft handle (see figure 3-180).



**Figure 3-180. Drive shaft**

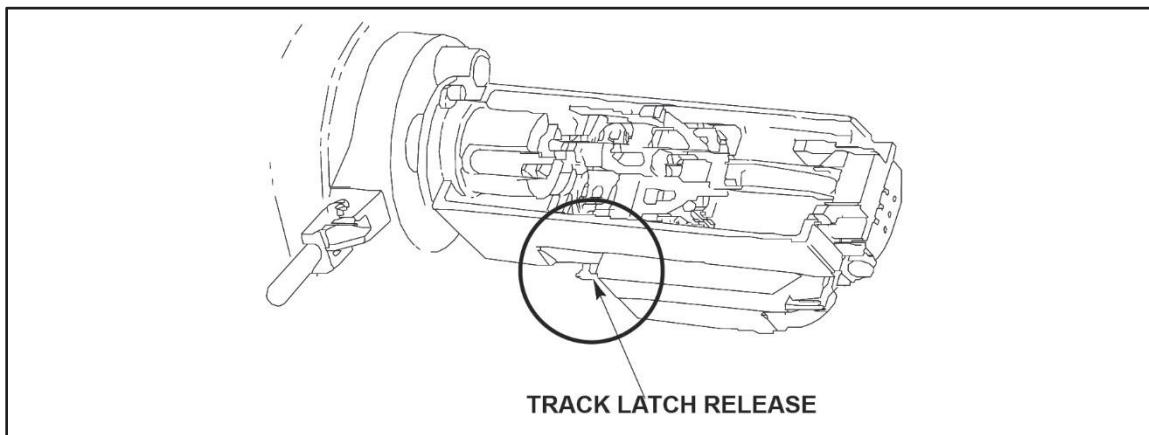
- (2) Cycle bolt out of sear position (see figure 3-181).



**Figure 3-181. Sear release**

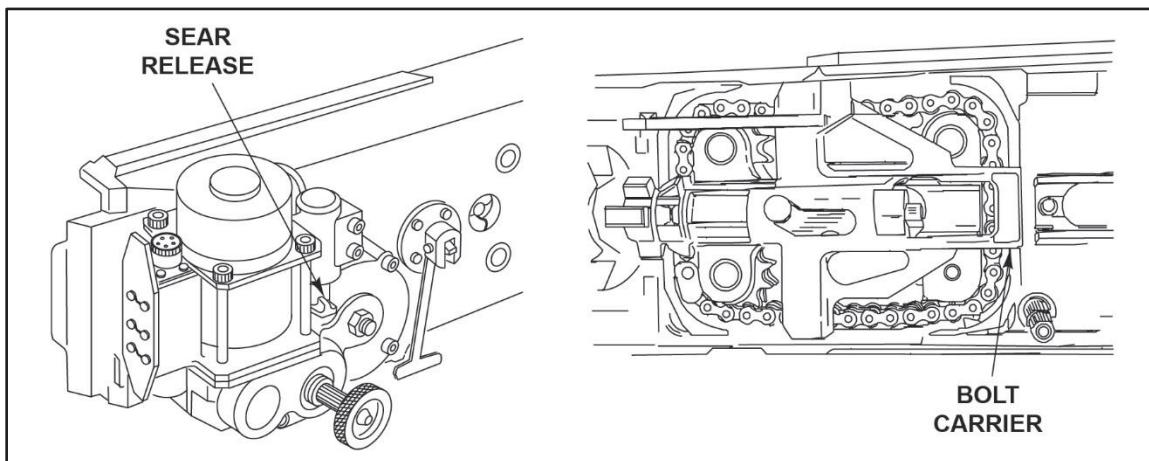
- (a) Push up and hold sear release.
- (b) Turn drive shaft handle until bolt moves to rear of the 25-mm gun receiver.
- (c) Release sear release.
- (3) Move bolt toward the breech.
  - (a) Turn the drive shaft handle left (toward gunner).
  - (b) Move the bolt carrier forward until rear of bolt is  $\frac{1}{2}$  inch from outside edge of chain.
- (4) Remove track and bolt assembly.

- (a) Push down on track latch handle until it is all the way down (see figure 3-182).



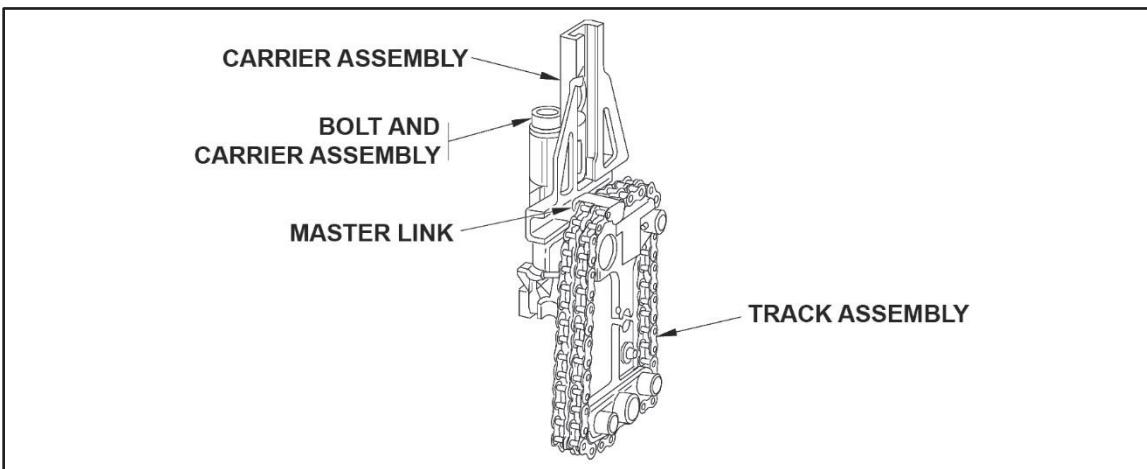
**Figure 3-182. Track latch handle**

- (b) Unseat the bolt carrier by pushing up and holding sear release with one hand while grasping and pulling the bolt carrier out with the other hand (see figure 3-183).



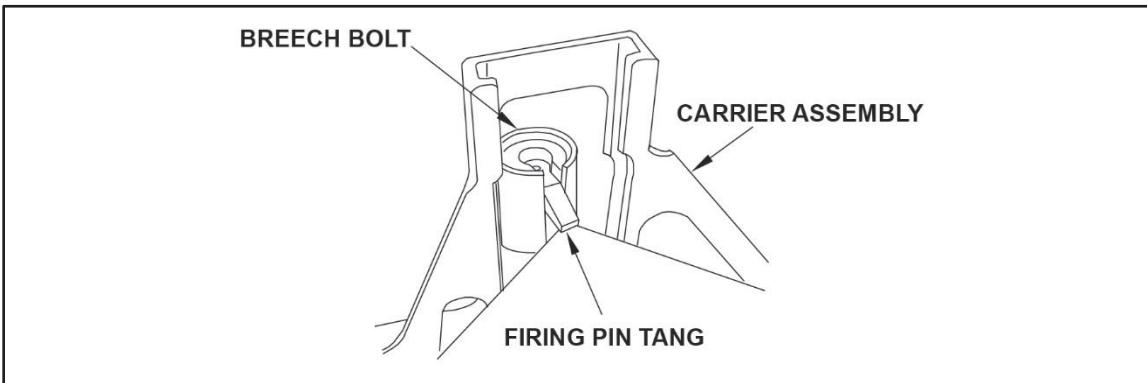
**Figure 3-183. Unseating the bolt carrier**

- (c) Release sear release.  
(d) Lift track and bolt assembly out of the 25-mm gun receiver.  
(e) Place track and bolt assembly on a smooth clean surface.  
e. Disassemble the 25-mm gun track and bolt assembly (see figure 3-184).



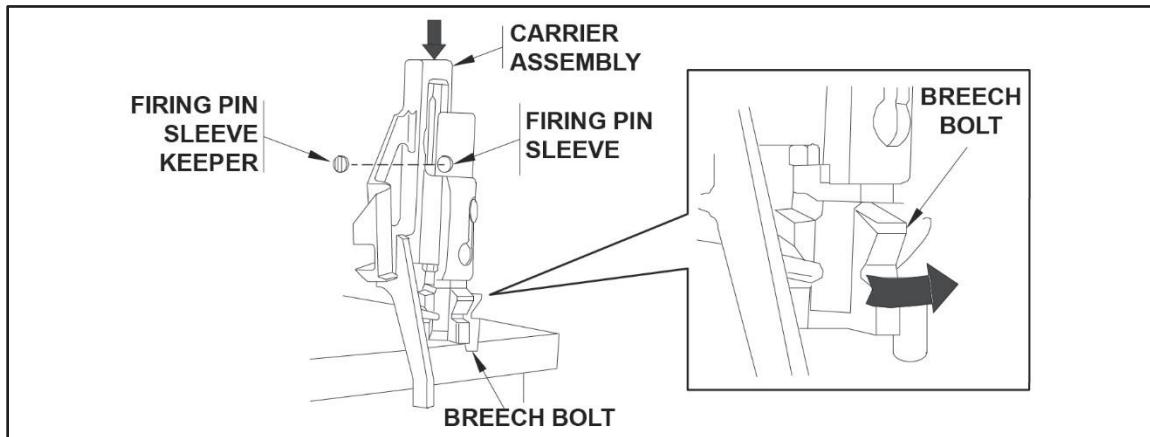
**Figure 3-184. Track and bolt assembly**

- (1) Position bolt and track assembly.
  - (a) Grasp track assembly at bottom.
  - (b) Grasp top of bolt and carrier assembly with other hand so that rear of carrier assembly is on top.
- (2) Remove bolt and carrier assembly.
  - (a) Move master link into center of carrier assembly.
  - (b) Lift bolt and carrier assembly from track assembly.
- (3) Unlock breech bolt from forward locking position (see figure 3-185).



**Figure 3-185. Firing pin tang**

- (a) Hold carrier assembly with breech bolt pointed downwards and firing pin tang hooked on corner of working surface.
- (b) Press down firmly on carrier assembly until firing pin tang unlocks.
- (4) Remove firing pin assembly and firing pin sleeve (see figure 3-186, page 3-568).

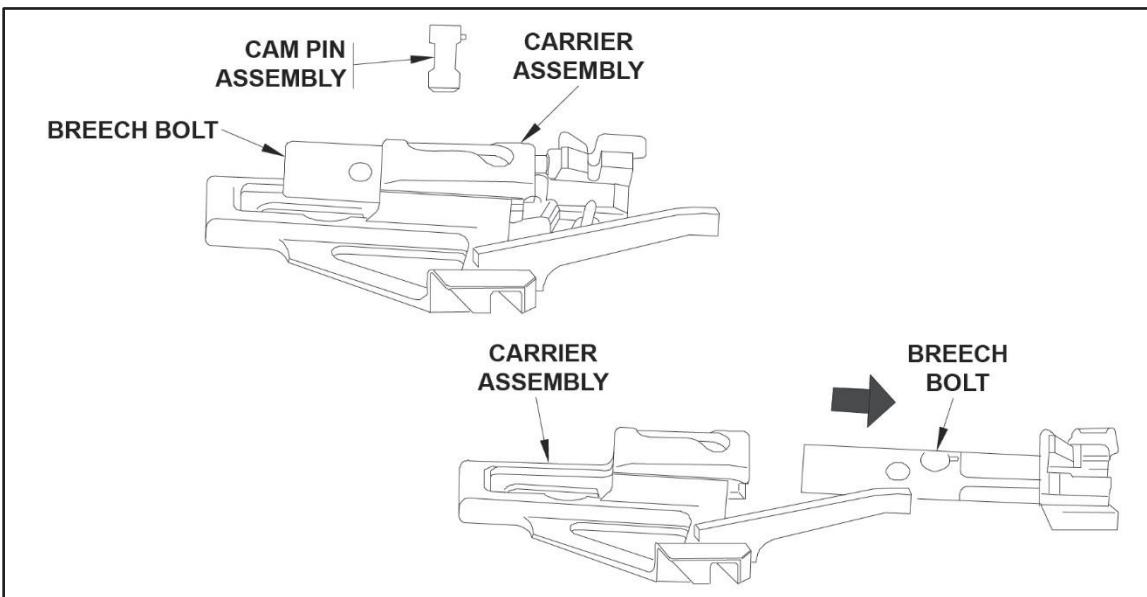


**Figure 3-186. Firing pin assembly and sleeve**

- (a) Turn face of breech bolt clockwise.
- (b) Place breech bolt on a solid surface.
- (c) Push down on carrier assembly to unlock breech bolt and to expose firing pin sleeve keeper.
- (d) Press rear of firing pin sleeve down.

**Note:** If firing pin sleeve cannot be depressed by hand,  $\frac{3}{4}$ -inch socket may be used with wiping rag to protect hand.

- (e) Remove firing pin sleeve keeper.
  - (f) Rotate firing pin tang to the side.
  - (g) Slide firing pin assembly and firing pin sleeve from rear of breech bolt.
- (5) Remove firing pin sleeve from firing pin assembly.
- (6) Remove breech bolt (see figure 3-187).



**Figure 3-187. Remove breech bolt**

- Pull cam pin assembly out of breech bolt.
- Remove breech bolt from carrier assembly.

#### **WARNING**

Solvent fumes and fluid are poisonous and can cause skin irritation. Solvent may be harmful if swallowed. Avoid skin contact and breathing of fumes. Solvent evaporates rapidly and makes fumes that are flammable. Do not smoke or allow open flames near solvent fumes.

#### **CAUTION**

Cleaning solvent can damage electrical connectors and rubber and plastic parts. Keep cleaning solvent away from the feed select solenoid, sear solenoid, sear solenoid cable, drive motor, electrical connector, and bolt position indicator cover.

Use of unauthorized cleaning materials and procedures could result in bore damage which may lead to premature condemnation of the cannon tube.

Use only cleaner, lubricant, and preservative (known as CLP) for the bore of the 25-mm chrome barrel assembly or damage to the barrel may result. The chrome barrel assembly can be identified by the manufacturer's identification code number 26978 or 19204.

Use rifle bore cleaner (known as RBC) for the nitrite barrel assembly.

4. Clean the 25-mm gun.

**Note:** When cleaning solvent is used instead of RBC, you do not have to remove cleaning agent. Parts can be air dried or wiped dry with clean, dry wiping rag.

a. Clean the 25-mm gun barrel.

**Notes:** The bore, chamber, and exterior of cannon tube must be thoroughly cleaned and dried prior to inspection. All powder residue, dust, and rust must be removed.

Do not expect to see or attempt to obtain shiny finish in the bore. The gun barrel may exhibit various colors throughout the length of the bore and may range from a uniform gray/black to streaks of gray, black, or dark brown. Copper streaks found in the bore do not affect range or accuracy and shall be ignored; do not try to remove the copper streaks. These are normal occurrences and, with additional firing, will continue to darken over the life of the cannon tube.

(1) Clean outside of the 25-mm gun barrel.

- (a) Dip wiping rag in RBC/CLP.
- (b) Scrub dirt and rust from outside of 25-mm gun barrel, gun barrel support bearing, and locking lugs.

(2) Apply RBC/CLP to bore.

- (a) Apply RBC/CLP to swab.
- (b) Put swab in swab holder of cleaning rod.
- (c) Run cleaning rod through and then back out of barrel.
- (d) Discard swab.

(3) Loosen carbon deposits from bore.

- (a) Apply RBC/CLP to bore brush.
- (b) Screw bore brush onto cleaning rod.
- (c) Push cleaning rod through and then back out of barrel.
- (d) Repeat process until carbon deposits are loosened.
- (e) Remove bore brush from cleaning rod.

(4) Clean chamber.

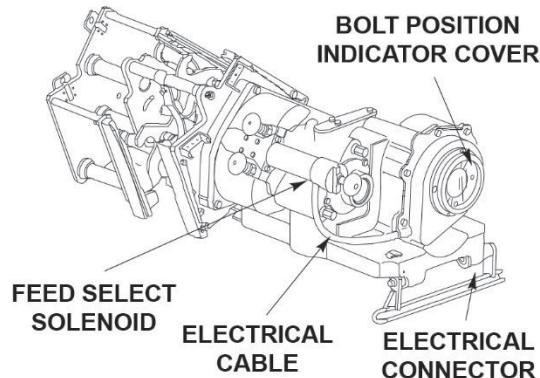
- (a) Apply RBC/CLP to chamber brush.
- (b) Screw chamber brush onto cleaning rod.
- (c) Push cleaning rod through and then back out of barrel.
- (d) Repeat process until carbon deposits are loosened.

- (e) Remove chamber brush from cleaning rod.
  - (f) Repeat steps (3) and (4) as needed.
- (5) Remove carbon from bore.
- (a) Apply RBC/CLP to swab.
  - (b) Put swab in swab holder of cleaning rod.
  - (c) Run cleaning rod through and then back out of barrel.
  - (d) Discard swab.
  - (e) Repeat process until swab that comes out of barrel is clean.
- (6) Dry bore of the 25-mm gun barrel.
- (a) Put clean, dry swab in swab holder of cleaning rod.
  - (b) Push cleaning rod down and pull back through length of barrel.

#### **CAUTION**

Keep cleaning solvent away from feed select solenoid, electrical cable, electrical connector, and bolt position indicator cover (see figure 3-188).

- b. Clean the 25-mm gun feeder.



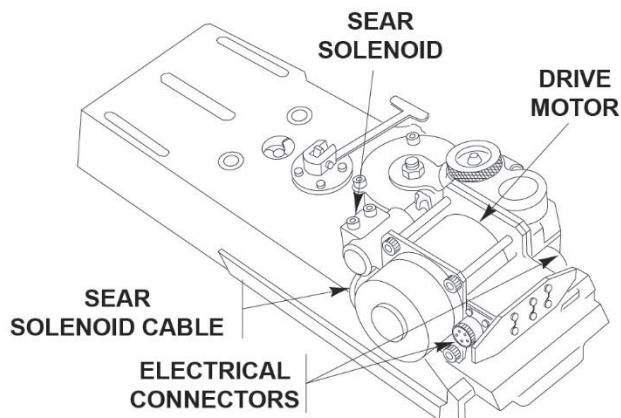
**Figure 3-188. No cleaning solvent/lubrication areas**

- (1) Dip clean wiping rag in cleaning solvent.
- (2) Clean exposed surface of the 25-mm gun feeder with wiping rag.

**CAUTION**

Keep cleaning solvent away from electrical connectors, sear solenoid, sear solenoid cable, and drive motor (see figure 3-189).

- c. Clean the 25-mm gun receiver.



**Figure 3-189. No cleaning solvent/lubrication areas on gun receiver**

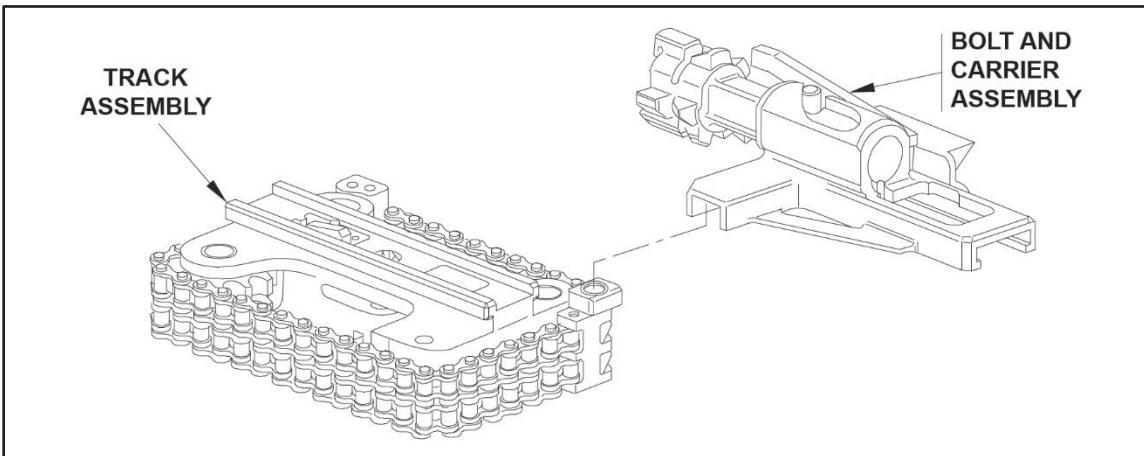
- (1) Put cleaning solvent on clean wiping rag.
- (2) Clean exposed surfaces of the 25-mm gun receiver with cleaning solvent.
- (3) Dip chamber brush in cleaning solvent.
- (4) Clean chamber with chamber brush.
- (5) Dry the 25-mm gun receiver by wiping with a clean, dry wiping rag or allowing receiver to air dry.

**CAUTION**

Preformed packings can be damaged by cleaning solvent. Do not soak track and bolt assembly in cleaning solvent. Use wiping rag only.

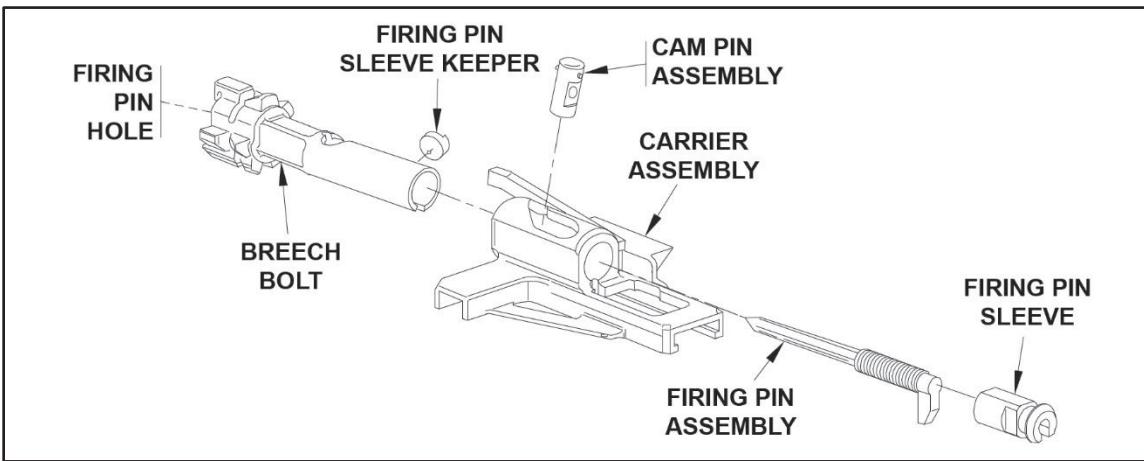
- d. Clean the 25-mm gun track and bolt assembly.

- (1) Clean track and bolt assembly by wiping grease from bolt and carrier assembly and from track assembly using a wiping rag damped in solvent (see figure 3-190).



**Figure 3-190. Track and bolt assembly**

- (2) Clean bolt and carrier assembly parts (see figure 3-191).



**Figure 3-191. Bolt and carrier assembly**

- (a) Clean firing pin assembly, breech bolt, firing pin sleeve keeper, firing pin sleeve, cam pin assembly, and carrier assembly using brush and dry cleaning solvent.
  - (c) Dry parts with a clean wiping rag.
5. Inspect the 25-mm gun.
- a. Inspect the 25-mm gun barrel.

**Note:** Notify field maintenance if a fault is discovered.

- (1) Inspect gun barrel for cracks on the outside.
- (2) (Nonribbed-type barrel) Inspect nonribbed barrel assembly (see figure 3-192, page 3-574).

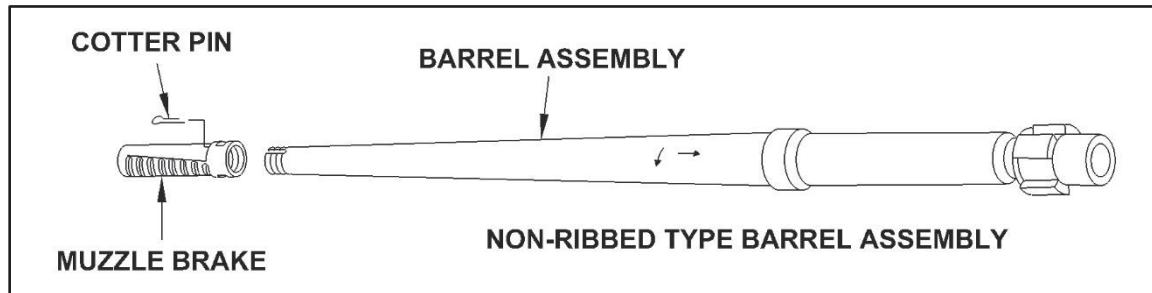


Figure 3-192. Nonribbed barrel assembly

- (a) Inspect for loose or broken muzzle brake.
- (b) Inspect for damaged or missing cotter pin.
- (3) (Ribbed-type barrel) Inspect ribbed barrel assembly (see figure 3-193).

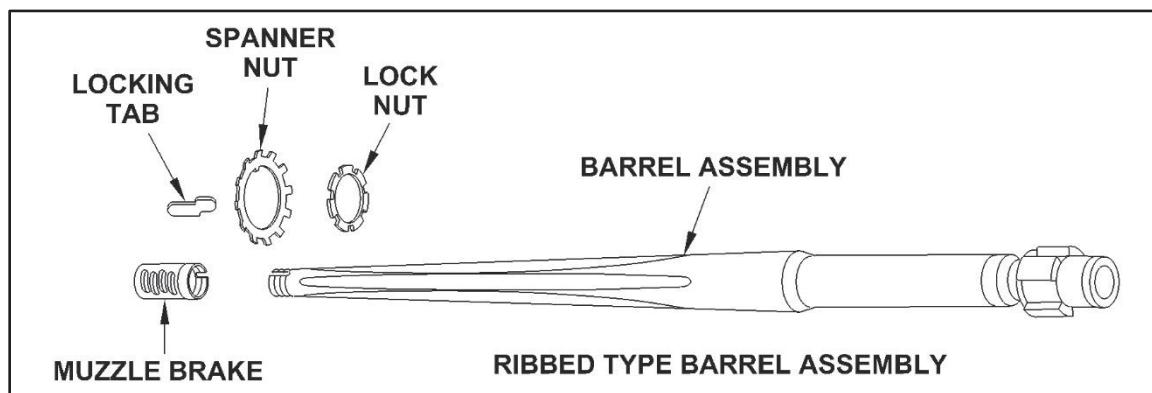


Figure 3-193. Ribbed barrel assembly

- (a) Inspect for loose or broken muzzle brake.
- (b) Inspect for loose spanner nut.
- (c) Inspect for damaged or missing key.
- (d) Inspect for broken or cracked locking tab washer and spanner nut.

**Note:** For barrels without locking tab washer, verify torque on spanner nut of 135 foot-pound (ft-lb)  $\pm$  10 ft-lb (183 Newton-meters [Nm]  $\pm$  14 Nm) using the spanner wrench.

- (4) Inspect for bends or pits in the bore by looking down the bore.
- (5) Inspect for cracked or chipped locking nuts.
- b. Inspect the 25-mm gun feeder.
  - (1) Inspect for cracks, bent or broken parts.
  - (2) Inspect for broken lock wire or loose screws (see figure 3-194).

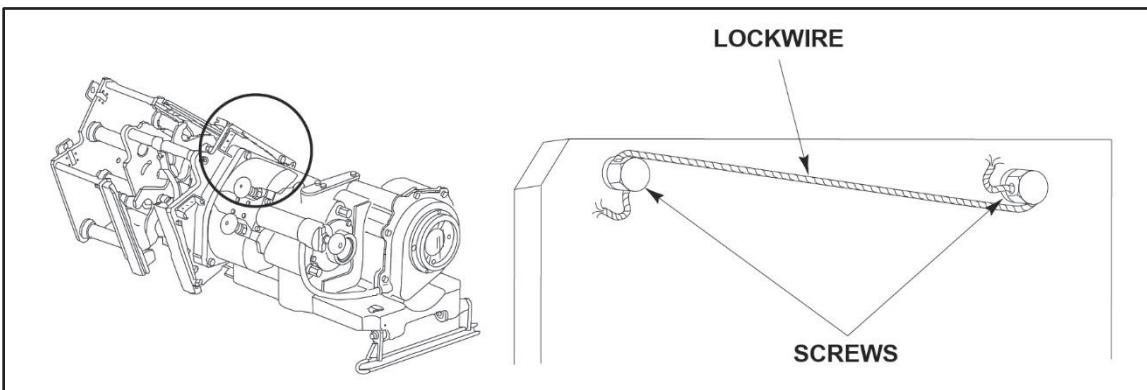


Figure 3-194. Lockwire and screws

- (3) Check for damaged electrical parts (see figure 3-195).

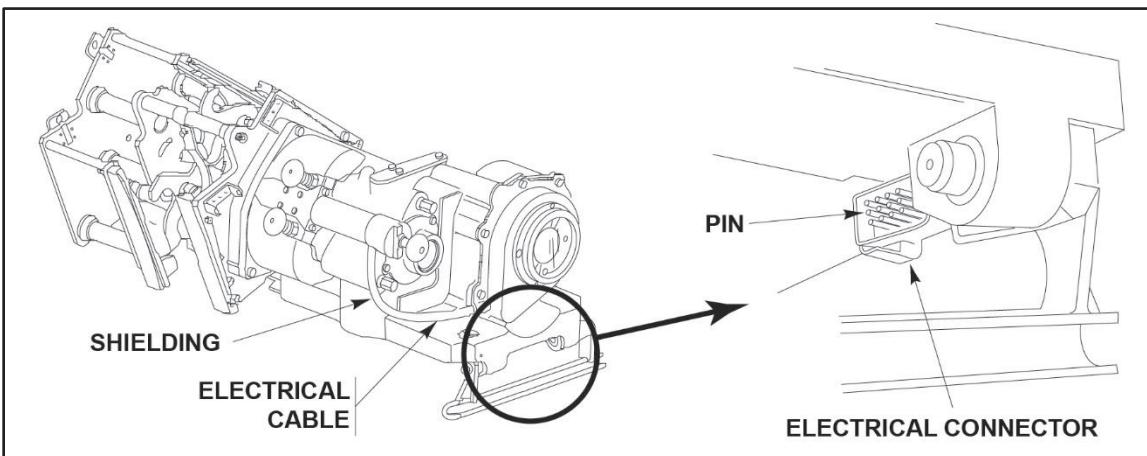
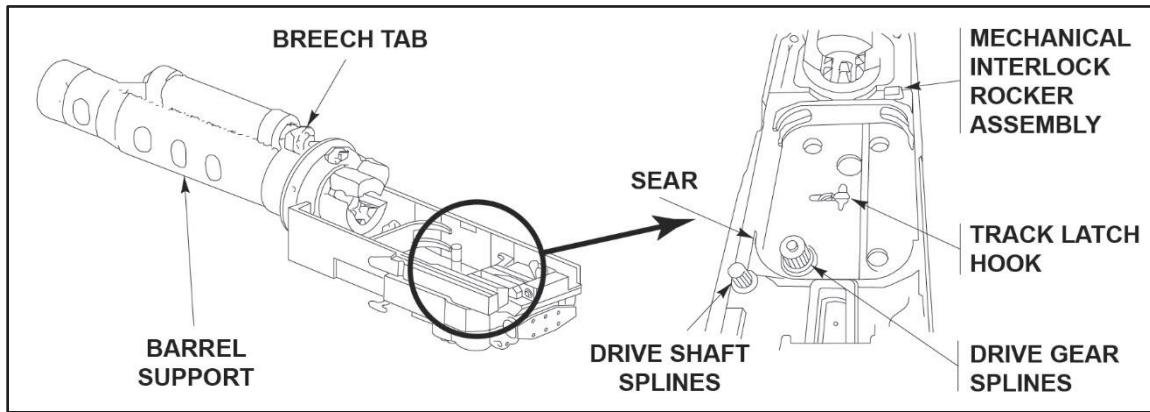


Figure 3-195. Electrical shielding, cable and connector

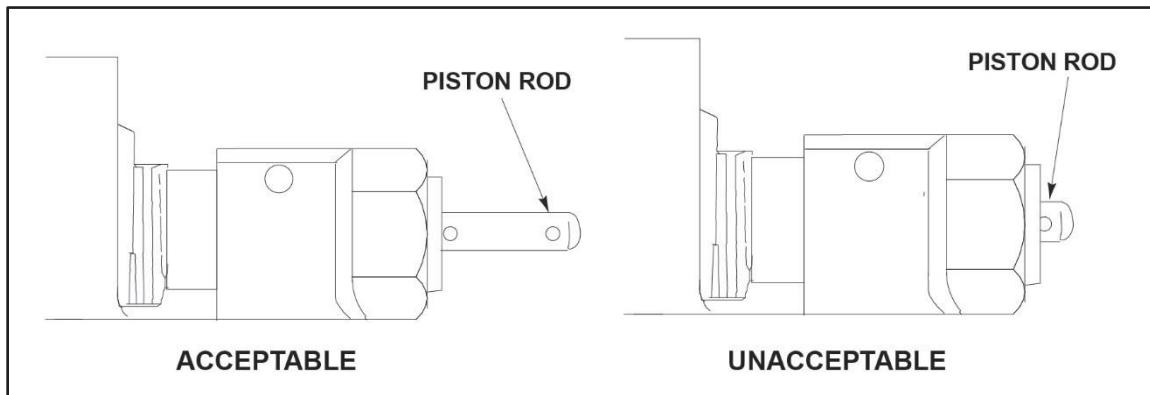
- (a) Check for cracked or broken shielding on outside of electrical cable.
- (b) Check for bent or broken pins on electrical connector.
- c. Inspect the 25-mm gun receiver (see figure 3-196, page 3-576).



**Figure 3-196. Gun receiver inspection**

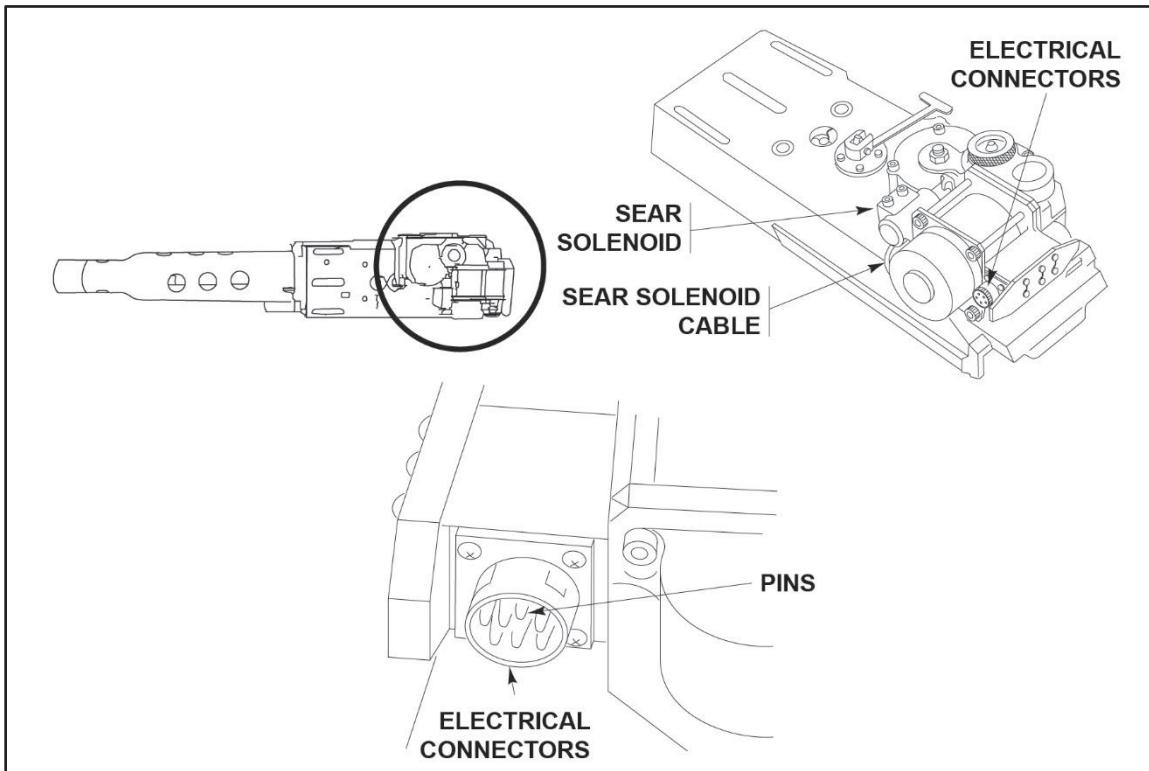
- (1) Inspect mechanical interlock rocker assembly, track latch hook, and sear for cracks, bends, or breaks.
- (2) Inspect for stripped or broken drive shaft splines or drive gear splines.
- (3) Inspect barrel support and breech tab for cracks, bends, or loose nuts.
- (4) Inspect recoil mechanism by observing if piston rod retracts into damper housing assembly to or below the first hole from the end of the piston rod (see figure 3-197).

**Note:** The hole farthest from the end of the piston rod represents the maximum fill level.



**Figure 3-197. Piston rod**

- (5) Check for damaged or broken electrical parts (see figure 3-198).



**Figure 3-198. Electrical parts**

- (a) Check for cracked or damaged protective housing around electrical connectors.
- (b) Check for cracked or broken shielding on outside of sear solenoid cable.
- (c) Check for bent or broken pins on electrical connectors.
- (6) Inspect for missing or broken breech assembly guide pin.
- (7) Inspect for other cracked, bent, or broken parts.
- d. Inspect the 25-mm gun track and bolt assembly.

**Note:** Some chipping and burring of track rails is normal.

- (1) Inspect bolt and carrier assembly and track assembly for cracked or broken parts.
- (2) Inspect slider path and track path for galls and burrs (see figure 3-199, page 3-578).

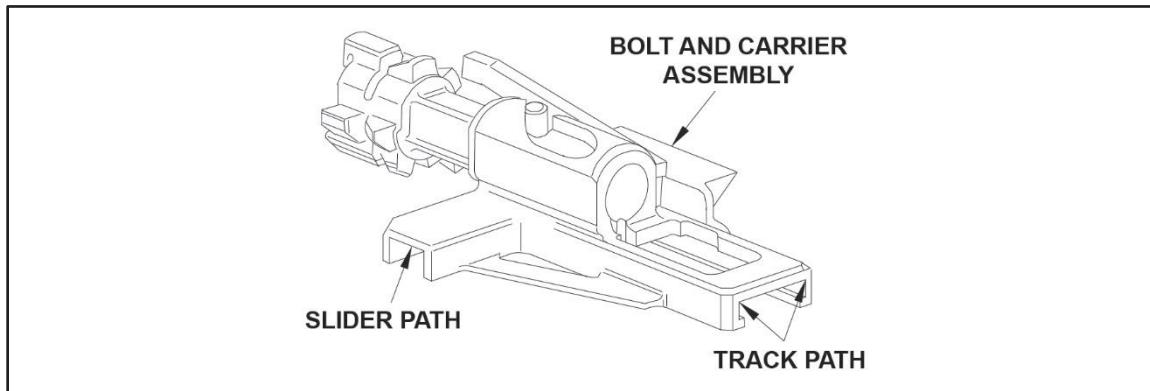


Figure 3-199. Slider and track paths

- (3) Inspect track rails (sliding surface) of track assembly for chips (see figure 3-200).

**Note:** Each track rail may exhibit chipping along the entire rail. The track assembly must be replaced if chipping crosses the top of the rail and exceeds 4-mm when measured along the outboard of the rail.

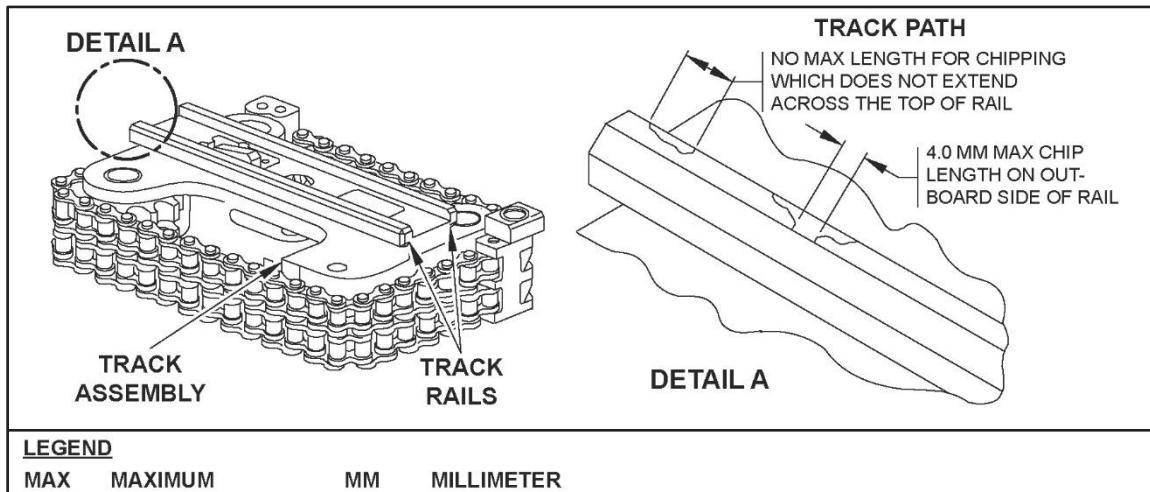


Figure 3-200. Track rails of track assembly

- (4) Inspect firing pin assembly protrusion (see figure 3-201).

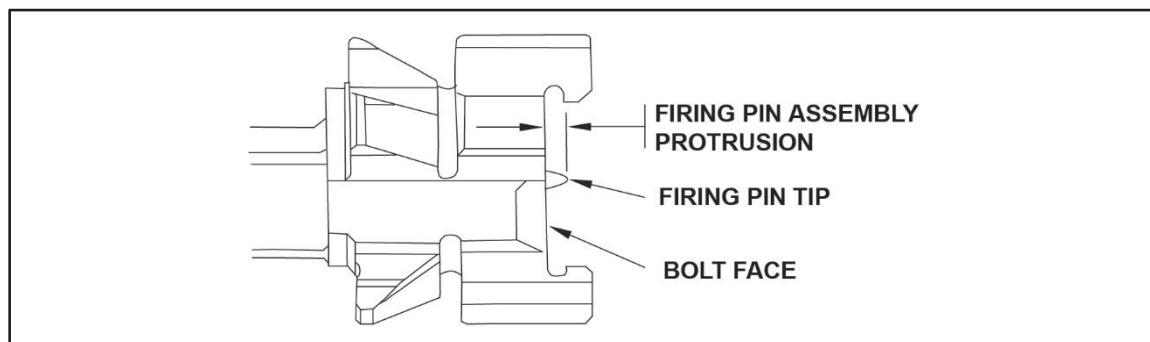


Figure 3-201. Firing pin protrusion

- (a) Ensure breech bolt is in the forward dwell position (uncocked).

- (b) Measure the firing pin tip protrusion.

**Note:** The firing pin must extend between 0.059 inches (1.5 mm) and 0.098 inches (2.5 mm) past the bolt face. If the firing pin protrusion is incorrect, replace firing pin assembly.

- (5) Inspect bolt and carrier parts.

- (a) Inspect firing pin assembly for broken spring.
- (b) Inspect firing pin assembly, breech bolt, firing pin sleeve keeper, firing pin sleeve, cam pin assembly, and carrier assembly for cracks and breaks.
- (c) Check breech bolt firing pin hole by attempting to fit a 0.125-inch drill bit shank into firing pin hole.

- 6. Lubricate the weapon.

**WARNING**

**Your hands may be cut by sharp edges when lubricating the 25-mm weapon barrel. Use rags or brush to lubricate the 25-mm weapon barrel.**

- a. Lubricate 25-mm gun barrel.

- (1) Lubricate bore.

- (a) Soak clean swab with general-purpose lubricating oil/CLP.
    - (b) Put swab in swab holder of cleaning rod.
    - (c) Push cleaning rod down and pull back through length of the 25-mm gun barrel.
    - (d) Remove excess oil/CLP with clean swab on swab holder.
    - (e) Repeat.

- (2) Lubricate outside of the 25-mm gun barrel.

- (a) Dampen wiping rag with general-purpose lubricating oil.
    - (b) Rub general purpose lubricating oil on outside of the 25-mm gun barrel.
    - (c) Remove excess oil from 25-mm gun barrel with a clean wiping rag.

**CAUTION**

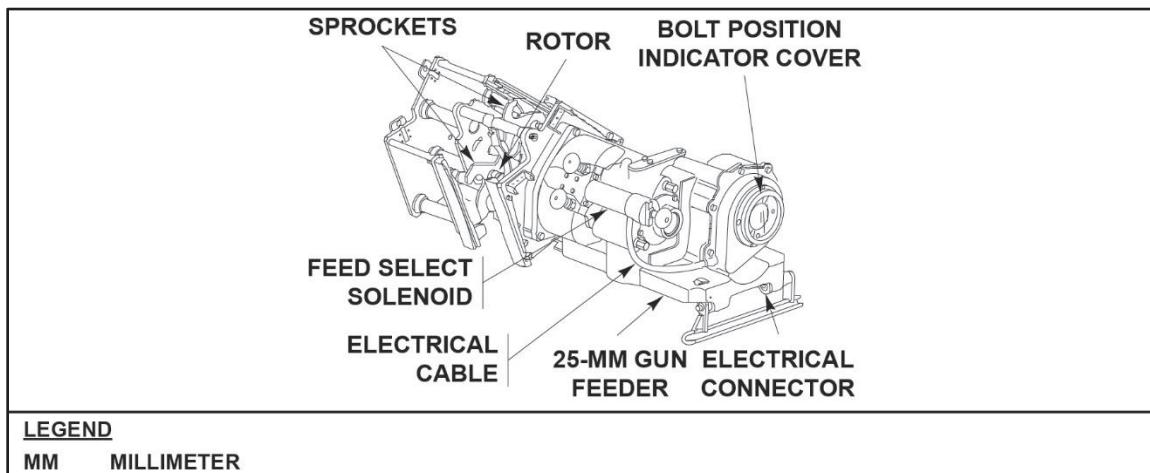
General-purpose lubricating oil and grease, molybdenum disulfide (known as GMD) can damage electrical parts. Do not let general-purpose lubricating oil or GMD get on electrical connectors, sear solenoid, sear solenoid cable, or drive motor.

- (1) Put a coat of GMD on locking lugs using oval brush.
- (2) Put light coat of GMD on gun barrel support bearing using oval brush.

**CAUTION**

Lubricating oil can damage electrical parts. Keep lubricating oil from feed select solenoid, electrical connector, electrical cable, and bolt position indicator cover (see figure 3-202).

- b. Lubricate the 25-mm gun feeder.



**Figure 3-202. Areas not to lubricate on 25-millimeter gun feeder**

- (1) Put general-purpose lubricating oil on a clean wiping rag.
- (2) Put a light coat of general-purpose lubricating oil on surfaces of the 25-mm gun feeder.

**CAUTION**

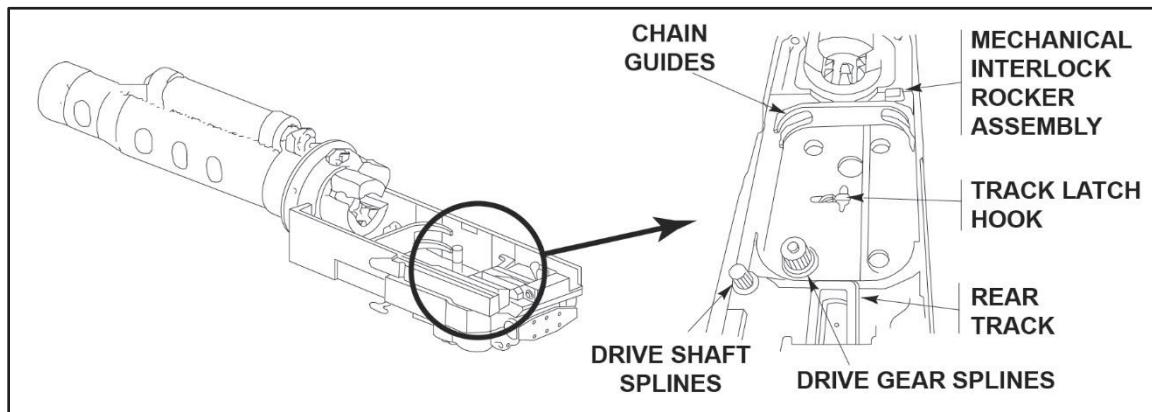
Keep general-purpose lubricating oil away from electrical connectors, sear solenoid, sear solenoid cable, and drive motor (see figure 3-203).

- c. Lubricate the 25-mm gun receiver.

**CAUTION**

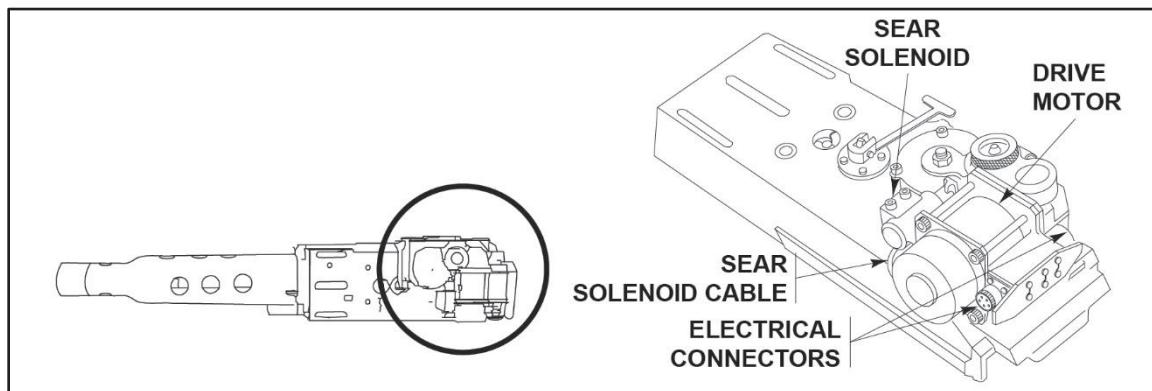
General-purpose lubricating oil and GMD can damage electrical parts.  
Do not let general-purpose lubricating oil or GMD get on electrical connectors, sear solenoid, sear solenoid cable, or drive motor.

- (1) Lubricate mechanical interlock rocker assembly, drive gear splines, drive shaft splines, rear track, chain guides, and track latch hook.
  - (a) Put GMD on oval brush.
  - (b) Place light coat of GMD on all parts of mechanical interlock rocker assembly, drive gear splines, drive shaft splines, rear track chain guides, and track latch hook (see figure 3-203).



**Figure 3-203. Locations for light coat of grease, molybdenum disulfide**

- (2) Lubricate surface of the 25-mm gun receiver.
  - (a) Dampen wiping rag with general-purpose lubricating oil.
  - (b) Rub a light coat of general-purpose lubricating oil over surfaces of the 25-mm gun receiver.
  - (c) Keep general-purpose lubricating oil away from electrical connectors, sear solenoid, sear solenoid cable, and drive motor (see figure 3-204).

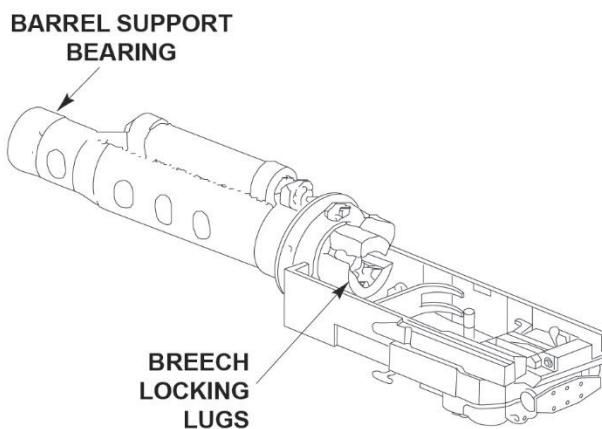


**Figure 3-204. Areas not to be lubricated on surface of the receiver**

**CAUTION**

When temperature is below 25 degrees ( $^{\circ}$ ) Fahrenheit (F) (32 $^{\circ}$  Celsius [C]), use lubricant, arctic, weapons (known as LAW) on barrel support bearing and breech locking lugs as GMD can cause barrel support bearing and breech locking lugs to stick.

- (3) Lubricate barrel support bearing and breech locking lugs (see figure 3-205).
  - (a) If temperature is above 25 $^{\circ}$  F (32 $^{\circ}$  C), put heavy coat of GMD, using an oval brush, on barrel support bearing and breech locking lugs.
  - (b) If temperature is below 25 $^{\circ}$  F (32 $^{\circ}$  C), put heavy coat of LAW, using an oval brush, on barrel support bearing and breech locking lugs.



**Figure 3-205. Barrel support bearing and breech locking lugs**

**CAUTION**

When temperature is below -25 $^{\circ}$  F (-32 $^{\circ}$  C), use LAW on breech bolt, firing pin, firing pin sleeve, and cam pin as GMD can cause bolt to stick. Do not apply grease to face of breech bolt. Grease will attract dust and dirt which might stop gun.

- d. Lubricate the 25-mm gun track and bolt assembly.
  - (1) Apply a light coat of grease to slider path and track path using an acid brush.
  - (2) Apply a heavy coat of grease to locking lugs of bolt.
  - (3) Apply a light coat of grease to rails on track assembly using an acid brush.
  - (4) Apply a heavy coat of grease to roller chain assembly, slider, and master link.

**Note:** If temperature is below -25 $^{\circ}$  F (-32 $^{\circ}$  C), use LAW instead of grease.

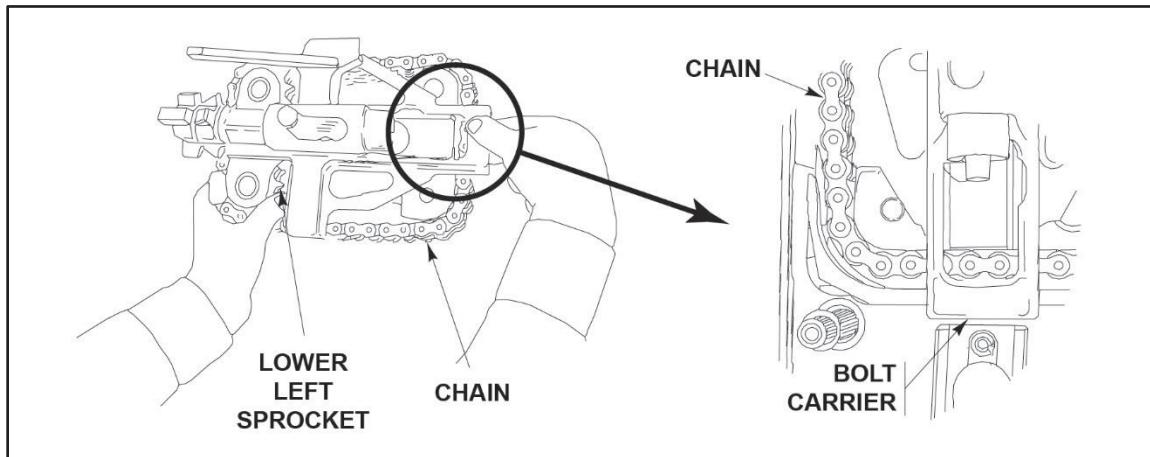
7. Assemble the 25-mm gun.
  - a. Assemble the 25-mm gun track and bolt assembly.
    - (1) Install breech bolt.
      - (a) Slide rear of breech bolt through front of carrier assembly.
      - (b) Install cam pin assembly into breech bolt so that top of cam pin assembly is flush with carrier assembly.
    - (2) Install firing pin assembly and firing pin sleeve.
      - (a) Slide rear of firing pin assembly through front of firing pin sleeve.
      - (b) Pass firing pin tang along groove in firing pin sleeve.
      - (c) Slide firing pin assembly and firing pin sleeve into rear of breech bolt.
      - (d) Place breech bolt face on a solid surface so that firing pin sleeve keeper slot is exposed.
    - (e) Push rear of firing pin sleeve down.
    - (f) Install firing pin sleeve keeper in slot so that it is flush with surface of breech bolt.
  - (3) Lock breech bolt.
    - (a) Turn bolt and carrier assembly over so that only rear of breech bolt rests on a solid surface.
    - (b) Push down with a hand on each side of the carrier track path until breech bolt locks.
  - (4) Align bolt and carrier assembly with track assembly.
    - (a) Stand track assembly on end with drive sprocket wheel at upper left.
    - (b) Center slider at rear of track assembly.
    - (c) Align track path of bolt and carrier assembly with track rails and slider of track assembly.
  - (5) Install the bolt and carrier assembly on track assembly.
    - (a) Lift master link.
    - (b) Position slider on top of the two lugs located in slider path of bolt and carrier assembly.
    - (c) Rotate roller chain assembly to right (clockwise) until bolt and carrier assembly and track assembly are engaged.
    - (d) Slide bolt and carrier assembly across the track rails to make sure it moves freely and does not bind.

**Note:** Binding may be caused by uneven alignment of the two spring pins located under the track rail. Ensure that bolt carrier does not contact spring pins. Replace defective parts if binding occurs.

- b. Install the track and bolt assembly (see figure 3-206).

**Note:** Track and bolt assembly is installed the same whether 25-mm gun receiver is on work area or installed in turret.

- (1) Install 25-mm gun receiver.
- (2) Install 25-mm gun barrel.
- (3) Install 25-mm gun feeder.



**Figure 3-206. Positioning the track and bolt assembly**

- (4) Place track and bolt assembly in receiver by lifting bolt and track assembly while holding lower left sprocket in position and lowering into receiver.
- (5) Seat track and bolt assembly by pressing the sear release, pushing down and wiggling track and bolt assembly until in position and then releasing sear release.
- (6) Pull up on track latch handle until track and bolt assembly is locked in receiver.
- (7) Turn the drive shaft handle until bolt moves to rear and locks in SEAR position.
- (8) Push in drive shaft handle.

- c. Install the 25-mm gun receiver.

- (1) Pull out anti-rotation latch handle as far as it will go.
- (2) Elevate manually 25-mm rotor to 200 mills.

**WARNING**

The 25-mm gun receiver is heavy and can cause back injuries if handled improperly.

**CAUTION**

The 25-mm gun receiver could be damaged if you drop it. Use two helpers when you carry and install the 25-mm gun receiver.

- (3) Check for presence of guide pin in breech assembly.
  - (4) Direct both assisting Soldiers to lift 25-mm gun receiver into the turret.
    - (a) Ensure first assistant enters turret holding barrel support end of the 25-mm gun receiver.
    - (b) Ensure second assistant supports rear end of the 25-mm gun receiver.
  - (5) Install the 25-mm gun receiver in trunnion with assisting Soldier's help.
    - (a) Align recoil mechanism housing with opening in trunnion.
    - (b) Push the 25-mm gun receiver all the way into trunnion.
    - (c) Rotate the 25-mm gun receiver to right until it stops.
  - (6) Lock gun in place by pushing anti-rotation latch handle forward.
  - (7) Depress manually, 25-mm gun rotor to 0 mills.
- d. Install the 25-mm gun barrel.
- (1) Prepare the 25-mm gun barrel support assembly.
    - (a) Clean old grease with a wiping rag.
    - (b) Put a heavy coat of GMD grease on gun barrel support assembly using an oval brush, until grooves are full of grease.
  - (2) Install the 25-mm gun barrel with assisting Soldier's help.

**WARNING**

You can be hurt if the gun barrel assembly slips from your hands. Clean your hands before you lift the gun barrel assembly. Have a helper assist with the lift.

- (a) Lift the 25-mm gun barrel to top front of vehicle.

**CAUTION**

The 25-mm gun barrel must be slid straight into the gun barrel support assembly to prevent damage.

- (b) Place gun barrel in gun barrel support assembly with ALINE arrow on top.
- (c) Slide the 25-mm gun barrel straight into gun barrel support assembly as far as it will go.

**WARNING**

**The 25-mm gun may explode if fired with the barrel not locked in place. Make sure that the barrel is locked in place and does not turn.**

- (3) Lock the 25-mm gun barrel.
    - (a) Turn 25-mm gun barrel in direction of lock arrow until you hear a loud click.
    - (b) Check that the 25-mm gun barrel is locked by turning it in the opposite direction of lock arrow.
  - (4) Raise the trim vane (A1 version).
    - a. Install the 25-mm gun feeder.
8. Perform a function check by dry cycling the gun electronically or manually.

**Note:** Performing a function check will end with the gun cover closed and the 25-mm gun guard installed.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured all weapon systems were cleared.	_____	_____
2. Updated round count information on DA Form 2408-4.	_____	_____
3. Disassembled the 25-mm gun.	_____	_____
4. Cleaned the 25-mm gun	_____	_____
5. Inspected the 25-mm gun.	_____	_____
6. Lubricated the 25-mm gun.	_____	_____
7. Assembled the 25-mm gun.	_____	_____
8. Performed a function check by dry cycling the gun electrically or manually.	_____	_____

**References**

**Required**

TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull

DA Form 2408-4 Weapon Record Data

TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret

TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry M2A2 (2350-01-248-7619) (EIC ALG) and Fighting Vehicle, Cavalry M3A2 (NSN 2350-01-248-7620) (EIC ALH) Hull

AR 385-10 The Army Safety Program

**Primary**

TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

071-001-0001

## Boresight the Weapon Systems on an M2A3/M3A3 or M2A2/M3A2 Operation Desert Storm-Situational Awareness Bradley Fighting Vehicle

**Conditions:** You are a gunner on an M2A3/M3A3 or M2A2/M3A2 Operation Desert Storm (known as ODS)-Situational Awareness (SA) Bradley fighting vehicle (known as BFV), and you have been directed to boresight the weapon system on the vehicle. The coaxial machine gun is installed. You have TM 9-2350-438-10-2, a boresight kit with 25-millimeter (mm) gun adapter, a 1200-meter 25-mm boresight panel, and an 800-meter coaxial boresight panel.

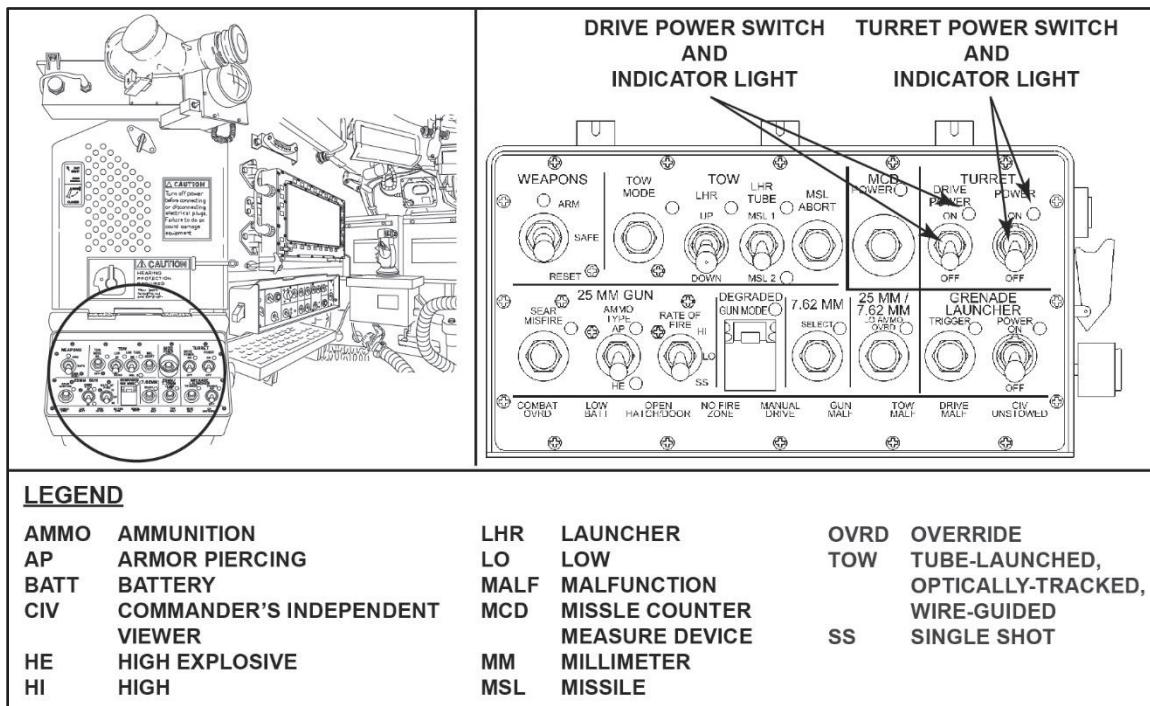
**Standards:** Prepare the M2A3/M3A3 or M2A2/M3A2 ODS SA BFV for boresighting and boresight the vehicle weapon systems in accordance with TM 9-2350-438-10-2.

**Note:** Boresighting aligns the improved Bradley acquisition subsystem (known as IBAS) and weapon systems to a common point of aim and simplifies the task of zeroing the turret weapon systems. Boresight the weapons systems when either the 25-mm receiver or the coaxial machine gun are replaced, before zeroing, or whenever it is believed that the boresight has been lost.

### Performance Steps

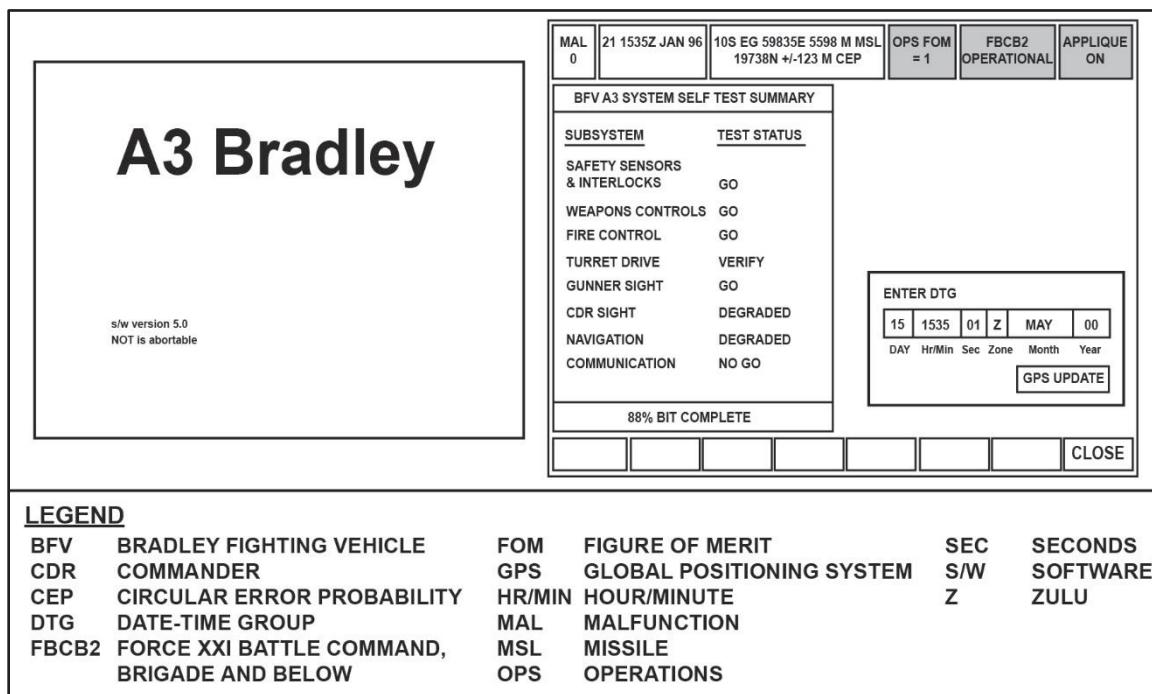
1. Prepare the M2A3/M3A3 or M2A2/M3A2 ODS SA BFV turret for boresighting.
  - a. Move the turret power switch on the system control box (known as SCB) to ON (see figure 3-207).

**Note:** The commander's tactical display (known as CTD) will display a series of five test patterns. Once the test patterns have completed, the A3 Bradley tactical software will initialize. Observe the A3 Bradley banner on the CTD. This banner is the indicator that the CTD is starting its self-test.



**Figure 3-207. Turret power and turret drive switches**

- b. Enter the appropriate vehicle password by using the commander's data entry tool (known as CDET) and the cursor control function on the commander's hand station (known as CHS) (see figure 3-208).

**Figure 3-208. Startup screen**

- c. Enter the correct date-time group by using the CDET and the cursor control function on the CHS.
- d. Select close on the CTD by using the soft-key on the CTD or the cursor control function from the CHS (see figure 3-209, page 3-590).

**Note:** A series of pop-up advisories will be displayed. These advisories must be closed in order for the system to complete the self-test.

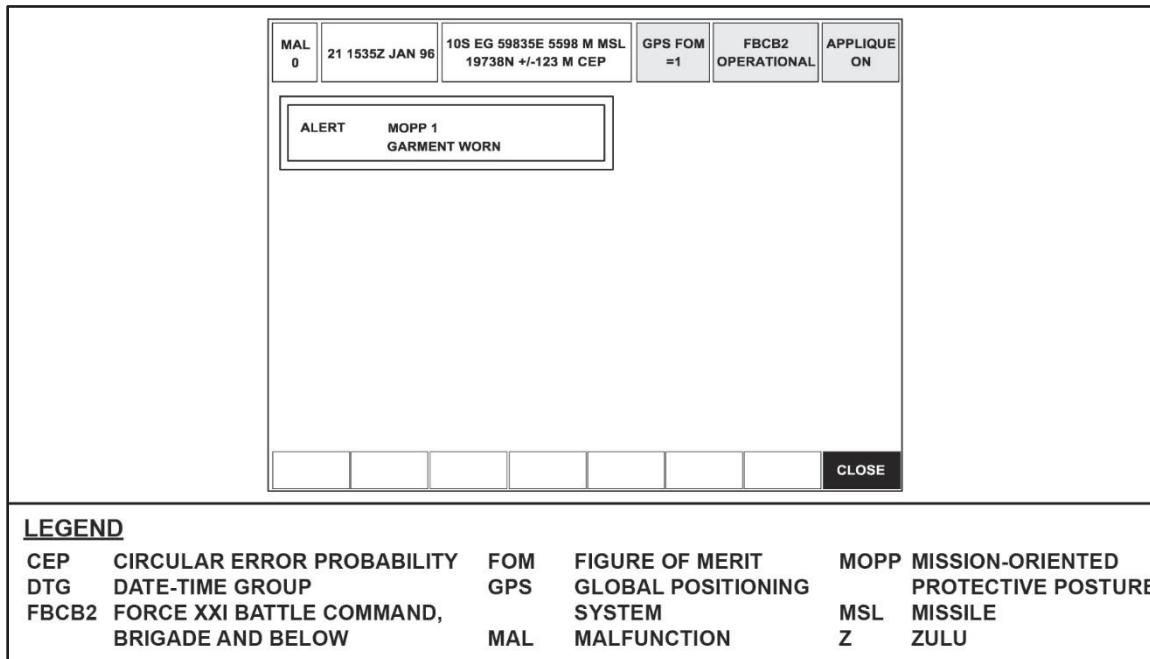
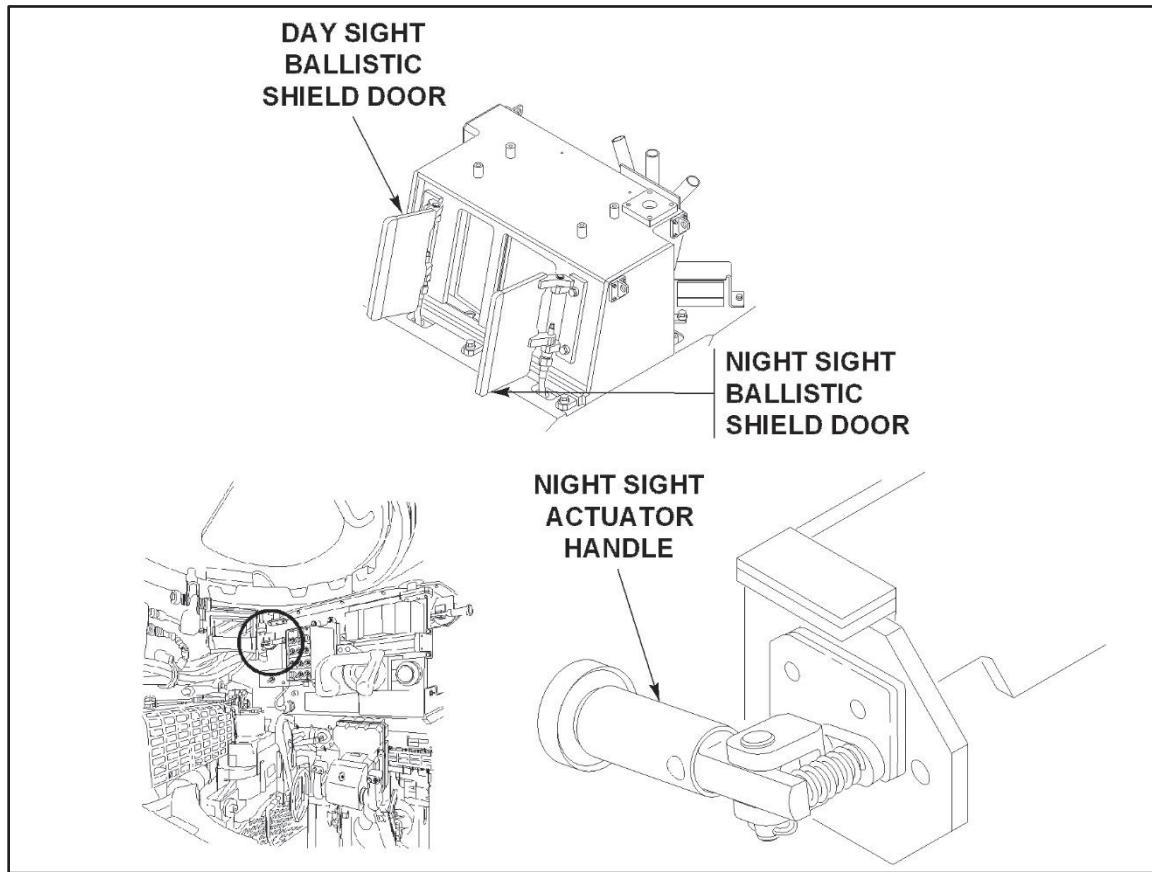


Figure 3-209. Pop-up message box

- e. Select MAIN on the CTD by using the soft-key on the CTD or the cursor control function on the CHS.
- f. Move the turret drive switch on the SCB to ON.
- g. Open the ballistic sight cover doors (see figure 3-210).



**Figure 3-210. Actuator handle**

- (1) Pull out on the day sight cover handle located on the upper right corner of the IBAS.
  - (2) Rotate the handle to the right until it locks into the open position.
  - (3) Pull out on the night sight cover handle located on the upper left corner of the IBAS.
  - (4) Rotate the handle to the left until it locks into the open position.
- h. Adjust the IBAS forward-looking infrared (FLIR) and DAY television (TV) sights so that the sight picture is clear.
- (1) Select FLIR mode on the gunner's hand station (known as GHS) (see figure 3-211, page 3-592).

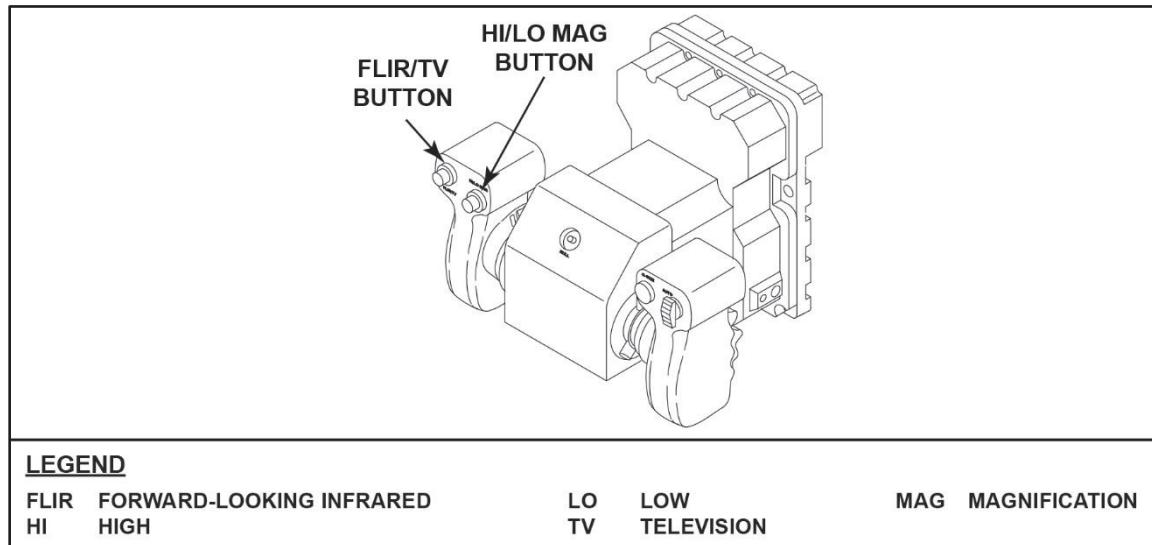


Figure 3-211. Gunner's hand station forward-looking infrared/TV button

- (2) Locate the MODE switch on the gunner's sight control panel (known as GSCP) (see figure 3-212).
- (3) Place the MODE switch in AUTO by pulling down and releasing.
- (4) Ensure the indicator light for AUTO is lit.
- (5) Adjust sight picture, as necessary, using the LEVEL, GAIN, FOCUS, BRIGHTNESS, CONTRAST switches on the GSCP (see figure 3-212).

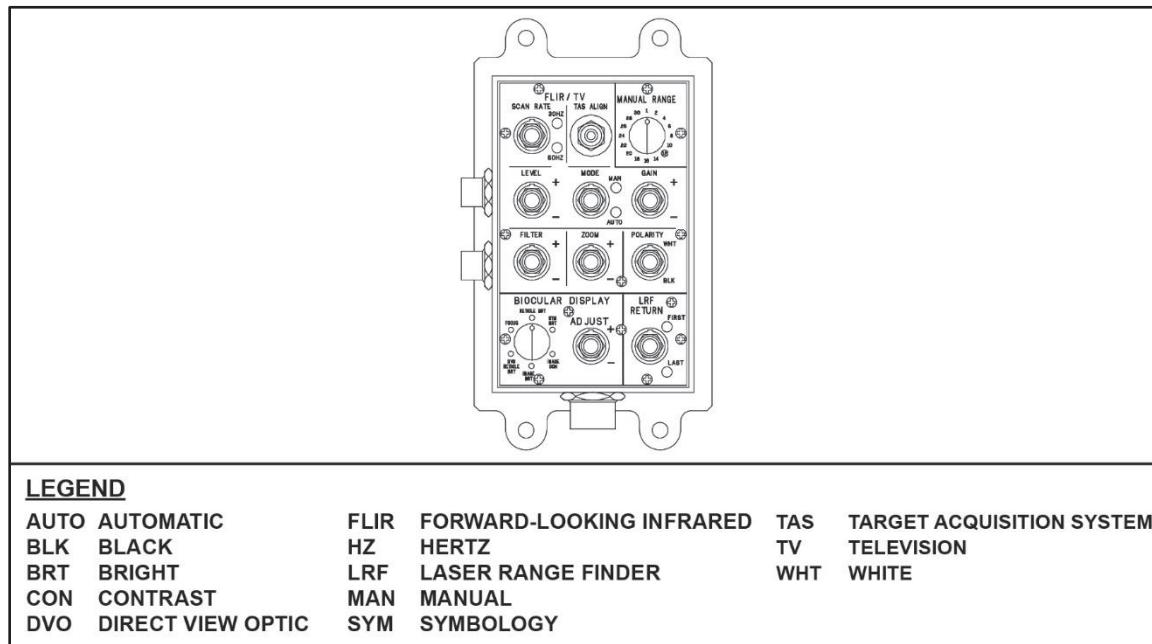


Figure 3-212. Gunner's sight control panel

- (a) Press up on the MODE switch to MANUAL.

- (b) Ensure the indicator light for MANUAL is lit and the AUTO light is not lit.
  - (c) Press up or pull down and release the LEVEL switch as needed to adjust sight picture.
    - \_1\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_2\_ Make coarse and fine adjustments to the sight picture.
  - (d) Press up or pull down and release the GAIN switch as needed to adjust sight picture.
    - \_1\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_2\_ Make coarse and fine adjustments to the sight picture.
  - (e) Rotate the DISPLAY knob to the FOCUS position.
  - (f) Adjust the focus level.
    - \_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.
    - \_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_3\_ Make coarse and fine adjustments to the sight picture.
  - (g) Rotate the DISPLAY knob to the BRIGHTNESS position.
  - (h) Adjust the brightness level.
    - \_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.
    - \_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_3\_ Make coarse and fine adjustments to the sight picture.
  - (i) Rotate the DISPLAY knob to the CONTRAST position.
  - (j) Adjust the contrast level.
    - \_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.
    - \_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_3\_ Make coarse and fine adjustments to the sight picture.
- i. Unstow the commander's independent viewer (known as CIV) (see figure 3-213, page 3-594).

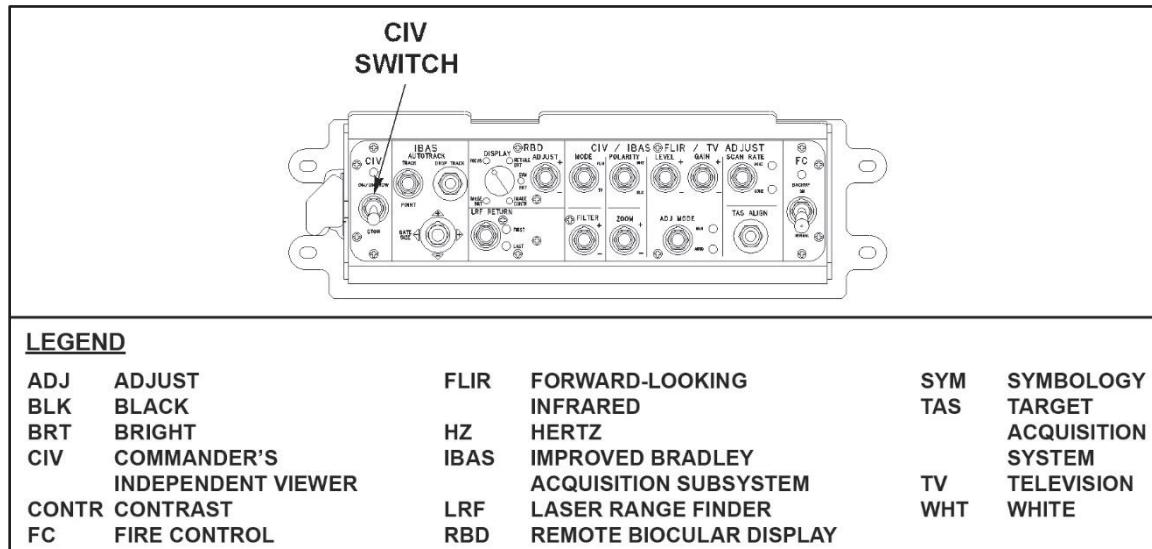


Figure 3-213. CIV STOW/UNSTOW switch

- (1) Move the CIV UNSTOW/STOW switch on the commander's sight control panel (known as CSCP) to the UNSTOW position.
- (2) Squeeze and hold the palm switch on the CHS (see figure 3-214).

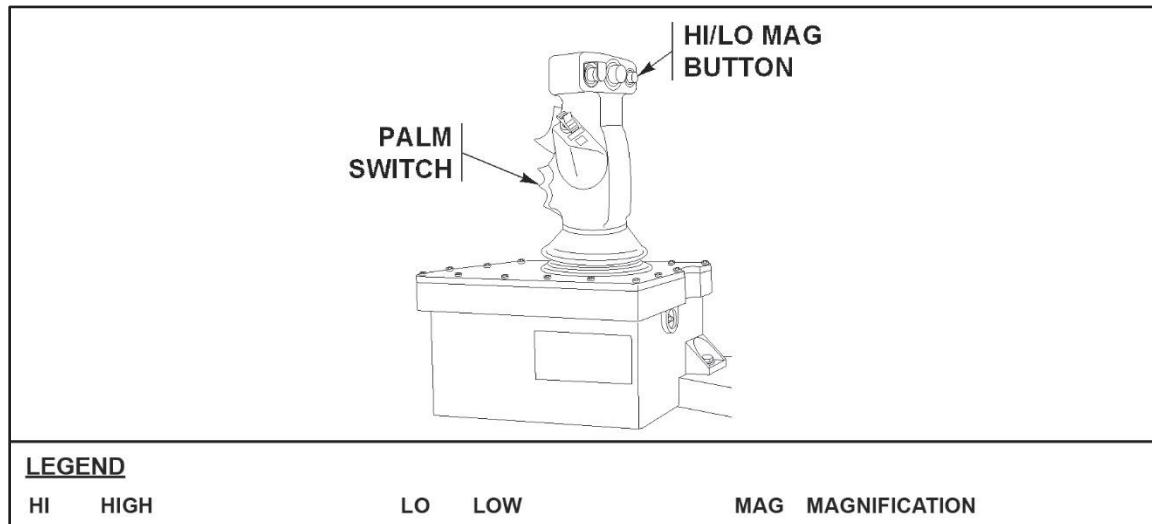
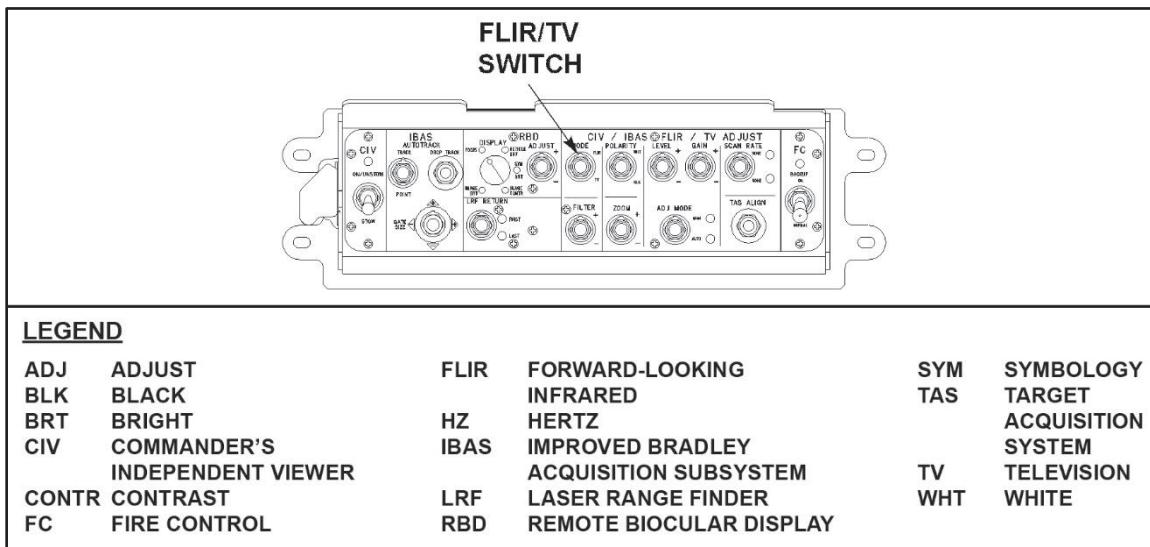


Figure 3-214. Commander's hand station palm switch

- (3) Observe that the UNSTOW indicator light on the CSCP is lit.
- (4) Release the palm switches.
- j. Adjust the CIV FLIR and DAY TV sights so that the sight picture is clear.
- (1) Select FLIR mode on the CSCP by pushing down and releasing the switch (see figure 3-215).



**Figure 3-215. Commander's sight control panel FLIR/TV MODE switch**

- (2) Push down and release the FLIR ADJ MODE switch on the CSCP to AUTO. Ensure the AUTO indicator light is lit.
- (3) Pull down and release the IBAS-CIV switch located on the lower left side of the remote biocular display.
- (4) Adjust sight picture, as necessary, using the LEVEL, GAIN, FOCUS, BRIGHTNESS, CONTRAST switches on the CSCP.
  - (a) Press up on the MODE switch to MANUAL.
    - \_1\_ Ensure the indicator light for MANUAL is lit.
    - \_2\_ Ensure the AUTO light is not lit.
  - (b) Press up or pull down and release the LEVEL switch as needed to adjust sight picture.
    - \_1\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_2\_ Make coarse and fine adjustments to the sight picture.
  - (c) Press up or pull down and release the GAIN switch as needed to adjust sight picture.
    - \_1\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.
    - \_2\_ Make coarse and fine adjustments to the sight picture.
  - (d) Rotate the DISPLAY knob to the FOCUS position.
  - (e) Adjust the focus level.
    - \_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.

\_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.

\_3\_ Make coarse and fine adjustments to the sight picture.

(f) Rotate the DISPLAY knob to the BRIGHTNESS position.

(g) Adjust the brightness level.

\_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.

\_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.

\_3\_ Make coarse and fine adjustments to the sight picture.

(h) Rotate the DISPLAY knob to the CONTRAST position.

(i) Adjust the contrast level.

\_1\_ Press up or down and release the display toggle switch as needed to adjust sight picture.

\_2\_ Observe through the sight that the adjust field wedge symbol with arrow indicator is visible.

\_3\_ Make coarse and fine adjustments to the sight picture.

k. Raise the tube launched, optically tracked, wire guided (TOW) launcher (see figure 3-216).

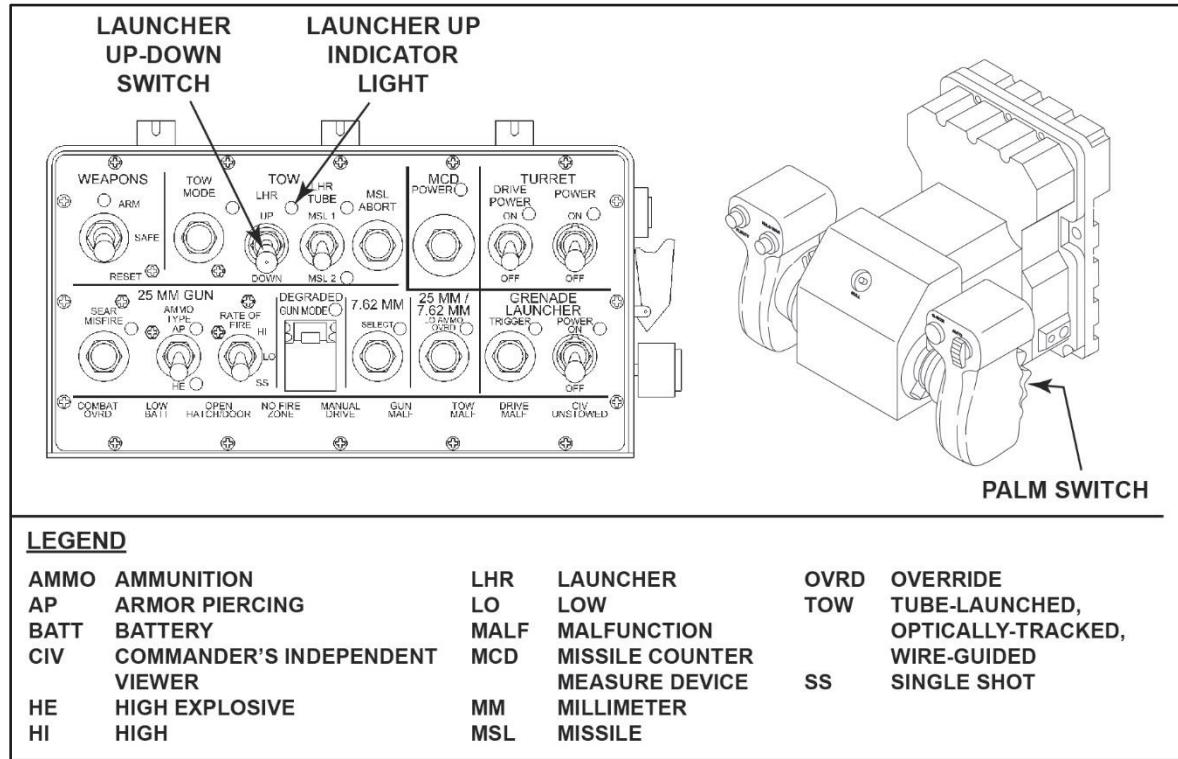
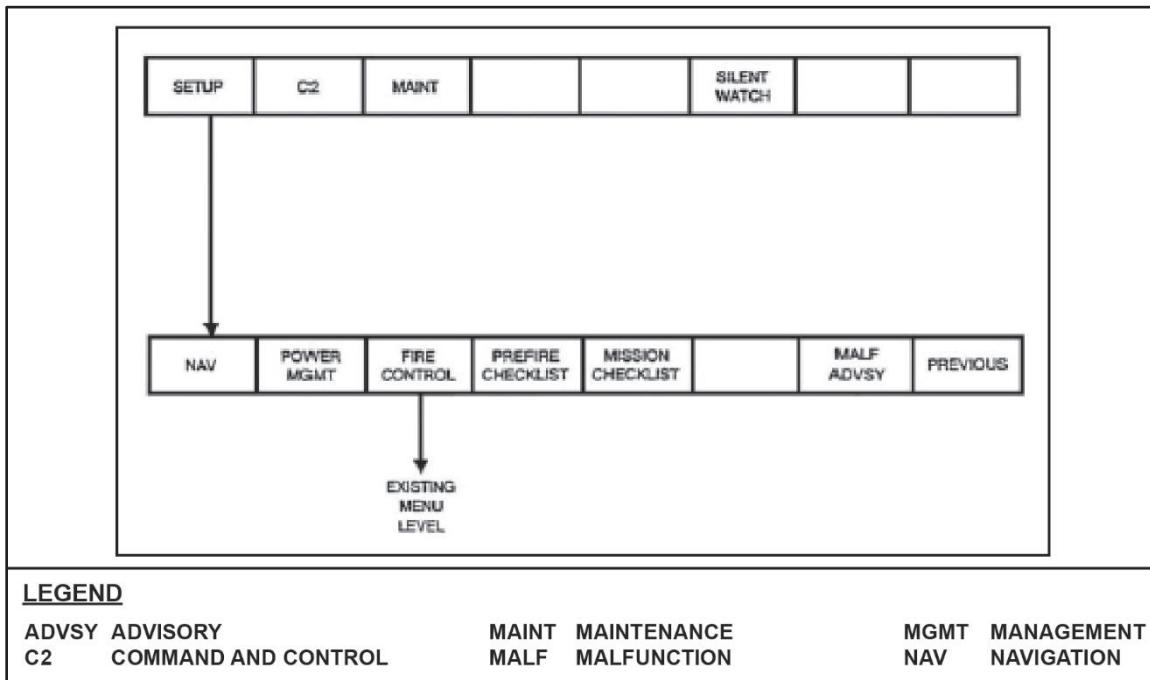


Figure 3-216. Launcher UP/DN switch

- (1) Move the TOW launcher switch on the SCB to the UP position.
  - (2) Squeeze and hold the palm switch on either the GHS or the CHS.
  - (3) Observe that the TOW UP indicator light on the SCB is lit.
  - (4) Release the palm switches.
- I. Manipulate through the screens by pressing the appropriate softkeys to arrive at the manual boresight screen.
    - (1) Select SETUP using the CTD softkey (see figure 3-217).



**Figure 3-217. Commander's tactical display menu's structure**

- (2) Select FIRE CONTROL using the CTD softkey.
- (3) Select BORESIGHT using the CTD softkey.
- (4) Select MANUAL BORESIGHT using the CTD softkey.
- (5) Observe the PRE-BORESIGHT/ZERO TASK screen on the CTD (see figure 3-218, page 3-598).

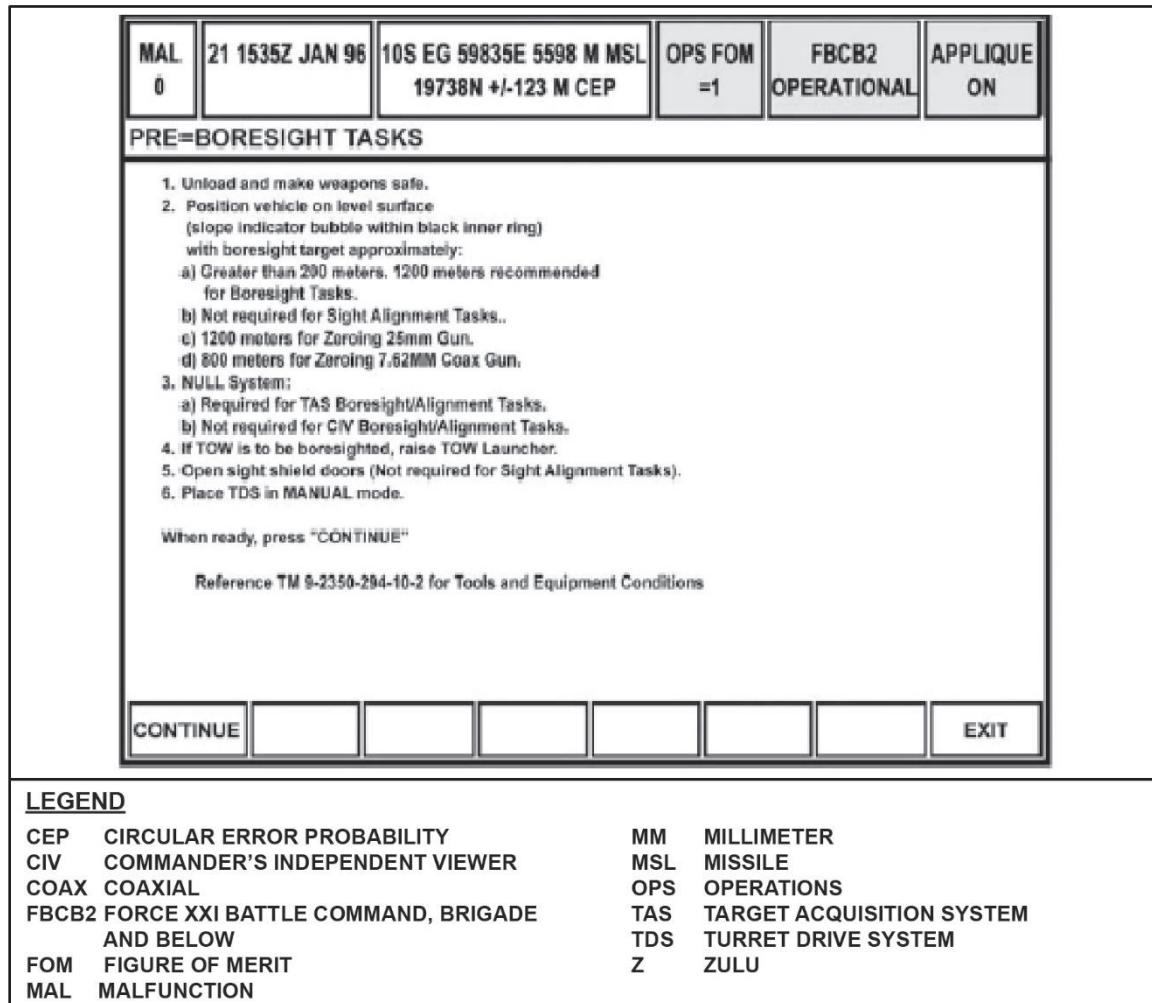


Figure 3-218. PRE-BORESIGHT screen

- m. Complete the pre-boresight tasks.
- (1) Unload and make weapons safe.
  - (2) Unstow CIV.
  - (3) Position vehicle on level surface (slope indicator bubble at the drivers station is within the black inner ring).
    - (a) Greater than 200 meters (1,200 meters is recommended) for boresighting.
    - (b) 800-1,200 meters for zeroing 25-mm gun.
    - (c) 800 meters for zeroing the 7.62-mm coaxial machine gun.
  - (4) Null system (see figure 3-219).

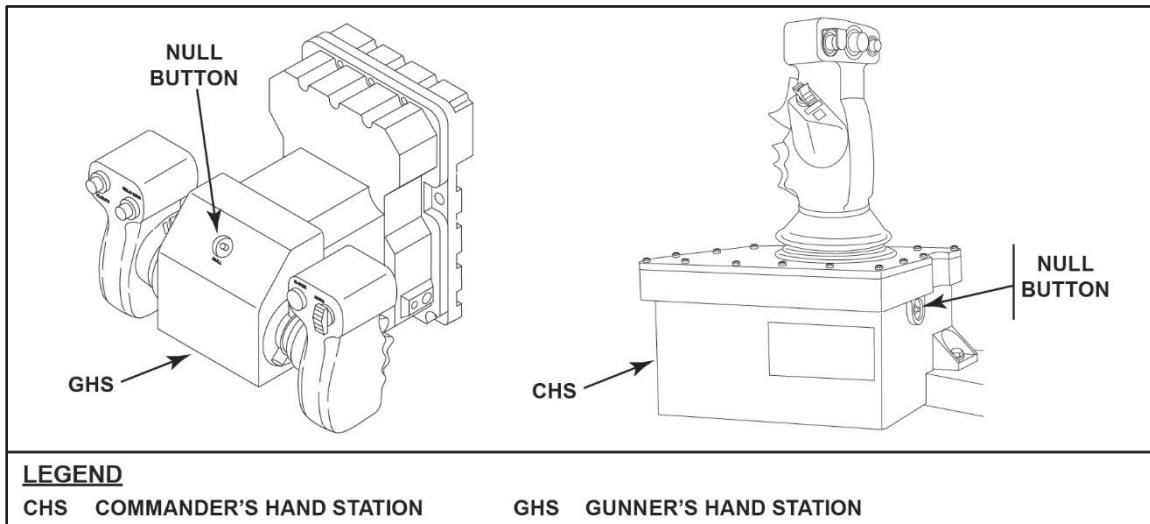


Figure 3-219. GHS and CHS NULL button

- Press the NULL button on the GHS or the CHS.
- Press target acquisition system (known as TAS) ALIGN button on the GSCP (if required by an IBAS message) (see figure 3-220).

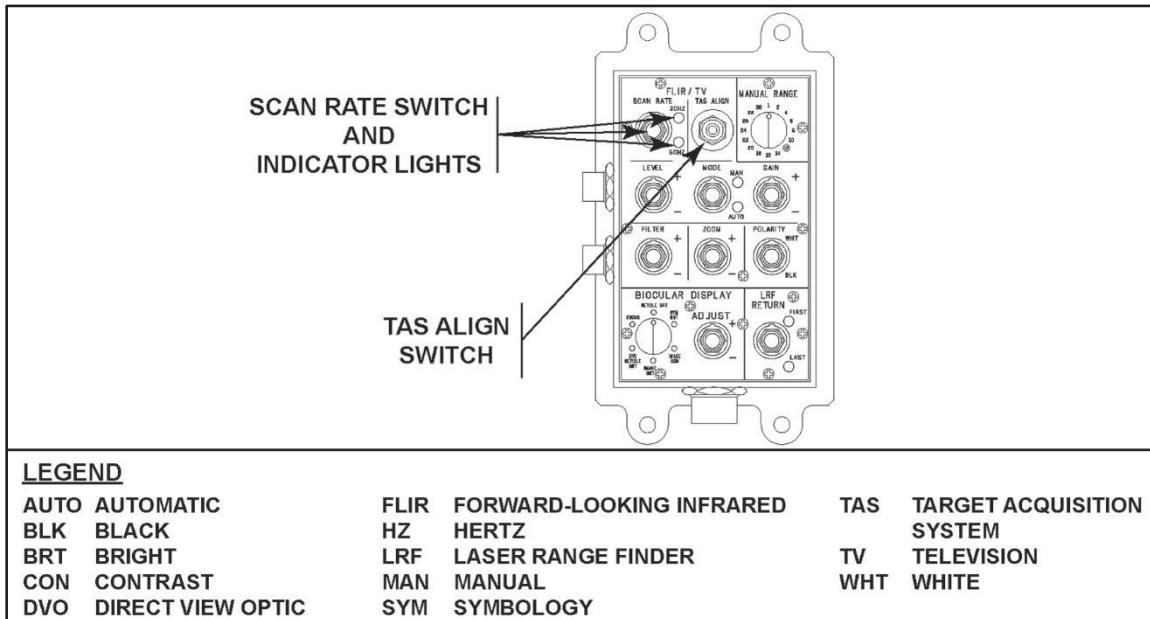
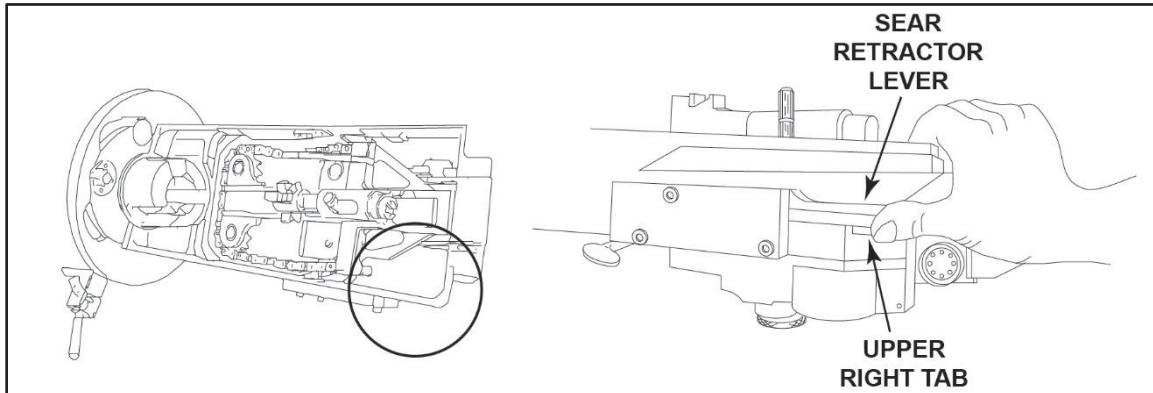


Figure 3-220. TAS ALIGN button

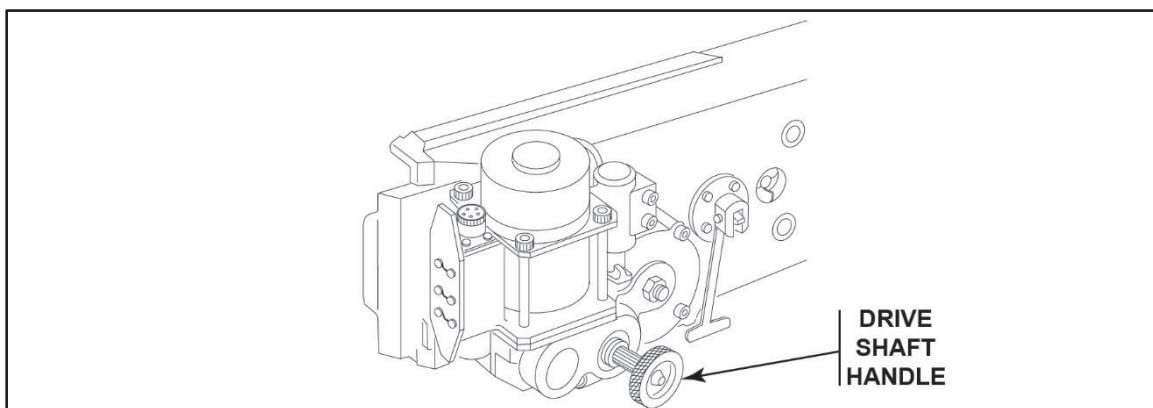
- Close ballistic sight shield doors.
- Wait for TAS alignment to be completed.
- Open ballistic sight shield doors.
- Perform functional checks on the 25-mm gun system.

- (5) If TOW is to be boresighted, raise TOW launcher.
- (6) Perform functional checks on the 25-mm gun system.
  - (a) Ensure the manual sear retractor is disengaged (see figure 3-221).



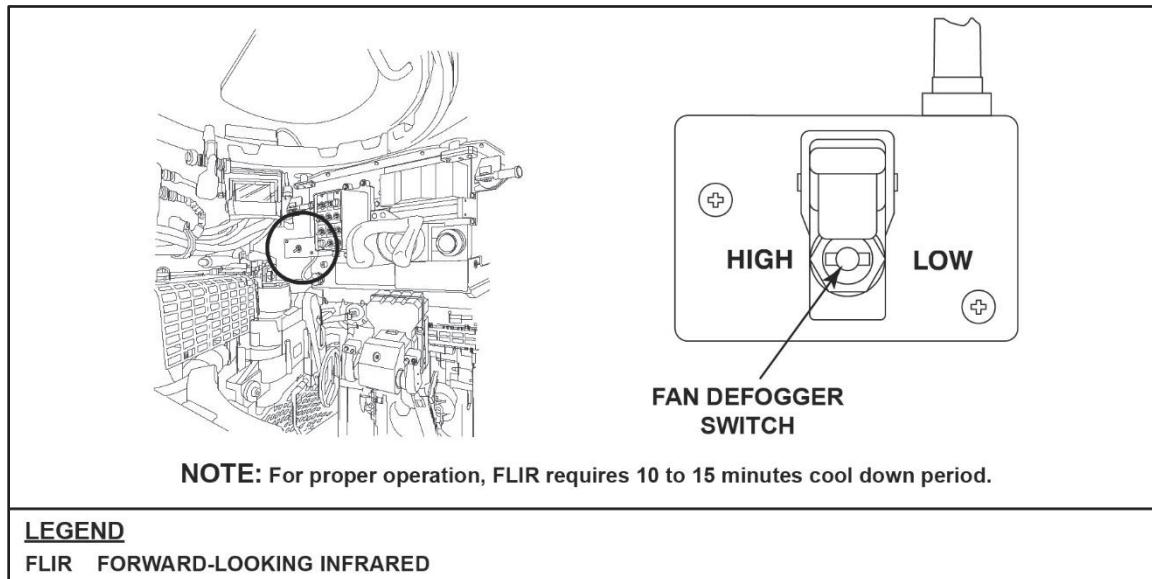
**Figure 3-221. Sear retractor lever**

- (b) Ensure the vertical drive shaft is up and locked into position (see figure 3-222).



**Figure 3-222. Vertical drive shaft**

- (c) Ensure the feed and eject chutes are connected.
- (d) In the power mode, dry cycle the 25-mm gun twice in high explosive and twice in armor piercing.
- (7) During normal operating conditions, ensure the IBAS defogger fan switch is in the OFF position (see figure 3-223).



**Figure 3-223. FAN DEFOGGER switch**

- (8) Position the direct view optic (known as DVO) reticle on a distant aiming point and compare the DVO reticle to the FLIR reticle.

**Note:** At 1,200 meters, the FLIR reticle should be about 0.2 mils to the left of the DVO reticle.

- (a) Squeeze and hold the palm switches on the GHS.
  - (b) Rotate the GHS to the left or right in order to move the gun and the sights in that direction.
  - (c) Rotate the GHS forward to depress the gun and sight picture or rotate the GHS backward to elevate the gun and sight picture.
  - (d) Move the sight reticle (the center dot) on the center of the boresight panel.
  - (e) Release palm switches.
  - (f) Select CONTINUE by using the softkey on the CTD.
2. Boresight the TAS/BACKUP sight to the 25-mm gun.
    - a. Select BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN (see figure 3-224, page 3-602).

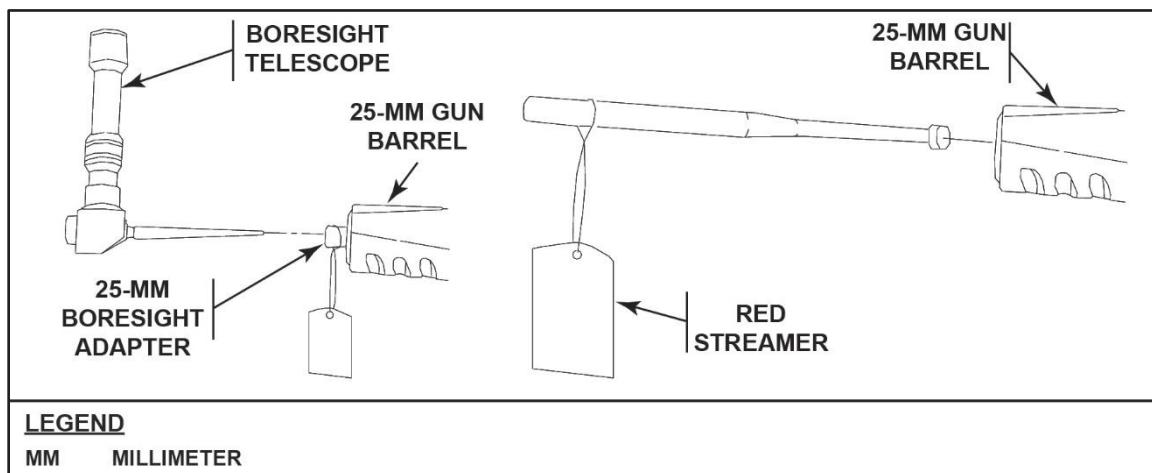
MAL 0	20 1138: 19Z NOV 00	31NAA 66021E 0 M 00000N 999 M CEP	GPS FOM NOT = 1	FBCB2 DOWN	APPLIQUE OFF
<b>BORESIGHT THS/BACKUP SIGHT TO 25MM GUN</b>			<b>SETUP</b>		
<p><b>PERSONNEL REQUIRED:</b>          Gunner          Helper (H)</p> <p><b>EQUIPMENT CONDITIONS: X</b></p> <p>System nulled</p> <p>a) Press "NULL" button on GHS or CHS</p> <p>b) Press "TAS ALIGN" on GSCP (If required by IBAS message)</p> <p>Sight shield doors opened</p> <p>Boresight telescope and adapter with streamer installed on 25mm gun</p> <p>TDS in MANUAL mode (gun elevation and traverse in MANUAL,          TOW elevation in POWER)</p> <p>BORESIGHT mode displayed on TRS biocular display</p> <p><b>TOOLS:</b></p> <p>7.62mm boresight kit</p> <p>25mm boresight adapter</p> <p>Open end wrench, 7/16-inch</p> <p>Socket wrench socket, 7/16-inch</p> <p>Socket wrench ratchet handle, 1/2-inch sq dr</p> <p>Flat-tip screwdriver, 1/8-inch</p>					
<b>CONTINUE</b>					<b>PREVIOUS</b>

**LEGEND**

CEP	CIRCULAR ERROR PROBABILITY	MAL	MALFUNCTION
CHS	COMMANDER'S HAND STATION	MM	MILLIMETER
CIV	COMMANDER'S INDEPENDENT VIEWER	MSL	MISSILE
COAX	COAXIAL	OPS	OPERATIONS
FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	SQ DR	SQUARE DRIVE
FOM	FIGURE OF MERIT	TAS	TARGET ACQUISITION SYSTEM
GHS	GUNNER'S HAND STATION	TDS	TURRET DRIVE SYSTEM
GPS	GLOBAL POSITIONING SYSTEM	TOW	TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED
IBAS	IMPROVED BRADLEY ACQUISITION SUBSYSTEM	TRS	THERMAL REFERENCE SOURCE
		Z	ZULU

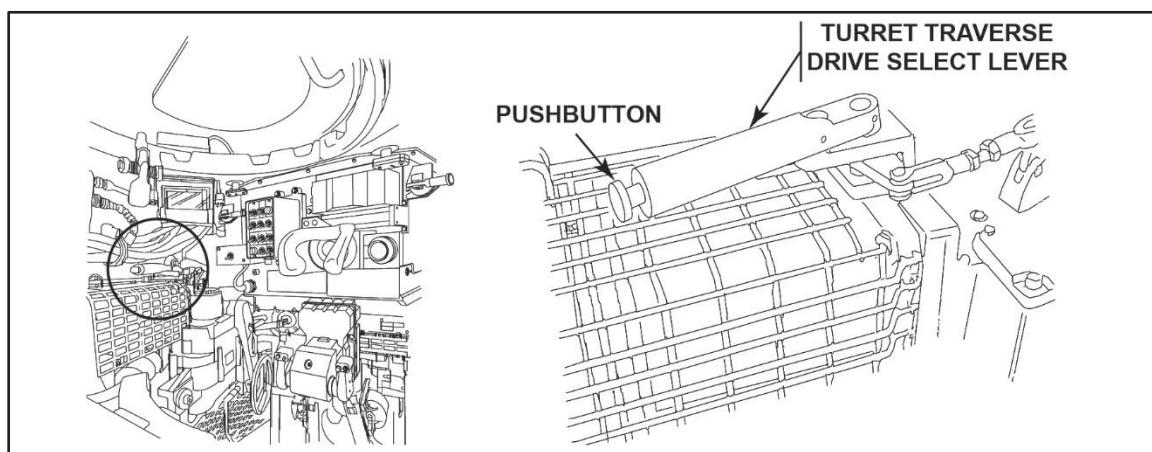
**Figure 3-224. BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN setup screen**

- (1) Use the cursor control on the CHS.
- (2) Observe the BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN setup screen.
- b. Ensure the equipment conditions are completed.
  - (1) Ensure the system has been nulled.
  - (2) Ensure sight shield doors are open.
  - (3) Install boresight telescope and adapter with streamer into the 25-mm gun barrel (see figure 3-225).



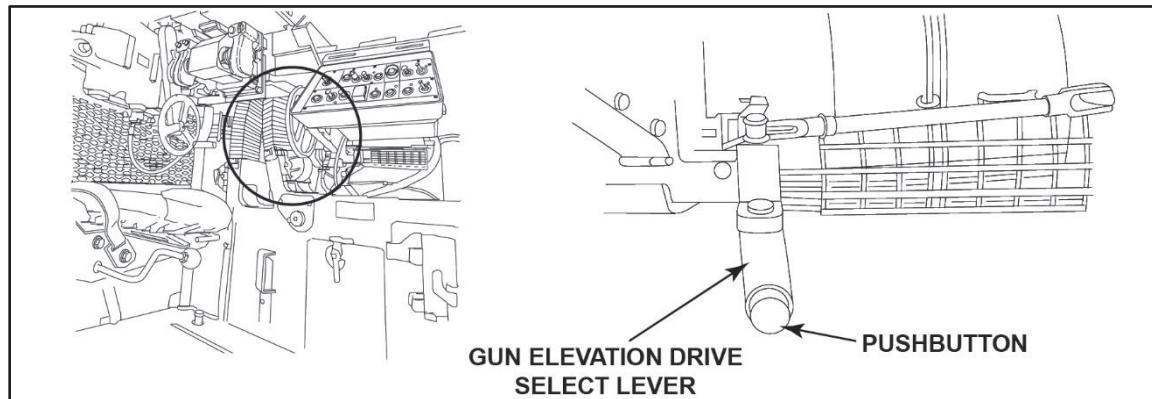
**Figure 3-225. 25-mm boresight adapter and boresight telescope**

- (4) Place the turret drive system (known as TDS) in the manual mode.
  - (a) Press and hold the push-button on the traverse drive handle (see figure 3-226).

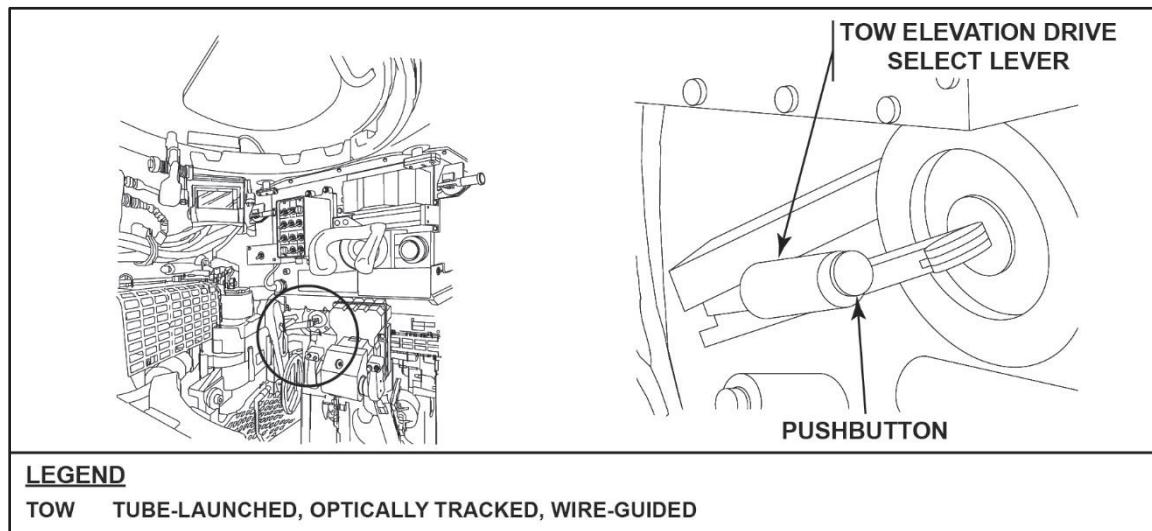


**Figure 3-226. Turret traverse drive select lever**

- (b) Pull the handle to the right until it stops and then release the push-button and handle.
- (c) Press and hold the push-button on the gun elevation drive handle (see figure 3-227, page 3-604).

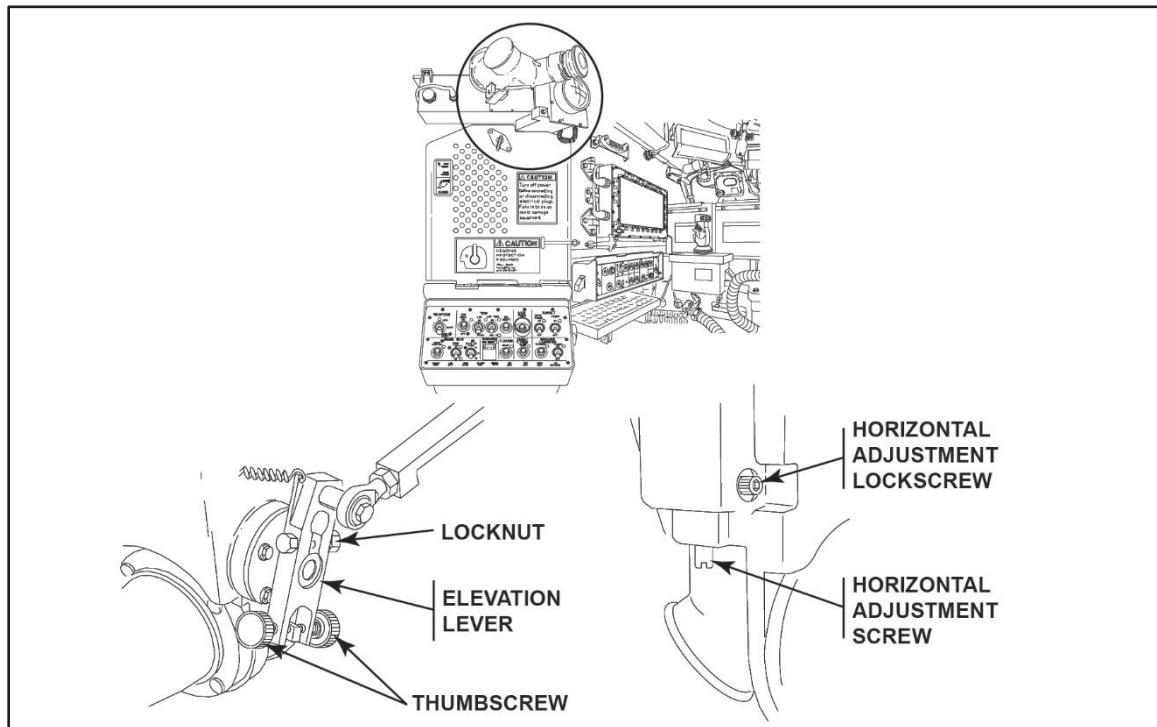
**Figure 3-227. GUN ELEVATION DRIVE SELECT lever**

- (d) Pull the handle to the left until it stops and then release the push-button and handle.
- (e) Ensure the TOW elevation drive is in power (see figure 3-228).

**Figure 3-228. TOW ELEVATION DRIVE SELECT lever**

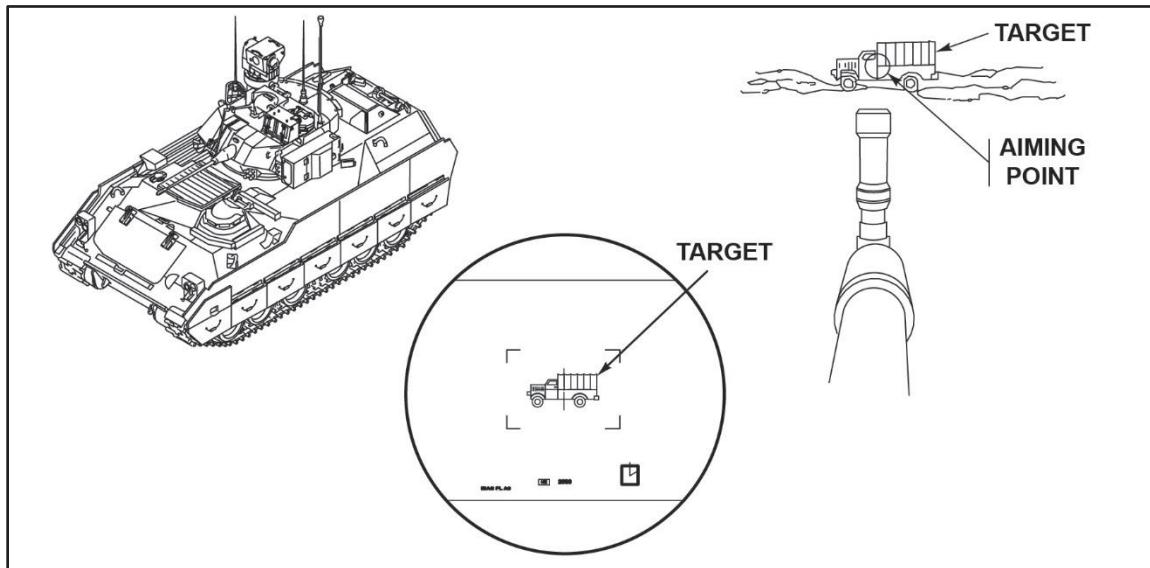
- (5) Ensure the BORESIGHT symbology is visible in the IBAS.
  - c. Select CONTINUE by using the softkey on the CTD.
  - d. Complete the BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN procedure tasks.
    - (1) Manually traverse the turret and elevate or depress the gun until the boresight telescope reticle is centered on the boresight panel.
    - (2) Perform "Check Boresight Accuracy" in accordance with the technical manual.
    - (3) Check the backup sight reticle crosshairs are aligned with the panel. If needed, align reticle crosshairs on target.

- (a) To move reticle in elevation (known as EL), loosen and tighten the thumb screws (see figure 3-229).



**Figure 3-229. Auxiliary sight adjustment screens**

- (b) To move the reticle in azimuth (known as AZ), loosen the horizontal adjustment locking screw using the socket head key wrench located in the 7.62-mm boresight kit and turn the horizontal adjustment screw clockwise or counterclockwise.
- (c) Tighten locking screw.
- (4) Use DVO (preferred) or DAY TV.
- (5) Select high magnification (known as HI MAG) - narrow field of view (known as NFOV) using HI/LO MAG switch on the GHS.
- (6) Center TAS reticle on the boresight panel using the GHS (see figure 3-230, page 3-606).



**Figure 3-230. Target acquisition system reticle**

- (7) Range the target using the laser range finder (LRF) or enter the range manually by using the range knob on the GSCP.
- (8) Ensure the reticle is in the center of the panel; if not, repeat step (6).
- (9) Press CALCULATE using the softkey function on the CTD (see figure 3-231).

MAL 0	21 1535Z JAN 96	10S EG 59835E 5598 M MSL 19738N +/-123 M CEP	GPS FOM = 1	FBCB2 OPERATIONAL	APPLIQUE ON
<b>BORESIGHT TAS/BACKUP SIGHT TO 25mm GUN</b>			<b>PROCEDURE</b>		
<ol style="list-style-type: none"> <li>1. Manually traverse turret and elevate/depress gun until boresight telescope reticle is centered on boresight target.</li> <li>2. Check that backup sight reticle crosshairs are aligned with target. If needed, align reticle crosshairs on target as follows:           <ol style="list-style-type: none"> <li>a. To move reticle in elevation, loosen locknut on elevation lever and adjust thumbscrews. Use wrench and socket.</li> <li>b. To move reticle in azimuth, loosen horizontal adjustment lock screw and turn horizontal adjustment screw. Use screwdriver.</li> <li>c. Tighten lock screw.</li> </ol> </li> <li>3. Use DVO (preferred), TV, or FLIR (using FLIR/TV switch on GHS to select TV or FLIR) for best viewing.</li> <li>4. Select HI MAG (NFOV) using HI/LO MAG switch on GHS.</li> <li>5. Center TAS reticle on boresight target using GHS.</li> <li>6. Range target using LRF or enter range manually on GSCP.</li> <li>7. Repeat step 5.</li> <li>8. Press "CALCULATE".</li> <li>9. To use new values, press "SAVE", or to repeat test, go to step 1.</li> <li>10. To perform "BORESIGHT CIV TO 25MM GUN", press "CONTINUE".</li> </ol>			New Values	Current Values	
			ELEV (MILS)	<input type="text"/>	<input type="text"/>
			AZ (MILS)	<input type="text"/>	<input type="text"/>
			RANGE (M)	<input type="text"/>	
<b>SHUTDOWN</b> 11. Remove boresight telescope, adapter, and streamer.					
<b>CONTINUE</b>	<b>CALCULATE</b>	<b>SAVE</b>		<b>PREVIOUS</b>	<b>EXIT</b>

**Figure 3-231. BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN procedure screen**

- (10) Press SAVE to use the new values or repeat the test from step (1).
  - (11) Press CONTINUE to perform BORESIGHT CIV TO 25MM GUN by using the softkey function on the CTD.

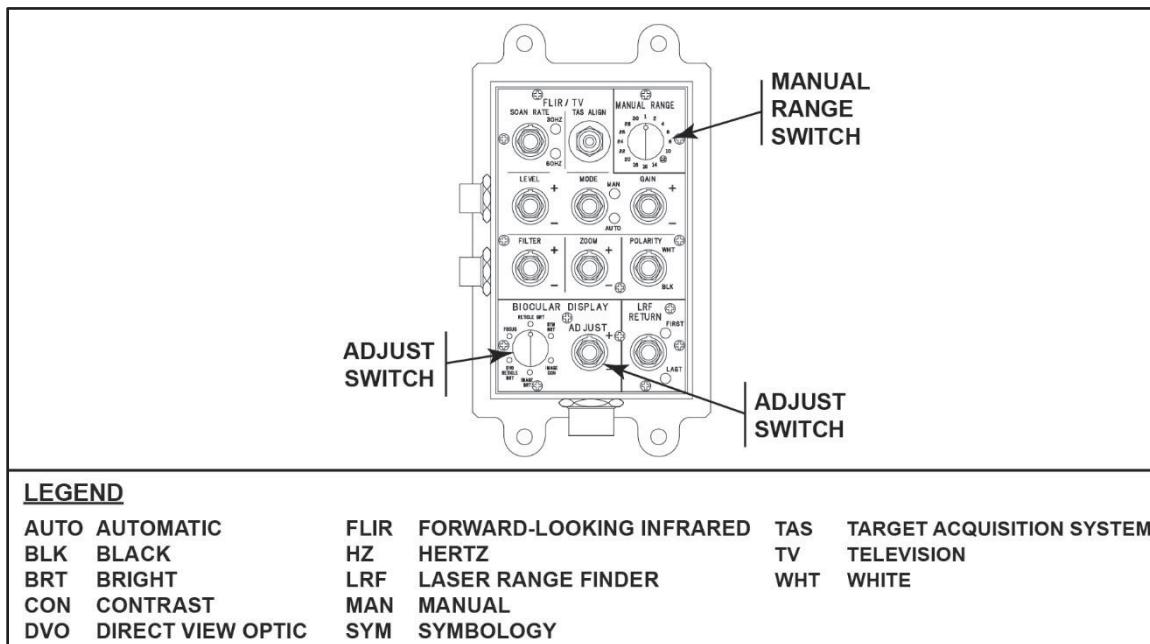
3. Boresight the CIV to the 25-mm gun.

  - a. Observe the BORESIGHT CIV TO 25MM GUN setup screen.
  - b. Ensure the equipment conditions are completed.

- (1) Ensure the CIV is unstowed.
  - (2) Install boresight telescope and adapter with streamer into the 25-mm gun barrel.
  - (3) Ensure the TDS is in the manual mode.
  - (4) Ensure the BORESIGHT symbology is visible in the IBAS.
  - (5) Select CONTINUE by using the softkey on the CTD.
- c. Complete the BORESIGHT CIV TO 25MM GUN procedure tasks.

**Note:** CIV will move automatically during CIV boresight.

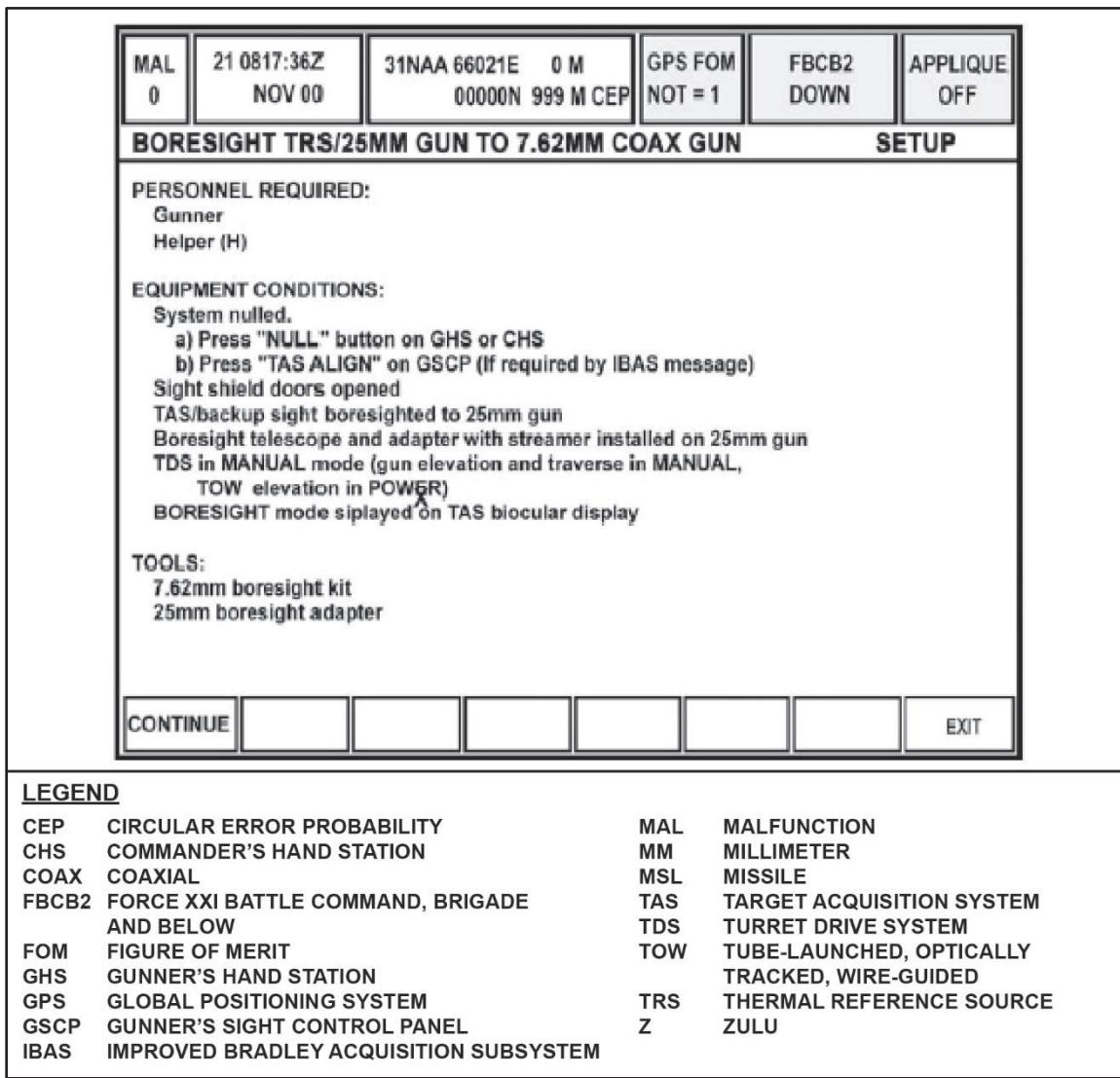
- (1) Select HI MAG using the HI/LO MAG switch on the GHS.
- (2) Manually traverse the turret and elevate or depress the gun until the boresight telescope reticle is centered on the boresight panel.
- (3) Center the CIV TV reticle onto the boresight panel using the GHS.
- (4) Enter the range manually using the GSCP (see figure 3-232).



**Figure 3-232. GSCP MANUAL RANGE switch**

- (5) Ensure reticle is in the center of the boresight panel; if not, repeat step (3).
- (6) Press CALCULATE using the softkey function on the CTD.
- (7) Press SAVE to use the new values or repeat the test from step (1).
- (8) Press CONTINUE to perform BORESIGHT TAS/25MM GUN TO 7.62MM COAXIAL MACHINE GUN by using the softkey function on the CTD.

4. Boresight the TAS/25-mm gun to the 7.62-mm coaxial machine gun.
- Observe the BORESIGHT TAS/25MM GUN TO 7.62MM COAXIAL MACHINE GUN setup screen (see figure 3-233).



**Figure 3-233. BORESIGHT TAS/25MM GUN TO 7.62MM COAX GUN setup screen**

- Ensure the equipment conditions are completed.
  - Ensure the system has been nulled.
  - Ensure sight shield doors are open.
  - Ensure TAS/BACKUP sight has been boresighted to the 25-mm gun.
  - Install boresight telescope and adapter with streamer into the 25-mm gun barrel.
  - Place the TDS in manual mode.

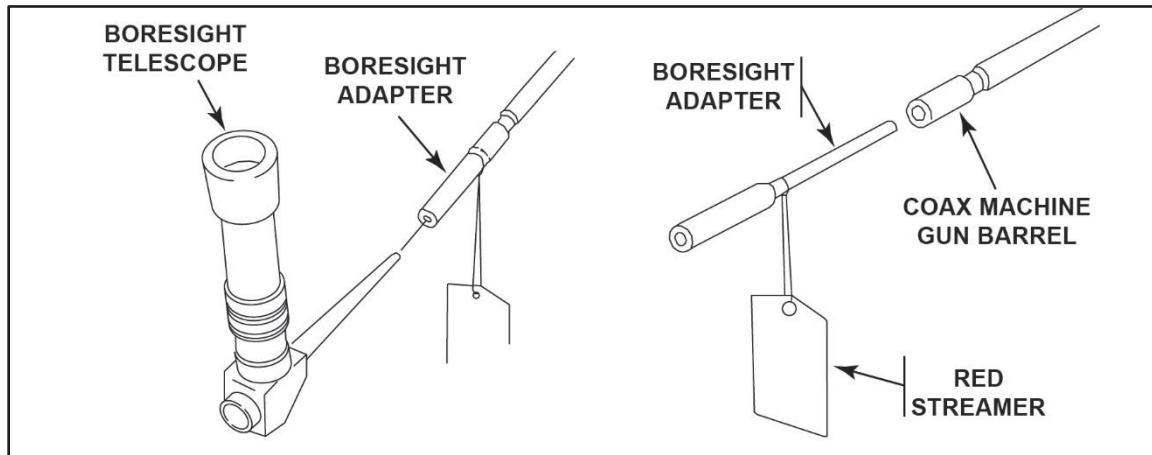
- (6) Ensure the BORESIGHT symbology is visible in the IBAS.
  - (7) Select CONTINUE by using the softkey on the CTD.
- c. Complete BORESIGHT TAS/25MM GUN TO 7.62MM COAXIAL MACHINE GUN procedure tasks (see figure 3-234).

MAL 0	21 0756:28Z NOV 00	31NAA 66021E 0 M 0000N 999 M CEP	GPS FOM NOT = 1	FBCB2 DOWN	APPLIQUE OFF						
<b>BORESIGHT TAS/25MM GUN TO 7.62MM COAX GUN</b>											
<b>PROCEDURE</b>											
<p>1. Select HI MAG (NFOV) using HI/LO MAG switch on GHS.      2. Manually traverse turret and elevate/depress gun if boresight telescope reticle on 25mm gun is not already centered on boresight target.      3. Relocate boresight telescope and adapter with streamer to 7.62mm coax gun.</p> <p><b>NOTE</b>      When moving between stations, make sure controls and handwheels are not moved.</p> <p>4. Open coax gun access doors.      5. Adjust EL and AZ knobs on coax gun mount to align boresight telescope reticle on boresight target.      6. Close coax gun access doors.      7. Use DVO (preferred), or TV.      8. Center TAS reticle on boresight target using GHS.      9. Range target using LRF or enter range manually on GSCP.      10. Repeat step 8.      11. Press "CALCULATE".      12. To use new values press "SAVE" or to repeat test, go to step 1.      13. Remove boresight telescope from 7.62 and move to TOW Launcher.      14. To perform "BORESIGHT TAS TO TOW LAUNCHER", PRESS "CONTINUE".</p>											
<span style="border: 1px solid black; padding: 2px;">New Values</span> <span style="border: 1px solid black; padding: 2px;">Current Values</span> <table style="margin-top: 5px; border-collapse: collapse;"> <tr> <td style="width: 15%;">ELEV (MILS)</td> <td style="width: 15%; text-align: center; border: 1px solid black; padding: 2px;">177.78</td> </tr> <tr> <td style="width: 15%;">AZ (MILS)</td> <td style="width: 15%; text-align: center; border: 1px solid black; padding: 2px;">88.89</td> </tr> <tr> <td style="width: 15%;">RANGE (M)</td> <td style="width: 15%; text-align: center; border: 1px solid black; padding: 2px;">10005</td> </tr> </table>						ELEV (MILS)	177.78	AZ (MILS)	88.89	RANGE (M)	10005
ELEV (MILS)	177.78										
AZ (MILS)	88.89										
RANGE (M)	10005										
<input type="button" value="CONTINUE"/> <input type="button" value=""/> <input type="button" value="CALCULATE"/> <input type="button" value=""/> <input type="button" value=""/> <input type="button" value=""/> <input type="button" value=""/> <input type="button" value="PREVIOUS"/> <input type="button" value=""/> <input type="button" value="EXIT"/>											
<b>LEGEND</b>											
AZ	AZIMUTH	LRF	LASER RANGE FINDER								
CEP	CIRCULAR ERROR PROBABILITY	M	METERS								
CHS	COMMANDER'S HAND STATION	MAG	MAGNIFICATION								
CIV	COMMANDER'S INDEPENDENT VIEWER	MAL	MALFUNCTION								
COAX	COAXIAL	MM	MILLIMETER								
DVO	DIRECT VIDEO OPTIC	MSL	MISSILE								
ELEV	ELEVATION	NFOV	NARROW FIELD OF VIEW								
FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	OPS	OPERATIONS								
FLIR	FORWARD-LOOKING INFRARED	SQ DR	SQUARE DRIVE								
FOM	FIGURE OF MERIT	TAS	TARGET ACQUISITION SYSTEM								
GHS	GUNNER'S HAND STATION	TDS	TURRET DRIVE SYSTEM								
GPS	GLOBAL POSITIONING SYSTEM	TOW	TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED								
GSCP	GUNNER'S SIGHT CONTROL PANEL	TRS	THERMAL REFERENCE SOURCE								
HI	HIGH	TV	TELEVISION								
IBAS	IMPROVED BRADLEY ACQUISITION SUBSYSTEM	Z	ZULU								
LO	LOW										

**Figure 3-234. BORESIGHT TAS/25MM GUN TO 7.62MM GUN procedure screen**

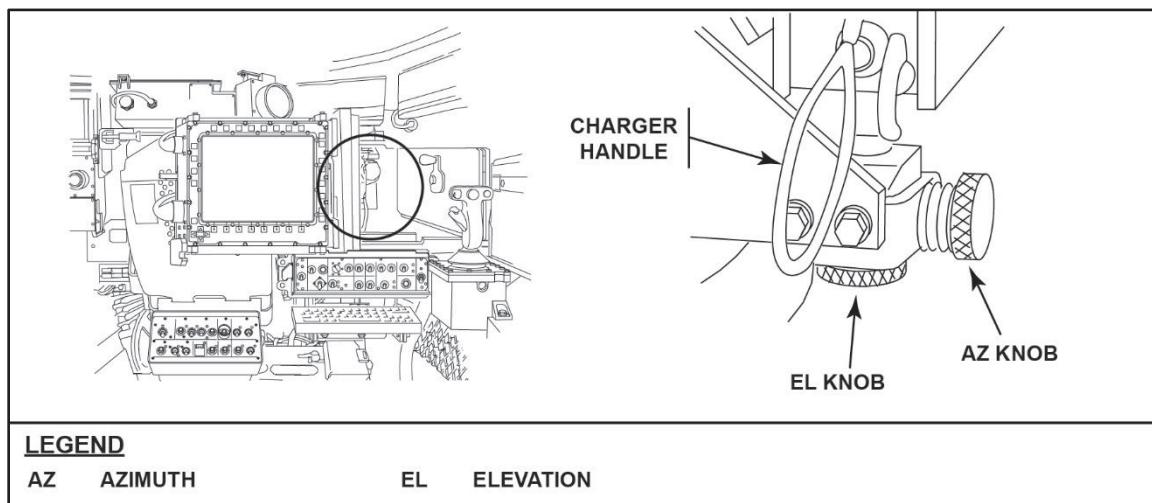
- (1) Select HI MAG using the HI/LO MAG switch on the GHS.
- (2) Manually traverse the turret and elevate or depress the gun until the boresight telescope reticle is centered on the boresight panel.

- (3) Remove the boresight telescope and 25-mm adapter with streamer from the 25-mm gun barrel.
- (4) Install the boresight telescope and 7.62-mm adapter with streamer into the 7.62-mm coaxial machine gun barrel (see figure 3-235).



**Figure 3-235. Coaxial boresight adapter and boresight telescope**

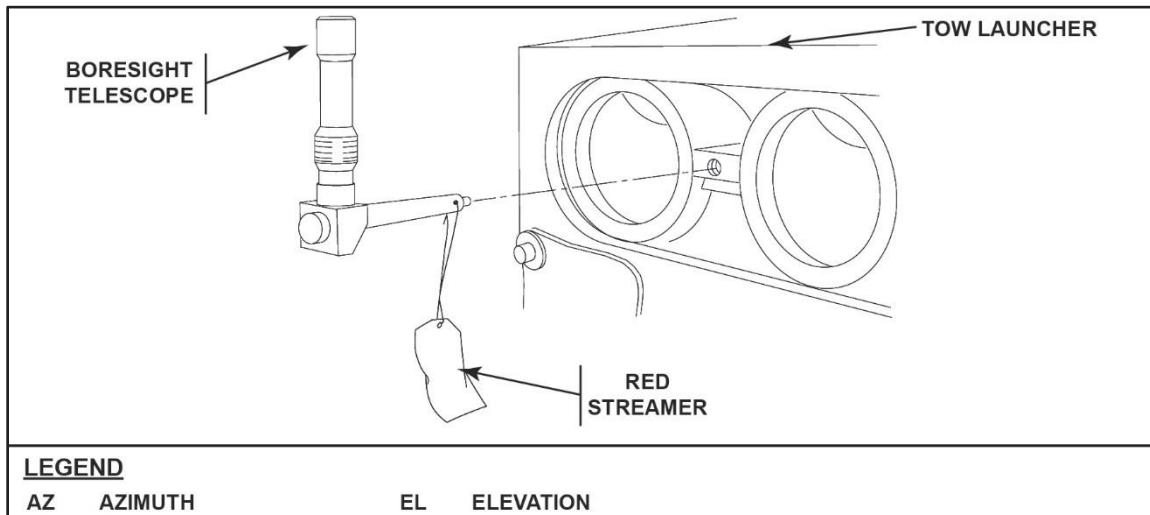
- (5) Open the coaxial machine gun access doors.
- (6) Adjust the EL and AZ knobs located on the coaxial machine gun mount to align the boresight telescope reticle on to the center of the boresight panel (see figure 3-236).



**Figure 3-236. Coaxial AZ and EL knobs**

- (7) Close the coaxial machine gun access doors.
- (8) Use DVO (preferred) or DAY TV sight.
- (9) Center TAS reticle on boresight panel using the GHS.
- (10) Range panel using the LRF or by entering the range manually using the GSCP.
- (11) Ensure the reticle is in the center of the panel; if not, repeat step (9).

- (12) Press CALCULATE using the softkey function on the CTD.
- (13) Press SAVE to use the new values or repeat the test from step (1).
- (14) Remove the boresight telescope and adapter with streamer from the 7.62-mm coaxial machine gun barrel and move it to the TOW launcher (see figure 3-237).



**Figure 3-237. Boresight telescope**

- (15) Press CONTINUE to perform BORESIGHT TAS TO TOW LAUNCHER by using the softkey function of the CTD.
5. Boresight the TAS to the TOW launcher.
- a. Observe the BORESIGHT TAS TO TOW LAUNCHER setup screen (see figure 3-238).

MAL 0	21 0817:36Z NOV 00	31NAA 66021E 0 M 00000N 999 M CEP	GPS FOM NOT = 1	FBCB2 DOWN	APPLIQUE OFF																													
<b>BORESIGHT TAS TO TOW LAUNCHER</b>						<b>SETUP</b>																												
<p><b>PERSONNEL REQUIRED:</b>            Gunner            Helper (H)</p> <p><b>EQUIPMENT CONDITIONS:</b>            System nulled            a) Press "NULL" button on GHS or CHS            b) Press "TAS ALIGN" on GSCP (If required by IBAS message)            Sight shield doors opened            TOW Launcher raised            Boresight telescope with streamer installed on TOW launcher            TDS in MANUAL mode (TOW elevation and traverse in MANUAL,            gun elevation in POWER)            Boresight mode displayed on TAS binocular display</p> <p><b>TOOLS:</b>            7.62mm boresight kit</p>																																		
<b>CONTINUE</b>						<b>EXIT</b>																												
<p><b>LEGEND</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">CEP</td> <td>CIRCULAR ERROR PROBABILITY</td> <td style="width: 15%;">IBAS</td> <td>IMPROVED BRADLEY ACQUISITION SUBSYSTEM</td> </tr> <tr> <td>CHS</td> <td>COMMANDER'S HAND STATION</td> <td>MAL</td> <td>MALFUNCTION</td> </tr> <tr> <td>FBCB2</td> <td>FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW</td> <td>MM</td> <td>MILLIMETER</td> </tr> <tr> <td>FOM</td> <td>FIGURE OF MERIT</td> <td>TAS</td> <td>TARGET ACQUISITION SYSTEM</td> </tr> <tr> <td>GHS</td> <td>GUNNER'S HAND STATION</td> <td>TDS</td> <td>TURRET DRIVE SYSTEM</td> </tr> <tr> <td>GPS</td> <td>GLOBAL POSITIONING SYSTEM</td> <td>TOW</td> <td>TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED</td> </tr> <tr> <td>GSCP</td> <td>GUNNER'S SIGHT CONTROL PANEL</td> <td>Z</td> <td>ZULU</td> </tr> </table>							CEP	CIRCULAR ERROR PROBABILITY	IBAS	IMPROVED BRADLEY ACQUISITION SUBSYSTEM	CHS	COMMANDER'S HAND STATION	MAL	MALFUNCTION	FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	MM	MILLIMETER	FOM	FIGURE OF MERIT	TAS	TARGET ACQUISITION SYSTEM	GHS	GUNNER'S HAND STATION	TDS	TURRET DRIVE SYSTEM	GPS	GLOBAL POSITIONING SYSTEM	TOW	TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED	GSCP	GUNNER'S SIGHT CONTROL PANEL	Z	ZULU
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GSCP	GUNNER'S SIGHT CONTROL PANEL	Z	ZULU																															

Figure 3-238. BORESIGHT TAS TO TOW LAUNCHER setup screen

- b. Ensure the equipment conditions are completed.
  - (1) Ensure the system has been nulled.
  - (2) Ensure sight shield doors are open.
  - (3) Ensure TOW launcher is raised.
  - (4) Ensure the boresight telescope is installed in the TOW launcher.
  - (5) Place the TDS into manual mode; the gun elevation drive must be in power and the TOW elevation and turret traverse drives in manual.
  - (6) Ensure the BORESIGHT symbology is visible in the IBAS.
  - (7) Select CONTINUE by using the softkey on the CTD.

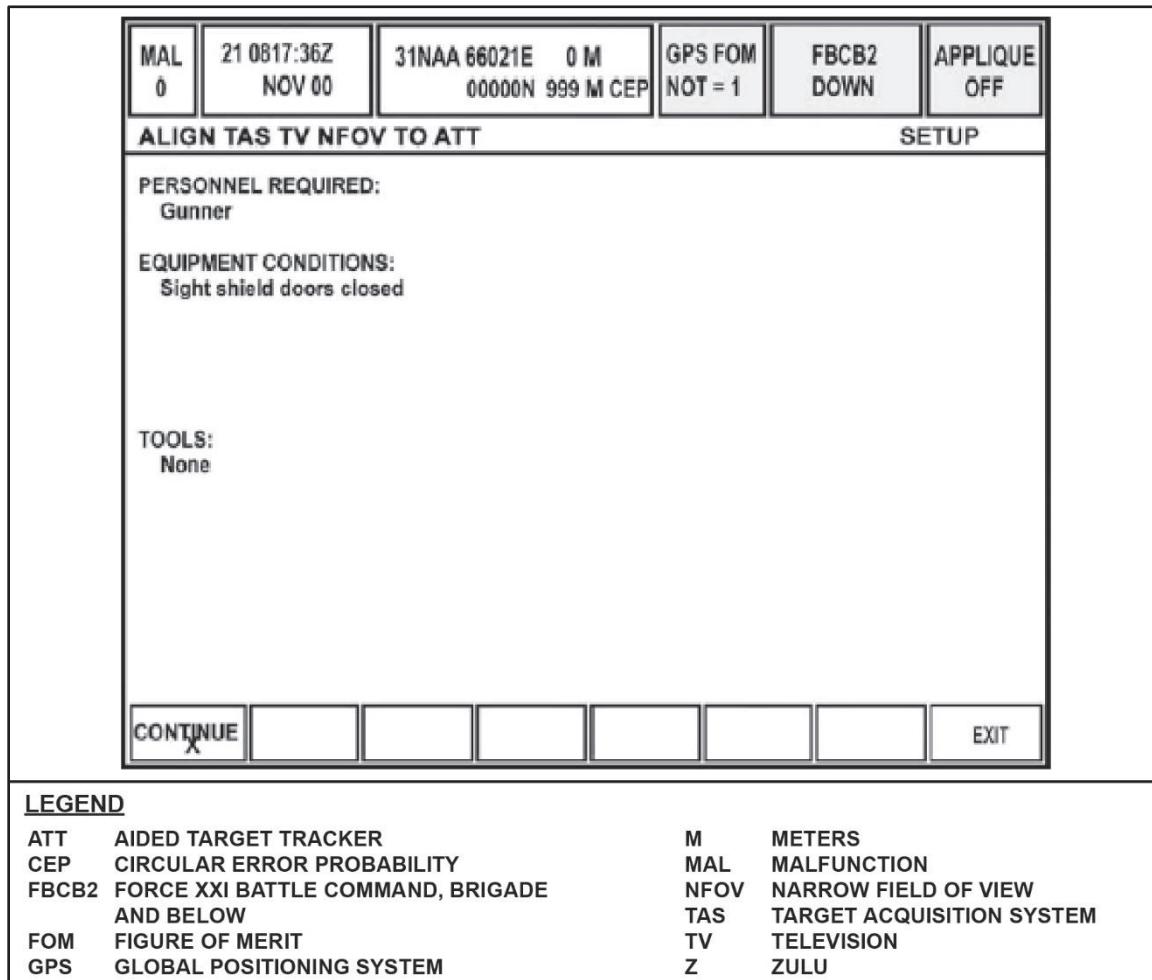
- c. Complete the BORESIGHT TAS TO TOW LAUNCHER procedure tasks (see figure 3-239).

MAL 0	21 0756:28Z NOV 00	31NAA 66021E 0 M 00000N 999 M CEP	GPS FOM NOT = 1	FBCB2 DOWN	APPLIQUE OFF																											
<b>BORESIGHT TAS TO TOW LAUNCHER</b>			<b>PROCEDURE</b>																													
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 20%;">New Values</th> <th style="text-align: center; width: 20%;">Current Values</th> </tr> </thead> <tbody> <tr> <td>1. Use DVD (preferred), or TV.</td> <td>ELEV (MILS)</td> <td><input type="text"/> 177.78</td> </tr> <tr> <td>2. Select HI MAG (NFOV) using HI/LO MAG switch on GHS.</td> <td>AZ (MILS)</td> <td><input type="text"/> 88.89</td> </tr> <tr> <td>3. Manually traverse turret and elevate/depress TOW Launcher until boresight telescope reticle is centered on boresight target.</td> <td>RANGE (M)</td> <td><input type="text"/> 10005</td> </tr> <tr> <td>4. Center TAS reticle on boresight target using GHS.</td> <td colspan="2"></td> </tr> <tr> <td>5. Press "CALCULATE".</td> <td colspan="2"></td> </tr> <tr> <td>6. To use new values press "SAVE" or to repeat test, go to step 1.</td> <td colspan="2"></td> </tr> <tr> <td>7. Remove boresight telescope and stow.</td> <td colspan="2"></td> </tr> <tr> <td>8. To perform "ALIGN TAS TV NFOV TO ATT", press "CONTINUE".</td> <td colspan="2"></td> </tr> </tbody> </table>							New Values	Current Values	1. Use DVD (preferred), or TV.	ELEV (MILS)	<input type="text"/> 177.78	2. Select HI MAG (NFOV) using HI/LO MAG switch on GHS.	AZ (MILS)	<input type="text"/> 88.89	3. Manually traverse turret and elevate/depress TOW Launcher until boresight telescope reticle is centered on boresight target.	RANGE (M)	<input type="text"/> 10005	4. Center TAS reticle on boresight target using GHS.			5. Press "CALCULATE".			6. To use new values press "SAVE" or to repeat test, go to step 1.			7. Remove boresight telescope and stow.			8. To perform "ALIGN TAS TV NFOV TO ATT", press "CONTINUE".		
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**Figure 3-239. BORESIGHT TAS TO TOW LAUNCHER procedure screen**

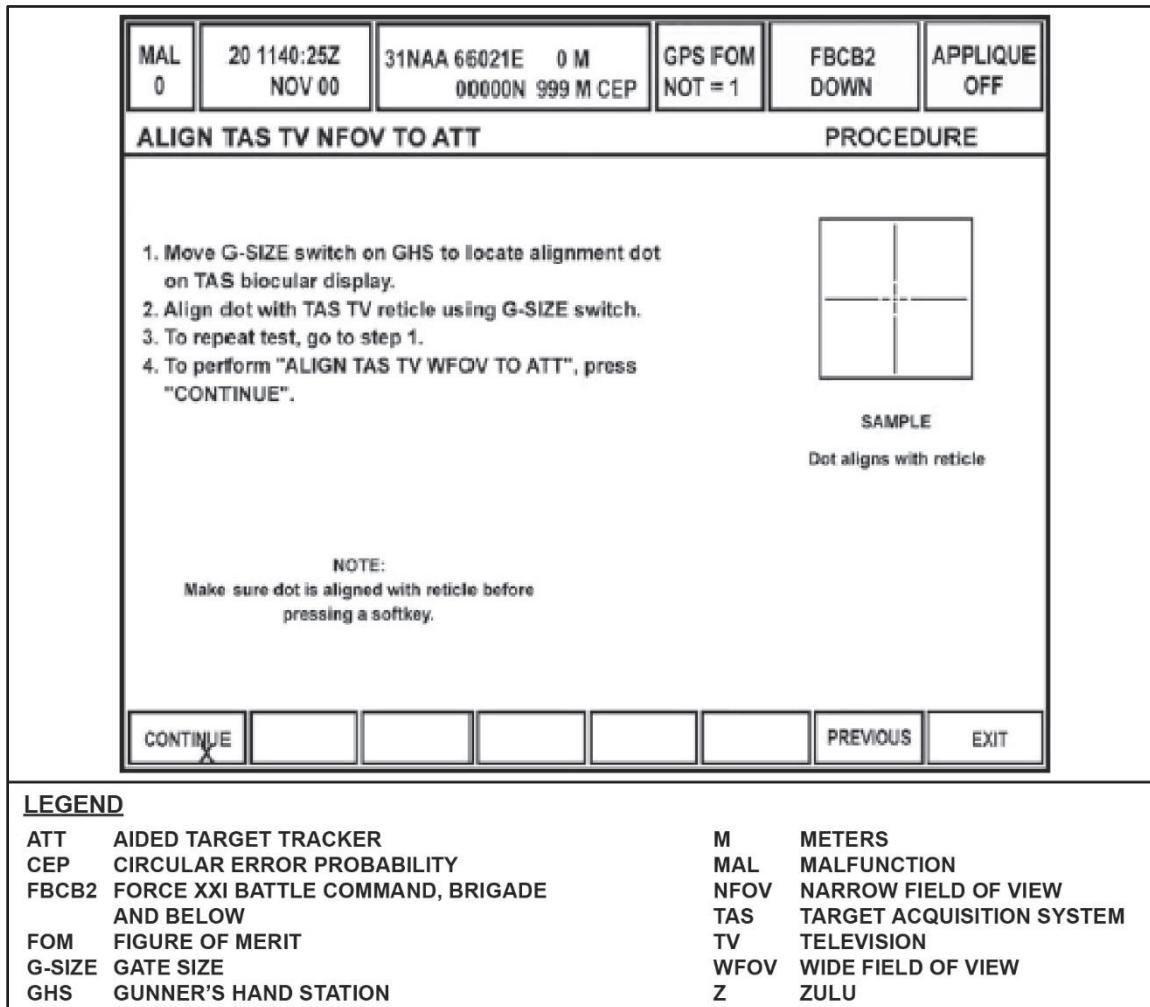
- (1) Use DVO (preferred) or DAY TV sight.
- (2) Select HI MAG using the HI/LO MAG switch on the GHS.
- (3) Manually traverse turret and elevate or depress the TOW launcher until the boresight telescope reticle is centered on the boresight panel.
- (4) Center TAS reticle on boresight panel using the GHS.
- (5) Press CALCULATE using the softkey function on the CTD.
- (6) Press SAVE to use the new values or repeat the test from step (1).

- (7) Remove boresight telescope and streamer from the TOW launcher.
- (8) Press CONTINUE to perform ALIGN TAS TV NFOV TO ATT by using the softkey function on the CTD.
6. Align the TAS TV NFOV to the aided target tracker (known as ATT).
- a. Observe the ALIGN TAS TV NFOV TO ATT setup screen (see figure 3-240).



**Figure 3-240. ALIGN TAS TO NFOV TO ATT setup screen**

- b. Ensure equipment conditions are completed.
- (1) Close ballistic sight shield doors.
  - (2) Press CONTINUE using the softkey function on the CTD.
- c. Complete the ALIGN TAS TV NFOV TO ATT procedure tasks (see figure 3-241, page 3-616).

**Figure 3-241. ALIGN TAS TV NFOV TO ATT procedures screen**

- (1) Move gate size (known as G-SIZE) switch on the GHS to locate alignment dot on TAS biocular display (see figure 3-242).

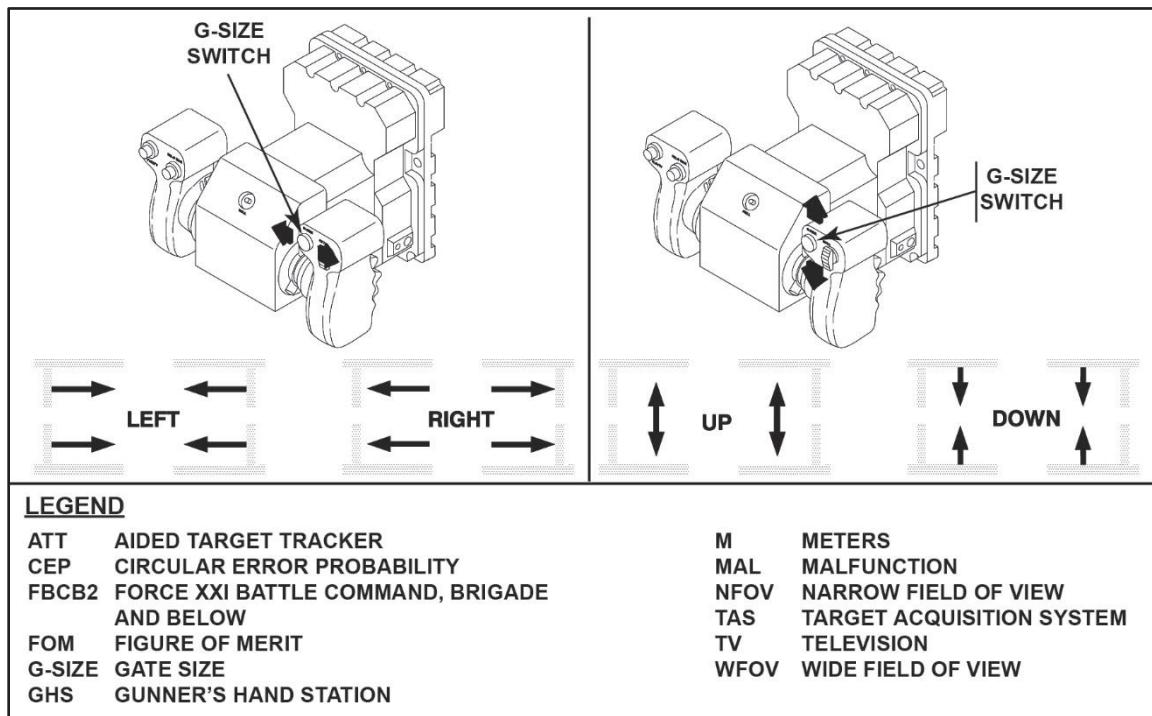
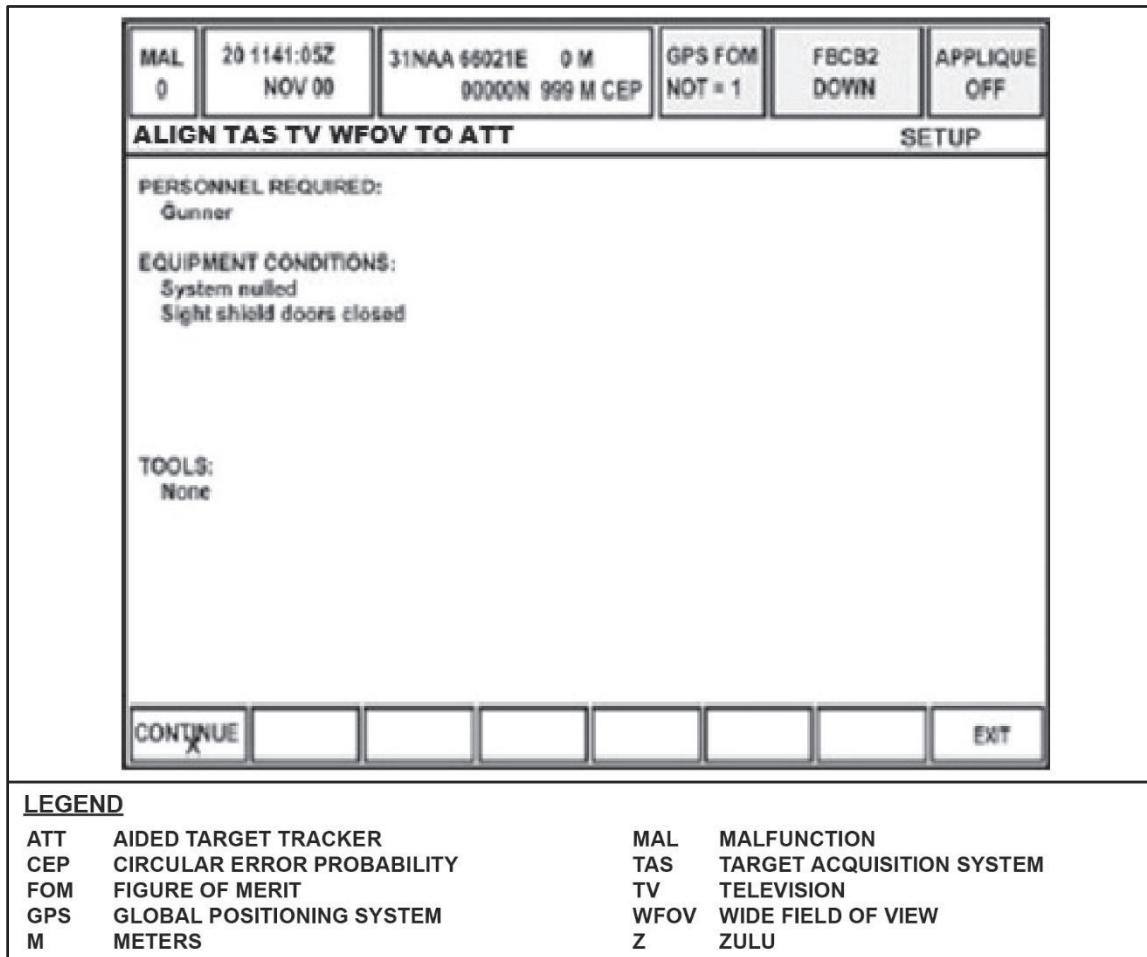


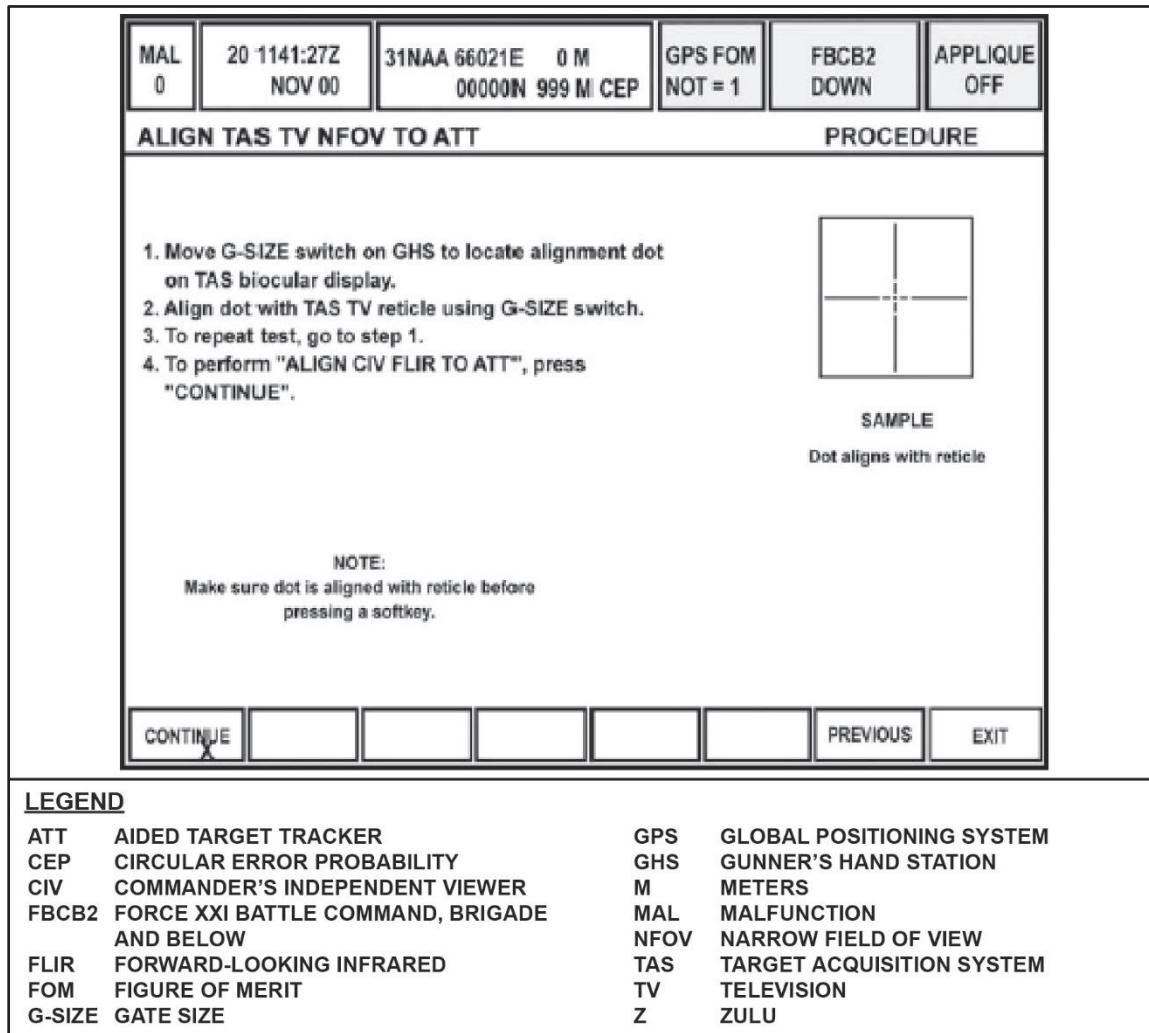
Figure 3-242. G-SIZE switch

- (2) Align the dot with the TAS TV reticle using the G-SIZE switch.
  - (3) Repeat the test if dot and reticle are not aligned. (Repeat step 1).
  - (4) Press CONTINUE to perform ALIGN TAS TV WFOV TO ATT by using the softkey function on the CTD.
7. Press CONTINUE to perform ALIGN TAS TV WFOV TO ATT by using the softkey function on the CTD.
- a. Observe the ALIGN TAS TV WFOV TO ATT setup screen (see figure 3-243, page 3-618).



**Figure 3-243. ALIGN TAS TV WFOV TO ATT setup screen**

- b. Ensure equipment conditions are completed.
  - (1) Ensure the system is nulled.
  - (2) Ensure ballistic sight shield doors are closed.
  - (3) Press CONTINUE using the softkey function on the CTD.
- c. Complete the ALIGN TAS TV WFOV TO ATT procedure tasks (see figure 3-244).

**Figure 3-244. ALIGN TAS TV WFOV TO ATT procedure screen**

- (1) Move G-SIZE switch on the GHS to locate alignment dot on TAS biocular display.
  - (2) Align the dot with the TAS TV reticle using the G-SIZE switch.
  - (3) Repeat the test if dot and reticle are not aligned.
  - (4) Press CONTINUE to perform ALIGN CIV FLIR TO TV by using the softkey function on the CTD.
8. Align the CIV FLIR to the TV.
- a. Observe the ALIGN CIV FLIR TO TV setup screen (see figure 3-245, page 3-620).

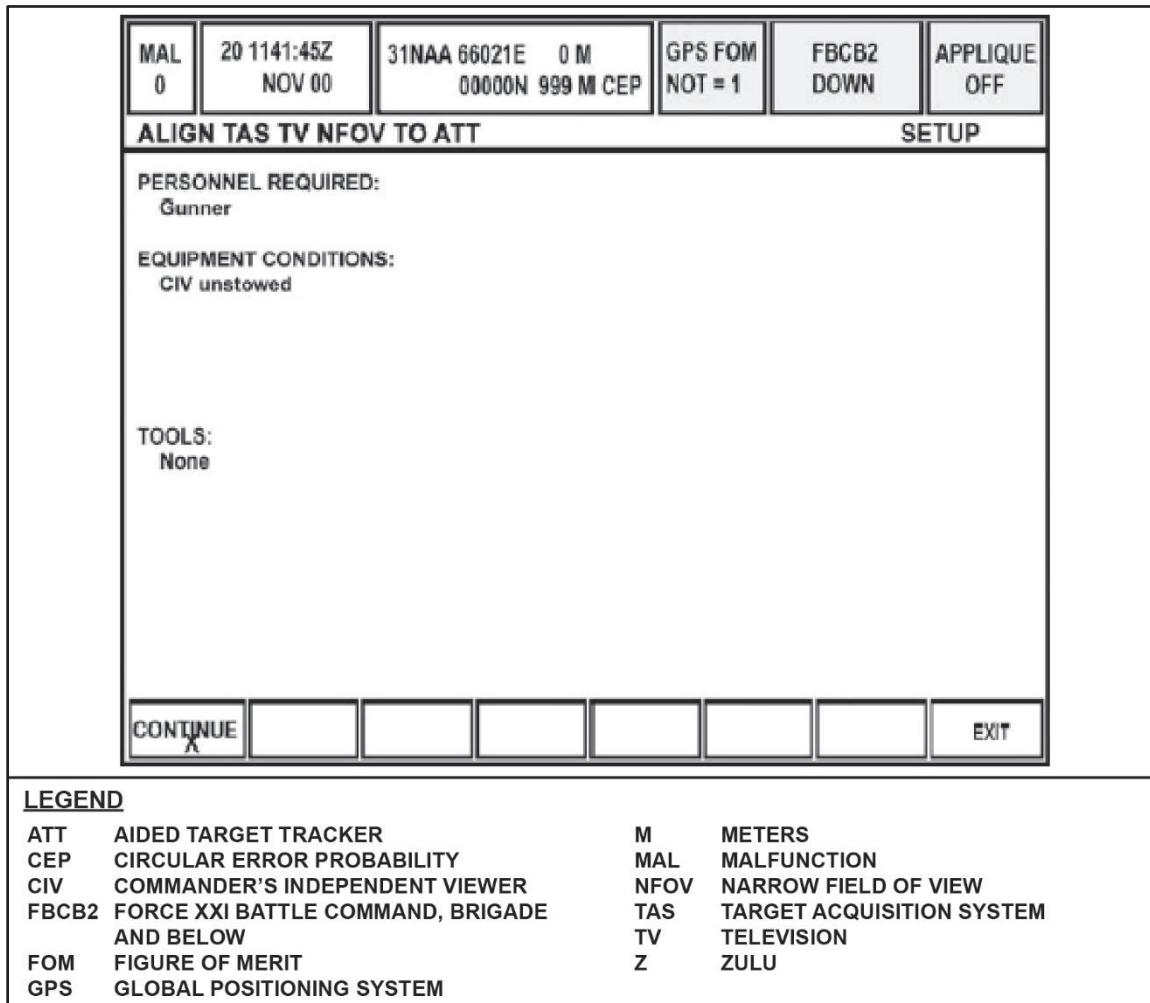


Figure 3-245. ALIGN CIV FLIR TO TV setup screen

- b. Ensure equipment conditions are completed.
  - (1) Ensure the CIV is unstowed.
  - (2) Press CONTINUE using the softkey function on the CTD.
- c. Complete the ALIGN CIV FLIR TO TV procedure tasks (see figure 3-246).

MAL 0	20 1141:59Z NOV 00	31NAA 66021E 0 M 00000N 999 M CEP	GPS FOM NOT = 1	FBCB2 DOWN	APPLIQUE OFF
<b>ALIGN CIV FLIR TO TV</b>			<b>PROCEDURE</b>		
<p>1. Select HI MAG (NFOV) using HI/LO MAG switch on GHS or CHS.      2. Select TV using FLIR/TV switch on GHS or CSCP.      3. Align TV reticle to boresight target GHS or CHS.      4. Select FLIR.      5. Align FLIR reticle to same boresight target for TV using GATE SIZE switch on GHS or CSCP.      6. To repeat test, go to step 1.      7. To perform "ZERO 25MM GUN", press "CONTINUE".</p> <p><b>NOTE:</b> Make sure FLIR reticle is aligned with boresight target before pressing a softkey.</p>					
<b>CONTINUE</b>					<b>PREVIOUS</b>
<b>LEGEND</b>					
CEP	CIRCULAR ERROR PROBABILITY	GPS	GLOBAL POSITIONING SYSTEM		
CHS	COMMANDER'S HAND STATION	HI	HIGH		
CIV	COMMANDER'S INDEPENDENT VIEWER	LO	LOW		
GSCP	GUNNER'S SIGHT CONTROL PANEL	M	METERS		
FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	MAG	MAGNIFICATION		
FLIR	FORWARD-LOOKING INFRARED	MAL	MALFUNCTION		
FOM	FIGURE OF MERIT	MM	MILLIMETER		
G-SIZE	GATE SIZE	NFOV	NARROW FIELD OF VIEW		
GHS	GUNNER'S HAND STATION	TV	TELEVISION		
		Z	ZULU		

**Figure 3-246. ALIGN CIV FLIR TO TV procedures screen.**

- (1) Select HI MAG (NFOV) using the HI/LO MAG switch on the GHS or CHS.
  - (2) Select TV using the FLIR/TV switch on the GHS or CHS.
  - (3) Align TV reticle to boresight panel using the GHS or CHS controls.
  - (4) Select FLIR using the FLIR/TV switch on the GHS or CHS.
  - (5) Align FLIR reticle to the same point of aim on the boresight panel as that of the TV using the G-SIZE switch on the GHS or CSCP.
  - (6) Repeat the test if sights are not aligned.
9. Select EXIT using the softkey functions of the CTD.
10. Select MAIN using the softkey functions on the CTD.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the M2A3/M3A3 or M2A2/M2A3 ODS SA BFV turret for boresighting.	_____	_____
2. Boresighted the TAS/BACKUP sight to the 25-mm gun.	_____	_____
3. Boresighted the CIV to the 25-mm gun.	_____	_____
4. Boresighted the TAS/25-mm gun to the 7.62-mm coaxial machine gun.	_____	_____
5. Boresighted the TAS to the TOW launcher.	_____	_____
6. Aligned the TAS TV NFOV to the ATT.	_____	_____
7. Aligned the TAS TV WFOV to the ATT.	_____	_____
8. Aligned the CIV FLIR to the TV.	_____	_____
9. Selected EXIT by using the softkey function on the CTD.	_____	_____
10. Selected MAIN by using the softkey function on the CTD.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) (EIC: APA) M2A1 (2350-01-179-1027) (EIC: ALE) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) (EIC: APB) M3A1 (2350-01-179-1028) (EIC: ALF) Turret	

**071-001-0002****Zero the Weapon Systems on an M2A3/M3A3 or M2A2/M2A3 Operation Desert Storm-Situational Awareness Bradley Fighting Vehicle**

**Conditions:** As a gunner, given an operational Bradley fighting vehicle (known as BFV) A3 or A2 Operation Desert Storm-Situational Awareness with basic issue items and an assisting crewmember (vehicle commander). The coaxial machine gun has been installed, and the weapons systems have been boresighted. You have 25-millimeter (mm) and 7.62 ammunition loaded and have a 25-mm target between 200 and 1,200 meters and a 7.62-mm coaxial zero target between 200 and 800 meters. You have been directed to zero the weapon systems.

**Standards:** Zero the 25-mm gun so that the point of aim and the strike of the round impact at the same point on the target and zero the 7.62-mm coaxial machine gun so that the point of aim and the strike of the rounds impact at the same point on the target.

**Note:** The purpose of zeroing is to define and compensate for the unique ballistic properties of the ammunition for a specific vehicle. The system allows you to zero at any range from 200 meters to 1,200 meters. However, the farther out you zero, the more the environment (such as wind) affects the strike of the round.

**Performance Steps**

1. Prepare the BFV for zero procedures.
  - a. Ensure master power switch is ON.
  - b. Ensure turret power switch on the system control box is ON.
  - c. Access the tactical menu screen, after successful completion of the system self-test.
  - d. Ensure turret drive is OFF.
  - e. Place gun elevation and traverse select levers in MANUAL.
  - f. Place tube launched, optically tracked, wire guided (TOW) select lever in POWER.
  - g. Adjust the target acquisition system (known as TAS) focus, reticle, and symbology brightness and image contrast on the TAS.
  - h. Adjust the commander's independent viewer (known as CIV) focus, reticle, and symbology brightness and image contrast.
  - i. Adjust the gain, level, polarity, and zoom on the forward-looking infrared (FLIR) radar.
2. Press the appropriate soft keys to navigate the manual boresight screen (see figure 3-247, page 3-624).

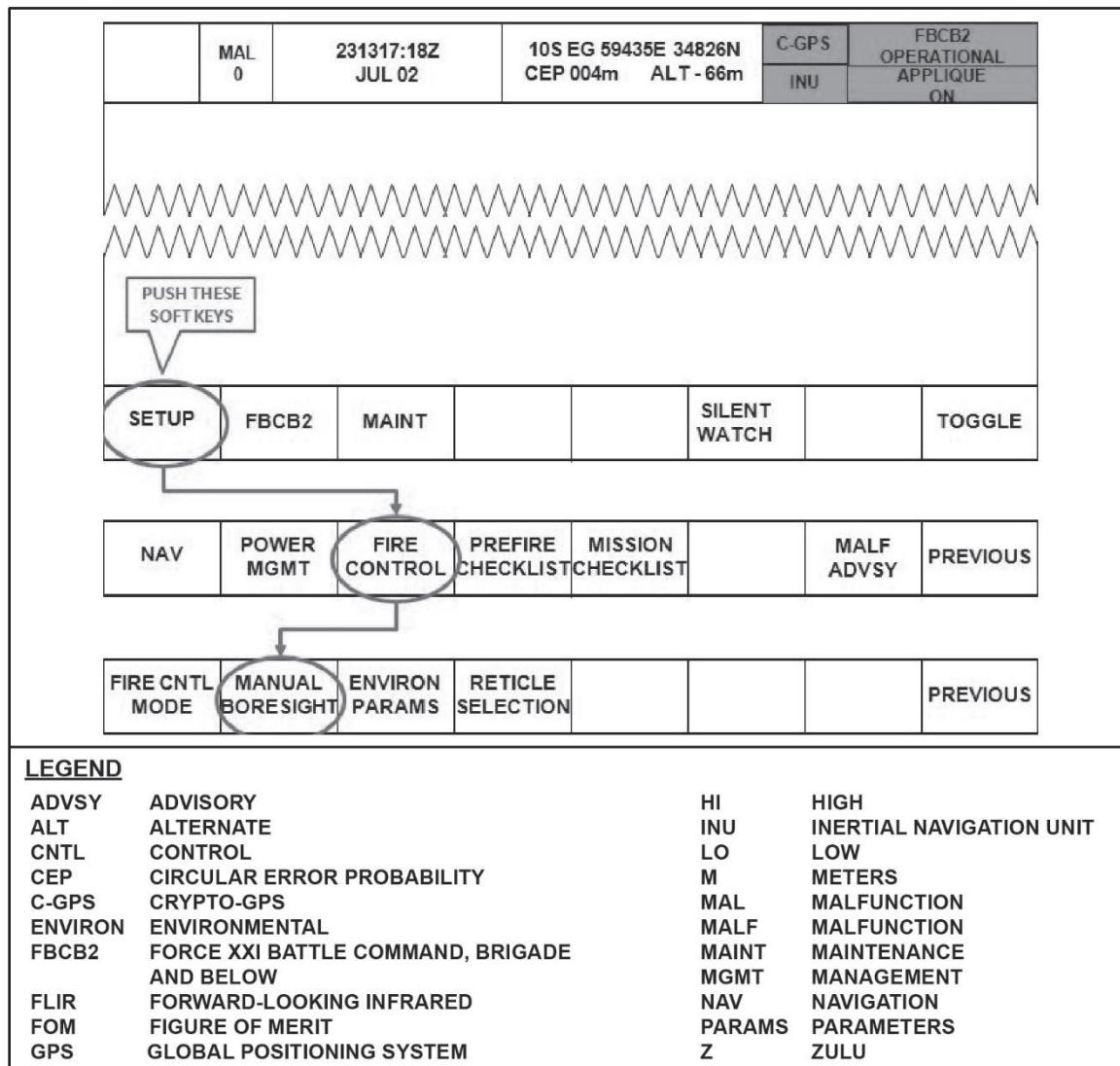


Figure 3-247. Screen selections

3. Perform all task listed on the PRE-BORESIGHT TASKS screen (see figure 3-248).
  - a. Select SETUP using the CTD soft key.
  - b. Select FIRE CONTROL using the CTD soft key.
  - c. Select MANUAL BORESIGHT using the CTD soft key.

MAL 0	231317:18Z JUL 02	10S EG 59435E 34826N CEP 004m ALT -66m	C-GPS INU	FBCB2 OPERATIONAL APPLIQUE ON	
<b>PRE-BORESIGHT TASKS</b>					
<p>1. Unload and make weapons safe.</p> <p>2. Unstow CIV</p> <p>3. Position vehicle on level surface. (slope indicator bubble at Driver Station within black inner ring) with boresight target approximately:</p> <ul style="list-style-type: none"> <li>A) Greater than 200 meters 1200 meter recommended for boresight task.</li> <li>B) 800-1200 meters for zeroing 25MM gun.</li> <li>C) 800 meters for zeroing 7.62MM COAX gun.</li> </ul> <p>4. Null System</p> <ul style="list-style-type: none"> <li>A) Press "NULL BUTTON" on GHS or CHS.</li> <li>B) Press "TAS ALIGN" on GSCP (if required by IBAS message).</li> <li>C) Open shield doors when complete.</li> </ul> <p>5. If TOW is to be boresighted raise TOW launcher.</p> <p>6. Perform the following functional checks on the 25MM gun system.</p> <ul style="list-style-type: none"> <li>A) Ensure the manual searfracteur is disengaged.</li> <li>B) Ensure the straight drive shaft to the feeder is locked in place</li> <li>C) Ensure the feed and ejection chutes are connected.</li> <li>D) Dry cycle the 25MM gun twice in HE and twice in AP. (in the power mode)</li> </ul> <p>7. During normal operating conditions, ensure the IBAS defogger fan OFF</p> <p>8. Lay DVO reticle on distant aim point and compare with FLIR reticle. At 1200 meters, FLIR reticle should be about 0.2 mil left of DVO reticle</p> <p>When ready, press "CONTINUE" Reference TM 9235010-2 for tools and equipment conditions</p>					
CONTINUE					PREVIOUS

**LEGEND**

ALT	ALTERNATE	GSCP	GUNNER'S SIGHT CONTROL UNIT
AP	ARMOR PIERCING	HE	HIGH EXPLOSIVE
CEP	CIRCULAR ERROR PROBABILITY	IBAS	IMPROVED BRADLEY ACQUISITION SYSTEM
CHS	COMMANDER'S HAND STATION	INU	INERTIAL NAVIGATION UNIT
CIV	COMMANDER'S INDEPENDENT VIEWER	MAL	MALFUNCTION
COAX	COAXIAL	MM	MILLIMETER
C-GPS	CRYPTO-GPS	TAS	TARGET ACQUISITION SYSTEM
DVO	DIRECT VIEW OPTIC	TOW	TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED
FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	Z	ZULU
FLIR	FORWARD-LOOKING INFRARED		
GHS	GUNNER'S HAND STATION		

**Figure 3-248. PRE-BORESIGHT TASKS screen**

- d. Unload and make weapons safe.
  - (1) Unload the 25-mm gun, coax, and TOW.
  - (2) Put all weapons on electrical safe by moving the ARM-RESET-SAFE switch to SAFE.
- e. Unstow the CIV.
  - (1) Move CIV switch to ON.
  - (2) Raise the CIV by squeezing palm switch on the commander's hand station (known as CHS).
- f. Position the vehicle on a level surface.

- (1) Ensure driver confirms slope indictor bubble is within black inner ring.
- (2) Ensure the BFV is positioned to observe the target(s).

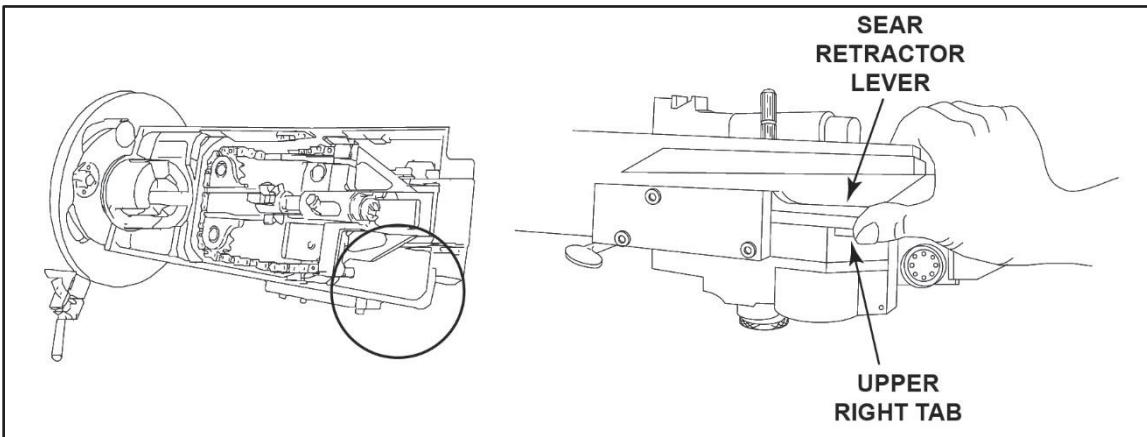
**DANGER**

**Falling from the vehicle can kill or seriously injure personnel.**

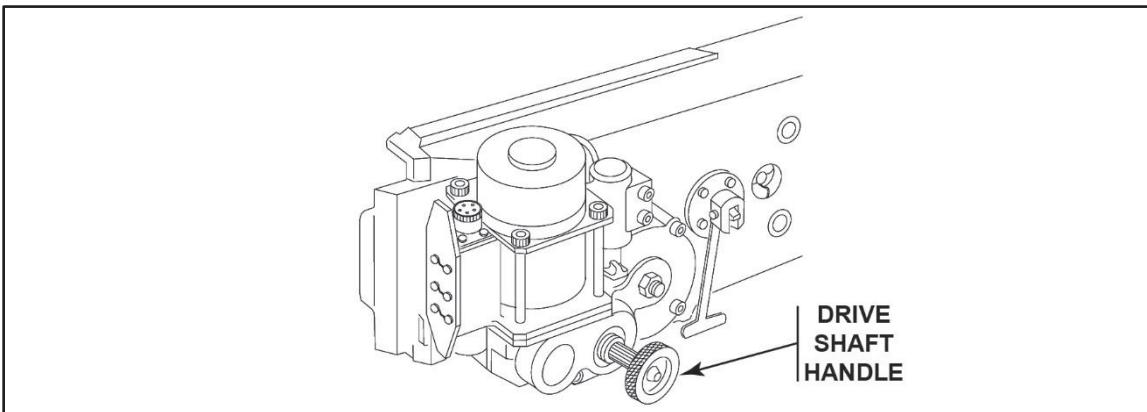
**WARNING**

**CIV motion can crush hands, startle personnel, or push them off the vehicle.**

- g. Check the null (fire control) system.
  - (1) Ensure the BFV is stationary.
  - (2) Ensure all personnel are clear of the CIV.
  - (3) Ensure that both gunner's hand station (known as GHS) and CHS are in centered positions with palm switches released.
  - (4) Press the NULL button on the GHS or the CHS.
- Note:** When the "nulling" process is complete, a "System Nulling Complete" message will appear on the CTD and on the TAS and CIV reticles.
- (5) Press the TAS ALIGN button if required by improved Bradley acquisition subsystem (known as IBAS) message.
- (6) Open both ballistic sight doors.
- h. Raise TOW launcher, if TOW is to be boresighted.
- i. Conduct functional checks on the 25-mm gun system.
  - (1) Ensure the manual sear retractor is disengaged by pressing hard on upper right tab of sear retractor lever (see figure 3-249).

**Figure 3-249. Sear retractor lever**

- (2) Ensure the straight driveshaft to the feeder is locked in place (see figure 3-250).

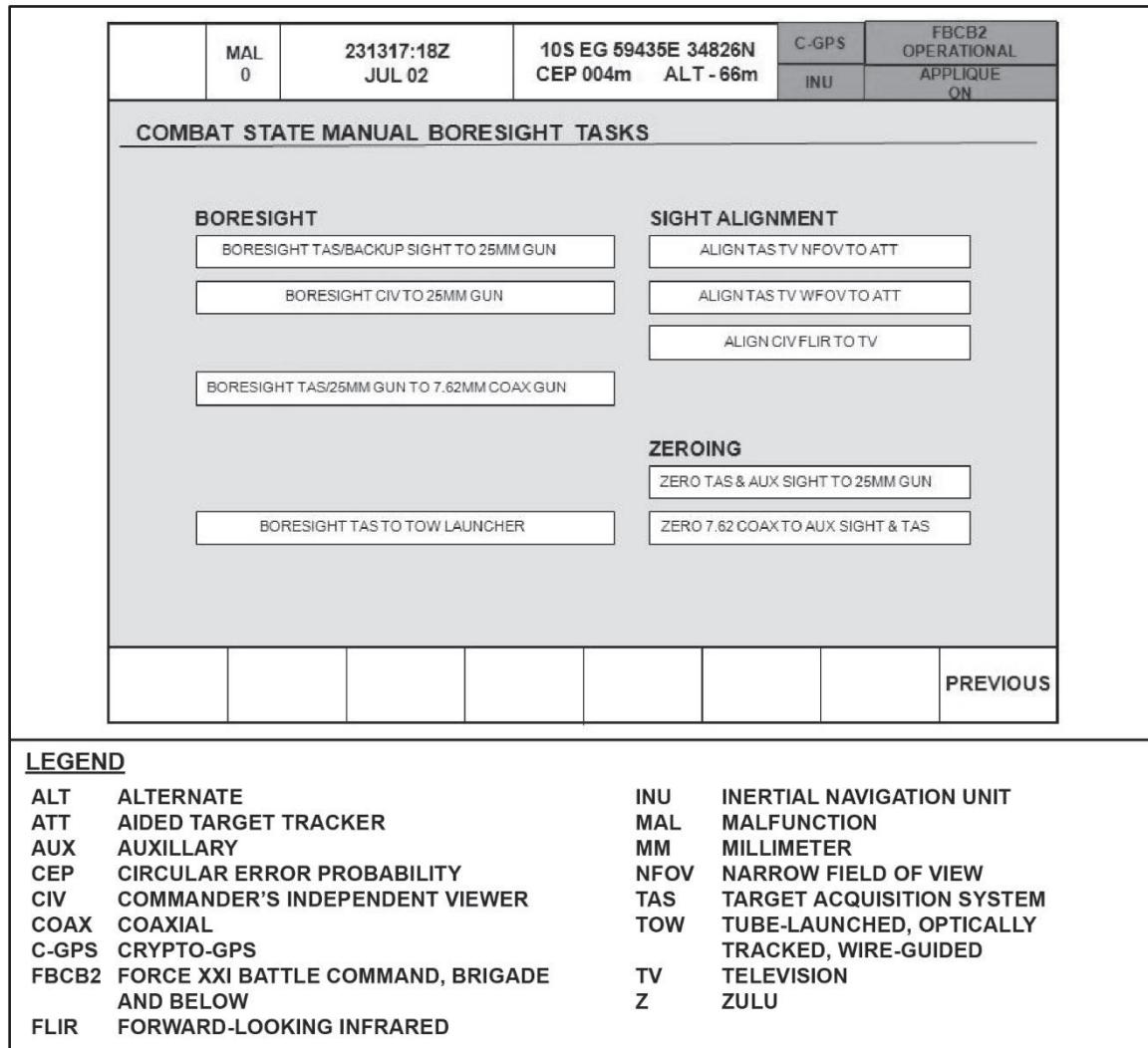
**Figure 3-250. Drive shaft**

- (3) Ensure the feed and eject chutes are connected.
- (4) Dry cycle the 25-mm gun twice in high explosive and twice in armor piercing (in the power mode).
- j. Ensure the IBAS defogger fan switch is in the OFF position, during normal operating conditions.
  - k. Lay direct view optics reticle on distant aiming point and compare with FLIR reticle.

**Note:** At 1,200 meters, the FLIR reticle should be about 0.2 mils to the left of the direct view optic (known as DVO) reticle.

- l. Press the CONTINUE soft key on the CTD, when ready to bring up the COMBAT STATE MANUAL BORESIGHT TASKS screen (see figure 3-251, page 3-628).

**Note:** Each procedure is composed of two screens. The first screen is the initial setup description and provides the information necessary to prepare for that procedure. The second screen is the actual procedure screen. It is recommended to start with the first boresight task, BORESIGHT TAS/BACKUP SIGHT TO 25MM GUN, and then proceed, in order, through the remaining tasks.

**Figure 3-251. Manual boresight screen**

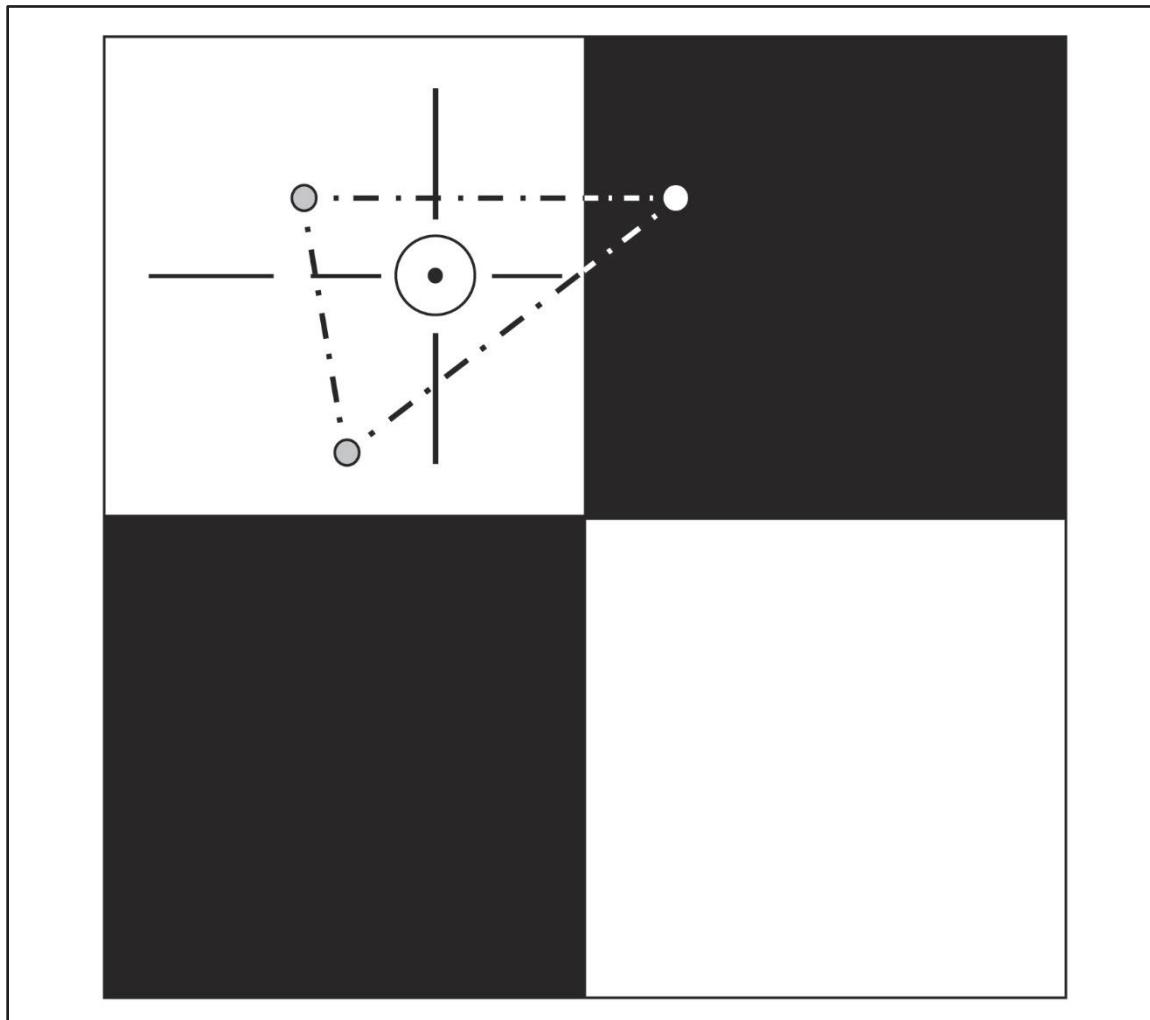
4. Zero the TAS and AUX sight to the 25-mm gun.
  - a. Select ZERO TAS & AUX SIGHT TO 25MM GUN to proceed to the setup screen.
  - b. Ensure all setup conditions are met.
    - (1) Ensure personnel required are present.
    - (2) Ensure equipment conditions are performed.
    - (3) Ensure required tools are present.
  - c. Press CONTINUE soft key to proceed to the procedures screen.
  - d. Ensure all procedures are performed (see figure 3-252).

**Note:** If your rounds are not hitting the target then you need to perform sight alignment steps and update the environmental parameter screen or perform the boresight tasks again. Refiring before changing these values will provide the same results since the sight alignment, boresight, and zero values have not changed.

	MAL 0	231317:18Z JUL 02	10S EG 59435E 34826N CEP 004m ALT -66m	C-GPS INU	FBCB2 OPERATIONAL APPLIQUE ON																																																
<b>ZERO TAS &amp; AUX SIGHT TO 25MM GUN</b>																																																					
<b>PROCEDURE</b> <ul style="list-style-type: none"> <li>• Use DVO (preferred), or TV, (FLIR should only be used if zeroing must be done at night).</li> <li>• Select HI MAG (NFOV) using HI/LO MAG switch on GHS</li> <li>• Center TAS reticle on target using elevation and traverse hand wheels.</li> <li>• Range target using LRF (or enter range manually on GSCP).</li> <li>• Repeat step 3 if required.</li> <li>• Cycle "GHOST ROUND" before firing the 25MM gun.</li> <li>• Have commander observe round impact point</li> <li>• Fire one tracer round at target. If round impact was on target go to step 14. If 25MM is not zeroed, proceed to step 9.</li> <li>• Ensure TAS reticle is still aligned with boresight target, re-aim as necessary using hand wheels.</li> <li>• Press "AIM POINT".</li> <li>• Center TAS reticle at round impact point using CHS or GHS.</li> <li>• Press "CALCULATE".</li> <li>• Press "SAVE".</li> <li>• Center TAS reticle on target using elevation and traverse hand wheels, and repeat steps 7-13 until either 25MM gun is zeroed, or three rounds have been fired.</li> </ul> <p>Note: If 25MM gun cannot be zeroed within three rounds, notify Master Gunner.</p> <p>15. To perform zero AUX sight to 25MM gun, press "NEXT PAGE".</p>																																																					
	AIM POINT	CALCULATE	SAVE	NEXT PAGE	PREVIOUS EXIT																																																
<b>LEGEND</b> <table> <tbody> <tr> <td>ALT</td> <td>ALTERNATE</td> <td>HI</td> <td>HIGH</td> </tr> <tr> <td>AUX</td> <td>AUXILIARY</td> <td>INU</td> <td>INERTIAL NAVIGATION UNIT</td> </tr> <tr> <td>AZ</td> <td>AZIMUTH</td> <td>LO</td> <td>LOW</td> </tr> <tr> <td>CEP</td> <td>CIRCULAR ERROR PROBABILITY</td> <td>M</td> <td>METERS</td> </tr> <tr> <td>CHS</td> <td>COMMANDER'S HAND STATION</td> <td>MAG</td> <td>MAGNIFICATION</td> </tr> <tr> <td>C-GPS</td> <td>CRYPTO-GPS</td> <td>MAL</td> <td>MALFUNCTION</td> </tr> <tr> <td>DVO</td> <td>DIRECT VIDEO OPTIC</td> <td>MM</td> <td>MILLIMETER</td> </tr> <tr> <td>ELEV</td> <td>ELEVATION</td> <td>NFOV</td> <td>NARROW FIELD OF VIEW</td> </tr> <tr> <td>FBCB2</td> <td>FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW</td> <td>TAS</td> <td>TARGET ACQUISITION SYSTEM</td> </tr> <tr> <td>FLIR</td> <td>FORWARD-LOOKING INFRARED</td> <td>TOW</td> <td>TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED</td> </tr> <tr> <td>GHS</td> <td>GUNNER'S HAND STATION</td> <td>TV</td> <td>TELEVISION</td> </tr> <tr> <td>GSCP</td> <td>GUNNER'S SIGHT CONTROL PANEL</td> <td>Z</td> <td>ZULU</td> </tr> </tbody> </table>						ALT	ALTERNATE	HI	HIGH	AUX	AUXILIARY	INU	INERTIAL NAVIGATION UNIT	AZ	AZIMUTH	LO	LOW	CEP	CIRCULAR ERROR PROBABILITY	M	METERS	CHS	COMMANDER'S HAND STATION	MAG	MAGNIFICATION	C-GPS	CRYPTO-GPS	MAL	MALFUNCTION	DVO	DIRECT VIDEO OPTIC	MM	MILLIMETER	ELEV	ELEVATION	NFOV	NARROW FIELD OF VIEW	FBCB2	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW	TAS	TARGET ACQUISITION SYSTEM	FLIR	FORWARD-LOOKING INFRARED	TOW	TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED	GHS	GUNNER'S HAND STATION	TV	TELEVISION	GSCP	GUNNER'S SIGHT CONTROL PANEL	Z	ZULU
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**Figure 3-252. ZERO THE TAS AND AUX SIGHT TO THE 25MM GUN procedures screen**

- (Optional) Perform the dispersion compensation technique to compensate for dispersion of ammunition (see figure 3-253, page 3-630).



**Figure 3-253. Dispersion compensation technique**

- (1) Fire three tracer rounds ensuring that all three hit the target.
  - (2) Triangulate the shot group.
  - (3) Ensure TAS reticle is still aligned with boresight target, adjusting if necessary.
  - (4) Press "AIM POINT."
  - (5) Move TAS reticle aim point to center of shot group using CHS or GHS.
  - (6) Press "CALCULATE."
  - (7) Press "SAVE."
- f. Press CONTINUE or EXIT soft key to proceed.

**Note:** It is recommended that both zero tasks be performed as a group.

5. Zero the 7.62-mm coaxial to AUX sight and TAS.

- a. Press CONTINUE to proceed to ZERO 7.62 COAX TO AUX SIGHT & TAS setup screen.
- b. Ensure all setup conditions are met.
  - (1) Ensure personnel required are present.
  - (2) Ensure equipment conditions are performed.
  - (3) Ensure required tools are present.
- c. Press CONTINUE soft key to proceed to the procedures screen.
- d. Perform all procedures listed on the screen.
- e. Press CONTINUE or EXIT soft key to proceed

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the BFV for zero procedures.	_____	_____
2. Pressed the appropriate soft keys to navigate the manual boresight screen.	_____	_____
3. Performed all task listed on the PRE-BORESIGHT TASKS screen.	_____	_____
4. Zeroed the TAS and AUX sight to the 25-mm gun.	_____	_____
5. Zeroed the 7.62-mm coaxial to AUX sight and TAS.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Operator's Manual for Machine Gun, 7.62MM, M240 (1005-01-025-8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359-2714, M240N (1005-01-493-1666)	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret

**071-001-0006**

## **Engage Targets using the Weapon Systems on a Bradley Fighting Vehicle**

### **DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to destroy. Ensure positive identification of target, backstop and beyond. Negligent firing of weapons can kill or seriously injure personnel.**

**Conditions:** You are a vehicle commander or gunner on a Bradley fighting vehicle (known as BFV) conducting operations. Possible targets have been identified within your assigned sector of fire. All weapon systems are loaded.

**Standards:** Detect and identify targets in assigned sector of fire. Decide on target engagement, confirm the target(s), and engage the target(s) using the appropriate weapon(s) while applying correct engagement techniques. Assess the effects on target(s) and cease fire once target is destroyed, suppressed, or order has been given to cease fire.

**Notes:** Detect, identify, decide, engage, and assess is the standardized and systematic approach to target engagement activities.

When you prepare to fire 25-millimeter (mm) gun, watch indicator lights on the system control box. See that proper lights go on and off when you use buttons and switches. If they do not, notify unit maintenance.

### **Performance Steps**

1. Detect target(s).
  - a. Determine target location by personal detection while observing assigned field of fire or by detection report from another Soldier.
  - b. Acquire the target using the BFV's sight system.
  - c. Determine range to target(s).
    - (1) Use the 100-meter unit of measure/flash to bang/or the appearance of objects method.
    - (2) Determine range.
      - (a) Use the eyesafe laser range finder (preferred method for A2 Operation Desert Storm and above variants).
      - (b) Use the integrated sight unit or target acquisition system sight reticle.
      - (c) Use the backup sight (auxiliary sight) or a range card.
2. Identify targets as threat and nonthreat targets.
  - a. Classify the target.

**Note:** Classification between vehicular or personnel targets is instantaneous and not viewed as a separate step. Vehicular targets are then classified by type (such as car, truck, or as a combat vehicle, such as a tank or personnel carrier).

- b. Discriminate targets as enemy, friend, or neutral/unknown.
- 3. Decide on target engagement.
  - a. Determine the target threat level and priority, if there is more than one target.

**Note:** The three threat levels are most dangerous, dangerous, and least dangerous. When multiple targets of the same threat level are encountered, the targets are prioritized by engaging close-range targets before engaging long-range targets, engaging stationary targets before engaging moving targets, and engaging frontal targets before engaging flank or rear targets.

- b. Select the appropriate weapon based on the type of target or range to target.

**Note:** If the BFV's weapons are incapable of destroying the target or rules of engagement preclude using the only available effective weapon, then immediately report the target to higher headquarters so other military options / weapons systems can be brought to bear. Sometimes a target may be engaged with a variety of weapons, and it is a judgment call of which weapon to use.

- (1) Employ M240C coaxial machine gun for personnel or unarmored targets that are within 900 meters.
- (2) Employ M242 25-mm main gun for lightly armored, unarmored, personnel or near aerial targets.

**Note:** Maximum effective range is 3,000 meters against personnel and unarmored targets, 2,000 meters against light armor, 1,200 meters against aerial using high explosive ammunition, and 2,000 meters against aerial if using armor piercing ammunition.

- (3) Employ tube launched, optically tracked, wire guided (TOW) for armored and distant aerial targets.

**Note:** Maximum effective range varies from 3,000 meters to 4,500 meters based on the type of TOW used.

- c. Select the appropriate ammunition or TOW type.
- d. Determine the appropriate weapon engagement techniques to employ.

**Note:** Techniques vary based on the target being hard or soft, ground or aerial, and whether it is a point or area target.

- e. Determine the mode of fire to engage the target(s).
  - (1) Employ precision gunnery if all systems are fully functional.
  - (2) Employ degraded gunnery if the fire control or weapon systems are not fully functional.
- f. Confirm target.

**Note:** Target confirmation is the rapid verification of the initial identification and discrimination of the target and is usually done by the vehicle commander. If gunners confirm that the target is hostile, they complete their final lay and engage the target on order. If gunners determine that the target is friendly or neutral, they announce their confirmation to the BFV commander (FRIENDLY or NEUTRAL). If they cannot determine the

nature of the target, they announce UNKNOWN. The BFV commander then confirms the target is in the gunner's field of view and conducts the combat identification process again.

- (1) Receive target confirmation from the vehicle commander.
  - (2) Use personal observation when given a fire and adjust command.
4. Engage target(s).
- a. Arm the system by moving the ARM-SAFE-RESET switch to ARM.
  - b. Ensure a correct sight picture.
  - c. Apply a lead, as appropriate, unless employing the kinetic lead on the A3 or firing a TOW missile.
  - d. Fire on targets using appropriate aiming and engagement techniques.
    - (1) Fire the 25-mm gun using against a point (hard) target, a point (soft) target, an area target, or an aerial target.
    - (2) Fire the coaxial machine gun against a point target, an area target, or an aerial target.
    - (3) Fire a TOW missile against a point target or an aerial target.
  - e. Observe the target for effects or location of a miss.
5. Assess effects on target.
- a. Announce the effects on the target or the results of an observed miss.
  - b. Receive assessment of effects on a target from the vehicle commander, if observed.
- Note:** The vehicle commander is ultimately responsible for assessing the effects on a target to determine when to cease fire against the target, when to shift fire to another target when multiple targets are present, and when to tactically move from one fighting position to another.
- c. Determine how to adjust fire on the target(s).
    - (1) Use the re-engage method.
    - (2) Use the standard adjustment method.
  - d. Continue to engage the target until the target is destroyed or the vehicle commander announces cease fire.
  - e. Move the ARM-SAFE-RESET switch to SAFE, if engagements are complete.
  - f. Return to step 2, identify target(s), if there is another target to engage.

Performance Measures	GO	NO-GO
1. Detected target(s).	_____	_____
2. Identified targets as threat and nonthreat targets.	_____	_____
3. Decided on target engagement.	_____	_____
4. Engaged target(s).	_____	_____
5. Assessed effects on target(s).	_____	_____

References Required	Primary
TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Turret	FM 3-20.21/MCWP 3-12.2 Heavy Brigade Combat Team (HBCT) Gunnery
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) and Fighting Vehicle, Cavalry M3A2 (2350-01- 248-7620) (EIC: ALH) Turret	

**071-024-0006**

**Perform a Function Check on the 25-millimeter Gun on a Bradley Fighting Vehicle**

**CAUTION**

Dry fire checks should be performed in exact sequence to prevent damage to the 25-millimeter (mm) gun.

**Conditions:** You are a gunner on Bradley fighting vehicle (known as BFV) and have just completed servicing the 25-mm gun. You must now ensure that the gun is fully operational.

**Standards:** Clear and perform a dry fire operation on the 25-mm gun to ensure it operating correctly. Restore the 25-mm gun to operational configuration.

**Note:** A function check on the 25-mm gun is accomplished by dry firing the 25-mm gun. The 25-mm gun may be dry fired manually or electronically.

**Performance Steps**

1. Clear the 25-mm gun.

**Note:** If you have just installed the feeder after unloading the feeder or after maintaining the gun, then clearing the gun was already accomplished. However, if you are not positive that the gun is clear, then you must clear the gun. Additionally, after unloading the feeder, the BFV controls will be in the proper position for conducting a function check (dry fire).

2. Prepare the BFV for dry fire operation of the 25-mm.

- a. Move TURRET DRIVE switch to OFF.
- b. Move TURRET POWER switch to OFF.
- c. Move ARM-SAFE-RESET switch to OFF.
- d. Remove 25-mm gun guard.
- e. Open gun cover.
- f. Move manual safe handle to SAFE position.

3. Verify that bolt is in SEAR position.

**Note:** If the bolt position indicator is not in the sear position, then either the feeder was not cycled fully during installation or the feeder is not operating properly.

- a. Cycle the bolt until the bolt position indicator moves into the SEAR position.
- b. Check that drive shaft handle does not turn over  $\frac{1}{2}$ -inch (13 mm).

4. Conduct an electronic dry fire of the 25-mm gun.

- a. Ready the turret.

- (1) Move TURRET POWER switch to ON.
  - (2) Move TURRET DRIVE switch to ON.
- b. Check initial ammunition selection indicator lights.
- (1) Select AP mode of fire (AP SS in A2 ODS, A2, and A1 variants).
  - (2) Move ARM-SAFE-RESET switch to ARM.
  - (3) Check that ARM indicator light comes ON.
  - (4) Check that SEAR/MISFIRE indicator light is ON.
  - (5) Check that LO AMMUNITION indicator light flashes.
  - (6) Press LO AMMUNITION OVRD button.
  - (7) Check that LO AMMUNITION OVRD becomes steady.
- c. Check function of MISFIRE indicators.

- (1) Fire the gun by squeezing gunner's palm and trigger switches.

**Note:** When the trigger switches are squeezed, the 25-mm automatic gun will dry fire and cycle to MISFIRE position because no ammunition is in the 25-mm automatic gun.

- (2) Check that bolt position indicator is in MISFIRE position.
  - (3) Check that SEAR/MISFIRE indicator light flashes when gun is in MISFIRE position.
- d. Check function of SEAR indicators.
- (1) Press MISFIRE button.
  - (2) Check the SEAR/MISFIRE indicator light goes out.
  - (3) Fire the gun by squeezing gunner's palm and trigger switches.

**Note:** When SEAR/MISFIRE button is pressed and palm and trigger switches squeezed, 25-mm gun will cycle to SEAR position and SEAR/MISFIRE indicator light will come on steady.

- (4) Check that bolt position indicator moves to SEAR position.
  - (5) Check that SEAR/MISFIRE indicator light comes on steady.
- e. Repeat steps 4b through 4d for all other modes of fire.
- f. Verify reset functioning of indicator lights.
- (1) Move ARM-SAFE-RESET switch to RESET.
  - (2) Move ARM-SAFE-RESET switch to SAFE.
  - (3) Check that ARM, AP, LO AMMUNITION OVRD, and SEAR/MISFIRE indicator lights go out.

5. Conduct a manual dry fire of the 25-mm gun, as required.

**Note:** A manual dry fire is accomplished by manually cycling the 25-mm gun through all the steps of the firing cycle by using a hand crank. A dry fire cycle of the 25-mm gun requires the hand crank assembly to be fully rotated nine times.

- a. Install hand crank assembly on manual drive gear hub.
- b. Cycle the bolt to misfire position by turning hand crank assembly to the right.

**Note:** Hand crank assembly will be hard to turn when bolt position indicator passes through FIRE position. Hand crank assembly will stop turning when bolt position indicator is in MISFIRE position.

- c. Cycle the bolt out of misfire position.
  - (1) Press and hold SEAR release.
  - (2) Turn hand crank assembly right one-half turn.
  - (3) Release sear release.
  - (4) Turn hand crank assembly until bolt locks in SEAR position.

**Note:** Bolt position indicator will stop in SEAR position.

- d. Remove hand crank assembly.
6. Restore the 25-mm gun to operational configuration.
  - a. Close the gun cover.
  - b. Install the 25-mm gun guard.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the 25-mm gun.	_____	_____
2. Prepared the BFV for dry fire operation of the 25-mm gun.	_____	_____
3. Verified that the bolt was in SEAR position.	_____	_____
4. Conducted an electronic dry fire of the 25-mm gun.	_____	_____
5. Conducted a manual dry fire of the 25-mm gun. (optional)	_____	_____
6. Restored the 25-mm gun to operational configuration.	_____	_____

References Required	Primary
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) (EIC: APA) M2A1 (2350-01-179-1027) (EIC: ALE) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) (EIC: APB) M3A1 (2350-01-179-1028) (EIC: ALF) Turret	TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01-248-7620) (EIC: ALH) Turret	

**071-314-0012**

**Fire the 25-millimeter Gun on a Bradley Fighting Vehicle M2A2/M3A2  
Operation Desert Storm**

**Conditions:** You are a gunner on an M2A2/M3A2 Operation Desert Storm Bradley fighting vehicle and stationary or moving enemy targets (point or area) have been identified in your sector of fire. Based on the type target(s), you have been directed to engage the target with the M242 25-millimeter (mm) gun. The gun is loaded, the appropriate sight cover (day or night) is open, and manual safety has been disengaged.

**Standards:** Verify vehicle is ready for 25-mm gun engagement. Acquire the target and select ammunition type and rate of fire. Track and determine range to target. Engage the target with the 25-mm gun and cease fire on target(s) once destroyed, suppressed, or an order to cease fire is received.

**Performance Steps**

1. Verify vehicle is ready for 25-mm gun engagement.
  - a. Check that the gun MALF annunciator light is OFF.
  - b. Check that SEAR/MISFIRE indicator light is ON.
2. Acquire the target.
  - a. Press and hold palm switches.
  - b. Center target in sight display.
  - c. Move MAG switch to HIGH until it clicks.
  - d. Center reticle on target.
  - e. Identify target as friend or threat.
3. Select ammunition type and rate of fire.

**Note:** When a feed change is made, the first round fired will be the same as the previous round. However, the automatic elevation correction for range is already set for the new ammunition. A high explosive (HE) round fired using armor piercing (known as AP) superelevation correction will fall short. An AP round fired using HE superelevation correction will fall long.

- a. Select the appropriate ammunition type, AP or HE.
    - (1) Move the ammunition-type toggle switch to the appropriate ammunition type for the target.
    - (2) Observe that the indicator light for the selected ammunition illuminates.
  - b. Move the rate of fire toggle switch to the desired rate of fire.
4. Determine range to target.
    - a. Find range of target using the eyesafe laser range finder (known as ELRF).
      - (1) Verify the ELRF switch is in the ON position.

- (2) Pull ELRF switches backward on the gunner's control handles (known as GCH).
- (3) Check for multiple returns indicator in the range field of the reticle.

**Note:** If the four digit display blinks in either return position, the laser is supplying “multiple returns” range information from more than one object in the path of the laser beam. If weapon indicators (AP, HE, 7.62, or TOW) blink, target(s) are out of range for that particular weapon.

- (a) If multiple returns are not displayed, range shown below reticle is accurate.
- (b) If multiple returns are displayed, center reticle on a different place on the target and lase again.
  - \_1\_ If multiple returns are still displayed, move laser range finder (LRF) switch on gunner's station control panel (known as GSCP) to FIRST and then to LAST.
  - \_2\_ Read the two ranges displayed on sight when switch is moved.
  - \_3\_ Visually estimate the location of the target in relation to objects that might be causing the multiple returns.
  - \_4\_ If the target is close to either the first or last return range, move LRF switch on GSCP to FIRST or LAST as needed.
  - \_5\_ Turn MANUAL RANGE switch on GSCP to desired range.

b. Find range of target using range finder in reticle.

- (1) Center target between stadia line and baseline in reticle.
- (2) Read range of target at point where target touches both stadia line and baseline.
- (3) Turn MANUAL RANGE switch on GSCP to desired range.

5. Track the target.

**Note:** Maintain the target centered in reticle by traversing turret or elevating/depressing the gun as needed.

- a. Center reticle on target.
- b. Traverse turret or elevate/depress the gun as needed to keep the target centered in the reticle.

**WARNING**

**Noise from weapon can damage hearing of Soldiers in or near vehicle. Use earplugs and other hearing protectors when gun is operated.**

6. Engage the target with the 25-mm gun.

- a. Move the ARM-SAFE-RESET switch to ARM position.

**Note:** If the LO AMMO OVRD (low ammunition override) indicator light flashes on the system control box, you can push the LO AMMO OVRD button and continue to fire or stop firing and reload.

- b. Fire a sensing round (two rounds if the ammunition selection was just changed) by squeezing the appropriate trigger.

- (1) Announce ON THE WAY.

- (2) Squeeze and hold the palm switch then squeeze and release trigger switch on the GCH.

- (3) Sense the round(s) impact.

**Note:** When the ammunition change is made, the first round fired is the same as the previous round. However, automatic elevation correction for the range is set for the new ammunition selection. If one HE round is fired using the AP superelevation correction, the round will fall short of the target. If one AP round is fired using the HE superelevation correction, the round will fall past the target.

- (a) React to rounds impacting the target.

- \_1\_ Announce TARGET.

- \_2\_ Maintain the same sight picture.

- \_3\_ Fire a killing burst (three to five rounds).

- (b) React to rounds missing the target.

- \_1\_ Announce the location of the rounds, if observed.

**Note:** For manual firing the commander announces the turret corrections to adjust fire.

- \_2\_ Adjust fire using the re-engage method (known as ELRF only) or the standard method.

- \_3\_ Announce ON THE WAY.

- \_4\_ Fire a killing burst (three to five rounds).

7. Cease fire on target(s) once destroyed, suppressed, or you receive an order to cease fire.

**Note:** The Bradley commander normally determines when to cease fire against a target, when to shift fire to another target when multiple targets are present, and when to tactically move from one fighting position to another.

- a. Move the ARM-SAFE-RESET switch to RESET, then to SAFE.

- b. Scan for targets.

- (1) Turn the MAG switch to change the magnification to LOW.

- (2) Scan your sector.

Performance Measures	GO	NO-GO
1. Verified vehicle was ready for 25-mm gun operations.	_____	_____
2. Acquired the target.	_____	_____
3. Selected ammunition type and rate of fire.	_____	_____
4. Determined range to target.	_____	_____
5. Tracked the target.	_____	_____
6. Engaged the target with the 25-mm gun.	_____	_____
7. Ceased fire on target(s) once destroyed, suppressed, or you received an order to cease fire.	_____	_____

References Required	Primary
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH)	FM 3-20.21/MCWP 3-12.2 Heavy Brigade Combat Team (HBCT) Gunnery

071-024-0007

## Load the 25-millimeter Gun Feeder on a Bradley Fighting Vehicle

**Conditions:** You are a gunner on a Bradley fighting vehicle (known as BFV) and must load the 25-millimeter (mm) gun feeder. You have the vehicle's basic issue items, an assisting crewmember, and 25-mm armor piercing (known as AP) and high explosive (HE) ammunition loaded in appropriate ammunition cans.

**Standards:** Prepare the BFV controls for loading, prepare the gun for loading, load the HE ammunition, load the AP ammunition, and replace the gun cover and guard. Ensure the proper ammunition has been loaded and 25-mm gun feeder is operable.

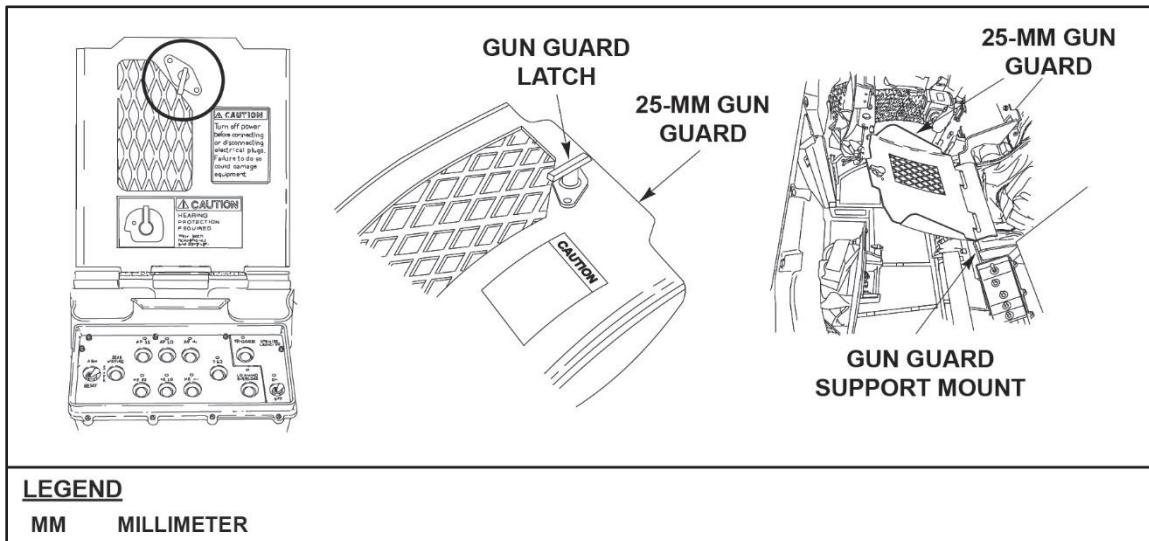
### Performance Steps

1. Prepare the BFV.
  - a. Ensure the MASTER POWER switch is ON.
  - b. Ensure the turret power is in OFF position.
  - c. Ensure the turret drive system switch is in OFF position.
  - d. Ensure the ARM-SAFE-RESET switch is in SAFE position.
2. Prepare the gun.

#### **WARNING**

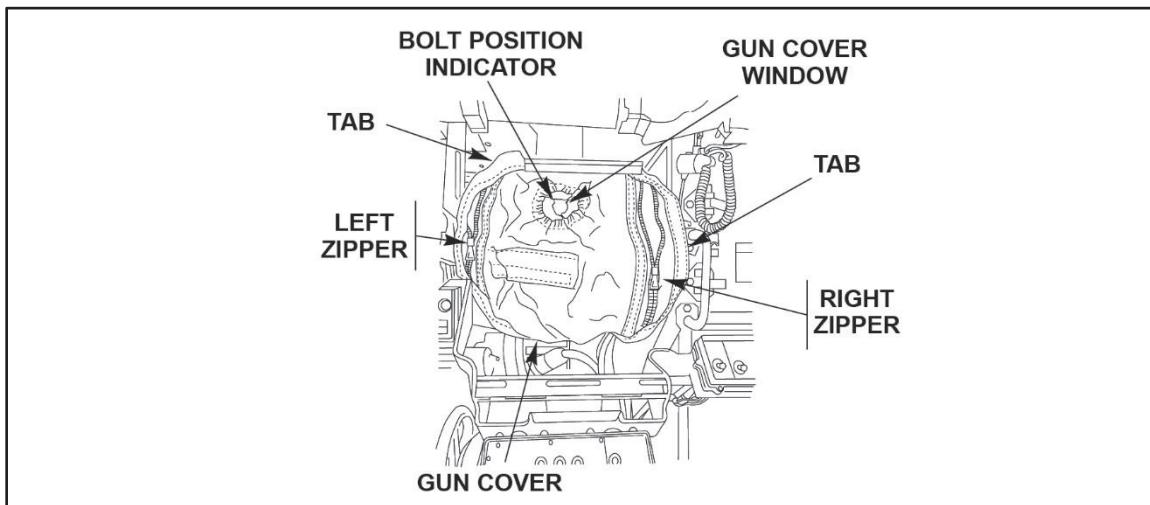
**Operating the 25-mm gun can move and crush hands when the gun guard is removed.**

- a. Remove the gun guard and open the gun cover (see figure 3-254).



**Figure 3-254. 25-millimeter gun guard**

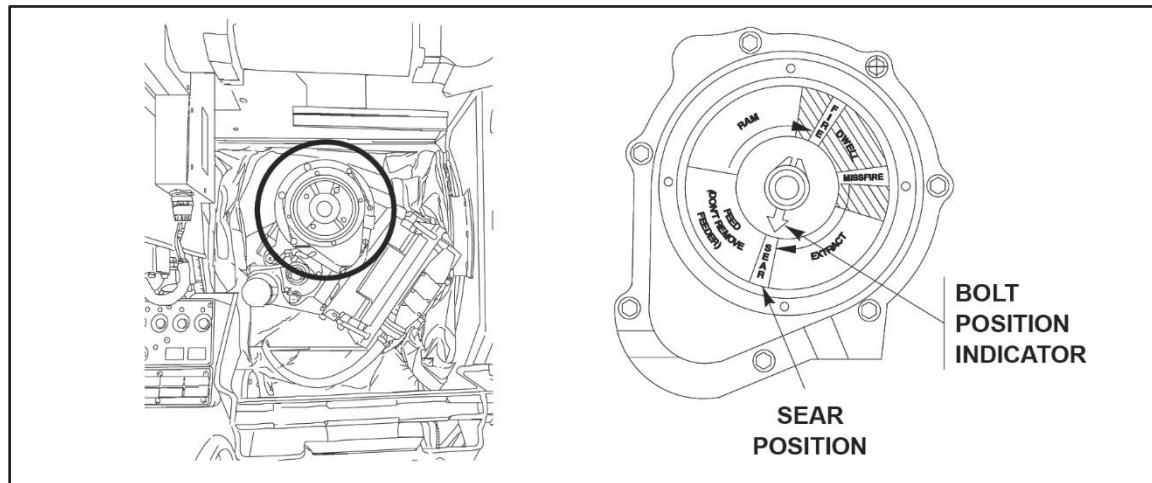
- (1) Turn the gun guard latch to right.
  - (2) Lower the gun guard.
  - (3) Remove the gun guard from gun guard support mount.
- b. Open the gun cover (see figure 3-255).



**Figure 3-255. 25-millimeter gun cover**

- (1) Lift the tab from over left and right zippers.
  - (2) Unzip the left and right zippers.
  - (3) Pull the gun cover window away from bolt position indicator.
  - (4) Fold the gun cover down and out of the way of the gun.
- c. Ensure the 25-mm gun manual safe handle is in SAFE position.
- d. Verify bolt position indicator is in SEAR position (see figure 3-256, page 3-646).

**Note:** The 25-mm gun feeder must be timed if the bolt position indicator is not in the SEAR position.



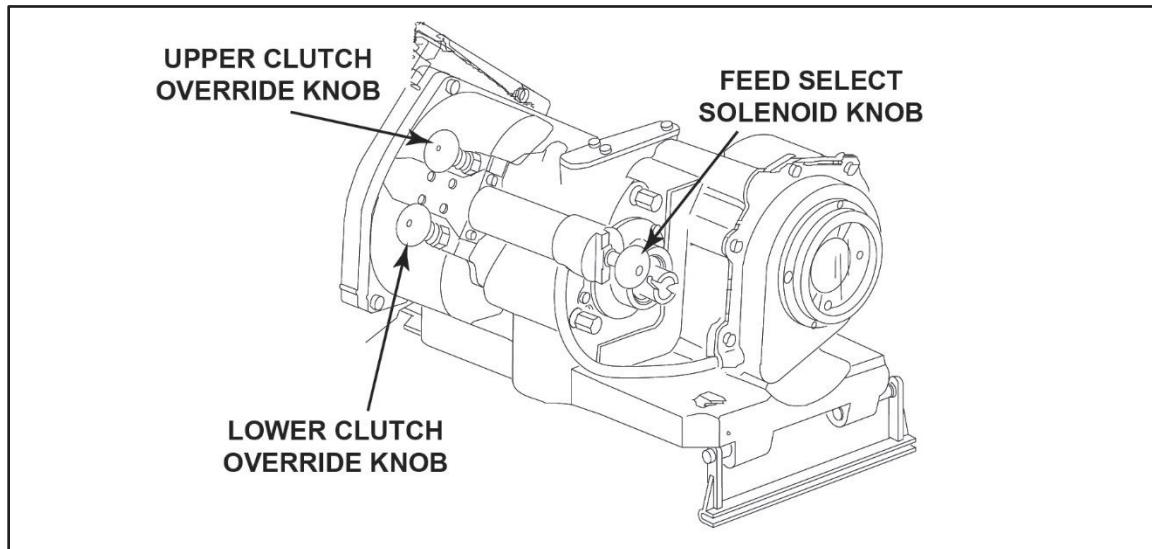
**Figure 3-256. Bolt position indicator in SEAR position**

- e. Manually elevate the 25-mm gun to 200 mils.
  - (1) Move gun elevation drive select lever to MANUAL position.
  - (2) Remove spring from handle.
  - (3) Manually elevate or depress the gun.
  - (4) Install spring on handle.
  - (5) Move gun elevation drive select lever to POWER position.

**CAUTION**

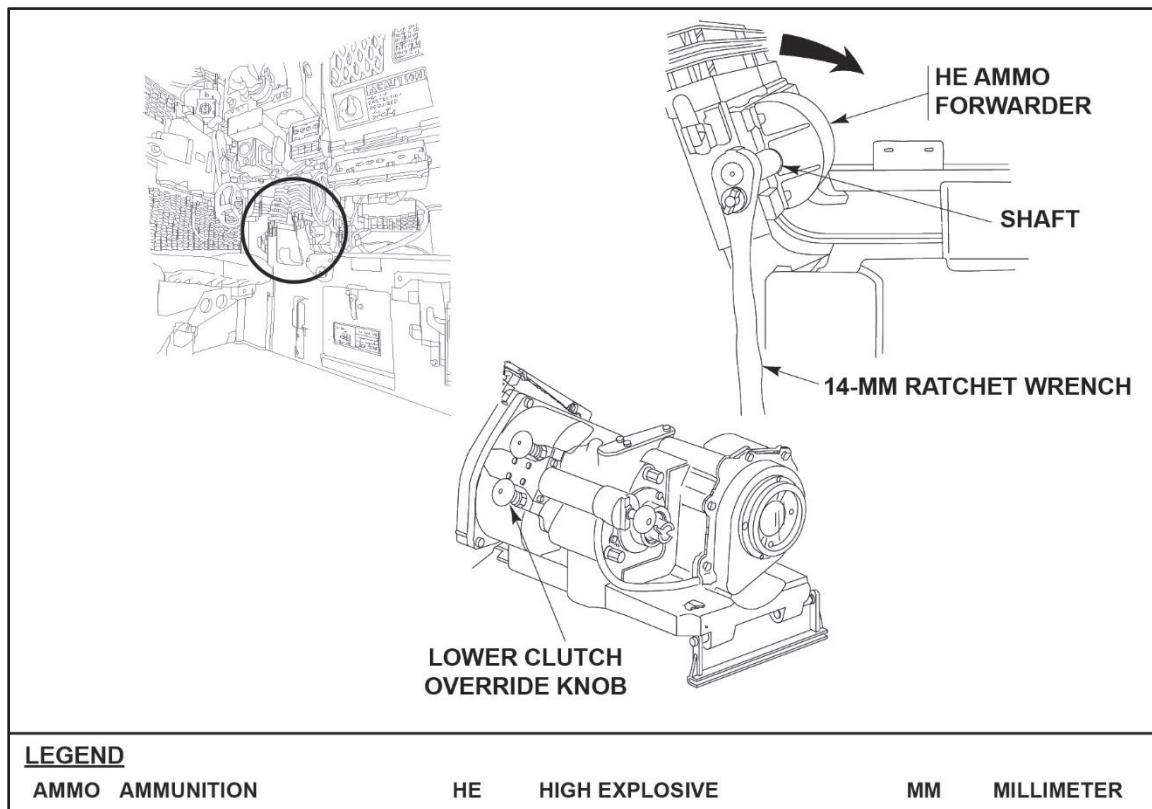
Do not cycle 25-mm gun feeder with feed select solenoid knob part way in AP or HE position, as doing so could damage the feeder. If a nose cap is missing or falls off, do not attempt to replace the nose cap.

3. Load the HE ammunition.
  - a. Pull out the feed select solenoid knob to the HE position (see figure 3-257).



**Figure 3-257. Feed select solenoid and clutch override knobs**

- b. Forward HE ammunition to the gun feeder (see figure 3-258).



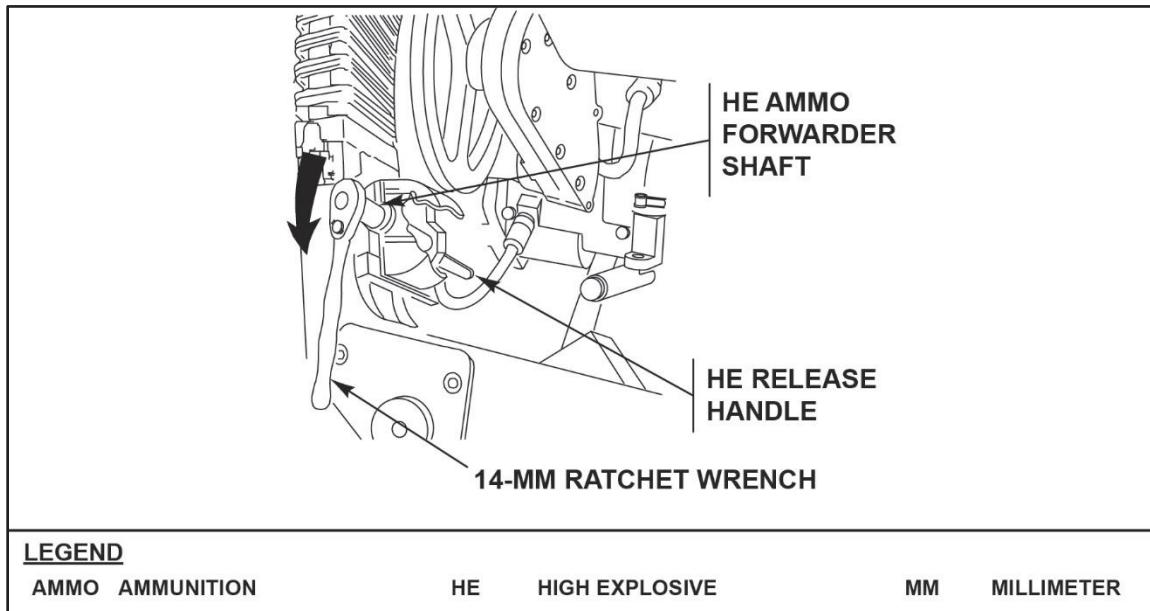
**Figure 3-258. Forwarding high explosives ammunition to 25-millimeter gun feeder**

- (1) Put the 14-mm ratchet wrench on the shaft of HE ammunition forwarder with wrench handle pointing down.
- (2) Slide first ammunition link into link stripper of gun feeder by hand.

- (3) Turn HE ammunition forwarder shaft right until the lower clutch override knob starts to come out.

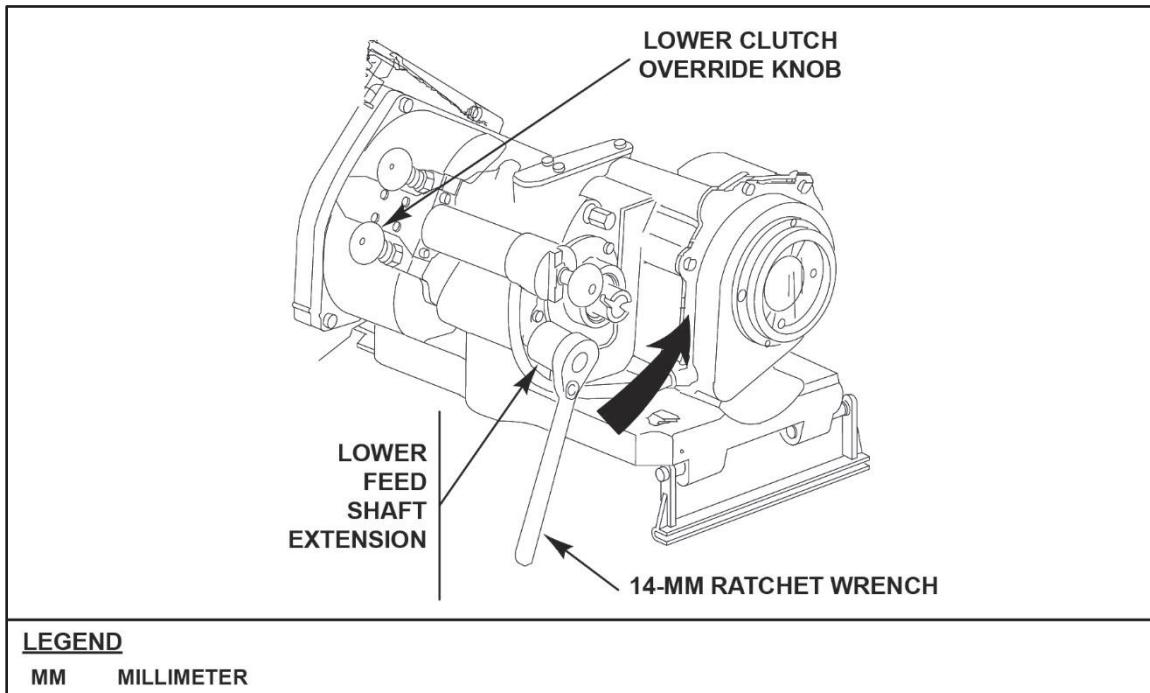
**Note:** The lower clutch override knob will come out about  $\frac{1}{4}$  inch and go back in as each round is loaded. Notify the chain of command if the lower clutch override knob fails to come out.

- (a) If HE ammunition jams, go to step c.
- (b) If HE ammunition does not jam, remove ratchet wrench and go to step d.
- c. Download jammed HE ammunition, if necessary. (See figure 3-259.)



**Figure 3-259. Downloading high explosive ammunition**

- (1) Put upward pressure on the 14-mm ratchet wrench.
- (2) Hold HE release handle up while turning HE ammunition forwarder shaft left.
- (3) Let go of HE release handle.
- (4) Turn HE ammunition forwarder shaft left until HE release handle pops back into place.
- (5) Repeat steps c(1) through (4) above until all HE ammunition clears the gun feeder.
- (6) Return to step 3b (forward HE ammunition to 25-mm gun feeder).
- d. Load 25-mm gun feeder with two rounds of HE ammunition (see figure 3-260).



**Figure 3-260. Loading two high explosive rounds**

- (1) Put the 14-mm ratchet wrench on lower feed shaft extension.
- (2) Turn the lower feed shaft extension to right until the lower clutch override knob goes in the second time.
- e. Remove tension off HE ammunition.
  - (1) Move the 14-mm ratchet wrench to the HE ammunition forwarder.
  - (2) Turn the HE ammunition forwarder shaft slightly right.
  - (3) Lift the HE release handle.
  - (4) Turn the HE ammunition forwarder shaft to left, taking tension off HE ammunition.
  - (5) Turn the HE ammunition forwarder shaft right until lower clutch override knob is fully seated.

**WARNING**

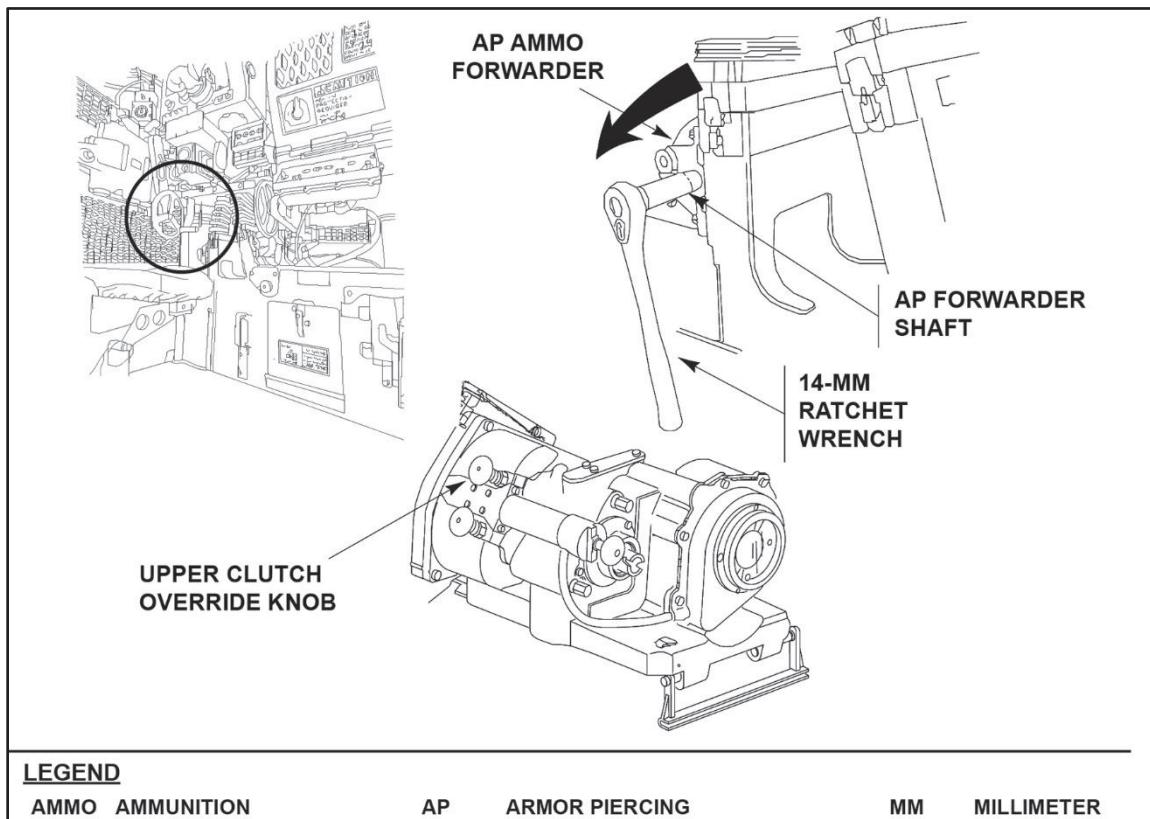
The M919 sabot round uses a depleted uranium penetrator, which emits low levels of radiation. Wear gloves when handling depleted uranium or M919 rounds. Wash hands before eating or touching your face. If you note depleted uranium corrosion (yellow or white powder or stain) on the surface of the round, dispose of gloves in accordance with DA Pam 385-24.

4. Load AP ammunition.

- a. Push in the feed select solenoid knob to AP position.

**Note:** Notify the chain of command if the upper clutch override knob fails to come out.

- b. Forward the AP ammunition to the 25-mm gun feeder (see figure 3-261).

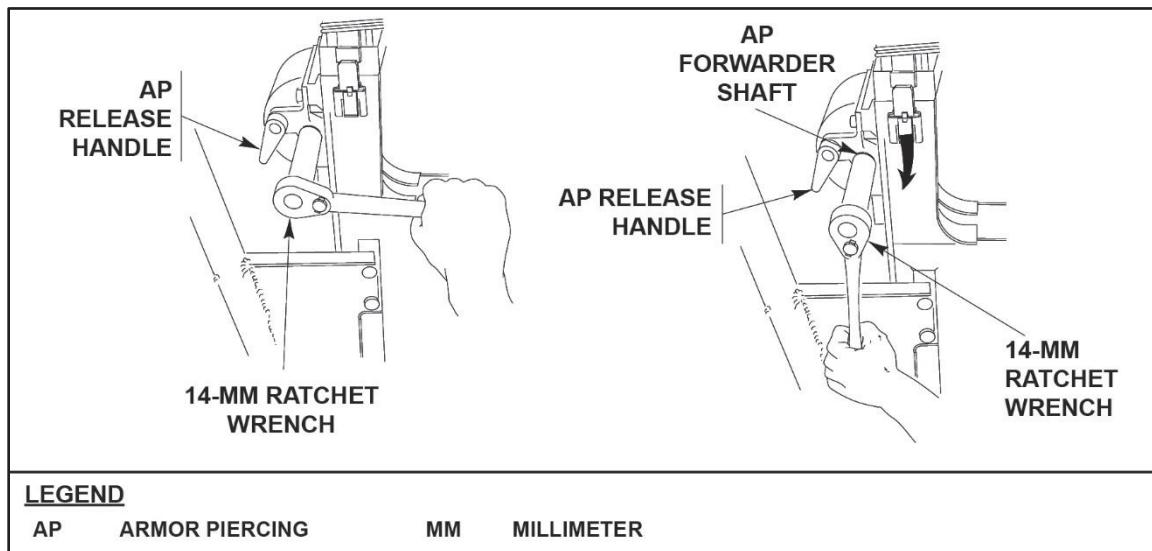


**Figure 3-261. Forwarding armor piercing ammunition to 25-millimeter gun feeder**

- (1) Put the 14-mm ratchet wrench on the shaft of AP ammunition forwarder with wrench handle pointing down.
- (2) Slide first ammunition link into link stripper of gun feeder by hand.
- (3) Turn AP ammunition forwarder shaft left until the upper clutch override knob starts to come out.

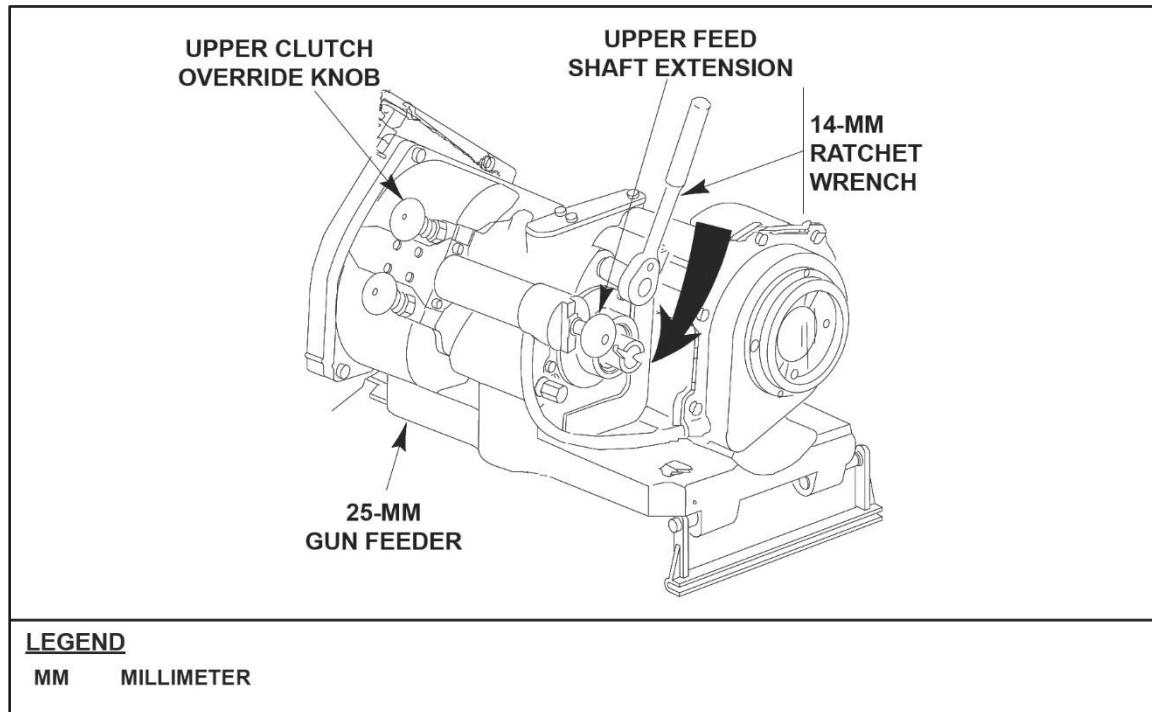
**Note:** The upper clutch override knob will come out about  $\frac{1}{4}$  inch and go back in as each round is loaded. Notify the chain of command if the lower clutch override knob does not come out.

- (a) If AP ammunition jams, go to step c.
- (b) If AP ammunition does not jam, remove ratchet wrench and go to step d.
- c. (For jammed AP ammunition only) Download jammed AP ammunition if the ammunition jams (see figure 3-262).



**Figure 3-262. Downloading armor piercing ammunition**

- (1) Put upward pressure on the 14-mm ratchet wrench.
  - (2) Hold AP release handle up while turning the wrench to the straight down position.
  - (3) Let go of the AP release handle.
  - (4) Turn AP ammunition forwarder shaft right until the AP release handle pops back into place.
  - (5) Repeat process (steps c[1] through c[4] above) until all AP ammunition is free from the 25-mm gun feeder.
  - (6) Return to step 4b (forward AP ammunition to the gun feeder) once all ammunition had cleared the gun feeder.
- d. Load 25-mm gun feeder with one round of AP ammunition (see figure 3-263, page 3-652).



**Figure 3-263. Loading one armor piercing round**

- (1) Put the 14-mm ratchet wrench on the upper feed shaft extension.
- (2) Turn the upper feed shaft extension left until the upper clutch override knob goes back in the first time.
- e. Take tension off the AP ammunition.
  - (1) Move the 14-mm ratchet wrench to AP ammunition forwarder.
  - (2) Turn the AP forwarder shaft slightly left.
  - (3) Lift the AP release handle.
  - (4) Turn the AP forwarder shaft right to take tension off AP ammunition.
  - (5) Turn the AP forwarder shaft left until upper clutch override knob is fully seated.
5. Replace gun cover and guard.
  - a. Close the gun cover.
    - (1) Pull the gun cover up and over the rear of the 25-mm gun.
    - (2) Place the gun cover window over the bolt position indicator.
    - (3) Zip the left and right zippers.
    - (4) Lower the tabs over left and right zippers.

- b. Install the 25-mm gun guard.
- (1) Place the gun guard in the gun guard support mount.
  - (2) Close the gun guard.
  - (3) Turn the gun guard latch to the left to lock the gun guard.

Performance Measures	GO	NO-GO
1. Prepared the BFV controls for loading.	_____	_____
2. Prepared the gun for loading the feeder.	_____	_____
3. Loaded HE ammunition.	_____	_____
4. Loaded AP ammunition.	_____	_____
5. Replaced gun cover and guard.	_____	_____

References Required	Primary
DA Pam 385-24 The Army Radiation Safety Program	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret
TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)	
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	

**071-024-0008**

## **Unload the 25-millimeter Gun Feeder on a Bradley Fighting Vehicle**

**Conditions:** You are the gunner on a Bradley Fighting Vehicle (known as BFV) and have been directed to unload the 25-millimeter (mm) gun feeder under usual conditions. Your BFV is stationary and the 25-mm is loaded with either armor piercing (known as AP) or high explosive (HE) ammunition. You have one crewmember to assist you.

**Standards:** Prepare the BFV controls for unloading, prepare the 25-mm gun, and remove the AP and HE link eject chute from the 25-mm gun feeder. Unload linked AP and HE ammunition from the 25-mm gun feeder and remove the gun feeder. Clear the 25-mm gun rotor, receiver, and chamber.

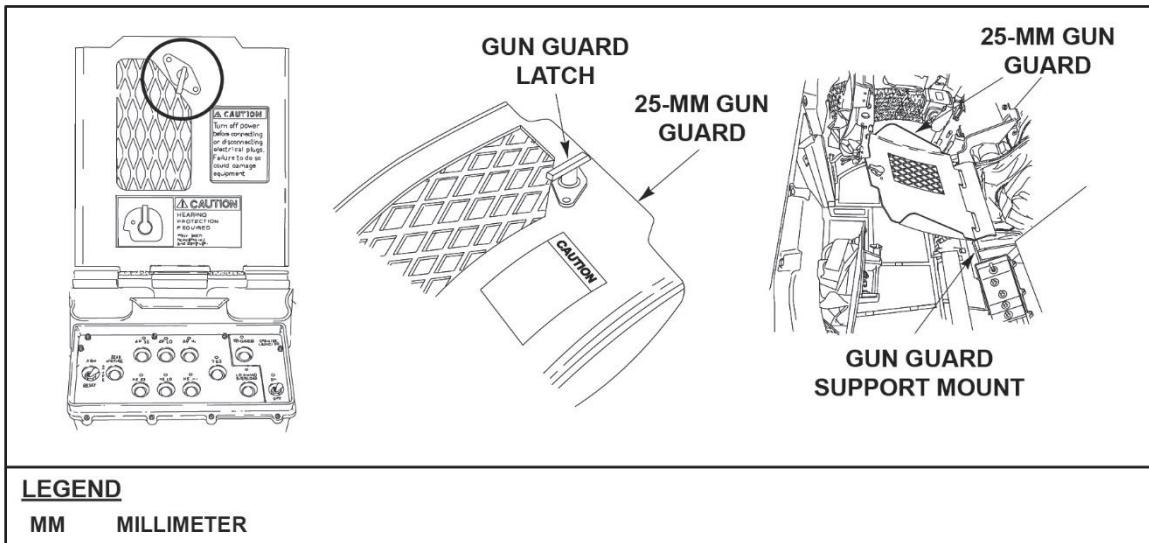
### **Performance Steps**

1. Prepare the BFV controls for unloading.
  - a. Set the MASTER POWER switch to ON.
  - b. Verify the turret power is in the OFF position.
  - c. Verify the turret drive system switch is in the OFF position.
  - d. Verify the ARM/SAFE/RESET switch is in the SAFE position.
  - e. Set the turret travel lock by pushing the travel lock lever to the LOCKED position.

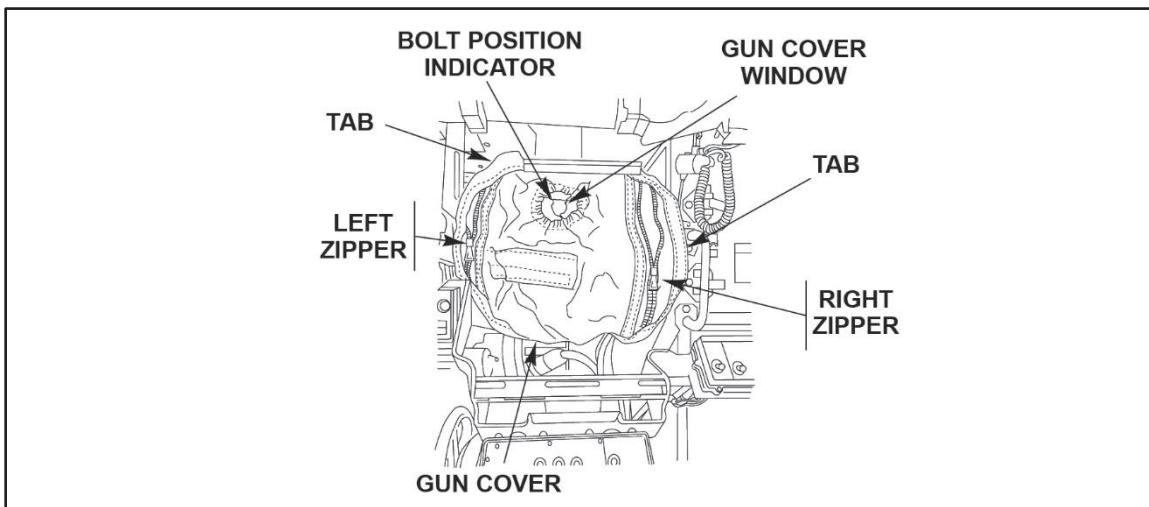
#### **WARNING**

**The 25-mm gun can move and crush hands when operated with the gun guard removed.**

2. Prepare the 25-mm gun.
  - a. Remove the 25-mm gun guard (see figure 3-264).

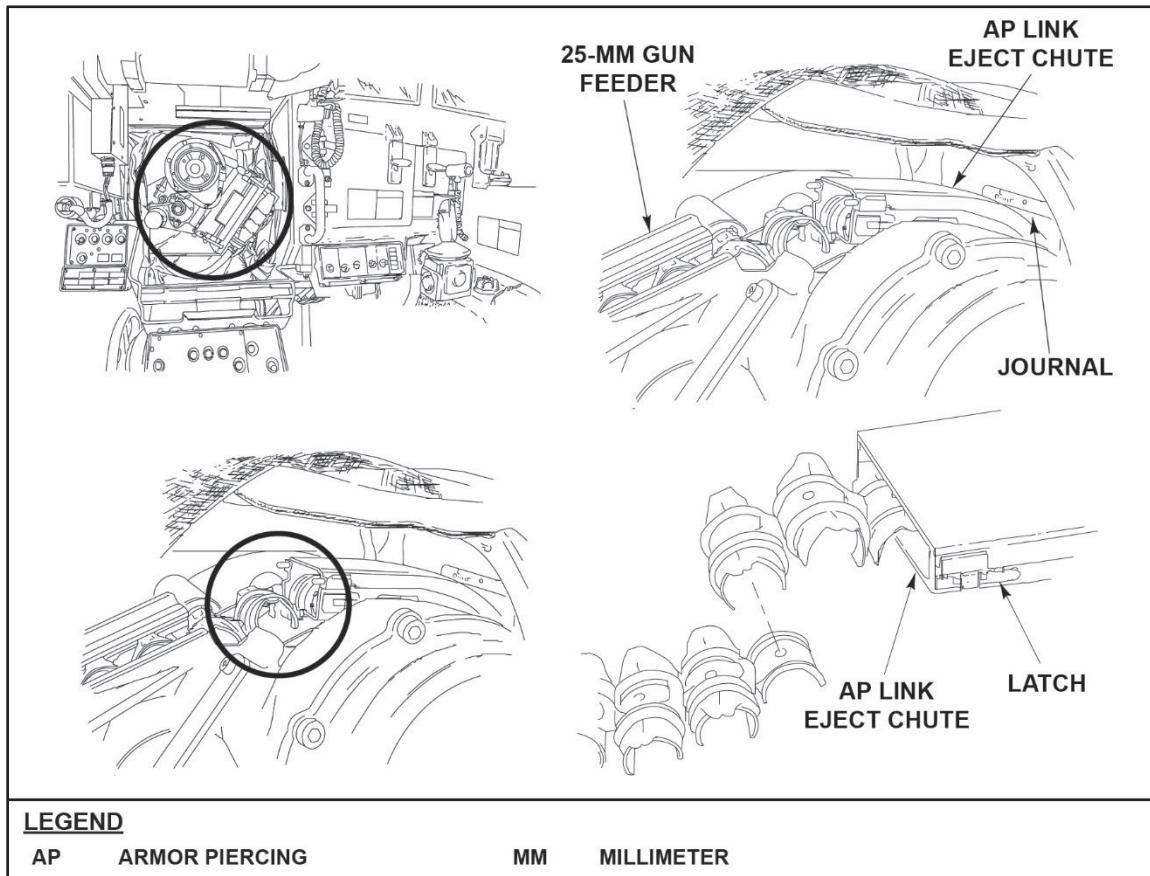
**Figure 3-264. 25-millimeter gun guard**

- (1) Turn the gun guard latch to the right.
  - (2) Lower the 25-mm gun guard.
  - (3) Remove the 25-mm gun guard from the gun guard support mount.
- b. Open the gun cover (see figure 3-265).

**Figure 3-265. 25-millimeter gun cover**

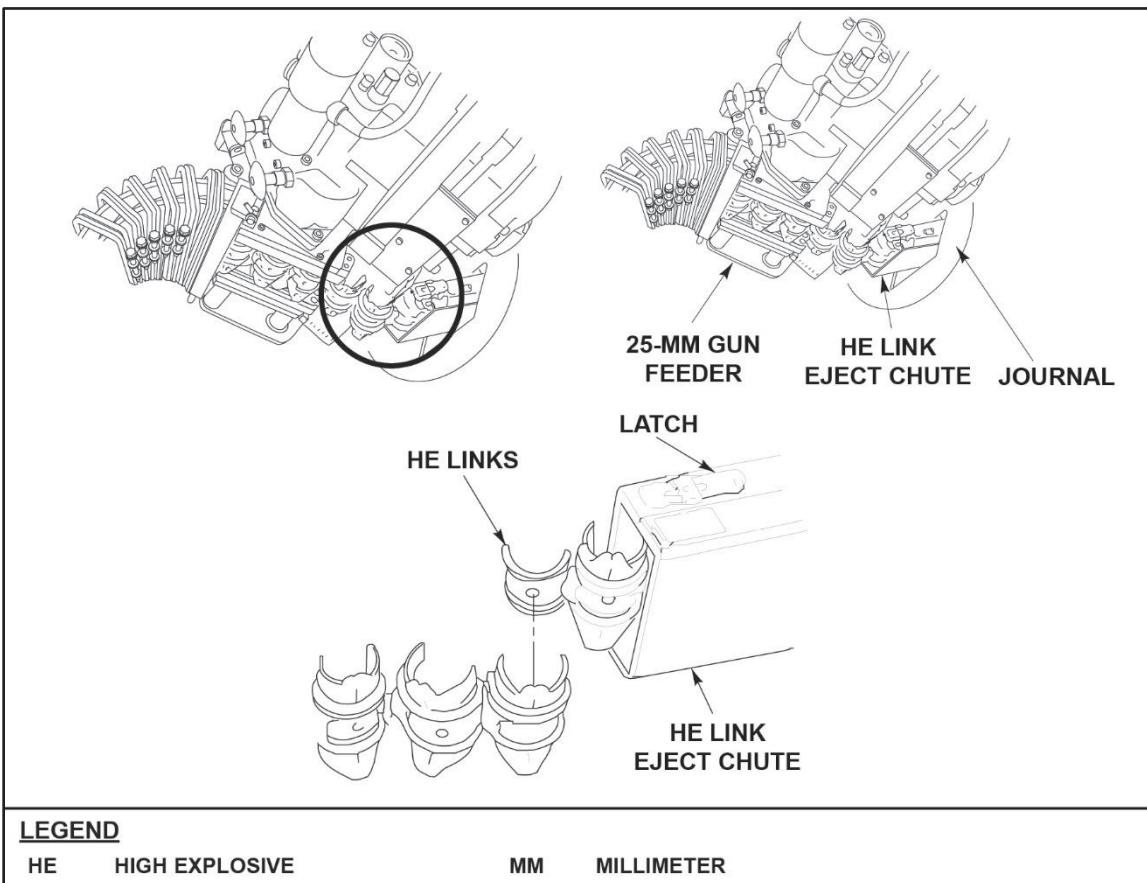
- (1) Lift the tab from over the left and right zippers.
- (2) Unzip the left and right zippers.
- (3) Pull the gun cover window away from the bolt position indicator.
- (4) Fold the gun cover down and out of the way of the 25-mm gun.

- c. Move the 25-mm gun manual safe handle to the SAFE position
3. Remove the AP link eject chute from the 25-mm gun feeder (see figure 3-266).



**Figure 3-266. Unloading armor piercing link eject chute**

- a. Squeeze and hold the latches.
  - b. Pull the AP link eject chute to the right and away from the 25-mm gun feeder.
  - c. Release the latches.
  - d. Disconnect the AP link in the AP link eject chute from the AP link coming out of the 25-mm gun feeder.
  - e. Remove the AP links from the AP link eject chute.
  - f. Remove the AP link eject chute from the journal by pulling up and left.
  - g. Place the AP link eject chute away from the 25-mm gun area.
4. Remove the HE link eject chute from the 25-mm gun feeder (see figure 3-267).



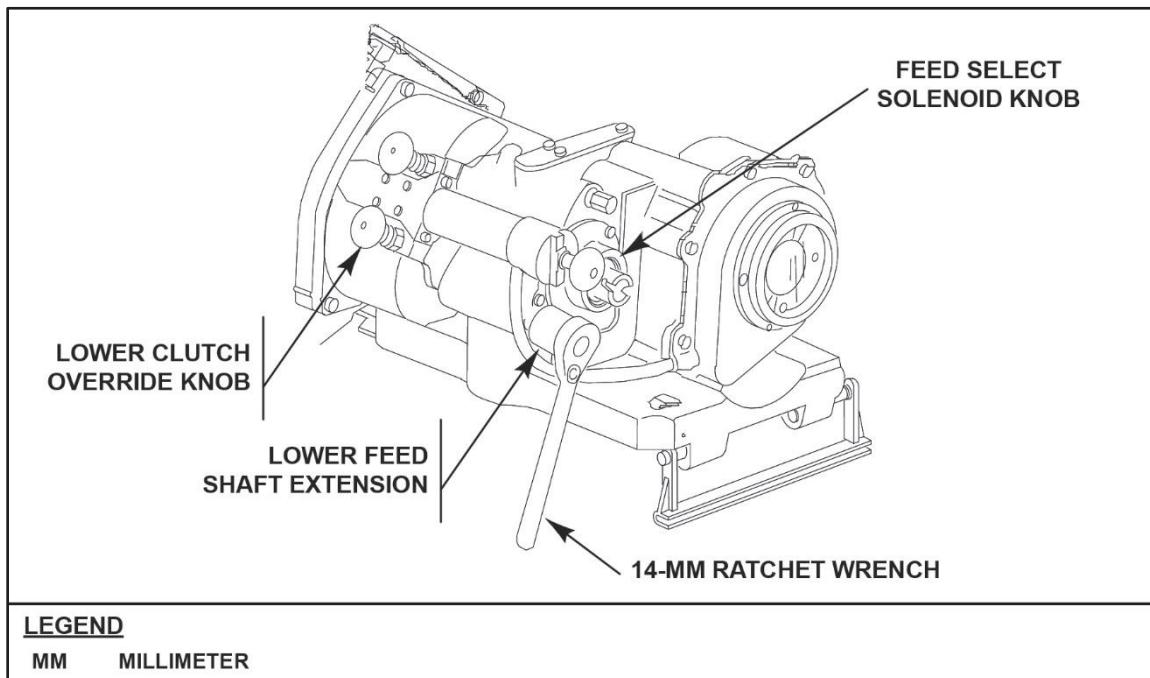
**Figure 3-267. Unloading high explosive link eject chute**

- a. Manually depress the gun to maximum depression.
- b. Squeeze and hold the latches.
- c. Pull the HE link eject chute to the right and away from the 25-mm gun feeder.
- d. Release the latches.
- e. Disconnect the HE link in the HE link eject chute from the HE link coming out of the 25-mm gun feeder.
- f. Remove HE links from the HE link eject chute.
- g. Remove the HE link eject chute from the journal by pulling up and left.
- h. Place the HE link eject chute away from the 25-mm gun area.

**WARNING**

The M919 sabot round uses a depleted uranium penetrator, which emits low levels of radiation. Wear gloves when handling depleted uranium or M919 rounds. Wash hands before eating or touching your face. If you note depleted uranium corrosion (yellow or white powder or stain) on the surface of the round, dispose of the gloves in accordance with DA Pam 385-24.

5. Unload the linked HE ammunition from the 25-mm gun feeder (see figure 3-268).



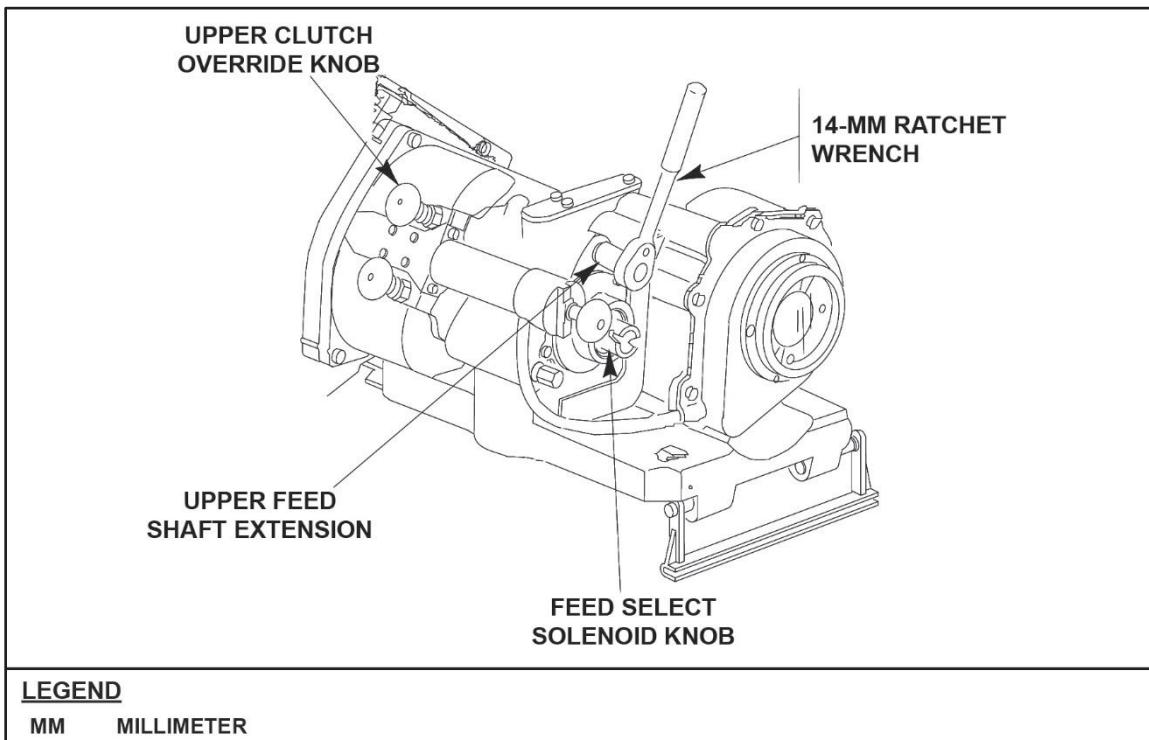
**Figure 3-268. Unloading high explosive ammunition from 25-millimeter gun feeder**

- a. Push in the feed select solenoid knob to the AP position.
- b. Place a 14-mm ratchet wrench on the lower feed shaft extension with the wrench handle straight down.
- c. Pull out and hold the lower clutch override knob until the next three steps are completed.

**Note:** It may be necessary to move the feed shaft extension back and forth to release the lower clutch override knob.

- d. Guide HE ammunition links onto the stripper rail while unloading the 25-mm gun feeder.
- e. Turn the 14-mm ratchet wrench clockwise until the last round of HE ammunition is clear of the feeder.
- f. Press the HE forwarder release lever as needed to release tension on the link in the HE ammunition chute.

- g. Release the lower clutch override knob.
  - h. Turn the 14-mm ratchet wrench left until the lower clutch override knob is seated.
  - i. Remove the 14-mm ratchet wrench.
6. Unload linked AP ammunition from the 25-mm gun feeder (see figure 3-269).



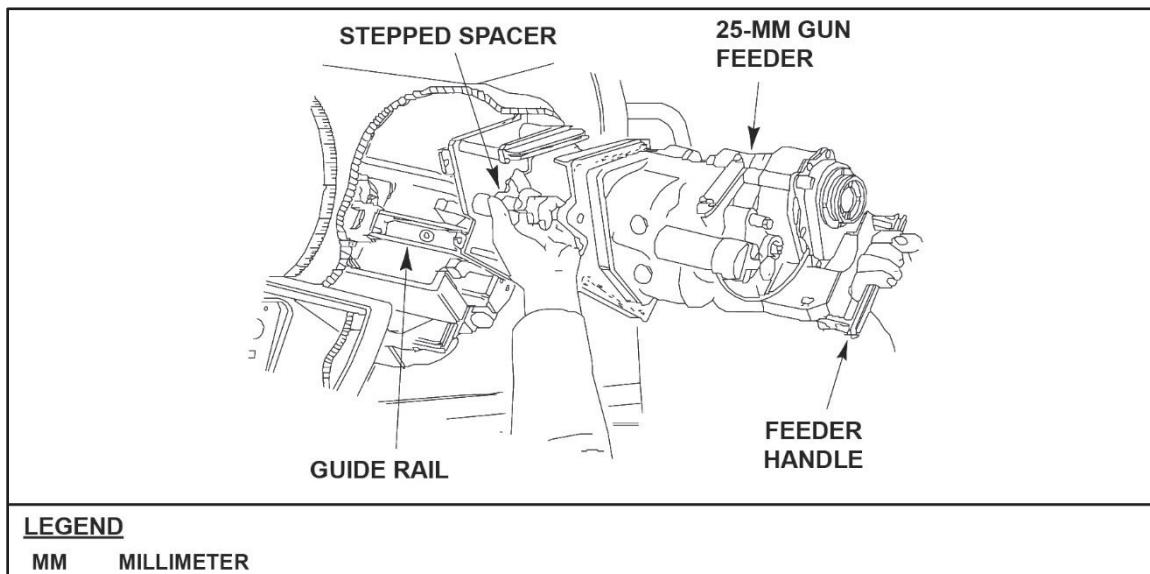
**Figure 3-269. Unloading armor piercing ammunition from 25-millimeter gun feeder**

- a. Pull out the feed select solenoid knob to the HE position.
- b. Place the 14-mm ratchet wrench on the upper feed shaft extension with the wrench handle up and to the right.
- c. Pull out and hold the upper clutch override knob until the next three steps are completed.

**Note:** It may be necessary to move the feed shaft extension back and forth to release the upper clutch override knob.

- d. Guide AP ammunition links onto the stripper rail while unloading the 25-mm gun feeder.
- e. Turn the 14-mm ratchet wrench left until the last round of AP ammunition clears the feeder.
- f. Press the AP forwarder release lever as needed to release tension on the links in the AP ammunition chute.
- g. Release the upper clutch override knob.
- h. Turn the 14-mm ratchet wrench left until the upper clutch override knob seats.

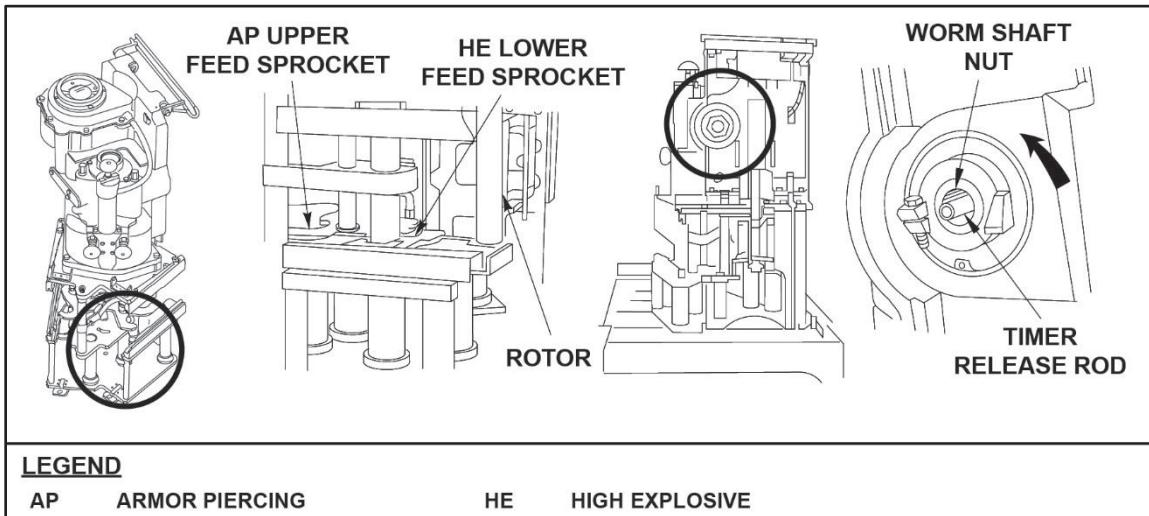
- i. Remove the 14-mm ratchet wrench.
7. Remove the 25-mm gun feeder (see figure 3-270).



**Figure 3-270. Remove 25-millimeter gun feeder**

- a. Push in the feed select solenoid knob to the AP position.
- b. Raise the feeder handle to the locked UP position.
- c. Remove the gun power cable from the receiver jack by—
  - (1) Pushing the cable plug in.
  - (2) Turning the cable plug to the left until unlocked.
  - (3) Pulling outward.
- d. Lower the feeder handle until it locks down.
- e. Remove the AP feed chute from the 25-mm gun feeder.
- f. Remove the HE feed chute from the 25-mm gun feeder.
- g. Manually elevate the gun to 200 mils.
- h. Pull out the drive shaft handle.
- i. Direct an assisting crewmember to raise the feeder handle.
- j. Grip the feeder handle with the right hand.
- k. Slide out the 25-mm gun feeder about 12 inches.
- l. Direct the assisting crewmember to lower the feeder handle.

- m. Grip the stepped spacer with the left hand.
  - n. Lift as you pull out the 25-mm gun feeder from the 25-mm gun receiver.
  - o. Lay the feeder down on a flat surface with the feeder handle facing upwards.
8. Clear the 25-mm gun rotor (see figure 3-271).



**Figure 3-271. Rotor area and timer release knob**

- a. Push the timer release rod down.
  - b. Turn the worm shaft nut left one turn.
  - c. Release the time release rod.
  - d. Continue turning the worm shaft nut until the round drops into the other hand.
9. Push in the drive shaft handle on the 25-mm gun receiver.

**Note:** Pushing in the drive shaft handle is only done to protect the drive shaft handle from damage while the feeder is removed.

10. Clear the 25-mm gun receiver.
- a. Remove the ammunition from face of the bolt if present.
  - b. Remove ammunition or links from the forward eject port, if present.
  - c. Remove ammunition from the chamber if present.
11. Clear the 25-mm gun chamber.
- a. Observe the chamber.
  - b. Remove any 25-mm rounds.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the BFV controls for unloading.	_____	_____
2. Prepared the 25-mm gun.	_____	_____
3. Removed the AP link eject chute from the 25-mm gun feeder.	_____	_____
4. Removed the HE link eject chute from the 25-mm gun feeder.	_____	_____
5. Unloaded linked HE ammunition from the 25-mm gun feeder.	_____	_____
6. Unloaded linked AP ammunition from the 25-mm gun feeder.	_____	_____
7. Removed the 25-mm gun feeder.	_____	_____
8. Cleared the 25-mm gun rotor.	_____	_____
9. Pushed in the drive shaft handle on the 25-mm gun receiver.	_____	_____
10. Cleared the 25-mm gun receiver.	_____	_____
11. Cleared the 25-mm gun chamber.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005)  
(EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2)  
Turret

**071-024-0004****Unload the 25-millimeter Armor-Piercing Discarding Sabot Tracer Ammunition Can on a Bradley Fighting Vehicle**

**Conditions:** You are a crewmember on a Bradley fighting vehicle and have been directed to unload the 25-millimeter (mm) armor piercing (known as AP) ammunition from the AP ammo can. You have another crewmember to assist.

**Standards:** Unload the AP ammunition can so that no rounds, expended cartridges, or links remain in the can. Stow ammunition in appropriate containers.

**Performance Steps****WARNING**

The M919 sabot round uses a depleted uranium penetrator, which emits low levels of radiation. Wear gloves when handling depleted uranium or M919 rounds. Wash hands before eating or touching your face. If you note depleted uranium corrosion (yellow or white powder or stain) on the surface of the round, dispose of the gloves in accordance with AR 385-10.

**CAUTION**

Empty ammunition links can jam 25-mm gun feeder if links do not align in stripper rail. Guide empty ammunition links onto stripper rail while ammunition is being unloaded from 25-mm gun feeder.

1. Prepare the turret for power mode.
  - a. Verify the 25-mm gun manual safe handle is in the SAFE position.
  - b. Set the MASTER POWER switch to ON.
  - c. Verify no one is on top of the vehicle.
  - d. Place the driver's hatch cover in the closed or pop-up position.
  - e. Place the cargo hatch cover in the closed or pop-up position.
  - f. (A3 only) Verify the emergency turret power shutdown switch is in the OFF position.

**Note:** The emergency turret power shutdown switch is located on the vehicle distribution box or, if equipped, the digital vehicle distribution box.

- g. Verify the turret shield door is closed and latched.
- h. Release the turret travel lock by pulling the travel lock lever all the way back to the OPEN position.

**CAUTION**

Lap safety belts hanging from the seat can get caught in the turret shield door opening and damage the turret. Ensure the lap safety belts are secured.

- i. Put on lap safety belts.
- j. Move the turret traverse drive select lever to the POWER position.
- k. Move the tow elevation drive select lever to the POWER position.
- l. Move the gun elevation drive select lever to the POWER position.
- m. (A3 only) Verify the emergency shutdown switch on the system control box is in the OFF position.
- n. Move the turret power switch to ON.
- o. (A2 only) Verify the relay box circuit breaker switch is in the ON position.
- p. (A2 ODS only) Verify the relay box's ten circuit breaker switches are all in the ON (up) position.
- q. Move the turret drive switch to the ON position.
- r. (A3 only) Verify the DRIVE MALF annunciator light is not lit.

**DANGER**

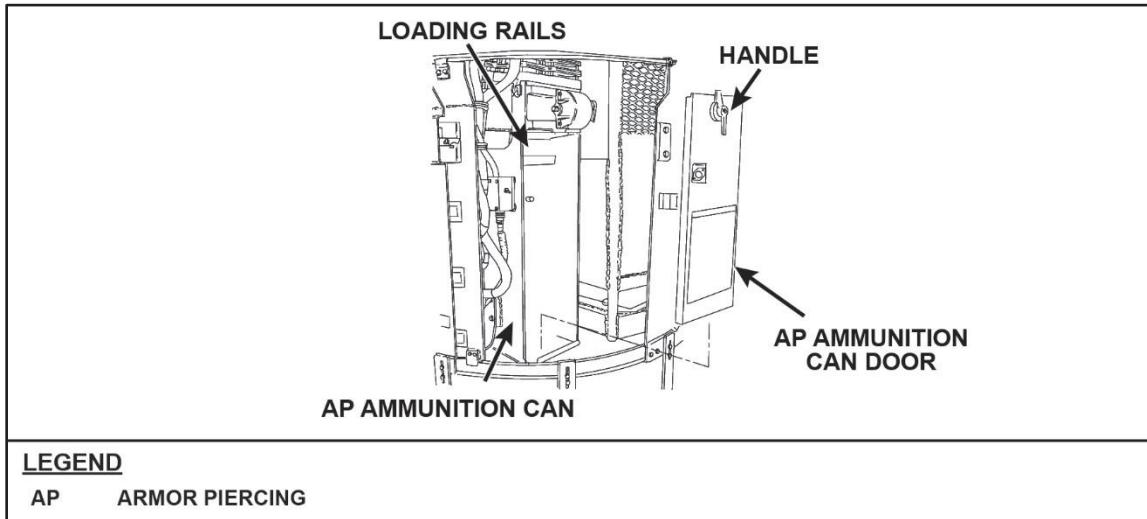
**The turret can rotate and severely injure or kill you. Do not reach through the turret shield opening when the turret power is on. Keep the turret shield door closed whenever the turret drive power is on. Engage the turret travel lock before moving or reaching through the turret shield opening.**

2. Traverse the turret to the AP load position (4,350 mils).
  - a. Verify the position of the turret by observing the azimuth indicator.
  - b. Squeeze and hold the palm switch(es) on the gunner's control handles or commander's control handle.
  - c. Turn the gunner's control handles or commander's control handle left or right until the turret azimuth indicator reads 4,350 mils.

**Note:** The turret traverses in the direction the handles are turned.

- d. Center the gunner's control handles or commander's control handle when the turret has traversed to the desired position.
- e. Release the palm switch(es).

3. Power down the turret.
  - a. Set the turret travel lock by pushing the travel lock lever to the LOCKED position.
  - b. Move the turret drive switch to OFF.
  - c. Move the turret power switch to OFF.
4. Open the turret shield door.
5. Remove the AP ammunition can door by turning the handle to the right and pulling outward. (see figure 3-272).



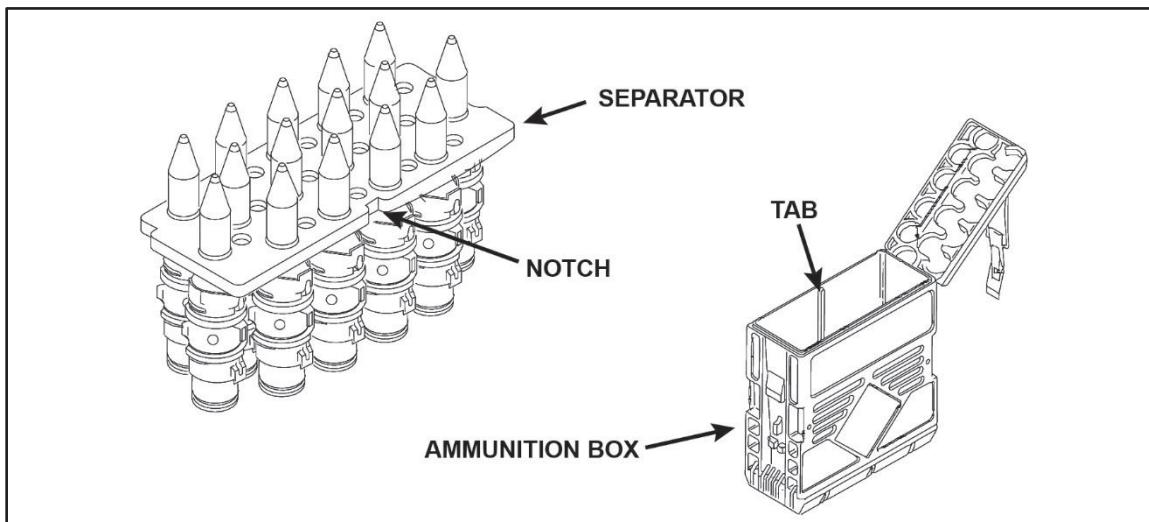
**Figure 3-272. Remove armor piercing ammunition can doors**

**DANGER**

Handle ammunition with care; it can explode when mishandled or exposed to heat. Do not drop ammunition or bump primers. Keep ammunition away from electrical sparks and high heat. Do not use or handle damaged ammunition.

6. Unload ammunition from the AP feed chute.
  - a. Place a 14-mm ratchet wrench on the shaft of the AP forwarder with the wrench handle to the left.
  - b. Put upward pressure on the 14-mm ratchet wrench as you pull the AP release handle to the right.
  - c. Hold the AP release handle to the right while moving the 14-mm ratchet wrench to a straight down position.
  - d. Let go of the AP release handle.
  - e. Turn the 14-mm ratchet wrench right until the AP release handle pops back into place.
  - f. Repeat step 6a through step 6e until only two rounds are visible in the AP feed chute.

7. Move ammunition onto the loading rail.
  - a. Reach into AP ammunition can.
  - b. Secure the round nearest the AP forwarder.
  - c. Pull the round onto the loading rail while releasing the last two rounds from the AP feed chute.
  - d. Remove 14-mm ratchet wrench from the AP forwarding shaft.
8. Stretch out the ammunition belt on the vehicle floor.
9. Separate ammunition into 15-round belts.
  - a. Count out 15 rounds starting at the end of the ammunition belt nearest the turret.
  - b. Pull the 15th round from the link.
- Note:** If the AP round does not release from the link, stop pulling the AP round. The AP round is freed by twisting and pulling up on the AP round at the same time.
- c. Separate the links.
- d. Place loose rounds in empty double links.
- e. Repeat the process until all ammunition is separated into 15-round belts.
10. Stow the 15-round belts into empty ammunition boxes. (See figure 3-273.)



**Figure 3-273. Stowing ammunition**

- a. Unlatch and open the ammunition box lid.
- b. Remove the separator from the AP ammunition box.
- c. Hold the separator with the projectile side up.
- d. Place the first ammunition belt in the large numbered inserts.

- e. Place rounds 1 through 4 in the middle of the separator and rounds 5 through 15 in the outer inserts.

**Note:** Be sure that the round number matches the insert number.

- f. Turn the separator and ammunition belt upside down.  
g. Insert into the AP ammunition box with the notch and tab aligned.

**Note:** The notch in the center of the separator must align with the mating tab in the body of AP the ammunition box.

- h. Ensure the center of the separator aligns with the mating tab in the body of AP of the ammunition box.  
i. Close the AP ammunition box lid.  
j. Repeat the process to stow remaining rounds.  
11. Secure the AP ammunition can door back on the AP ammunition can.  
a. Place ammunition can door on AP ammunition can.  
b. Turn handle to the left.

Performance Measures	GO	NO-GO
1. Prepared the turret for power mode.	_____	_____
2. Traversed the turret to the AP load position (4,350 mils).	_____	_____
3. Powered down the turret.	_____	_____
4. Opened the turret shield door.	_____	_____
5. Removed the AP ammunition can door.	_____	_____
6. Unloaded ammunition from the AP feed chute.	_____	_____
7. Moved ammunition onto the loading rail.	_____	_____
8. Stretched the ammunition belt out on the vehicle floor.	_____	_____
9. Separated ammunition into 15-round belts.	_____	_____
10. Stowed the 15-round belts into empty ammunition boxes.	_____	_____
11. Secured the AP ammunition can door on the AP ammunition can.	_____	_____

**References  
Required**

AR 385-10 The Army Safety Program

TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)

**Primary**

TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

**071-024-0003****Unload the 25-millimeter High-Explosive Incendiary Tracer Ammunition Can  
on a Bradley Fighting Vehicle**

**Conditions:** You are a crewmember on a Bradley fighting vehicle and have been directed to unload the 25-millimeter (mm) high explosive (HE) ammunition from the HE ammo can. You have another crewmember to assist.

**Standards:** Unload the 25-mm ammunition from the HE ammunition can so that no rounds, expended cartridges, or links remain in the can. Store the ammunition in the original ammunition boxes, and correctly stow the ammunition boxes.

**Performance Steps****CAUTION**

Empty ammunition links can jam 25-mm gun feeder if links do not align in stripper rail. Guide empty ammunition links onto stripper rail while ammunition is being unloaded from the 25-mm gun feeder.

1. Prepare the turret for power mode.
  - a. Verify the 25-mm gun manual safe handle is in the SAFE position.
  - b. Set the MASTER POWER switch to ON.
  - c. Verify no one is on top of the vehicle.
  - d. Place the driver's hatch cover in the closed or pop-up position.
  - e. Place the cargo hatch cover in the closed or pop-up position.
  - f. (A3 only) Verify the emergency turret power shutdown switch is in the OFF position.

**Note:** The emergency turret power shutdown switch is located on the vehicle distribution box or, if equipped, the digital vehicle distribution box.

- g. Verify the turret shield door is closed and latched.
- h. Release the turret travel lock by pulling the travel lock lever all the way back to the OPEN position.

**CAUTION**

Lap safety belts hanging from seats can get caught in the turret shield door opening and damage the turret.

- i. Put on the lap safety belts.
- j. Ensure lap belts are secured.
- k. Move the turret traverse drive select lever to the POWER position.

1. Move tow elevation drive select lever to the POWER position.
- m. Move the gun elevation drive select lever to the POWER position.
- n. (A3 only) Verify the emergency shutdown switch on the system control box is in the OFF position.
- o. Move the turret power switch to ON.
- p. (A2 only) Verify the relay box circuit breaker switch is in the ON position.
- q. (A2 ODS only) Verify the relay box's ten circuit breaker switches are all in the ON (up) position.
- r. Move the turret drive switch to the ON position.
- s. (A3 only) Verify the DRIVE MALF annunciator light is not lit.

**DANGER**

**The turret can rotate and severely injure or kill you. Do not reach through the turret shield opening when the turret power is on. Keep the turret shield door closed whenever the turret drive power is on. Engage the turret travel lock before moving or reaching through the turret shield opening.**

2. Traverse the turret to the HE load position (2,150 mils).
  - a. Verify the position of the turret by observing the azimuth indicator.
  - b. Squeeze and hold the palm switch(es) on the gunner's control handles or commander's control handle.
  - c. Turn the gunner's control handles or commander's control handle left or right until the turret azimuth indicator reads 2,150 mils.
- Note:** The turret traverses in the direction the handles are turned.
  - d. Center the gunner's control handles or commander's control handle when the turret has traversed to the desired position.
  - e. Release the palm switch(es).
3. Power down the turret.
  - a. Set the turret travel lock by pushing the travel lock lever to the LOCKED position.
  - b. Move the turret drive switch to OFF.
  - c. Move the turret power switch to OFF.
4. Open the turret shield door.
5. Remove the three 25-mm ammunition can doors with the help of an assisting crewmember.
  - a. Remove the 25-mm HE ammunition can top door by turning the handle and lifting up.

- b. Remove the 25-mm HE ammunition side access door by turning the handle and pulling outwards.
- c. Remove the 25-mm HE ammunition can rear door by turning the handle and pulling outwards.

**WARNING**

**Ammunition can explode when mishandled or exposed to heat. Handle ammunition with care. Do not drop ammunition or bump primers. Keep ammunition away from electrical sparks and high heat. Do not use or handle damaged ammunition.**

6. Unload ammunition from the HE feed chute.
  - a. Place a 14-mm ratchet wrench on the shaft of the HE forwarder with the wrench handle to the left.
  - b. Put upward pressure on the 14-mm ratchet wrench as you pull the HE release handle to the right.
  - c. Hold the HE release handle to the right while moving the 14-mm ratchet wrench to a straight down position.
  - d. Let go of the HE release handle.
  - e. Turn the 14-mm ratchet wrench right until the HE release handle pops back into place.
  - f. Remove the 14-mm ratchet wrench from the shaft.
  - g. Repeat step 6a through step 6f until only two rounds are visible in the HE feed chute.
7. Move ammunition onto the loading rail.
  - a. Reach into the HE ammunition can.
  - b. Secure the round nearest the HE forwarder.
  - c. Pull the round onto the loading rail while releasing the last two rounds from the HE feed chute.
8. Pull the HE ammunition from the HE ammunition can and stretch out the ammunition belt on the vehicle floor.
9. Separate ammunition into 15-round belts.

**Note:** If the HE round does not release from the link, stop pulling the HE round. The HE round is freed by twisting and pulling up on the HE round at the same time.

- a. Count out 15 rounds starting at the end of the ammunition belt nearest the turret
- b. Pull the 15th round from the link.
- c. Separate the links.
- d. Place loose rounds in empty double links.

- e. Repeat the process until all ammunition is separated into 15-round belts.
10. Stow the 15-round belts into empty ammunition boxes.
  - a. Unlatch and open the ammunition box lid.
  - b. Remove the separator from the HE ammunition box.
  - c. Hold the separator with the projectile side up.
  - d. Place the first ammunition belt in the large numbered inserts.
  - e. Place rounds 1 through 4 in the middle of the separator and rounds 5 through 15 in the outer inserts.
  - f. Turn the separator and ammunition belt upside down.
  - g. Insert into the HE ammunition box with the notch and tab aligned.
  - h. Ensure the center of the separator aligns with the mating tab in the body of the HE ammunition box.
  - i. Close the HE ammunition box lid.
  - j. Repeat the process to stow remaining rounds.
11. Replace the three 25-mm ammunition can doors.
  - a. Replace the 25-mm HE ammunition can top door by lowering the door and turning the handle to lock.
  - b. Replace the 25-mm HE ammunition can side door by installing the door and turning the handle to lock.
  - c. Replace the 25-mm HE ammunition side access door by installing the door and turning the handle to lock.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the turret for power mode.	_____	_____
2. Traversed the turret to the HE load position (2,150 mils).	_____	_____
3. Powered down the turret.	_____	_____
4. Opened the turret shield door.	_____	_____
5. Removed the three 25-mm ammunition can doors with the help of an assisting crewmember.	_____	_____
6. Unloaded ammunition from the HE feed chute.	_____	_____
7. Moved ammunition onto the loading rail.	_____	_____
8. Pulled the HE ammunition from the HE ammunition can and stretched out the ammunition belt on the vehicle floor, with the assistance of a crewmember.	_____	_____

Performance Measures	GO	NO-GO
9. Separated ammunition into 15-round belts.	_____	_____
10. Stowed the 15 round belts into the empty ammunition containers.	_____	_____
11. Replaced the three 25-mm ammunition can doors.	_____	_____

References Required	Primary
TM 9-2350-411-10 Operator Manual for Fighting Vehicle, Infantry, Operation Desert Storm, M2A2 ODS (NSN 2350-01-405-9886) (EIC APE)	TM 9-2350-438-10-1 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460) (EIC AP2) Hull
TM 9-2350-284-10-1 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (2350-01-248-7619) (EIC ALG) Fighting Vehicle, Cavalry M3A2 (2350-01-248-7620) (EIC ALH) Hull	

**071-026-0010**

## **Install an M240C Coaxial Machine Gun on a Bradley Fighting Vehicle**

**Conditions:** You are a crewmember on a Bradley fighting vehicle (known as BFV) and your vehicle commander has directed you to install the M240C machine gun in preparation for a mission. The BFV turret power is off and the turret is locked.

**Standards:** Install the M240C machine gun on the BFV so that it is ready for operation.

**Note:** The A3 variant includes a commander's tactical display positioned in front of the left access door. This changes the configuration of the access door handles and also how the left access door opens.

### **Performance Steps**

#### **DANGER**

**The machine gun must be clear prior to installing or uninstalling it from the vehicle. Accidental firing of the coaxial machine gun could kill or injure Soldiers.**

1. Clear the M240C machine gun.
2. Manually elevate the coaxial machine gun rotor to 300 mils (200 mils for old mount).
3. Open the coaxial machine gun access doors.
4. Mount the coaxial machine gun.
  - a. Mount the coaxial machine gun on M2, M2A1, M3, and M3A1 (old mount with firing solenoid installed on gun).
    - (1) Place the coaxial machine gun in the plenum with the gun barrel pointing forward and the trigger to the right.
    - (2) Align the coaxial machine gun alignment lugs with the cradle slots.
    - (3) Push the coaxial machine gun until it locks behind the release latch.
    - (4) Check that the alignment lugs are locked in position by pulling on the rear of the machine gun.
    - (5) Secure the rear mount to the coaxial machine gun.
    - (6) Install the solenoid cable plug on the plenum jack.
  - b. Mount the coaxial machine gun on M2, M2A1, M3, and M3A1 (old mount with firing solenoid installed on the gun mount).
    - (1) Place the coaxial machine gun in the plenum with the gun barrel pointing forward and the trigger to the right.
    - (2) Insert quick release pin into the bracket.
    - (3) Push the coaxial machine gun until it locks behind the release latch.

- (4) Check that machine gun is fully seated in position by pulling on the rear of the machine gun.
  - (5) Check that quick release pin is locked in position by pulling on the rear of the machine gun.
  - (6) Secure the rear mount to the coaxial machine gun.
  - (7) Install the solenoid cable plug on the plenum jack.
- c. Mount the coaxial machine gun on M2A2, M2A2 Operation Desert Storm (known as ODS), M2A3, M3A2, M3A2 ODS, and M3A3 (new mount).
- (1) Pull the retaining pin out.
  - (2) Place the coaxial machine gun in the plenum.
  - (3) Push the coaxial in all the way.
  - (4) Ensure the coaxial is fully seated.
  - (5) Push the retaining pins in fully.
  - (6) Ensure the retaining pins are locked in position by pulling on the rear of the coaxial.
5. Close the coaxial machine gun access doors.

Performance Measures	GO	NO-GO
1. Cleared the coaxial machine gun.	_____	_____
2. Manually elevated the coaxial machine gun rotor to 300 mils (200 mils for old mount).	_____	_____
3. Opened the coaxial machine gun access doors.	_____	_____
4. Mounted the coaxial machine gun.	_____	_____
5. Closed the coaxial machine gun access doors.	_____	_____

References Required	Primary
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

<b>References Required</b>	<b>Primary</b>
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TM 9-2350-438-10-2 Operator Manual Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005)  
(EIC APG) Fighting Vehicle, infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)

**071-026-0004****Perform a Function Check on the M240C Coaxial Machine Gun on a Bradley Fighting Vehicle**

**Conditions:** You are a crewmember on a Bradley fighting vehicle and have been directed to do a functions check on the M240C coaxial machine gun in preparation for a mission.

**Standards:** Conduct checks of the M240C machine gun to ensure it is correctly assembled and functions properly.

**Note:** A function check is the final step of maintaining an M240C. It is also performed anytime the proper operation of an M240C is in question. If the M240C does not function properly, troubleshooting should be conducted in accordance with the appropriate technical manual.

**Performance Steps**

1. Open coaxial machine gun access doors.

**Note:** The A3 variant includes a commander's tactical display (known as CTD), which is in front of the left access door.

- a. (A2 Operation Desert Storm variant and below) Open the coaxial machine gun access doors.

- (1) Pull down both handles.
    - (2) Pull out left coaxial machine gun access door.
    - (3) Push in right coaxial machine gun access door.
    - (4) Release both handles.

- b. (A3 variant) Open coaxial machine gun access doors.

- (1) Pull the CTD latch out of bracket.
    - (2) Rotate handle on right access door upward to unlatch door.
    - (3) Pull out on left side of CTD to open left access door.
    - (4) Push in right coaxial machine gun access door.

2. Ensure the M240C is clear.

**Note:** If you have not recently cleared the M240C (such as during disassembly), then clear the M240C before performing a function check.

3. Place the weapon on fire by moving the safety lever to the F position.

4. Lock the bolt to the rear.

- a. Grasp the charging cable with either hand.
  - b. Pull the charging cable to the rear until the bolt locks to the rear.

5. Place the weapon on safe by moving the safety lever to the S position.
6. Squeeze the trigger.

**Note:** The bolt should not go forward. If the bolt does go forward, this indicates the machine gun is inoperative. Notify supervisor and turn in for maintenance.

7. Ride the bolt forward.
  - a. Grasp the charging cable with either hand.
  - b. Pull and hold the charging cable to the rear.
  - c. Place the weapon on fire by moving the safety to the F position.
  - d. Squeeze the trigger, and manually ride the bolt forward.

**Note:** Riding the bolt forward prevents damage to the bolt.

8. Close coaxial machine gun access doors.
  - a. (A2 and below variants) Close coaxial machine gun access doors.
    - (1) Pull down both handles.
    - (2) Pull out right coaxial machine gun access door.
    - (3) Push in left coaxial machine gun access door.
    - (4) Release both handles.

**CAUTION**

CTD and extension light cables can be damaged if closed in access doors. Make sure cables are clear of doors before latching doors closed.

- b. (A3 variant) Close coaxial machine gun access doors.
  - (1) Pull out right coaxial machine gun access door.
  - (2) Push in on left side of CTD to close left access door.
  - (3) Rotate handle on right access door downward to latch door.
  - (4) Push CTD latch into bracket.

Performance Measures	GO	NO-GO
1. Opened coaxial machine gun access doors.	_____	_____
2. Ensured the M240C was clear.	_____	_____
3. Placed the weapon on fire by moving the safety lever to the F position.	_____	_____
4. Locked the bolt to the rear.	_____	_____
5. Placed the weapon on safe by moving the safety lever to the S position.	_____	_____
6. Squeezed the trigger.	_____	_____
7. Rode the bolt forward.	_____	_____
8. Closed the coaxial machine gun access doors.	_____	_____

References Required	Primary
TM 9-2350-284-10-2      Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01-248-7620) (EIC: ALH) Turret	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Operator's Manual for Machine Gun, 7.62MM, M240 (1005-01-025-8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359-2714, M240N (1005-01-493-1666)

**071-313-4007**

**Fire the M240C Coaxial Machine Gun on a Bradley Fighting Vehicle**

**DANGER**

**Accidental firing of weapons can kill or seriously injure personnel. Keep weapons aimed downrange. Be sure target area is clear of personnel.**

**Conditions:** You are a gunner on a Bradley fighting vehicle and stationary or moving enemy targets (point or area) have been identified in your sector of fire. Based on the type target(s) you have been directed to engage the target with the M240C coaxial machine gun.

**Standards:** Prepare the coaxial for engagement. Acquire target(s) and determine range to the target(s). Track and engage targets until they are destroyed, suppressed, or you receive an order to cease fire.

**Performance Steps**

1. Place operator controls in the correct position.

**Note:** As various buttons and switches are operated, watch indicator lights on control boxes to ensure that the proper lights go on and off appropriately. If they do not, notify unit maintenance.

- a. Turn master power switch to ON.
- b. Turn Arm-safe-reset switch to SAFE.
- c. Move turret power switch to ON.
- d. Move turret drive system switch to ON.
- e. Move turret drive select lever to POWER position.

**Note:** If the turret is inoperable, ensure both the turret drive system switch is OFF and the turret power switch is set to OFF. With the power off, the turret can be operated manually.

2. Verify vehicle is ready for coaxial operations.

- a. Open sight cover door (day or night as appropriate) by turning the appropriate day or night sight cover door handle.
- b. Verify with the Bradley commander that the coaxial is ready.
- c. Press 7.62 button.
- d. Move turret drive switch to ON.

3. Prepare the coaxial machine gun for night firing or day firing, as appropriate.

- a. Prepare for night firing.
  - (1) Move night vision power switch to ON.

**Note:** Night vision controls require 10 minutes of cooling time after NIGHT VISION PWR switch is moved to ON to reach their super cold operating temperature.

- (2) Move sensor select switch to night.
- (3) Move night vision PLRT (polarity) switch to W/H or B/H as desired.

**Note:** W/H position on NIGHT VISION PLRT switch shows red image on black background in gunner's and commander's eyepiece. B/H position on NIGHT VISION PLRT switch shows black image on red background in gunner's and commander's eyepiece.

- (4) Move CON (contrast) knob to adjust contrast.
  - (5) Turn BRT (brightness) knob to adjust brightness.
  - (6) Turn FOCUS knob to focus image in gunner's eyepiece.
- b. Prepare for day firing by moving sensor select switch to clear of neutral.
  - c. Adjust reticle for best view.
    - (1) Turn RET BRT (reticle brightness) knob to adjust reticle brightness.
    - (2) Move MAG (magnification) switch to HIGH until it clicks.
4. Acquire the target.
    - a. Center target in reticle by traversing turret or elevating/depressing the gun as needed (powered operation).
    - b. Center target in the front sight ring if the integrated sight unit (known as ISU)/improved Bradley acquisition subsystem is not working (manual operation).
      - (1) Open the commander's hatch.
      - (2) Raise front sight ring.
      - (3) Raise aperture ring.
      - (4) Traverse turret and elevate/depress the gun as needed.
  5. Set the range to target.

**Note:** If in manual mode there is no need to determine range. In manual mode, the gunner adjusts fires using the burst on target technique until the target is hit.

- a. Determine range using the most appropriate method.
  - (1) (A2 Operation Desert Storm [known as ODS] and above) Lase the target using the eyesafe laser range finder (known as ELRF).
  - (2) Determine range by using the ISU or target acquisition system sight reticle, the backup sight (auxiliary sight), or a range card.

- (3) Estimate range using methods such as the 100-meter unit of measure method, flash-to-bang method, or the appearance of objects method.
- b. Turn range control knob to estimated range (if not using the ELRF).
6. Track the target.
  - a. Maintain the target centered in reticle by traversing turret or elevating/depressing the gun as needed.

**Note:** If firing manually, the gunner and commander must work together to fire before the target reaches the center crosshairs in front ring sight and pointer post in aperture ring.

- b. Employ autotracking (A3 variant only).
  - (1) Open the night sight shield door.
  - (2) Center the reticle crosshairs on the target.
  - (3) Establish a track box around the target.
    - (a) Move the AUTO TRK-AUTO PT switch momentarily to AUTO-TRK.
    - (b) Observe the flashing track box around the target and the flashing TRK 1 symbol in the upper left corner of the display.

- (4) Adjust the track gate to the size of the target.
  - (a) Move the G-SIZE (gate-size) switch up to set the horizontal lines apart.
  - (b) Move down to bring the horizontal lines together.
  - (c) Move right to set the vertical lines apart.
  - (d) Move left to bring the vertical lines together.
- (5) Lock the track gate onto the target.
  - (a) Move the AUTO TRK-AUTO PT switch momentarily to AUTO-TRK.
  - (b) Observe for the track box and TRK 1 symbol to stop flashing and appear solid.
  - (c) Observe that the track box follows the target as long as the target stays within the field of view.
  - (d) Return to establish a track box around the target if the track box and TRK 1 symbol continue to flash.

- (6) Employ autotracking on a second target by repeating the above steps.
- (7) Drop a track box by pressing and releasing the DROP TRK button.

**Note:** This drops the track box closest to the crosshairs.

- c. Autopoint a tracked target (A3 variant only).

**Note:** The autopoint function moves the reticle crosshairs to the track box closest to the reticle crosshairs.

- (1) Squeeze and hold the palm switch on the gunner's hand station.
- (2) Move and hold down on the AUTO TRK-AUTO PT switch to AUTO PT until the crosshairs move to the center of the track box.

### **WARNING**

**Noise from weapon can damage hearing of Soldiers in or near vehicle. Use earplugs and other hearing protectors when gun is operated.**

7. Engage target(s) with the coaxial machine gun.

- a. Move the ARM-SAFE-RESET switch to ARM position.

**Note:** When firing the coaxial if LO AMMO indicator light on weapon control box flashes, you can push LO AMMO OVRD button and fire the remaining ammo. You can also stop firing and reload.

- b. Fire sensing bursts of 5 to 7 rounds by squeezing the appropriate trigger.

**Note:** When the FIRE command is received the gunner fires announces ON THE WAY and fires.

- (1) Squeeze and hold the palm switch then squeeze and release trigger switch on gunner's control handles.
  - (2) Squeeze and hold the palm switch then squeeze and release trigger switch on commander's control handle.
  - (3) Press trigger on turret traverse handwheel if control handles do not work.
  - (4) Squeeze the manual trigger on the coaxial machine gun (manual fire only).
- c. Sense the round(s) impact.
    - (1) React to rounds impacting the target.
      - (a) Announce TARGET.
      - (b) Maintain the same sight picture.
      - (c) Fire a killing burst (20 to 25 rounds).
    - (2) React to rounds missing the target.
      - (a) Announce the location of the rounds, if observed.

**Note:** For manual firing the commander announces the turret corrections to adjust fire.

- (b) Adjust fire using the re-engage method (known as ELRF only).
  - (c) Adjust fire using the standard method.
  - (d) Announce ON THE WAY.
  - (e) Fire a killing burst (three to five rounds).
8. Cease fire on target(s) once destroyed, suppressed, or you receive an order to cease fire.

**Note:** The Bradley commander normally determines when to cease fire against a target, when to shift fire to another target when multiple targets are present, and when to tactically move from one fighting position to another.

- a. Move the ARM-SAFE-RESET switch to RESET, then to SAFE.
- b. Scan for targets by pressing the HI/LO MAG button to change the magnification to low and observe your sector.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Placed operator controls in the correct position.	_____	_____
2. Verified vehicle was ready for coaxial operations.	_____	_____
3. Prepared the coaxial machine gun for night firing or day firing, as appropriate.	_____	_____
4. Acquired the target(s).	_____	_____
5. Set the range to target.	_____	_____
6. Tracked the target(s).	_____	_____
7. Engaged target(s) with the coaxial machine gun.	_____	_____
8. Ceased fire on target(s) once destroyed, suppressed, or an order to cease fire was received.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry, M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

<b>References Required</b>	<b>Primary</b>
----------------------------	----------------

TM 9-2350-438-10-2 Operator Manual Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005)  
(EIC APG) Fighting Vehicle, infantry, Operation  
Desert Storm, Situational Awareness (ODS SA) M2  
ODS SA (NSN 2350-01-565-3460 (EIC AP2)

**071-026-0011**

## **Remove an M240C Coaxial Machine Gun on a Bradley Fighting Vehicle**

**Conditions:** You are a gunner on a Bradley fighting vehicle and have a requirement to remove the M240C coaxial machine gun from the vehicle. The M240C may be loaded.

**Standards:** Verify the operator controls are in the correct position. Clear the M240C machine gun, manually elevate the coaxial machine gun rotor, open the coaxial machine gun access doors, remove the machine gun, and close the machine gun access doors.

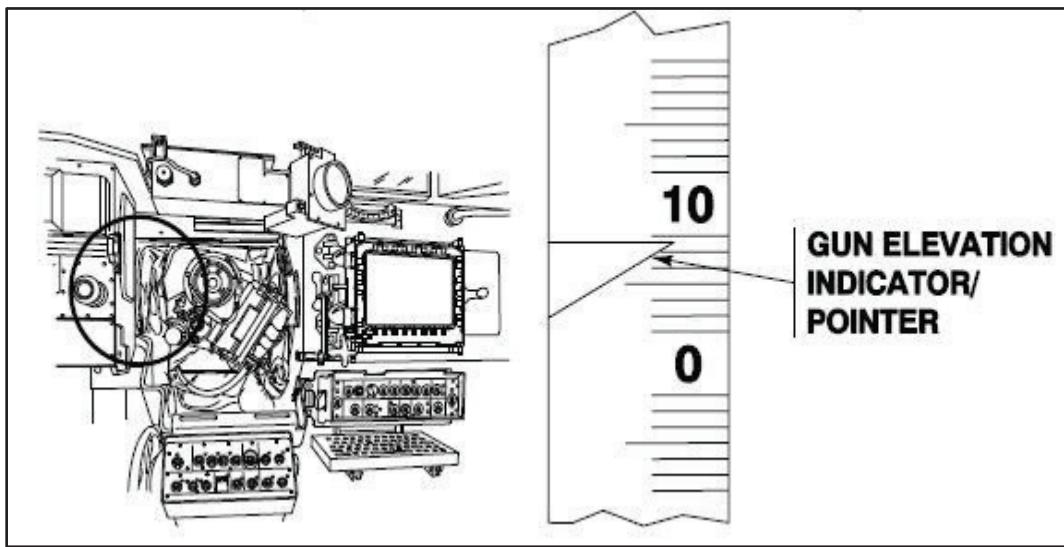
### **Performance Steps**

1. Verify operator controls are in the correct position.
  - a. Ensure ARM-SAFE-RESET switch is in SAFE.
  - b. Ensure TURRET DRIVE SYSTEM switch is OFF.
  - c. Ensure TURRET POWER switch is OFF.
2. Clear the M240C machine gun.

#### **CAUTION**

Linkage between tube launched, optically tracked, wire guided (TOW) and gun elevation systems can be damaged if gun elevation handwheel is turned while both levers are in MANUAL position. Never turn gun elevation handwheel with both TOW elevation drive select lever and gun elevation drive select lever in MANUAL position.

3. Manually elevate the coaxial machine gun rotor.
  - a. Move gun elevation drive select lever to manual position.
  - b. Remove spring from handle.
  - c. Manually elevate or depress 25-millimeter (mm) gun as required (see figure 3-274).



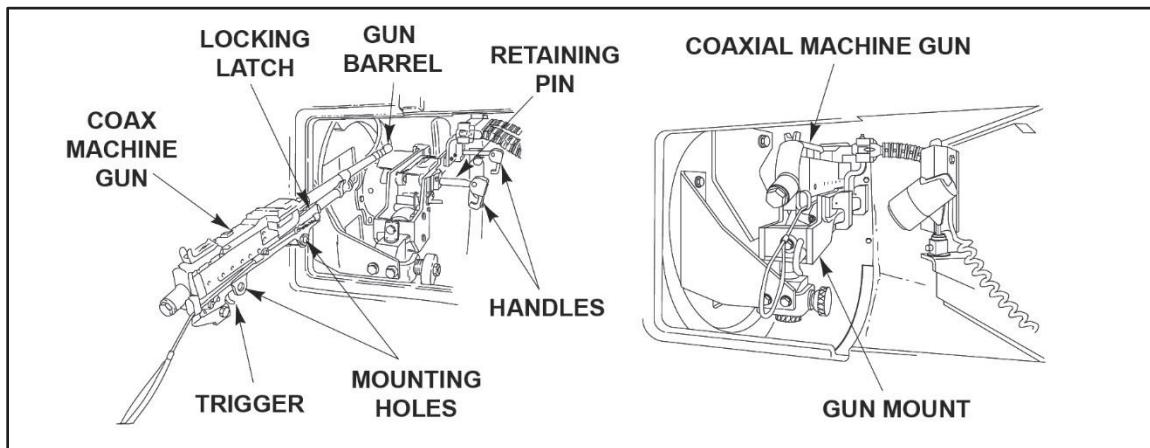
**Figure 3-274. Gun elevation indicator**

- (1) Turn gun elevation handwheel back to elevate 25-mm gun.
  - (2) Turn gun elevation handwheel forward to depress 25-mm gun.
  - d. Install spring on handle.
  - e. Ensure to elevate to 300 mils (200 mils on the old mount).
4. Open the coaxial machine gun access doors.

**Note:** The A3 variant includes a commander's tactical display (known as CTD), which is positioned in front of the left access door, thereby changing the configuration of the access door handles and how the left access door is opened.

- f. Open coaxial machine gun access doors on the A1, A2, and A2 Operation Desert Storm (known as ODS) variants.
  - (1) Pull down both handles.
  - (2) Pull out left coaxial machine gun access door.
  - (3) Push in right coaxial machine gun access door.
  - (4) Release both handles.
- g. Open the coaxial machine gun access doors on the A3 variant.
  - (1) Pull CTD latch out of bracket.
  - (2) Rotate handle on right access door upward to unlatch door.
  - (3) Pull out on left side of CTD to open the left access door.
  - (4) Push in right side access door to open.

5. Remove the coaxial machine gun from the mount (see figure 3-275).



**Figure 3-275. Remove coaxial machine gun**

- a. Remove M240C coaxial machine gun on the A1 variant.
  - (1) Remove solenoid cable plug from plenum jack.
  - (2) Remove the rear mount from coaxial machine gun.
  - (3) Pull coaxial machine gun fully out of the mount.
- b. Remove M240C coaxial machine gun on the A2, A2 ODS, and A3 variants.
  - (1) Flip out handles on retaining pins to unlock.
  - (2) Pull retaining pins out
  - (3) Pull coaxial machine gun fully out of the mount.

6. Close the coaxial machine gun access doors.

**Note:** The A3 variant includes a CTD, which is positioned in front of the left access door, thereby changing the configuration of the access door handles and how the left access door is closed.

- a. Close coaxial machine gun access doors on the A1, A2, A2 ODS variants.
  - (1) Pull down both handles.
  - (2) Pull out right coaxial machine gun access door.
  - (3) Push in left coaxial machine gun access door.
  - (4) Release both handles.

**CAUTION**

The CTD and extension light cables can be damaged if closed in access doors. Make sure cables are clear of doors before latching doors closed.

- b. Close coaxial machine gun access doors on the A3 variant.
  - (1) Pull out the right coaxial machine gun access door.
  - (2) Push in on the left side of the CTD to close the left access door.
  - (3) Rotate handle on right access door downward to latch door.
  - (4) Push CTD latch into bracket.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Verified operator controls were in the correct position.	_____	_____
2. Cleared the M240C machine gun.	_____	_____
3. Manually elevated the coaxial machine gun rotor.	_____	_____
4. Opened the coaxial machine gun access doors.	_____	_____
5. Removed the coaxial machine gun from the mount.	_____	_____
6. Closed the coaxial machine gun access doors.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01- 248-7620) (EIC: ALH)
TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry, M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)	

**071-217-0019**

**Correct Malfunctions of the Primary Weapon on a Stryker Vehicle Remote Weapon Station**

**DANGER**

**To prevent injury or death to personnel, ensure primary weapon is aimed in a safe direction and that no personnel or equipment are in line of fire.**

**WARNING**

**Power down remote weapons station (known as RWS) prior to exit from commander's or squad leader's hatches to prevent injury to personnel and damage to equipment.**

**Conditions:** You are engaging target with an M2 .50 caliber machine gun or MK19 40-millimeter (mm) grenade machine gun installed the remote weapon station (known as RWS) on a Stryker vehicle and have had a weapon malfunction or runaway gun. You have the technical manuals for the Stryker vehicle and TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 for the M2 .50 caliber machine gun or TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 for the MK19 40-mm grenade machine gun.

**Standards:** Apply the immediate action required to correct the weapon malfunction or runaway gun in the RWS. Perform all steps in sequence and maintain control of the weapon system at all times.

**Performance Steps**

1. Apply immediate action for a weapon malfunction.
  - a. Ensure that GUN ARM/SAFE switch is set to SAFE on the fire control unit (known as FCU).
  - b. Wait the appropriate amount of time in case the misfire is caused by a hangfire.

**Note:** Wait 5 seconds for the M2-series machine gun and 15 seconds for the MK19 grenade machine gun.

- c. Open vehicle commander's hatch.

**Note:** For RWS-I, the CHG button on control grip can be used as an alternative to GUN CHG button on the FCU.

- d. Press GUN CHG button on the FCU.

**Note:** The CHG button on control grip can be used as an alternative to GUN CHG button on the FCU.

- e. Observe the feeding and ejection of ammunition.
  - (1) If round ejects, attempt to fire again.
    - (a) If weapons fire, continue engagement.

- \_1\_ Close vehicle commander's hatch.
- \_2\_ If weapon fails to fire a second time, proceed to step 1f.
  - (b) If weapon fails to fire, proceed to step 1f.
  - (2) If round does not eject, continue to step 1i.
    - f. Wait 5 seconds.
    - g. Close GUN ARM/SAFE switch guard on the FCU.
    - h. Open vehicle commander's hatch.
    - i. Refer to the appropriate machine gun technical manual for remedial action and troubleshooting.

**Note:** See TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 for the M2 .50 caliber machine gun or TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 for the MK19 40-mm grenade machine gun.

2. Apply immediate action for a runaway gun.

**Note:** A runaway primary weapon is most often caused by mechanical breakdown of the weapon. Powering off the RWS may have no effect on this type of malfunction.

- a. Set GUN ARM/SAFE switch to SAFE on the FCU.

**Note:** Do not open any vehicle hatch.

- b. Maintain control and hold the RWS in downrange position until firing stops.
- c. Power-down the RWS.
- d. Open commander's hatch.
- e. Verify that weapon bolt is fully forward.
- f. Retract bolt to rear and apply mechanical safety to machine gun.
- g. Unload weapon and ensure that weapon is clear of all ammunition.
- h. Notify field maintenance.

Performance Measures	GO	NO-GO
1. Applied immediate action for a weapon malfunction.	_____	_____
2. Applied immediate action for a runaway gun.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)	TM 9-2355-311-10-2-1 Operator's Manual Volume 1 Of 4 Infantry Carrier Vehicle (ICV) M1126 NSN: 2355-01-481-8575 (EIC: AFF)
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	

071-316-3006

## Fire the TOW Missile on a Bradley Fighting Vehicle M2A2/M3A2 Operation Desert Storm

### DANGER

**A tube launched, optically tracked, wire guided (TOW) or TOW wire touching a high-tension wire may cause injury or death. Do NOT fire the TOW over high-tension wires.**

**Conditions:** You are a gunner on an M2A2/M3A2 Operation Desert Storm Bradley fighting vehicle (known as BFV), and stationary or moving enemy targets (armored vehicle, aircraft, or bunker) have been identified in your sector of fire. Based on the type target(s), you have been directed to engage the target with the TOW. Both TOWs are loaded, the BFV is stationary on level (not exceeding 10-degrees side slope) and ground and the dust covers have been removed from the TOW.

**Standards:** Verified the BFV was ready for TOW engagement and readied the TOW system. Selected the appropriate missile tube. Tracked and engaged the target. Ceased fire when the target was destroyed or you received an order to cease fire.

### Performance Steps

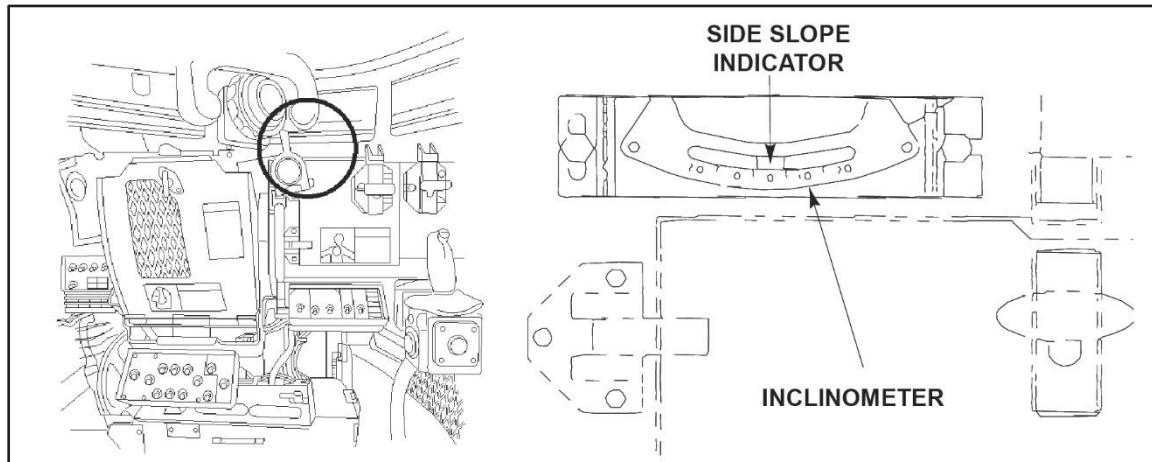
1. Verify that the BFV is ready for TOW engagement.

**Note:** As various buttons and switches are operated, watch indicator lights on control boxes to ensure that the proper lights go on and off appropriately. If they do not, notify unit maintenance.

- a. Ensure the ARM-SAFE-RESET switch is in SAFE.
- b. Verify that the BFV is stationary and sufficiently level for firing.

**Note:** The BFV must be halted and on sufficiently level ground to fire the TOW.

- (1) Check that the air bubble in the inclinometer does not indicate a slope greater than 10 degrees (see figure 3-276).



**Figure 3-276. Slope Indicator**

- (2) Check that the air bubble in the slope indicator is not touching the left or right side of outer ring (red line) of the slope indicator.
  - c. Open both day and night sight cover doors.
  - d. Ensure all four hatches (driver, commander, gunner, and cargo) and the ramp are closed.
  - e. Move MAG switch to HIGH until it clicks.

**Note:** MAG switch must be in HI MAG position or TOW system will not work.

2. Ready the TOW system.
  - a. Raise TOW launcher.
    - (1) Move LAUNCHER UP-DN switch to UP.
    - (2) Squeeze palm switches until launcher stops moving and LAUNCHER UP indicator light comes on.
    - (3) Release palm switches.
    - (4) Press TOW button.

**Note:** TOW system will perform a self-test when TOW button is pressed. This self-test will last 12 seconds and TOW TEST indicator light should then go out. In an emergency situation, the test process can be skipped.

The TOW indicator light will come on and stay on. If it does not, notify field maintenance.

- (a) Verify that TOW indicator light comes on and stays on.
- (b) Verify that TOW TEST indicator light comes on and then goes out after 12 seconds.

**Note:** If TOW indicator light does not stay on or TOW TEST indicator light does not go out after 12 seconds, move the ARM-SAFE-RESET switch to RESET and press the TOW button. If TOW indicator light still does not stay on or TOW TEST indicator light still does not go out after 12 seconds, then the TOW may not fire and other tactical options should be considered. Notify unit maintenance when the tactical situation permits.

- b. Check the status of the annunciator lights on the annunciator box.
  - (1) Proceed to next step 2c, if all three annunciator lights are off.
  - (2) If one or more of the annunciator lights come on perform the following:
    - (a) If the TOW CKT OPEN light is on, move the ARM-SAFE-RESET switch to RESET and notify unit maintenance.
    - (b) If the NO FIRE ZONE annunciator light is on close the cargo hatch cover and use the commander's override.
    - (c) If the OPEN HATCH annunciator light is on close all hatch covers and use the commander's override.

**Note:** For steps (b) and (c) consider other tactical options and notify unit maintenance when the tactical situation permits.

- c. Check status of the annunciator lights on the TOW control box.
  - (1) Proceed to the step 2d, if all TOW control box annunciator lights are off.
  - (2) Abort firing of TOW missiles, if any TOW control box annunciator lights are on.

**Note:** Notify unit maintenance when the tactical situation permits.

- d. Confirm presence of TOW status indicator by observing the reticle in the gunner's eyepiece.
  - (1) Use the RET BRT knob to adjust the brightness of TOW reticle.
  - (2) Use the FOCUS BARRE to adjust the focus of TOW reticle.
  - (3) Verify the TOW status indicator is present.
    - (a) Proceed to the next step, if TOW status indicator is present.
    - (b) Abort firing of TOW missiles, if TOW status indicator is not present.

**Note:** Notify unit maintenance when the tactical situation permits.

- e. Prepare the TOW for firing.

**Note:** When firing TOW 2 missile, NIGHT VISION PWR must be ON for both day and night firing to ensure proper tracking of missile.

- (1) Move MAG switch to HIGH until it clicks.
- (2) Ensure proper alignment of TOW horizontal and vertical reticles to electronic alignment reticle.
  - (a) Look into gunner's eyepiece.
  - (b) Press TOW test button to view the electronic alignment reticle.

**Note:** The electronic alignment reticle should display only the two alignment squares near where the TOW vertical and horizontal reticles cross but may display two heavy crosshairs. Adjusting the reticle removes the heavy lines.

- (c) Adjust reticle until only the crosshairs and the two squares are visible.
  - \_1\_ Press the TOW TEST button to brighten the electronic alignment reticle for less than 20 seconds, as needed.
  - \_2\_ Turn the BRT and CON knobs to eliminate excess lines.
- (d) Check vertical alignment of the TOW reticle to the electronic alignment reticle by ensuring vertical TOW reticle is centered between inside edges of the two squares of the electronic alignment reticle.
  - \_1\_ If TOW reticle is vertically aligned, proceed to next step.
  - \_2\_ If TOW reticle is not vertically aligned, abort firing of TOW.

- (e) Check horizontal alignment of the TOW reticle to the electronic alignment reticle by ensuring TOW reticle is centered between the two squares of electronic alignment reticle and does not touch edges of electronic alignment reticle squares.

\_1\_ If TOW reticle is horizontally aligned, proceed to next step.

\_2\_ If TOW reticle is not horizontally aligned, abort firing of TOW.

**Note:** Notify unit maintenance when tactical situation allows.

- (f) Adjust reticle controls for best viewing.

\_1\_ Use the CON knob to adjust contrast.

\_2\_ Use the BRT knob to adjust brightness.

\_3\_ Use the FOCUS knob to focus image in gunner's eyepiece.

3. Select the appropriate missile tube.

**Note:** Do not select a second TOW missile while a TOW missile is in flight. This will cause the first TOW missile to abort.

- a. Press MSL 1 or MSL 2 button on TOW control box.

**Note:** If MSL 1 or MSL 2 indicator light flashes, MSL 1 or MSL 2 is empty.

If the selected tube contains a TOW 2 missile, then the TOW 2 indicator light will come on.

- b. Confirm appropriate missile indicator light illuminates.

**WARNING**

**Do not fire a TOW missile over a body of water so large that the wire touches or drags in water. If a TOW missile wire touches water, missile control can be lost. Do not fire TOW missiles over electric power lines. If a TOW missile or TOW missile wire touches electric power lines, missile control can be lost and electrical current may travel along the TOW guide wire.**

4. Track the target.

- a. Center reticle on target.

- b. If target is moving, estimate target exposure time.

5. Engage the target.

- a. Ensure there is sufficient time to engage target by observing for any obstacles between the reticle centerline and the edge of the field of view in the target's direction of movement.

**Note:** If there is an obstacle, then the target may reach the obstacle before the missile reaches the target. If this is the case, do NOT fire the missile. Select another target, hand off the target to another crew, or have driver move vehicle so the path to the target is clear.

## DANGER

**All vehicle personnel must be inside vehicle when a TOW missile is fired. Keep everyone at least 246 feet (75 meters) from the TOW blast area. A TOW missile may explode when it touches trees or bushes. A TOW missile explosion could kill or injure Soldiers. Do not fire a TOW missile through trees or bushes.**

- b. Fire the TOW missile once the FIRE command is received.
  - (1) Move the ARM-SAFE-RESET switch to ARM position.
  - (2) Announce that the TOW missile is ON THE WAY.
  - (3) Squeeze and hold the palm switch, then squeeze and release trigger switch on gunner's control handles.

**Note:** When the trigger is squeezed, there is a 1.5-second delay before the TOW missile fires.

- (4) Track target by continuing to squeeze palm switches and maintaining the reticle centered on the target until missile impacts.

**Note:** Palm switches are squeezed and held to allow power operation of turret while tracking target. Target may be tracked using handwheels if power operation is lost.

## DANGER

**Aborting a TOW missile in an unsafe area could kill or injure Soldiers. Check path of a TOW missile for Soldiers and equipment before you abort a TOW missile.**

- (5) Abort TOW missile, if required.
  - (a) If TOW missile flight path is safe, move TOW ABORT switch up.
  - (b) If flight path is unsafe, guide the TOW missile to safe area until TOW missile impacts.
- c. Cut the TOW missile command wire from the launcher.

**Note:** Separation of missile command guidance control wire from launcher does not automatically occur on missile detonation.

6. Cease fire when the target has been destroyed or you receive an order to cease fire.

**Note:** The vehicle commander normally determines when to cease fire against a target, when to shift fire to another target when multiple targets are present, and when to tactically move from one fighting position to another.

- a. Move the ARM-SAFE-RESET switch to RESET, then to SAFE.
- b. Scan for targets.
  - (1) Switch the MAG switch to change the magnification to LOW.
  - (2) Scan your sector.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Verified the BFV was ready for TOW engagement.	_____	_____
2. Readied the TOW system.	_____	_____
3. Selected the appropriate missile tube.	_____	_____
4. Tracked the target.	_____	_____
5. Engaged the target.	_____	_____
6. Ceased fire when the target was destroyed or you received an order to cease fire.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry' M3A2 (2350-01- 248-7620) (EIC: ALH) Turret	

**071-056-0067**

**Perform Immediate-Action Procedures on the TOW System on a Bradley Fighting Vehicle**

**DANGER**

**A misfired the tube launched, optically tracked, wire guided (TOW) missile could seriously injure or kill personnel. Keep all personnel inside the vehicle or 246 feet away from vehicle for 30 minutes after last attempt. Be sure all hatches and ramp are closed.**

**The TOW wire can shock you if it contacts an electrical wire. Do not fire a TOW missile over electric power lines.**

**WARNING**

**Firing a TOW missile through bushes and trees or over bodies of water can cause premature explosion or loss of missile control. Do not fire a TOW missile through bushes and trees or over bodies of water.**

**Noise from firing weapons can permanently damage hearing. Noise and back blast from weapon firing can permanently damage hearing. All personnel in or near a vehicle must wear double hearing protection when weapons are being fired. All hatches should be closed during weapon firing.**

**Conditions:** You are a gunner on a Bradley fighting vehicle (known as BFV) engaging a target with TOW missile. The TOW missile has misfired. The master power, turret power, and turret drive system switches are ON, all hatches are closed, and the ramp is closed.

**Standards:** Perform immediate action so that the TOW missile fires or is prepared for removal.

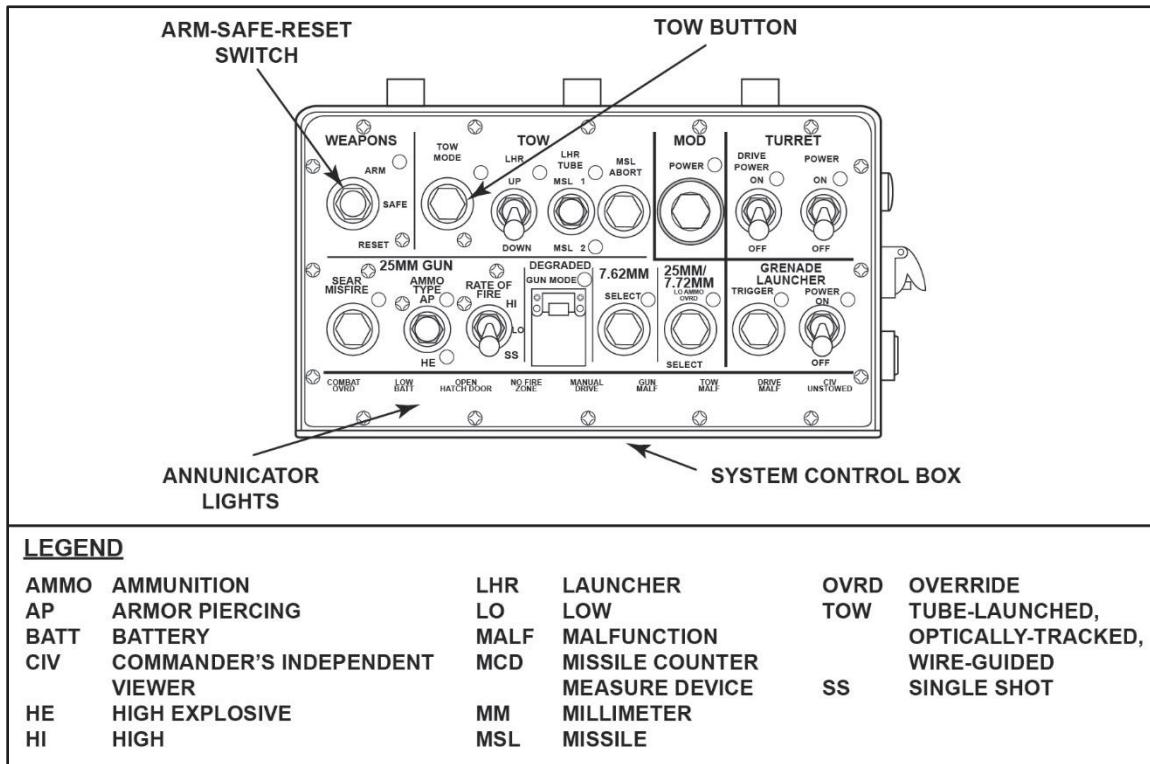
**Note:** A misfire is the failure of the missile to fire within 5 seconds after the trigger is depressed.

**Performance Steps**

1. Perform misfire procedures on the TOW system.
  - a. Announce to the crew over the intercom TOW MISSILE HAS MISFIRE AND ANOTHER ATTEMPT WILL BE MADE TO FIRE TOW MISSILE.
  - b. Immediately squeeze the palm switch and the trigger on the gunner's hand station and continue to track the target for 5 seconds.
    - c. If the TOW missile fires, the task is over.
    - d. If the TOW missile does not fire, immediately perform remedial action on a misfired TOW missile.
2. Perform remedial action on a misfired TOW missile.

- Move the ARM-SAFE-RESET switch to RESET, then to SAFE (see figure 3-277).

**Note:** ARM-SAFE-RESET switch deselects the TOW when the switch is moved to the RESET position.



**Figure 3-277. TOW button**

- Press and release the TOW mode button.
- Observe the system control box (see figure 3-278).

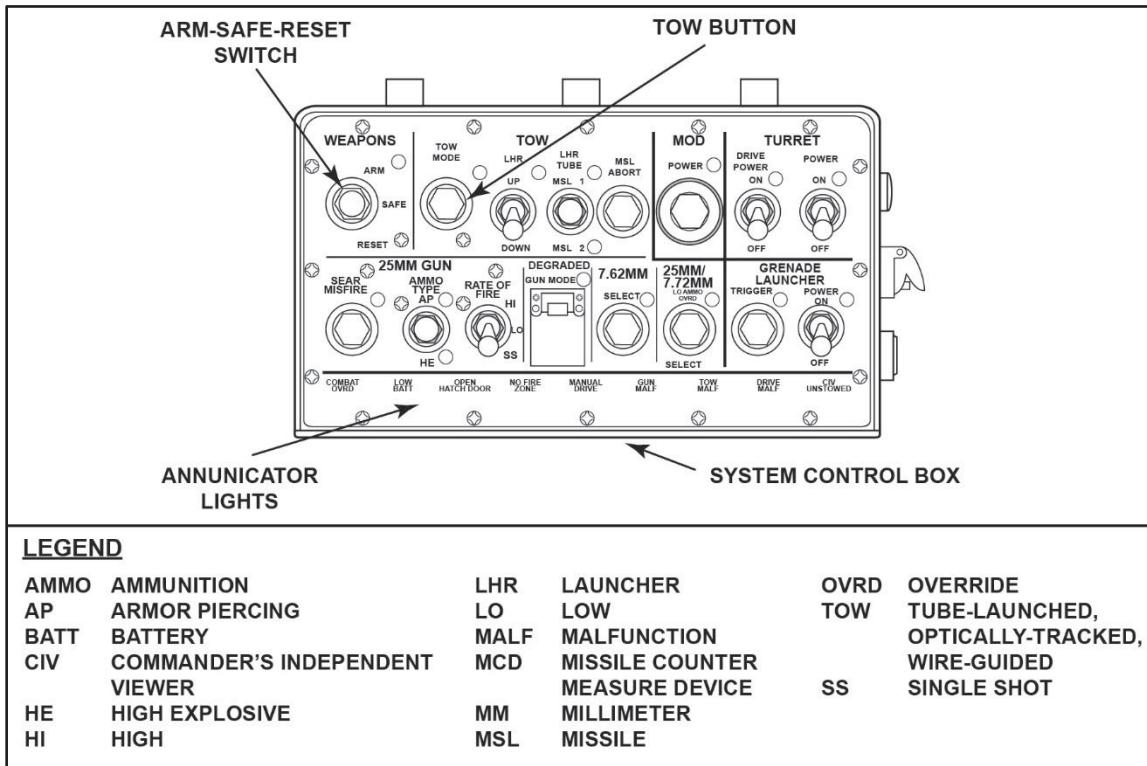


Figure 3-278. System control box

- (1) If any annunciator lights come on go.
  - (a) Move ARM-SAFE-RESET switch to RESET, then to SAFE.
  - (b) Move turret drive switch to OFF (see figure 3-279, page 3-702).

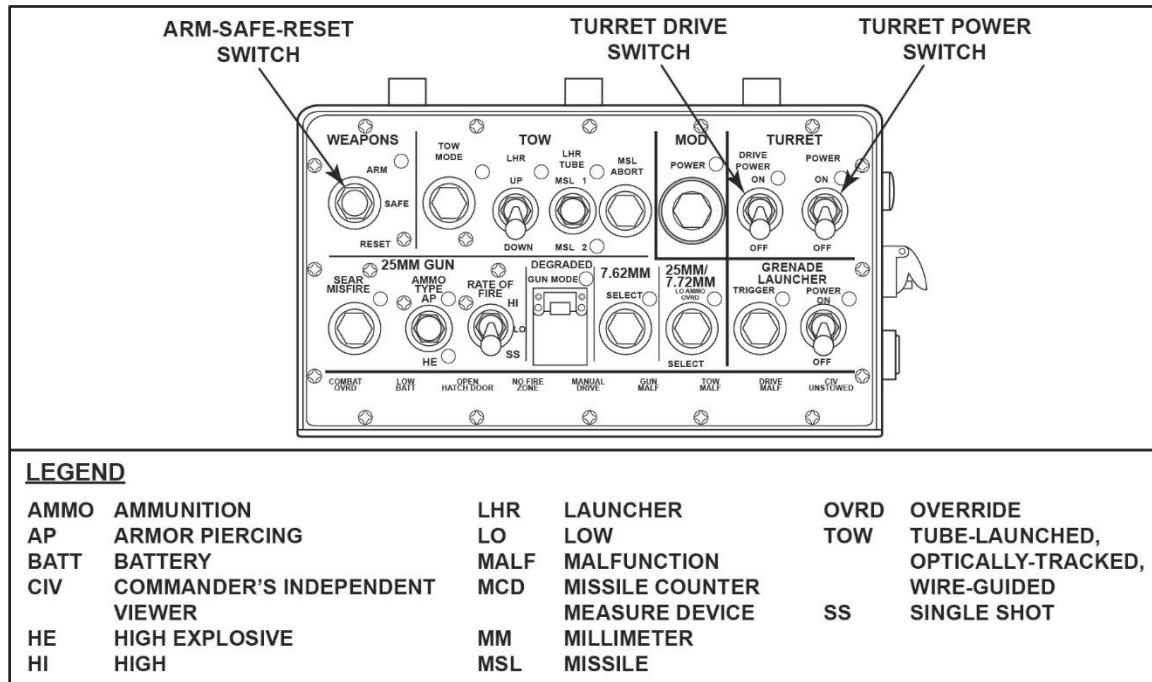


Figure 3-279. TURRET POWER and DRIVE switch

- (2) Move turret power switch to OFF.
- (3) Open turret shield door.
- (4) Ensure crew exits the turret but remain in the squad area for 30 minutes.
- (5) Close turret shield door.
- (6) Notify unit maintenance of the TOW misfire condition.
- (7) If no annunciator lights come on, follow step a.

### WARNING

**Accidental firing of weapons can kill or seriously injure personnel. Make sure ARM-SAFE-RESET switch is set to SAFE until ready to fire.**

- a. Reselect the misfired TOW missile by moving the missile select switch to the missile that was selected when the TOW missile misfired (see figure 3-280).

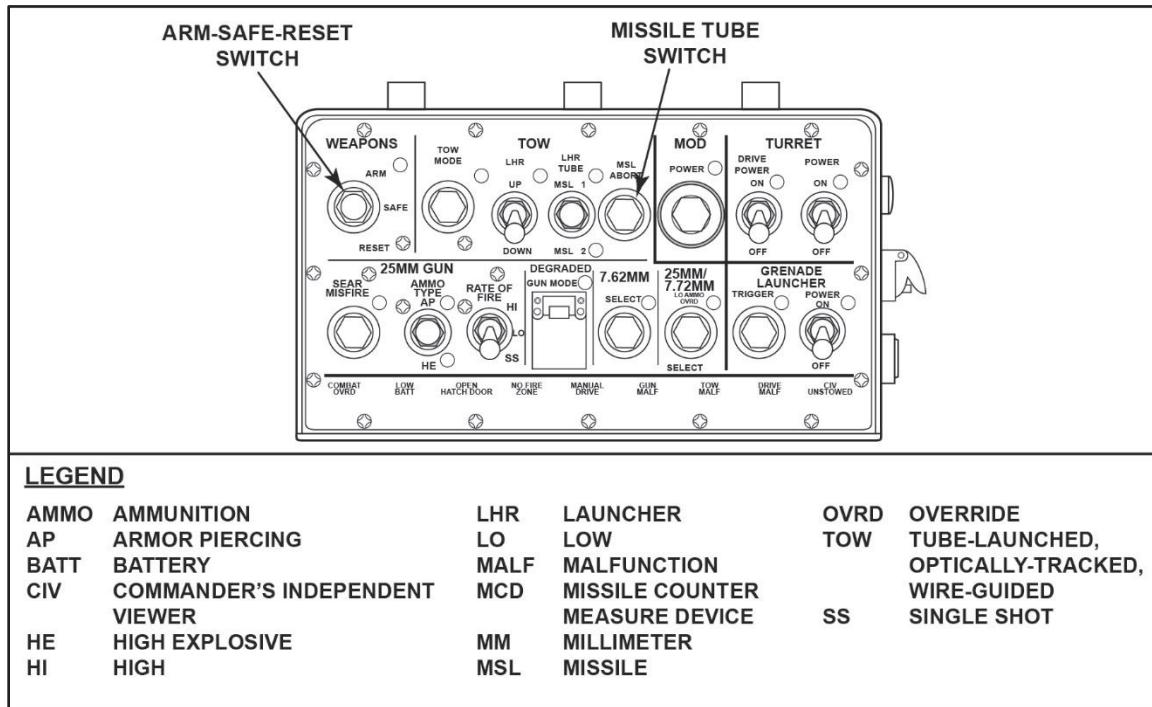


Figure 3-280. MISSILE TUBE switch

- b. Move ARM-SAFE-RESET switch to ARM.
- c. Squeeze and hold palm switches, then squeeze and hold trigger switches.
  - (1) If TOW missile fires, end remedial action.
  - (2) If TOW missile does not fire in 5 seconds, proceed to step a.
    - (a) Select and fire the second TOW missile.
    - (b) If second TOW missile fails to fire, perform misfire procedures.
- d. If the second TOW missile does or does not fire again, prepare BFV for removal of misfired TOW missile.

Performance Measures	GO	NO-GO
1. Performed misfire procedures on the TOW system.	_____	_____
2. Performed remedial action on a misfired TOW missile.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01- 248-7620) (EIC: ALH) Turret
TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)	

071-324-4003

**Fire the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle****DANGER**

The hatches should be closed when firing the smoke grenade launchers to prevent red phosphorus being blown in on the crew, as red phosphorus can cause serious burns. All personnel outside the vehicle must stay at least 200 meters from the vehicle during firing. Electrical system malfunctions or surges can cause smoke grenades to kill or injure Soldiers. Before loading any smoke grenades, make sure the grenade launcher switches are in the OFF position.

**Conditions:** You are a gunner on a moving Bradley fighting vehicle (known as BFV) and have been directed to fire smoke to mask vehicle movement. The M257 smoke grenade launchers are loaded.

**Standards:** Fire the smoke grenades from the M257 grenade launcher and prevent enemy observation of the BFV.

**Note:** If the tactical situation permits, remove the discharged caps before firing the smoke grenades.

**Performance Steps**

1. Announce GRENADE LAUNCHER to alert the crew that the grenade launcher is to be fired.
2. Move the grenade launcher switch to ON. (See figures 3-281 for A2 and 3-282 for A3, page 3-706.)

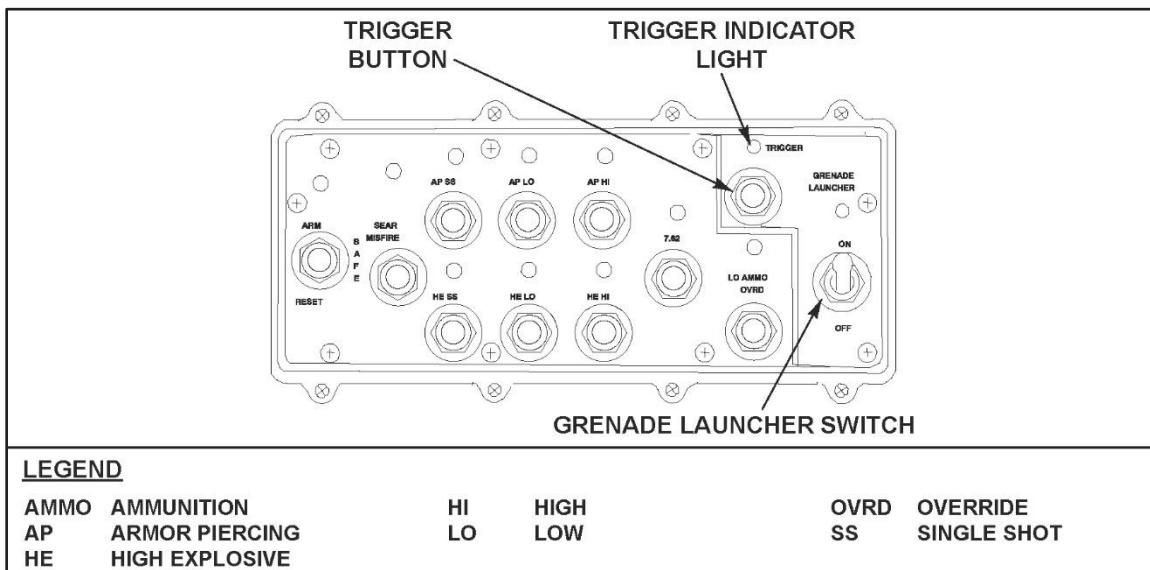


Figure 3-281. Weapon control box A2

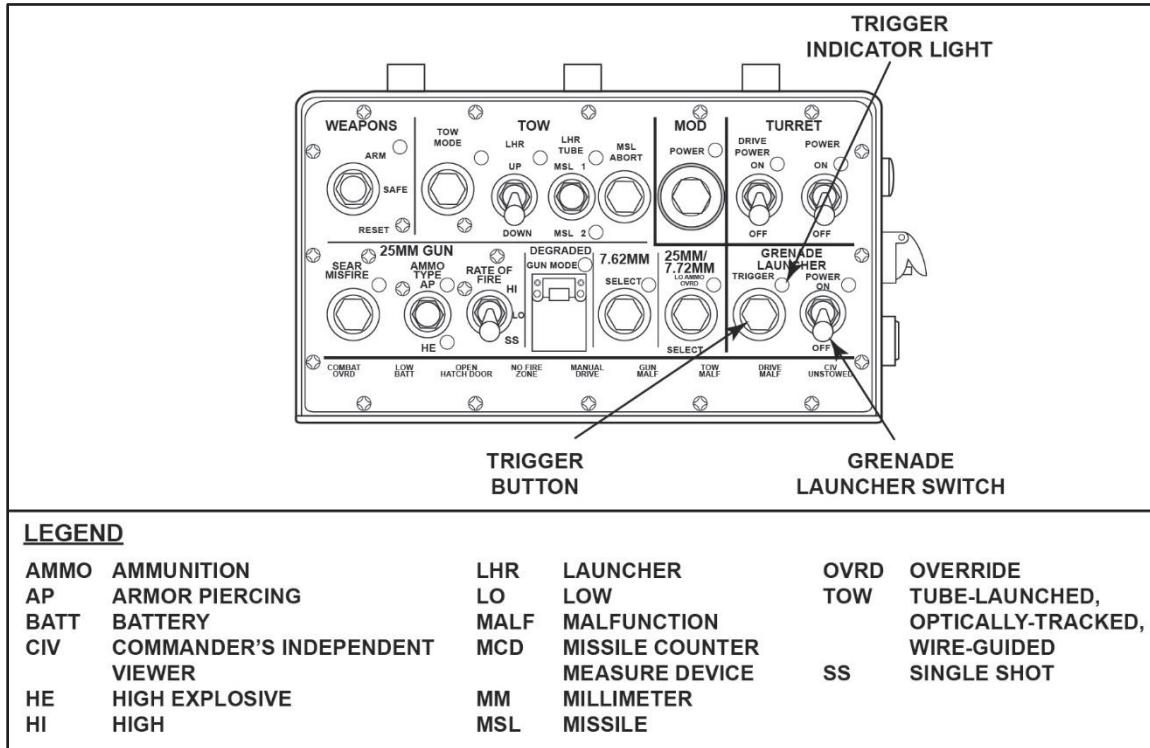


Figure 3-282. Weapon control box A3

3. Fire the smoke grenades.
  - a. On the command FIRE, press the smoke grenade trigger button.
  - b. Verify that trigger indicator light is ON.
    - (1) If trigger indicator light is ON, go to step 4.
    - (2) If the trigger indicator light is not ON, take immediate action.
4. Move the grenade launcher switch to OFF.
5. Check the launch tubes for misfired smoke grenades, when the tactical situation permits.

Performance Measures	GO	NO-GO
1. Announced GRENADE LAUNCHER.	_____	_____
2. Moved the smoke grenade launcher switch to ON.	_____	_____
3. Fired the smoke grenades.	_____	_____
4. Moved the grenade launcher switch to OFF.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Checked the launch tubes for misfired smoke grenades, when the tactical situation permitted.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (NSN 2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01-248-7620) (EIC: ALH) Turret	
TM 9-2350-438-10-2 Operator Manual for Fighting Vehicle, Infantry M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)		

**071-324-4004**

**Perform Misfire Procedures on the M257 Smoke Grenade Launcher on a Bradley Fighting Vehicle**

**DANGER**

**An electrical malfunction could cause smoke grenades to fire during unloading, and Soldiers in the area could be killed or injured. For training purposes only, make sure that turret power and smoke grenade launcher switches are off before unloading. Do not place any part of your body in front of smoke grenade launchers.**

**Conditions:** You are a gunner or commander of a Bradley fighting vehicle (known as BFV) maneuvering as part of a section or platoon. You are providing a smoke screen using your smoke grenade launcher, and one or more of the smoke grenades did not fire. All hatches are closed.

**Standards:** Repeat firing sequence and check launchers for misfired smoke grenades. Remove any misfired smoke grenades and place them in a well-marked spot at least 650 feet (200 meters) from the nearest vehicle, building, personnel, or equipment. Notify your chain of command of exact location, type, and number of misfired smoke grenades. Notify maintenance that smoke grenade launchers on vehicle have malfunctioned.

**Performance Steps**

1. Repeat firing sequence.

**Note:** The firing sequence is repeated if smoke grenades do not discharge from the grenade launcher when firing is attempted.

- a. Reset the system by turning the grenade launcher switch to OFF, then to ON position.
- b. Press trigger button on weapons control box.
- c. Look for smoke through periscope.

2. Check smoke grenade launchers for misfire.

**Note:** Smoke does not mean that all eight smoke grenades have fired. Check smoke grenade launchers for misfired smoke grenades.

- a. Move grenade launcher switch to OFF position.
- b. Open commander's hatch cover.
- c. Stand on the commander's seat to inspect smoke grenade launchers.
  - (1) If smoke grenade launchers are empty, the task is completed.
  - (2) If you see smoke grenades in smoke grenade launchers, go to step 3.

3. Remove misfired smoke grenade(s).

- a. Push the travel lock lever to locked position.

- b. Move turret drive system switch to OFF position.
- c. Move turret power switch to OFF position.
- d. Move master power switch to OFF position.
- e. Direct helper to leave vehicle.
- f. Grasp the smoke grenade from the side.
- g. Carefully pull and twist the smoke grenade left and remove from the grenade launcher tube.
- h. Pass smoke grenade to helper standing on ground.

**Note:** Repeat steps 3f and 3g until all misfired smoke grenades are removed from smoke grenade launcher.

4. Move smoke grenades to a well-marked spot at least 650 feet (200 meters) from nearest vehicle, building, personnel, or equipment.
5. Notify your chain of command of exact location, type, and number of smoke grenades left at safe location.
6. Notify maintenance that smoke grenade launchers on your vehicle have malfunctioned.

Performance Measures	GO	NO-GO
1. Repeated firing sequence.	_____	_____
2. Checked smoke grenade launchers for misfire.	_____	_____
3. Removed misfired smoke grenade(s).	_____	_____
4. Moved smoke grenades to a well-marked spot at least 650 feet (200 meters) from nearest vehicle, building, personnel, or equipment.	_____	_____
5. Notified chain of command of exact location, type, and number of smoke grenades left at safe location.	_____	_____
6. Notified maintenance that smoke grenade launchers on your vehicle have malfunctioned.	_____	_____

References Required	Primary
TM 9-2350-252-10-2 Operator's Manual Fighting Vehicle, Infantry, M2 (NSN 2350-01-048-5920) M2A1 (2350-01-179-1027) and Fighting Vehicle, Cavalry, M3 (2350-01-049-2695) M3A1 (2350-01-179-1028) Turret	TM 9-2350-438-10-2 Operator Manual Fighting Vehicle, Infantry, M2A3 (NSN 2350-01-436-0005) (EIC APG) Fighting Vehicle, Infantry, Operation Desert Storm, Situational Awareness (ODS SA) M2 ODS SA (NSN 2350-01-565-3460 (EIC AP2)

<b>References Required</b>	<b>Primary</b>
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TM 9-2350-284-10-2 Operator's Manual for Fighting Vehicle, Infantry, M2A2 (NSN 2350-01-248-7619) (EIC: ALG) Fighting Vehicle, Cavalry M3A2 (2350-01- 248-7620) (EIC: ALH) Turret

171-157-0013

**Engage Targets with Primary Weapon on a Reconnaissance Vehicle****DANGER**

If barrel turns in either direction while bolt is locked in the forward position or if timing adjustment nut turns easily, do not fire weapon. Notify your noncommissioned officer in charge. Failure to do so could result in a catastrophic failure of the weapon, causing death or injury to personnel in the immediate vicinity or damage to the equipment.

When the vehicle is in motion, use travel locks and operate in battlefield defensive mode. The machine gun can easily be discharged accidentally, by grasping the trigger area while the vehicle is moving, causing death or injury to personnel in the immediate vicinity or damage to equipment.

If the machine gun is fired while cupola travel lock is disengaged (unlocked) at critical angles, the cupola could rotate due to recoil of the gun, causing death or injury to personnel in the immediate vicinity or damage to the equipment.

Ensure primary weapon is aimed in a safe direction and that no personnel or equipment are in line of fire.

**WARNING**

High noise levels from vehicle operation and/or weapon firing can cause damage to hearing. All on-vehicle personnel must wear serviceable combat vehicle crewman helmets or equivalent. Personnel within 60 feet (20 meters) of the vehicle during primary weapon firing must wear hearing protection.

**Conditions:** You are a crewmember on a reconnaissance vehicle and must engage targets within your sector of fire. You have a .50 cal. machine gun or MK19 grenade machine gun mounted and loaded. Prefire checks have been completed.

**Standards:** Search for targets within your sector of fire. Confirm and engage targets with the primary weapon system. Cease fire once target(s) is destroyed or is no longer a threat.

**Note:** Soldiers should always consider some or all the elements of the detect, identify, decide, engage, and assess combat identification process and emphasize the importance of maintaining situational awareness (SA). Accurate target identification and maintaining SA result in increased combat effectiveness. Improper target identification and lack of SA are the main causes of fratricide.

**Performance Steps**

1. Scan sector of fire.
  - a. Use search techniques to locate targets in your assigned sector of fire.
  - b. Search for targets near to far.

2. Identify target(s).

**Notes:** The target's appearance and your knowledge of the tactical situation complete your evaluation of the target.

Do not engage target until a positive identification is made.

3. Classify multiple targets, if required.

- a. Most dangerous.

**Note:** This is a target that can see you, has capability to engage you, and appears to be preparing to fire at you. This type of target must be engaged quickly, especially if it is close to your location.

- b. Dangerous.

**Note:** This is a target that can destroy you but cannot see you. This type of target should be engaged as soon as possible.

- c. Least dangerous.

**Note:** A target that does not have the capability to destroy you but can call or report your location to targets can destroy you. This target should be engaged as soon as the tactical situation permits.

4. Command DRIVER STOP, if the vehicle is moving.

5. Assume a stabilized firing position on the commander's seat.

6. Traverse cupola to position primary weapon.

- a. Grasp force stick with one hand.

- b. Grasp right- or left-side fixed handgrip with the other hand.

**DANGER**

**When the vehicle is in motion, use travel locks and the weapon safety while operating in battlefield defensive mode. The machine gun can easily be discharged accidentally by grasping the trigger area while the vehicle is moving, causing death or injury to personnel in the immediate vicinity or damage to equipment.**

- c. Manually traverse cupola left or right to traverse cupola in desired position.

- d. Lift up on the cupola lock handle to lock cupola.

- e. Verify that the cupola unlocked light-emitting diode is extinguished.

7. Alert the crew that the weapon is being fired.

8. Engage target(s).

**Notes:** If weapon malfunctions, perform immediate action procedures as required.

Engage multiple targets based on classification of threat.

- f. Switch weapon from safe to fire.
- g. Press the trigger for the weapon system announcing ON THE WAY.
  - (1) Ensure to announce ON THE WAY with every subsequent firing burst.
  - (2) For longer range target, slightly raise the muzzle end of barrel.
  - (3) For shorter range target, slightly lower the barrel.
- 9. Cease fire when enemy target(s) is destroyed or is no longer a threat.
  - a. Announce CEASE FIRE.
  - b. Place weapon on safe.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Scanned sector of fire.	_____	_____
2. Identified target(s).	_____	_____
3. Classified multiple targets, if required.	_____	_____
4. Commanded DRIVER STOP, if the vehicle was moving.	_____	_____
5. Assumed a stabilized firing position on commander's seat.	_____	_____
6. Traversed cupola to position primary weapon.	_____	_____
7. Alerted the crew that the weapon is being fired.	_____	_____
8. Engaged target(s).	_____	_____
9. Ceased fire when enemy target(s) is destroyed or is no longer a threat.	_____	_____

<b>References Required</b>	<b>Primary</b>
FM 3-20.21/MCWP 3-12.2 Heavy Brigade Combat Team (HBCT) Gunnery	TC 3-20.31-4 Direct Fire Engagement Process (DIDEA)
TC 3-20.0 Integrated Weapons Training Strategy (IWTS)	
TM 9-2355-311-10-5-3 Operator's Manual Volume 3 of 3, Reconnaissance/Scout Vehicle (RV) M1127 NSN: 2355-01-481-8572 (EIC: AFG) Stryker	

<b>References Required</b>	<b>Primary</b>
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TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513

TM 9-2355-311-10-5-1 Operator's Manual, Volume 1 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker

TM 9-2355-311-10-5-2 Operator's Manual, Volume 2 of 4, Reconnaissance/Scout Vehicle (RV) M1127 NSN 2355-01-481-8572 (EIC: AFG) Stryker

## 071-000-0008

### Prepare a Range Card

**Conditions:** You are a member of a squad or section in a defensive fighting position and you have been directed to prepare a range card (DA Form 5517 [*Standard Range Card*]) for the position. You have been assigned a primary sector of fire with recognizable targets (either a final protective line [FPL] or principal direction of fire [known as PDF]) and a secondary sector of fire with recognizable targets. Your maximum engagement line (known as MEL) has been identified along with avenues of approach (known as AAs) and target reference points. You have two blank copies of DA Form 5517, a compass, and a military map of the area.

**Standards:** Complete the marginal information. Sketch the primary sector of fire, develop the sketch for the primary sector of fire and record the weapon system data. Sketch the secondary sector of fire, label the dead space, and record the position of the weapon system. Make a duplicate range card and prepare a range card for the alternate and supplementary positions, as applicable.

**Note:** Range cards should be prepared as soon as you have a primary sector of fire and a designated defensive position, regardless of the length of stay. Update the range card, as necessary.

#### Performance Steps

1. Complete the marginal information located at the top and center of the standard range card. (See figure 3-283.)

STANDARD RANGE CARD	
For use of this form see ATP 3-21.8; the proponent agency is TRADOC.	
SQD	<b>2nd</b>
PLT	<b>1st</b>
CO	<b>C</b>
May be used for all types of direct fire weapons.	
MAGNETIC NORTH	
DATA SECTION	
POSITION IDENTIFICATION <b>PRIMARY</b> DATE <b>11 FEB 2018</b>	
WEAPON NO.	<b>M240B</b>
DIRECTION/ LOCATION	
EACH CIRCLE EQUALS <b>100</b> METERS	
RA      MM      MO	
A      P      R	
LEGEND	
CO FM	COMPANY FIELD MANUAL
PLT SQD	PLATOON SQUAD
TRADOC	U.S. ARMY TRAINING AND DOCTRINE COMMAND

**Figure 3-283. Marginal information sections on DA Form 5517**

- a. Record the squad, platoon, and company designations.

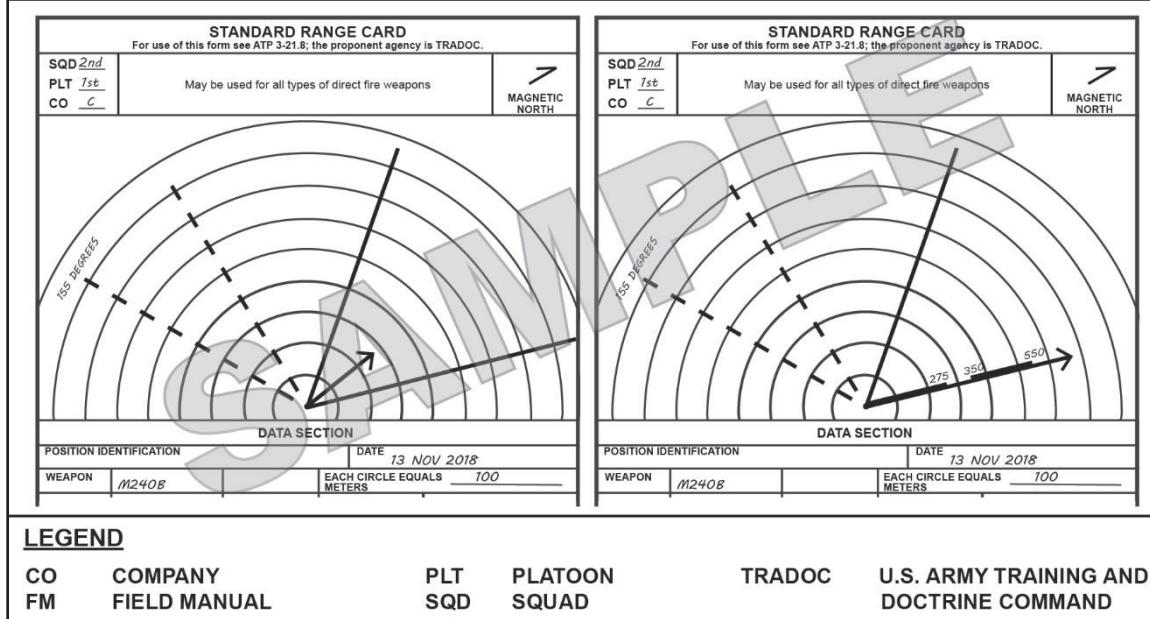
**Note:** Do not record unit designations higher than company.

- b. Record the relative direction of magnetic north.

- (1) Use the magnetic north symbol.
  - (2) Orient the range card to the terrain.
  - (3) Determine magnetic north.
- c. Record your defensive position as primary, alternate, or supplementary.
  - d. Record the date and time the range card was prepared.
  - e. Record the type of weapon system used.
  - f. Record the incremental distance of the nine range circles.

**Note:** If the distance to the terrain feature is less than 450 meters, then each circle represents 50 meters. If the distance is between 450 and 900 meters, then each circle represents 100 meters. If the distance to the terrain feature is greater than 900 meters, then each circle represents 200 meters.

- (1) Use the farthest prominent terrain feature that is within the weapon system's range.
  - (2) Determine the distance that each range circle represents.
  - (3) Record the distance.
  - (4) Draw this terrain feature on the sketch.
2. Sketch the primary sector of fire using either an FPL or PDF. (See figure 3-284.)



**Figure 3-284. Sector of fire with a principal direction of fire (left) and a final protective line (right)**

- a. Sketch the primary sector of fire using a PDF. (See figure 3-284 [left].)

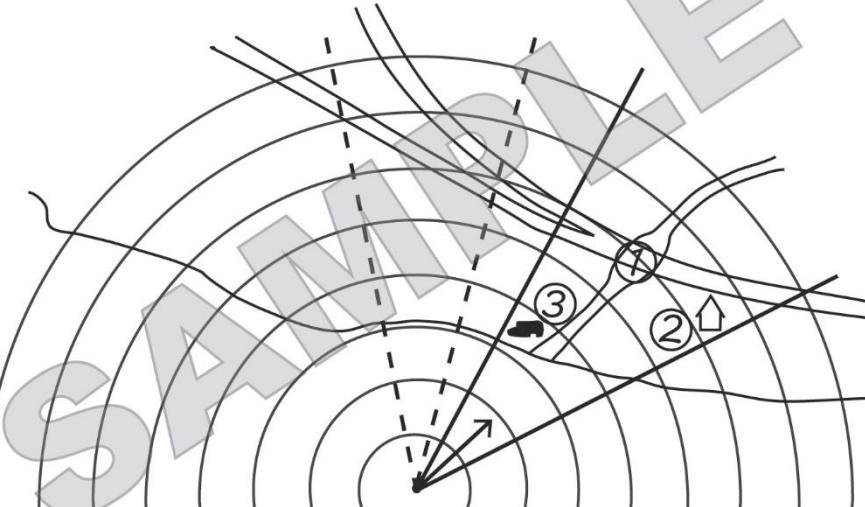
- (1) Draw the symbol appropriate to your weapon system or vehicle pointing in the direction of the PDF.
- (2) Draw two solid lines, one for the left limit and one for the right limit to the left and right of the symbol.

**Note:** The limits should be 437 mils to the left and right of the PDF unless reduced by the presence of friendly positions. Both lines are drawn out to the maximum range of the weapon or to the ninth range circle, whichever is less. If you cannot use the maximum traverse to establish a left or right firing limit, then you must record the actual direction of the limit at the end of the arrow or line.

- b. Sketch the primary sector of fire using an FPL. (See figure 3-284 [right].)
  - (1) Draw the symbol appropriate to your weapon system or vehicle as a long line down the appropriate left or right limit.
  - (2) Draw another long arrow for the opposite limit (left or right).
- (3) Sketch the grazing fire and dead space along the FPL. (See figure 3-284.)

**Note:** Grazing fire is represented by a shaded blade on the inside of the FPL line while dead space is represented by breaks in this shaded blade.

- (a) Observe Soldier walking the FPL.
  - (b) Look through or over the sights of the machine gun.
  - (c) Adjusts the elevation to achieve maximum amount of grazing fire out to the 600 meters maximum range of grazing fire.
  - (d) Record the actual maximum range of grazing fire at the end of the shaded blade.
  - (e) Identify any area of dead space by determining where individuals drop below the weapon's line of sight (LOS) and where they return to the LOS.
- (4) If the enemy situation prevents a person from walking the FPL estimate the locations and limits of dead space and the maximum range of grazing fire, then record the results on the sketch as appropriate.
3. Develop the sketch for the primary sector of fire. (See figure 3-285, page 3-718.)

<b>STANDARD RANGE CARD</b>					
For use of this form see ATP 3-21.8; the proponent agency is TRADOC.					
SQD <u>2nd</u> PLT <u>1st</u> CO <u>C</u>	May be used for all types of direct fire weapons  <b>MAGNETIC NORTH</b>				
					
<b>DATA SECTION</b>					
<b>POSITION IDENTIFICATION</b> <b>DATE</b> <u>13 NOV 2018</u>					
<b>WEAPON</b> <u>M240B</u>	<b>EACH CIRCLE EQUALS</b> <u>100</u> <b>METERS</b>				
<b>LEGEND</b>					
<b>CO</b> <b>FM</b>	<b>COMPANY</b> <b>FIELD MANUAL</b>	<b>PLT</b> <b>SQD</b>	<b>PLATOON</b> <b>SQUAD</b>	<b>TRADOC</b>	<b>U.S. ARMY TRAINING AND DOCTRINE COMMAND</b>

**Figure 3-285. Marginal information and a sector sketch using a principal direction of fire**

- Identify all prominent terrain features within the primary sector of fire.

**Note:** Prominent terrain features are locations where enemy elements may position themselves during periods of limited visibility, such as road junctions, buildings, and ditches.

- Sketch an appropriate symbol for each target at the targets' approximate position within the primary sector of fire.
- Number all targets consecutively, beginning with the number 2, in order of tactical importance and circle the target number.

**Note:** The FPL or PDF, whichever is used, is target number 1.

- Number all mounted AAs by placing a small circled number around each.
- Draw the MEL.

**Note:** Have the MEL for all weapon systems that could be used in sector.

- Record the weapon system firing data in appropriate space of the data section. (See figure 3-286.)

DATA SECTION					
POSITION IDENTIFICATION			DATE <u>11 FEB 2018</u>		
WEAPON <b>M240B</b>		EACH CIRCLE EQUALS METERS <u>100</u>			
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1	<i>L035°</i>	<i>0/25</i>	<i>575m</i>	<i>BALL</i>	<i>PDF (BRIDGE)</i>
2	<i>R375°</i>	<i>+50/5</i>	<i>625m</i>	<i>BALL</i>	<i>BARN</i>
3	<i>L200°</i>	<i>-50/2</i>	<i>375m</i>	<i>BALL</i>	<i>TREE LINE</i>
REMARKS:					

DA FORM 5517, FEB 2016      PREVIOUS EDITIONS ARE OBSOLETE.      APD LC v1.00

<u>LEGEND</u>					
°	DEGREE	M	METERS		
AMMO	AMMUNITION	NO	NUMBER		
L	LEFT	PDF	PRINCIPAL DIRECTION OF FIRE	R      RIGHT	

Figure 3-286. Data section, gun firing data

- Record the target numbers, in numerical order.
- Record DIRECTION/DEFLECTION data in the appropriate block.

**Note:** Target number is always either the FPL or the PDF and uses unique data.

- Record FPL data by writing either 'L' or 'R', whichever traversing limit designates the FPL (Block 1 only).
- Record PDF data by writing either '0' if the tripod is centered on the PDF or the actual left or right direction/deflection of the PDF (Block 1 only).
- Record data for all other targets.
  - Lay the weapon system on the base of the target.
  - Determine the direction of the weapon system (L or R).
  - Record the direction.
- Record ELEVATION data in the appropriate block (mounted weapon system only).
  - Record, for FPL only, any elevation change used to obtain the maximum distance of grazing fire (Block 1 only).

- (2) Record the actual elevation for PDF and all other targets.
  - (a) Ensure the barrel is in line with the target.
  - (b) Use the weapon mount to elevate the weapon system until the sight picture reaches the base of the target.
  - (c) Determine the elevation.
  - (d) Recording the elevation in the elevation column.
- d. Record the RANGE data, in meters, in the appropriate block.
  - (1) Record for an FPL, the maximum achieved distance of grazing fire.
  - (2) Record for the PDF and all other targets the distance to the target.
- e. Record any special ammunition required in the AMMO block.
- f. Describe the target in the block labeled DESCRIPTION.
  - (1) Record an FPL as 'FPL'.
  - (2) Record a PDF as 'PDF'.
  - (3) Describe all other targets by providing a simple description of the target.
- g. Record REMARKS in the appropriate block. (See figure 3-287.)

DATA SECTION					
POSITION IDENTIFICATION <b>PRIMARY</b>			DATE <b>11 FEB 2018</b>		
WEAPON <b>M240B</b>		EACH CIRCLE EQUALS METERS <b>100</b>			
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1	L	+50/3	550m		FPL
2	R275	+50/15	525m		BARN
3	L102	0/28	425m		ROAD JUNCTION
4	L370	0/12	375m		BOULDER
REMARKS: <b>(1) -4</b> <b>(3) TW 15/L13</b>					

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<u>LEGEND</u>					
AMMO	AMMUNITION	M	METERS	TW	TARGET WIDTH
FPL	FINAL PROTECTIVE LINE	M NO	METERS NUMBER		
L	LEFT	R	RIGHT		

Figure 3-287. Data section with remarks added

- (1) Record the elevation change, for the FPL only that causes the rounds to strike the ground at the beginning of the first dead space.
- (2) Record mounted machine gun specific target data.
  - (a) Record data for large (deep) targets that defines the target's depth.
    - \_1\_ Lay the weapon on target.
    - \_2\_ Record target number.
      - \_a\_ Write and circle the target number in the remarks section.
      - \_b\_ Write the letters 'TD' (target depth).
      - \_c\_ Write the already determined elevation and the word 'to'.
    - \_3\_ Rotate the elevating handwheel until the sight picture reaches the top of the target.
    - \_4\_ Determine the depth.

**Note:** This is a second elevation reading, which can be done by reading the number above the first visible line on elevating screw scale (including the "+" or "-") and then reading the number on the elevating handwheel.

\_5\_ Record these two numbers after the 'to'.

**Note:** Example TD +50/15 to +50/22.

- (b) Record data for linear targets that defines the target's width.

\_1\_ Record target number.

\_a\_ Write and circle the target number in the remarks section.

\_b\_ Write the letters 'TW' (target width) followed by some blank space and then a slash.

\_2\_ Lay the gun on the target using existing data.

**Note:** The initial target data should lay the gun on the most dangerous point of the target, which may be anywhere on the target.

\_3\_ Traverse from this initial lay point, to the most dangerous edge of the target.

\_a\_ Count the number of mils.

\_b\_ Note the direction (L or R) of movement.

\_4\_ Record this data to the right of the slash.

\_5\_ Traverse the gun to the opposite edge of the target counting the total number of mils.

\_6\_ Record this data to the left of the slash.

**Note:** Example TW 15/L8.

5. Sketch the secondary sector of fire.

a. Draw a 'V' using two broken lines to represent the left and right limits of the secondary sector of fire.

(See figure 3-286, page 3-719; or figure 3-287, page 3-721.)

b. Sketch identified targets in the secondary sector of fire.

c. Record the range (in meters) to each target above the target's sketch.

d. If necessary, employ field expedient firing aids for the secondary sector.

e. Sketch the field expedient firing aid above the target for ease of identification.

**Note:** Firing data is not determined for the secondary sector of fire as the tripod remains fixed in the primary firing position. To fire in the secondary sector of fire, the gun is dismounted from the tripod, moved, and fired in the bipod mode. The gunner uses field expedient firing aids for targets in the secondary sector.

6. Label the area between the primary and secondary sectors as dead space.

7. Record the position of the weapon system or vehicle.

a. Use the grid method.

(1) Determine the eight-digit grid coordinate of the gun.

- (2) Record the coordinate directly below the gun position.
- b. Use the reference point method.
- (1) Orient the firing position to a prominent terrain feature (recognizable on a map) no more than 1,000 meters away.
  - (2) Draw a line between these two points, with barbed arrows pointing to the gun position.
  - (3) Determine the azimuth from the terrain feature to the gun position.
  - (4) Record the azimuth in mils of degrees below the barbed line.
  - (5) Determine the distance from the terrain feature to the gun position and recording above the barbed line.
8. Make a duplicate copy of the range card.
- a. Ensure one range card stays at the defensive position.
  - b. Ensure one range card is given to the squad or platoon leader.
9. Prepare range cards for alternate and supplementary positions, as required.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Completed the marginal information located at the top and center of the standard range card.	_____	_____
2. Sketched the primary sector of fire using either an FPL or PDF.	_____	_____
3. Developed the sketch for the primary sector of fire.	_____	_____
4. Recorded the weapon system firing data in appropriate space of the data section.	_____	_____
5. Sketched the secondary sector of fire.	_____	_____
6. Labeled the area between the primary and secondary sectors as dead space.	_____	_____
7. Recorded the position of the weapon system or vehicle.	_____	_____
8. Made a duplicate copy of the range card.	_____	_____
9. Prepared range cards for alternate and supplementary positions, as required.	_____	_____

**References  
Required**

DA Form 5517 Standard Range Card

TC 3-22.249 Light Machine Gun M249 Series

**Primary**

ATP 3-21.8 Infantry Rifle Platoon and Squad

## Subject Area 9: WEAPONS

**071-004-0007**  
**Maintain an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
 Treat all weapons as if they are loaded and prepared to fire. Never  
 point a weapon at anything you do not intend to shoot.**

**Conditions:** You are a member of a squad or team that has just returned from a mission and you have been directed to conduct maintenance on your M17 or M18 pistol. You have a cleaning kit, which includes a bore brush; wiping rags; an M4 cleaning rod (a one-section handle and a swab holder); small-arms cleaning swabs; and cleaner, lubricant, and preservative (known as CLP); or lubricant, semi-fluid, automatic weapons (known as LSA).

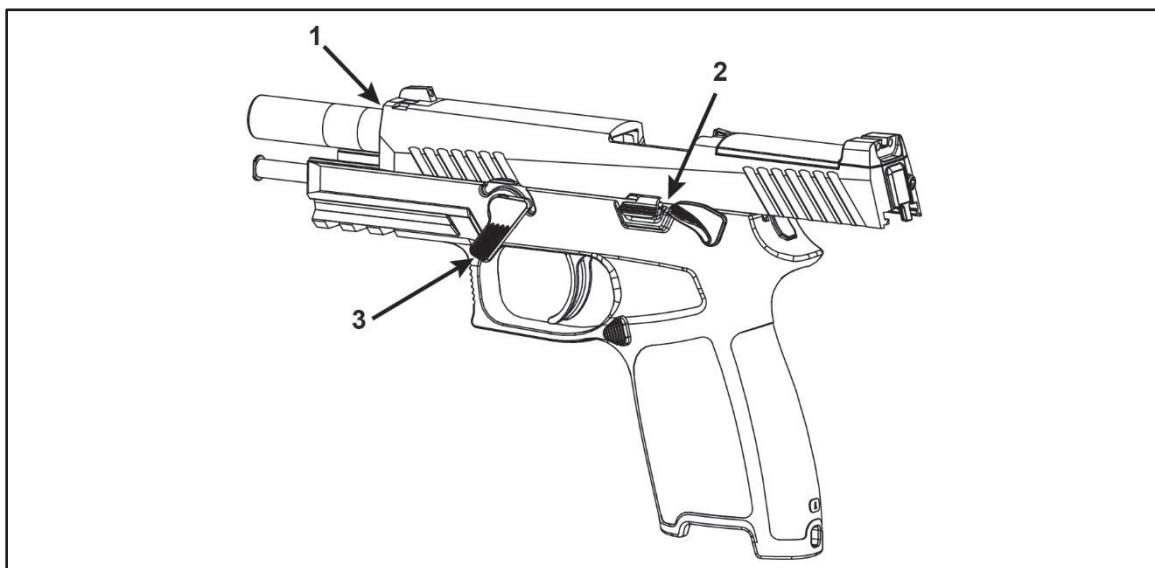
**Standards:** Clear the pistol. Disassemble the pistol and magazine. Clean, inspect, and lubricate the pistol's components. Assemble the pistol and magazine. Perform a function check.

**Performance Steps**

1. Clear the pistol.

**Note:** Disassembly of M17 or M18 pistol beyond field strip is not authorized.

2. Disassemble the pistol.
  - a. Push the manual safety upward.
  - b. Grasp slide serrations and pull the slide (see figure 3-288, item 1) fully to the rear.
  - c. Lock slide to rear with slide catch (see figure 3-288, item 2).



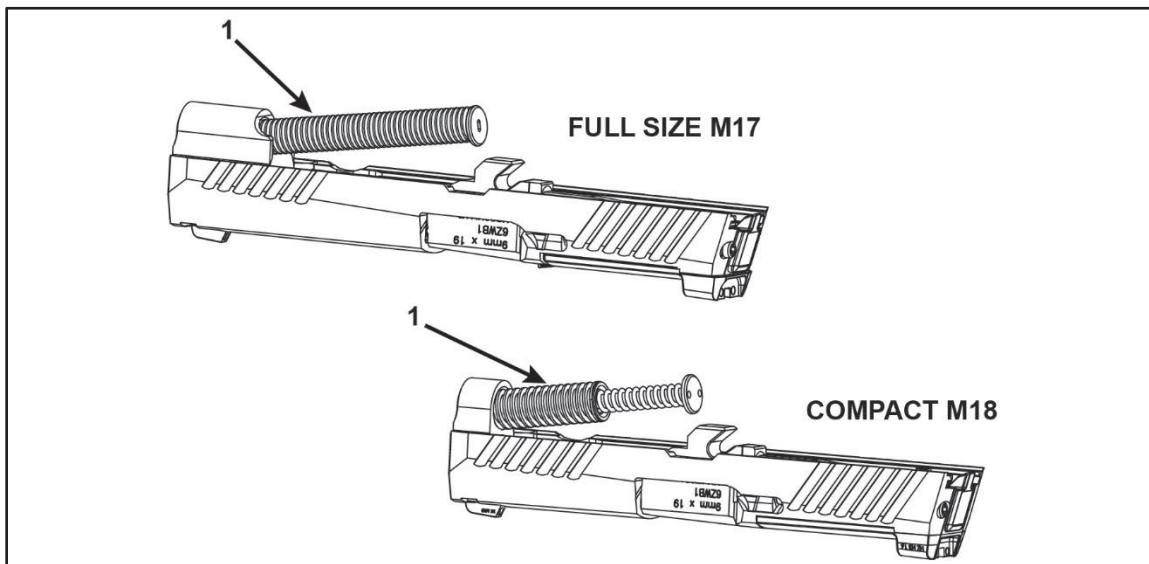
**Figure 3-288. Pistol**

- d. Rotate the takedown lever (see figure 3-288, item 3) downward on receiver (see figure 3-288, item 3).
- e. Pull slide to rear of receiver to release slide catch.
- f. Pull slide forward and remove from the receiver.

**WARNING**

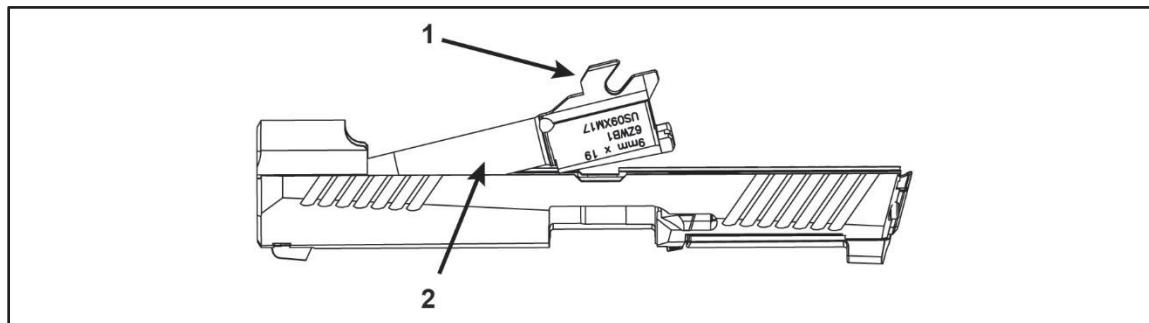
**Use care when removing recoil spring and spring guide. Because of amount of compression, the assembly will be released under spring tension and could cause injure to personnel or part damage/loss.**

- g. Slightly compress recoil spring guide assembly (see figure 3-289, item 1) and remove from slide.



**Figure 3-289. Recoil spring guide assembly**

- h. Lift and remove barrel (see figure 3-290, item 2) from slide by barrel lug (see figure 3-290, item 1).



**Figure 3-290. Barrel removal**

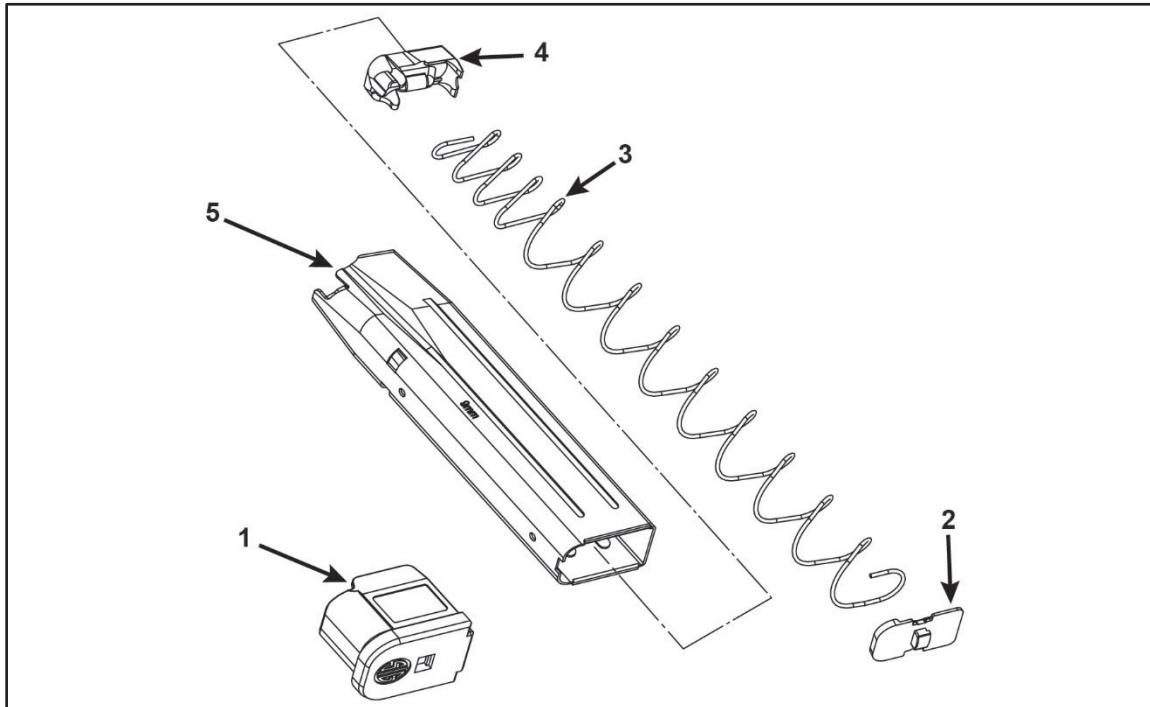
3. Disassemble the magazine.

- a. Unload magazine.
- b. Invert magazine.

**WARNING**

**Magazine spring is under great pressure. Keep work operation away from face to avoid personnel injury.**

- c. Depress magazine insert (see figure 3-291, item 2).



**Figure 3-291. Disassemble magazine**

- d. Push the magazine floorplate forward until it is clear of the magazine tube (see figure 3-291, item 5).
- e. Remove magazine follower (see figure 3-291, item 4) and magazine spring (see figure 3-291, item 3) from the magazine tube (see figure 3-291, item 5).

**CAUTION**

The bore brush should only be used to clean the bore. Using it on any other part of the pistol will cause damage.

4. Clean the pistol's components.
  - a. Clean the slide assembly.

- (1) Clean slide assembly with a cloth.
  - (2) Use CLP on a soft brush to remove excess dirt and carbon.
  - (3) Wipe dry with a clean cloth.
  - b. Clean the barrel assembly.
    - (1) Using a cleaning rod, insert a cleaning patch soaked with CLP/LSA in the chamber end of barrel and push out muzzle to remove loose firing residues and soften carbon deposits.
    - (2) Push a clean swab through the bore to clean and dry the barrel.
    - (3) Clean locking block with a soft brush.
  - c. Clean the recoil spring and spring guide with CLP and a soft brush or cloth.
  - d. Clean the receiver and grip module assembly.
    - (1) Wipe the receiver and grip module assembly with a soft cloth.
    - (2) Use cotton swabs to clean hard-to-reach areas, such as the frame rails, takedown lever, and slide catch lever.
  - e. Clean the magazine.
    - (1) Wipe the magazine tube and the follower with CLP and a cloth or brush.
    - (2) Clean the magazine spring, floor plate retainer, and floor plate with a clean cloth.
5. Inspect pistol's components for serviceability.

**Note:** Inspect pistol for damage or missing components.

- a. Inspect the slide assembly.
  - b. Inspect the barrel assembly.
  - c. Inspect the recoil spring and guide assembly.
  - d. Inspect the receiver/grip module.
  - e. Inspect the magazine.
6. Lubricate the pistol.

**Note:** CLP, LSA, and lubricant, arctic weather are the only lubricants authorized for the pistol. Lubricants should not be mixed. Changing lubes requires cleaning of weapon with solvent, drying, and relubing. Remove excess lubricant from bore before firing. Light coat is defined as a film barely visible to eye. Generously lubed is defined as heavy enough to be spread using a finger.

- a. Lubricate all parts with a light coat of lubricant.
- b. Remove excess lubricant from the bore before firing the pistol.

7. Assemble the pistol.
  - a. Insert muzzle of barrel into forward open end of slide while lowering the rear of barrel into slide (see figure 3-291, page 3-727).
  - b. Insert recoil spring guide assembly into slide.
  - c. Seat round end of recoil spring guide assembly to barrel lug of pistol.
  - d. Ensure that the takedown lever is rotated fully clockwise.
  - e. Guide slide onto frame rails from the front.
  - f. Lock slide to rear with slide catch lever.
  - g. Rotate takedown lever counterclockwise until it stops.
  - h. Press down on slide catch lever to release slide.
8. Assemble the magazine.
  - a. Position magazine follower on magazine spring.
  - b. Insert magazine spring fully into magazine tube until magazine insert is flush with magazine tube bottom.
  - c. Slide magazine floorplate onto magazine tube lips until magazine floorplate is locked in place by magazine insert.
9. Perform a function check.
  - a. Insert an empty magazine into magazine well.
  - b. Push up on manual safety lever to engage safety.
  - c. Grasp slide serrations and pull the slide to rear until it locks.

**Note:** Ensure magazine catch engages and locks the magazine in place.

- d. Press magazine catch.
- e. Press slide catch.

**Note:** Magazine will fall free from pistol.

- f. Press trigger.
- g. Depress manual safety lever.

- h. Press trigger and hold to rear.

**Note:** Striker should be released. An audible click should be heard.

- i. While still holding trigger to rear, fully retract and release slide.
- j. Release trigger.

**Note:** A light audible click should be heard and felt as the striker resets.

- k. Press trigger.

**Note:** The striker should release and you should hear and feel a loud audible click.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the pistol.	_____	_____
2. Disassembled the pistol.	_____	_____
3. Disassembled the magazine.	_____	_____
4. Cleaned the pistol's components.	_____	_____
5. Inspected pistol's components for serviceability.	_____	_____
6. Lubricated the pistol.	_____	_____
7. Assembled the pistol.	_____	_____
8. Assembled the magazine.	_____	_____
9. Performed a function check.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) PISTOL, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)

**071-004-0008**  
**Perform a Function Check on an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
Treat all weapons as if they are loaded and prepared to fire. Never  
point a weapon at anything you do not intend to shoot.**

**Conditions:** You are a member of a squad or team preparing to conduct a mission. You have your assigned weapon, an M17 or M18 pistol, and must perform a function check on the pistol as part of a precombat check or inspection. The pistol has been cleared and you have an empty pistol magazine on hand.

**Standards:** Ensure the pistol is clear. Insert empty magazine into the magazine well. Grasp slide and pull completely to rear until slide catch lever locks slide open. Press magazine catch. Pull back and release slide. Push up on manual safety lever to engage safety. Press trigger to the rear. Push down manual safety lever to disengage safety. Press and hold the trigger to the rear. Pull slide completely to the rear and release slide. Release trigger and press trigger again.

**Performance Steps**

1. Ensure the pistol is clear.
2. Insert empty magazine into the magazine well.

**Note:** If magazine catch fails to lock magazine in place, notify field maintenance.

3. Grasp slide and pull completely to rear until slide catch lever locks slide open.
4. Press magazine catch.

**Note:** If magazine fails to fall free of pistol under its own weight, notify field maintenance.

5. Pull back and release slide.
6. Push up on manual safety lever to engage safety.
7. Press trigger to the rear.

**Note:** Striker should not be released. If striker is released, notify field maintenance.

8. Push down manual safety lever to disengage safety.
9. Press trigger to the rear and hold to rear.

**Note:** Striker should be released and an audible click should be heard.

10. Pull slide completely to the rear and release slide.
11. Release trigger.

**Note:** A light audible click should be heard and felt as the striker resets.

12. Press trigger.

**Note:** The striker should release and you should hear and feel a loud audible click.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the pistol was clear.	_____	_____
2. Inserted empty magazine into the magazine well.	_____	_____
3. Grasped slide and pulled completely to rear until slide catch lever locked slide open.	_____	_____
4. Pressed magazine catch.	_____	_____
5. Pulled back and released slide.	_____	_____
6. Pushed up on manual safety lever to engage safety.	_____	_____
7. Pressed trigger to the rear.	_____	_____
8. Pushed down manual safety lever to disengage safety.	_____	_____
9. Pressed trigger to the rear and held it to rear.	_____	_____
10. Pulled slide completely to the rear and released slide.	_____	_____
11. Released trigger.	_____	_____
12. Pressed trigger.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-23.35 Pistol	TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) Pistol, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)

**071-004-0009**  
**Load an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to shoot. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are assigned an M17 or M18 pistol and have been directed to load it in preparation for a tactical operation. You have a pistol, magazine, and 9-millimeter ammunition.

**Standards:** Load the magazine. Engage the manual safety lever. Grasp serrated portion of slide and pull it to the rear until it locks. Conduct three-point safety check. Insert the loaded magazine into the magazine well and press slide catch lever to release the slide.

**Performance Steps**

1. Load the magazine.
  - a. Hold the magazine in one hand.
  - b. Press down on the magazine follower with the first cartridge.
  - c. Push the cartridge to the rear under the magazine lips.
  - d. Align the next cartridge.
  - e. Continue to load cartridges until the magazine is fully loaded.

**Note:** The standard magazine's capacity is 17 rounds. The extended magazine's capacity is 21 rounds.

2. Press up on manual safety lever to engage safety.
3. Grasp serrated portion of slide and pull it to the rear until it locks.
4. Conduct three-point safety check.
  - a. Ensure chamber is empty.
  - b. Ensure there is no magazine present in the magazine well.
  - c. Ensure the breech face is clear of live or expended cartridges, foreign debris, and has no physical damage.
5. Insert the loaded magazine into the magazine well.

**Note:** When the magazine is fully seated, you should hear an audible click.

6. Press slide catch lever to release the slide.

**Note:** Visually observe the cartridge enter the chamber. The loaded chamber indicator should now be in the UP position.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Loaded the magazine.	_____	_____
2. Pressed up on manual safety lever to engage safety.	_____	_____
3. Grasped serrated portion of slide and pulled it to the rear until it locked.	_____	_____
4. Conducted three-point safety check.	_____	_____
5. Inserted the loaded magazine into the magazine well.	_____	_____
6. Pressed slide catch lever to release the slide.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) Pistol, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)	

**071-004-0010**  
**Engage Targets with an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to shoot. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are a member of a squad or team engaged in active ground combat. Your primary weapon has failed to fire while engaging a threat. The proximity of the threat necessitates transitioning to your secondary weapon. You have a holstered M17 or M18 pistol and additional loaded pistol magazines.

**Standards:** Transition to secondary weapon. Present the pistol and engage the target. If necessary, reload the pistol. Reholster the pistol when no longer required.

**Performance Steps**

1. Transition to secondary weapon.
  - a. Attempt to put primary weapon on safe.
  - b. Move firing hand to the pistol while simultaneously guiding the primary weapon down to the nonfiring side with the nonfiring hand.

**Note:** This action happens very quickly and must be practiced. Remember: slow is smooth and smooth is fast. Ensure location of primary weapon does not block access to secondary weapon.

- c. Establish high, firm grip on the pistol.
- d. Disengage the holster's retention device.
- e. Release primary weapon and bring nonfiring hand to center of chest.
- f. Swiftly extract the pistol from the holster by pulling it straight up.
- g. As soon as the muzzle of the pistol clears the holster, drop the elbow of your firing hand and rotate the pistol to orient the muzzle toward the target.

**Note:** Hold the pistol close against the body.

- h. Slide the fingers of the nonfiring hand under and against the trigger guard forming an initial grip.

**Note:** The pistol should be centered at the chest and pointed at the target.

- i. Place the heel on your nonfiring hand against the grip between the space provided by the fingers and heel of your firing hand.
  - j. Disengage the manual safety lever.
2. Present the pistol.

- a. Extend your arms driving the pistol on a straight line to the target and bringing the sights into your sight line.
- b. As you drive the pistol forward, shift focus from the target to the front sight.
- c. Complete your grip by extending your thumbs and placing them in position along nonfiring side of the frame.

**Note:** Ensure the thumb of your firing hand is on top of your other (nonfiring) thumb.

- d. Place trigger finger on the trigger.
  - e. Begin taking in the trigger slack by applying smooth, continuous pressure straight to the rear.
3. Engage the target.

- a. Ensure sights are aligned on the target.

**Note:** When aiming, the front sight should be in focus with the target and rear notched sight out of focus. There should be equal height and equal light between the front sight and rear notched sight.

- b. Press the trigger by applying smooth, continuous pressure straight to the rear without disturbing sight alignment.
- c. Release the trigger, just far enough for the sear to reset.

**Note:** You will feel and hear a metallic click as the sear resets. Pressure should be maintained on the trigger until engagement is complete or reloading is necessary. The action of releasing the trigger must happen during the recoil.

- d. Assess effects on target.
  - (1) If target is not destroyed or additional target is identified—
    - (a) Adjust point of aim, as needed.
    - (b) Re-engage target.
  - (2) If target is destroyed, go to next step (3e).

- e. Cease fire when the target is destroyed, suppressed, or you receive an order to cease fire.
  - (1) Fully release the trigger.
  - (2) Remove trigger finger from the trigger guard and rest it along the frame.
  - (3) Bring pistol back into workspace.

**Note:** The workspace is a spherical area, 12 to 18 inches in diameter centered on the Soldiers' chin and about 12 inches in front of their chin. The workspace is where the majority of weapons manipulations occur.

4. Reload the pistol, if necessary.

**Notes:** Reloading can be performed anytime during the engagement process.

The two types of reloads for pistol are reload and reload with retention. The purpose of the reload is to bring an empty pistol back to firing condition in the shortest possible time. The reload with retention is a tactical reload used to bring the pistol back to its fully loaded status after firing one or more rounds but with ammunition remaining in both the chamber and magazine.

- a. Ensure trigger finger is free of the trigger guard and resting along the frame.
- b. Bring pistol back into workspace with the firing hand while simultaneously reaching for a new magazine with the nonfiring hand.
- c. Press the magazine catch.

**Note:** The magazine should fall free. If it does not, forcefully remove the magazine from the pistol.

- (1) If conducting a reload with retention, secure the empty magazine with the nonfiring hand.
- (2) If conducting a reload, visually observe that empty magazine falls free of the magazine well.
- d. Insert a new loaded magazine.

**Note:** When the magazine is fully seated, you should hear an audible click.

- e. Press slide catch lever to release the slide.

**Note:** Visually observe the round enter the chamber. The loaded chamber indicator should now be in the UP position.

- f. If conducting a reload with retention, secure the empty magazine in a magazine pouch.
- g. Engage target, as necessary.
5. Reholster the pistol.

**Note:** There is no time limit for reholstering; reholster without rushing.

- a. Ensure the manual safety is engaged.
- b. Ensure that the trigger finger is off the trigger and outside the trigger guard.
- c. Slide the pistol back into the holster.
- d. Watch the pistol go into the holster.
- e. Re-engage the holster's retention device.

Performance Measures	GO	NO-GO
1. Transitioned to secondary weapon.	_____	_____
2. Presented the pistol.	_____	_____
3. Engaged the target.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
4. Reholstered the pistol.	_____	_____
5. Transitioned to secondary weapon.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) Pistol, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)	TC 3-23.35 Pistol
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**071-004-0011**  
**Correct Malfunctions of an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Never point a weapon at anything you do not intend to shoot. Keep finger straight and out of the trigger guard until ready to fire. Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are a member of a squad or team engaged in active ground combat. Your M17 or M18 pistol has failed to fire while engaging a threat. You have additional loaded pistol magazines on hand.

**Standards:** Apply immediate action and, if necessary, perform remedial action required to correct malfunction and continue engagement.

**Performance Steps**

1. Perform immediate action.

**Note:** Immediate action involves quickly applying a possible correction to a malfunction without determining the actual cause. It does not involve observation, diagnosis of the malfunction, or decision-making beyond recognition that there is a problem. As the term suggests, it is performed immediately and quickly, taking no more than a few seconds. Like a battle drill, it is conducted reflexively, without thought or hesitation.

- a. Ensure the manual safety lever on the pistol is disengaged.
- b. Remove trigger finger from the trigger and ensure it is straight and pressed along the frame.
- c. Bring pistol back into workspace.

**Note:** The workspace is a spherical area, 12 to 18 inches in diameter centered on the Soldiers' chin and about 12 inches in front of their chin. The workspace is where the majority of weapons manipulations occur.

- d. Rotate pistol so that magazine well is facing the shooter's nonfiring side.
  - e. Forcefully tap upward onto the baseplate of the magazine with the heel of the nonfiring hand.
  - f. Rotate pistol so that top of the slide is facing the shooter.
  - g. Grasp the slide serrations and retract the slide fully to the rear and release.
  - h. Observe that the chambered round has been ejected and a fresh round has been chambered.
  - i. Reacquire target.
  - j. Drive the pistol back on target.
  - k. Press the trigger.
- (1) Continue the engagement if the pistol fires.

- (2) Proceed to remedial action if the pistol does not fire.
2. Perform remedial action procedures.

**Note:** Remedial action is a conscious, observed attempt to determine the cause of a malfunction and correct it using a specific set of actions. It differs from immediate action in that it requires a Soldier to consciously analyze the status of the weapon to determine the problem and select the appropriate actions to correct it.

- a. Observe the pistol to identify the cause of the malfunction.
- b. Keep the pistol pointed at the intended target.
- c. Tilt the pistol upward to observe the position of the slide.
  - (1) If the slide is not fully forward or fully locked to the rear, lock the slide to the rear.
  - (2) Ensure chamber is empty.
  - (3) Ensure the breech face is clear of live or expended cartridges, foreign debris, and has no physical damage.
- d. Bring pistol back into workspace.
- e. Press the magazine catch.

**Note:** The magazine should fall free. If it does not, forcefully remove the magazine from the pistol.

- f. Insert a new loaded magazine.
- Note:** When the magazine is fully seated, you should hear an audible click.
- g. Press slide catch lever to release the slide.
- h. Visually observe the round enter the chamber.
- i. Reacquire target.
- j. Drive the pistol back on target.
- k. Press the trigger.
  - (1) Continue the engagement if the pistol fires.
  - (2) If pistol fails to fire, evacuate pistol to maintainer when tactical situation permits.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Performed immediate action.	_____	_____
2. Performed remedial action procedures.	_____	_____

References Required	Primary
TC 3-23.35 Pistol	TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) Pistol, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)

**071-004-0012**  
**Unload an M17 or M18 Pistol**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
Treat all weapons as if they are loaded and prepared to fire. Never  
point a weapon at anything you do not intend to shoot.**

**Conditions:** You are assigned an M17 or M18 Pistol and must unload it in order to conduct preventive maintenance checks and services or in preparation for storage.

**Standards:** Clear the pistol and unload the ammunition from the magazine.

**Performance Steps**

1. Clear the pistol.
  - a. Push the manual safety upward to engage it.
  - b. Press magazine catch.
  - c. Grasp the slide serrations and fully retract the slide to remove the chambered cartridge.
  - d. Push up on slide catch lever to lock the slide to the rear.
  - e. Conduct a three-point safety check.
    - (1) Ensure chamber is empty.
    - (2) Ensure there is no magazine present in the magazine well.
    - (3) Ensure the breech face is clear of live or expended cartridges, foreign debris, and has no physical damage.
  - f. Press slide catch lever to release the slide.
2. Remove the ammunition from the magazine.
  - a. Hold magazine upright with front of magazine forward.
  - b. Firmly press down on the cartridge rim and push forward with your thumb.
  - c. Continue to remove cartridges until the magazine is empty.

Performance Measures	GO	NO-GO
1. Cleared the pistol.	_____	_____
2. Removed the ammunition from the magazine.	_____	_____

References Required	Primary
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TM 9-1005-470-10/TO 11W3-3-4-31/TM 13141A-10/1/SW370-DA-OPI-010 Operator Manual for Modular Handgun System (MHS) Pistol, 9MM, Semiautomatic M17 (NSN 1005-01-661-7317) (EIC 2VN) Pistol, 9MM, Semiautomatic M18 (NSN 1005-01-661-7323) (EIC 2VP) Pistol, 9MM, Semiautomatic GO (NSN 1005-01-661-7309) (EIC 2VO)

**071-022-0001**  
**Maintain a Caliber .50 M2-Series Machine Gun**

**WARNING**

Failure to properly install the M2A1 barrel into the barrel extension may cause injury to personnel and damage to equipment. Improper installation will cause the weapon to malfunction and damage the barrel assembly by shearing the barrel alignment guide pin off the barrel. During barrel installation the square on the barrel extension must NOT be pulled back PAST the 3/8-inch hole on the right side of the receiver. Pulling the square of the barrel extension past the 3/8-inch hole will prevent the barrel from attaching to the barrel extension.

Headspace and timing must be verified by the unit armorer or field maintenance prior to issuing. Improper headspace and timing can cause injury to personnel and weapon damage.

**Conditions:** You are assigned as a gunner for a .50 caliber M2 or M2A1 machine gun and must maintain the weapon system. You have TM 9-1005-213-10, a headspace and timing gauge, as required, and cleaning materiel which includes a rifle bore cleaner (known as RBC), lubricating oil, carbon removing compound, a bore brush, chamber brush, clean rags, four cleaning rods, small-arms (2-inch) cleaning swabs, and a wooden block.

**Standards:** Clear, disassemble, clean, inspect, lubricate, assemble, and perform a function check on the .50 caliber M2 or M2A1 machine gun in accordance with TM 9-1005-213-10. Report any deficiencies, if found, to your supervisor.

**Performance Steps**

1. Clear the machine gun.
  - a. Place the trigger block on S (Safe).
  - b. Unlock the bolt latch release (see figure 3-292, item 1).

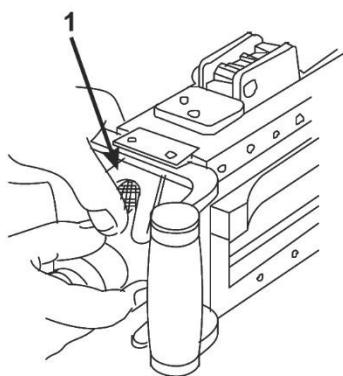


Figure 3-292. M2 bolt latch release

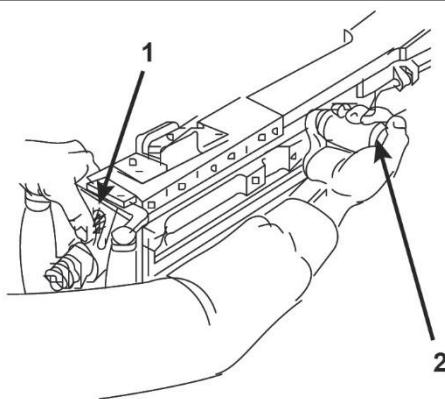
- c. Raise the cover.

- d. Lift the cartridge extractor.
- e. Remove the ammunition belt from the feedway.
- f. Place cartridge extractor down.
- g. Close the cover.
- h. Pull and lock the bolt to the rear, leaving the retracting slide handle to the rear.
- i. Open the cover.

**WARNING**

**Chamber may be hot. Use caution while inspecting T-slot.**

- j. Inspect the chamber and T-slot for rounds.
- k. Grasp the retracting slide handle (see figure 3-293, item 2), press the bolt latch release (see figure 3-293, item 1) and ease the bolt forward.



**Figure 3-293. M2 bolt release latch and retracting slide handle**

- l. Close the cover.
- m. Press the trigger.

**WARNING**

**Heat protective mitten should be used when barrel is hot.**

- 2. Disassemble the machine gun.

- a. Raise the cover.
- b. Remove the barrel assembly.

**CAUTION**

Care must be taken to prevent the bolt from slamming forward with the barrel removed.

- (1) (M2) Remove the barrel assembly.

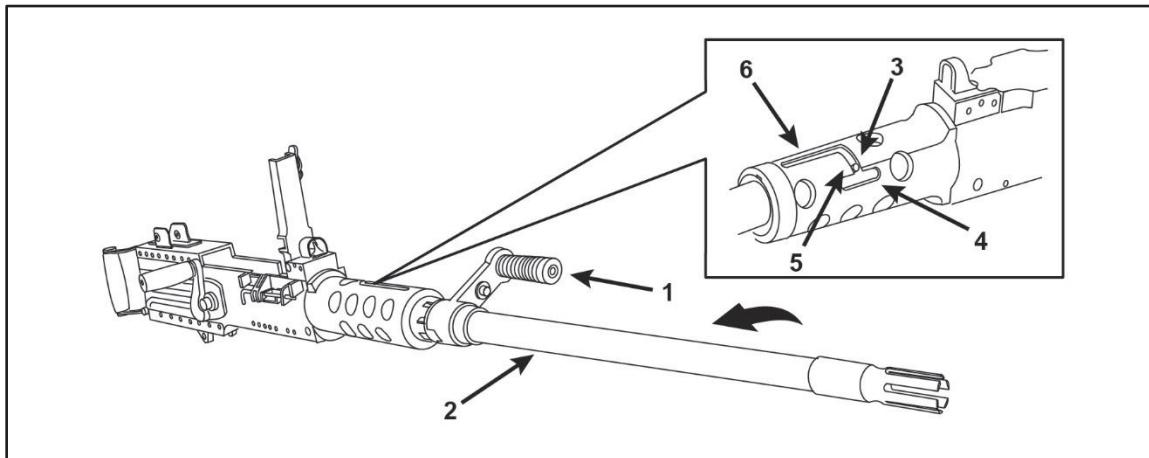
- (a) Pull the bolt to the rear until the barrel locking spring lug aligns with the 3/8-inch hole in the right-side plate of the receiver.

**CAUTION**

Be care not to damage the threads or barrel locking notches.

- (b) Rotate the barrel counterclockwise until it is free from the receiver.
  - (c) Rotate barrel from receiver.
  - (d) Release the retracting slide handle and allow the bolt and retracting slide to go forward.

- (2) (M2A1) Remove barrel assembly (see figure 3-294).



**Figure 3-294. M2A1 barrel removal**

- (a) Pull the bolt to the rear until the barrel locking spring lug aligns with the 3/8-inch hole in the right side plate of the receiver.
  - (b) Grasp carrying handle (see figure 3-294, item 1) and rotate barrel assembly (see figure 3-294, item 2) counterclockwise until locking pin (see figure 3-294, item 3) disengages retention slot (see figure 3-294, item 4) and engages camming slot (see figure 3-294, item 5).
  - (c) Continue rotating barrel assembly counterclockwise until locking pin engages alignment slot (see figure 3-294, item 6).
  - (d) Pull barrel assembly forward out of barrel support.

- (e) Release the retracting slide handle and allow the bolt and retracting slide to go forward.

### **WARNING**

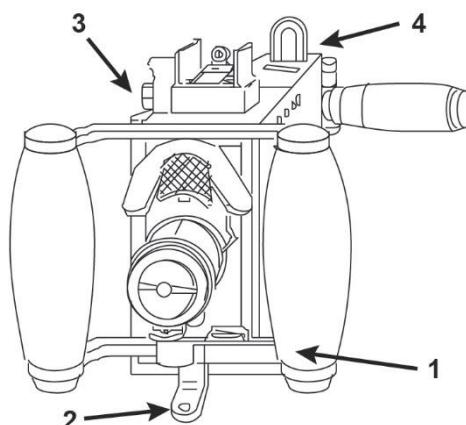
**Never remove the backplate assembly from any weapon until the chamber has been cleared.**

**Do not attempt to remove backplate unless the bolt is in the forward position.**

**Do not attempt to charge weapon without backplate assembled to the machine gun.**

- c. Remove the backplate assembly. (See figure 3-295.)

- (1) Ensure weapon is in single-shot mode and bolt is in the forward position.
- (2) Pull backplate latch lock (see figure 3-295, item 1) straight back, while lifting up on backplate latch (see figure 3-295, item 2).
- (3) Raise backplate assembly (see figure 3-295, item 3) straight up and remove it from receiver (see figure 3-295, item 4).



**Figure 3-295. Backplate assembly**

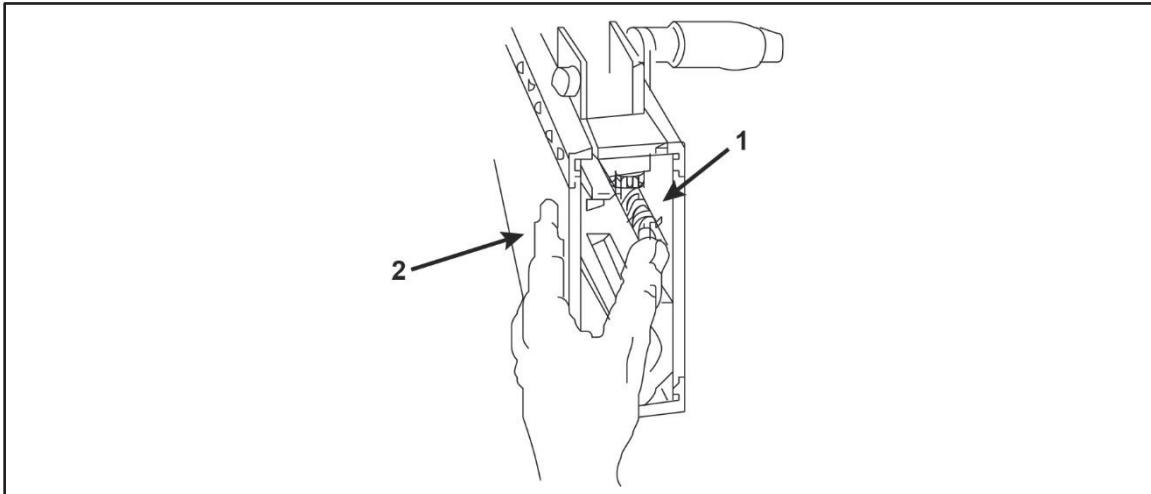
### **WARNING**

**Never attempt to cock the machine gun with the backplate removed and the driving spring rod assembly in place. If the backplate is off and the driving spring rod assembly is compressed, the retaining pin on the driving spring rod assembly could slip from its seat in the sideplate and could cause serious injuries to anyone behind the machine gun.**

- d. Remove the driving spring rod assembly.

**Note:** The driving spring rod is located at the sideplate.

- (1) Push in on head of driving spring rod assembly (see figure 3-296, item 1) and push it to the left to remove retaining pin from its seat in the receiver (see figure 3-296, item 2) right sideplate.

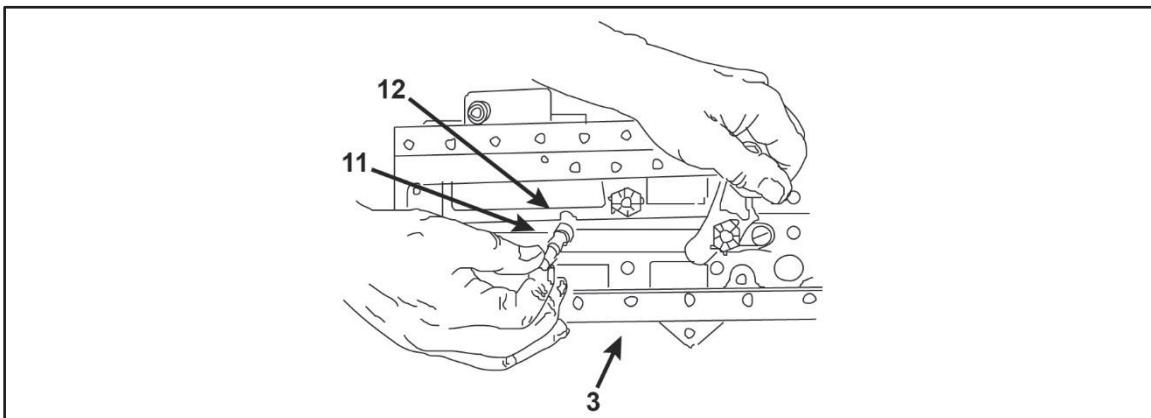


**Figure 3-296. Driving spring rod removal**

- (2) Pull the driving spring rod assembly to the rear out of receiver.
  - e. Remove the bolt assembly.
    - (1) Retract bolt assembly far enough to align bolt stud (see figure 3-297, item 11) with (enlarged) bolt stud hole (see figure 3-297, item 12) in receiver (see figure 3-297, item 3).

**Notes:** For flex type, the bolt latch must be pushed up to remove the bolt.

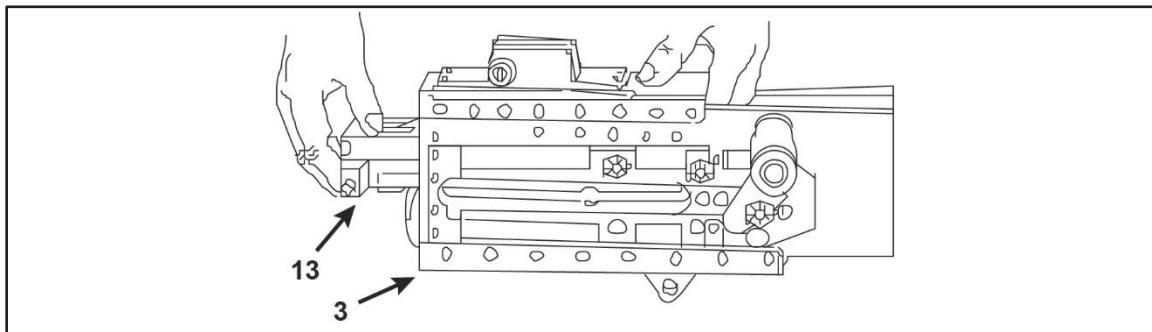
If you accidentally move the bolt all the way to the rear, the bolt latch will engage in the bolt latch notches in the top of the bolt. If this occurs, raise the bolt latch and push the bolt forward to align the bolt stud with the clearance hole.



**Figure 3-297. Removal of the bolt stud**

- (2) Remove the bolt stud.

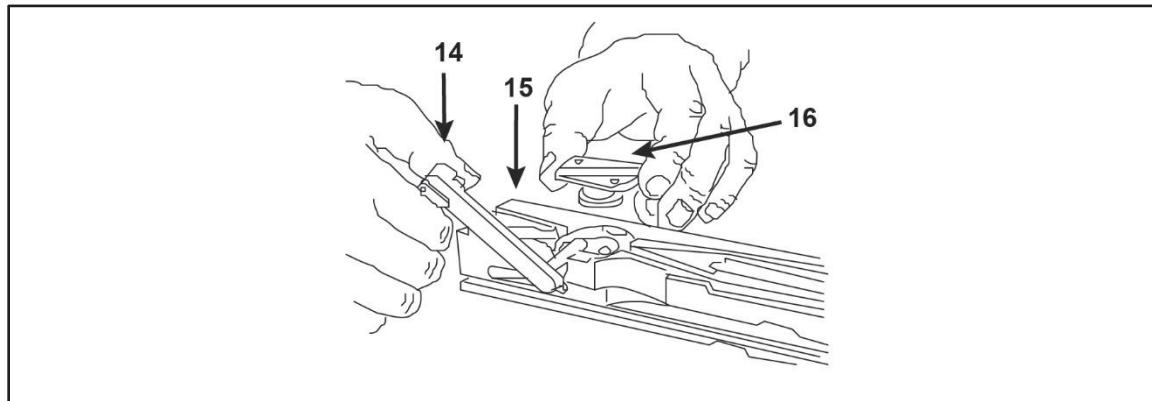
- (3) Slide bolt assembly (see figure 3-298, item 13) to the rear and out of the receiver (see figure 3-298, item 3).



**Figure 3-298. Removal of the bolt from the receiver**

- (4) Disassemble the bolt.

- (a) Rotate cartridge extractor (see figure 3-299, item 14) upward and remove from left side of bolt (see figure 3-299, item 15).
- (b) Remove bolt switch (see figure 3-299, item 16) by lifting straight up from bolt.

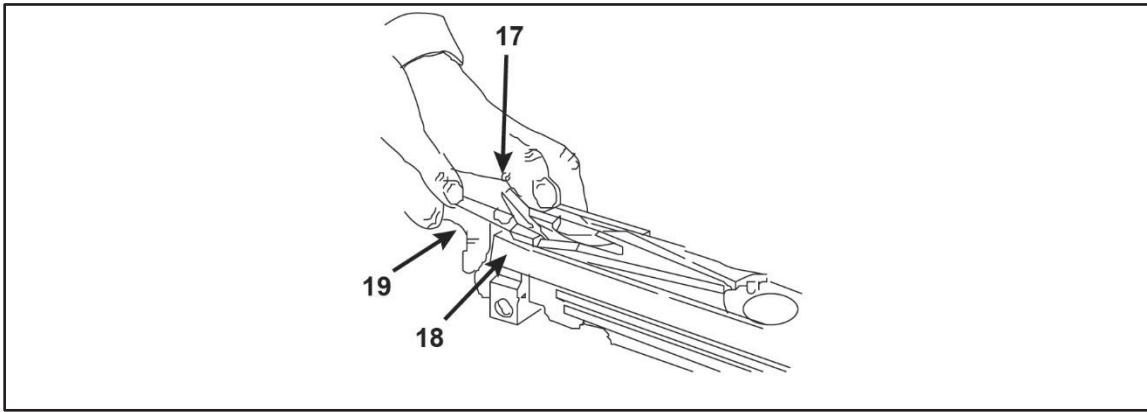


**Figure 3-299. Removal of the cartridge extractor and bolt switch**

**WARNING**

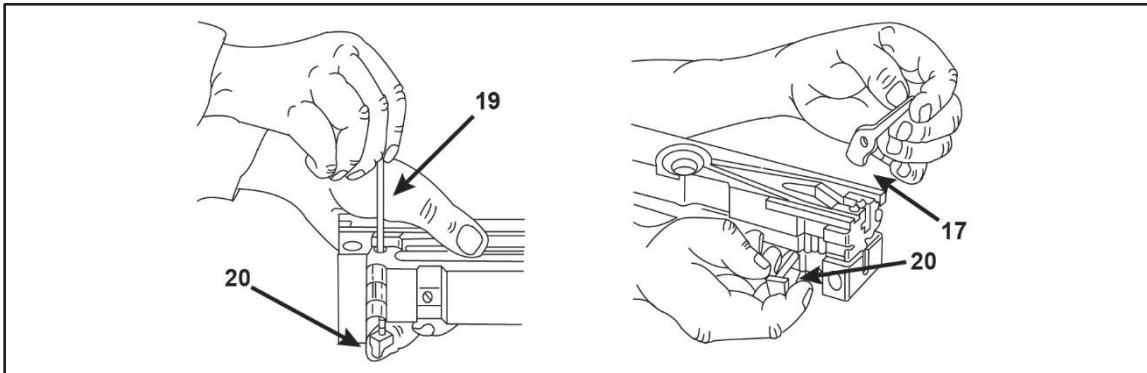
**Do not place finger between the cocking lever and sear or injury could occur.**

- (c) Place the cocking lever in its rearmost position.
- (d) Release firing pin spring by pressing down on sear (see figure 3-300, item 18, page 3-750) with swab holder section (see figure 3-300, item 19, page 3-750).



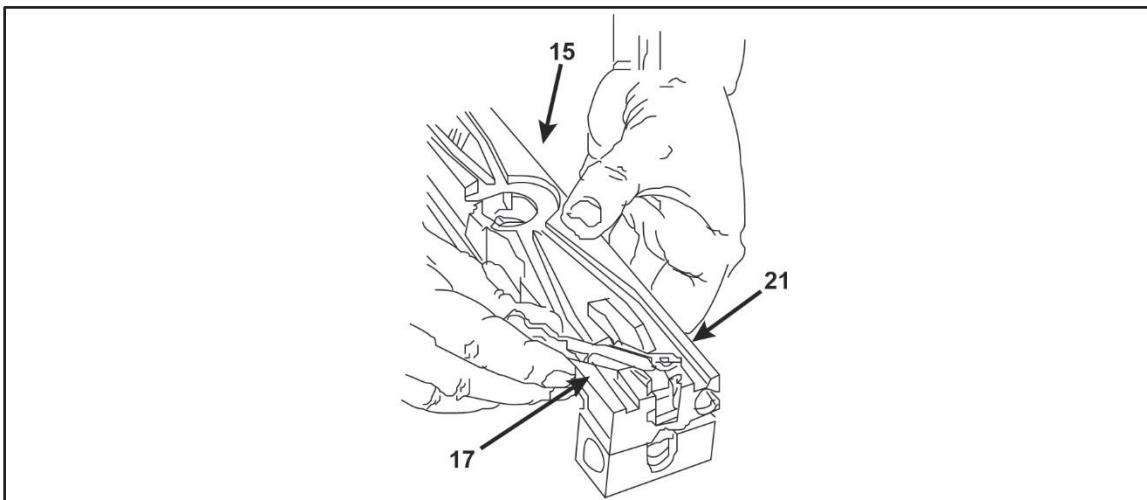
**Figure 3-300. Release the firing pin spring**

- (e) Using swab holder section (see figure 3-301, item 19), remove cocking lever pin (see figure 3-301, item 20) and cocking lever (see figure 3-301, item 17).



**Figure 3-301. Removal of the cocking lever pin and cocking lever**

- (f) (M2) Remove the accelerator stop lock. (See figure 3-302.)



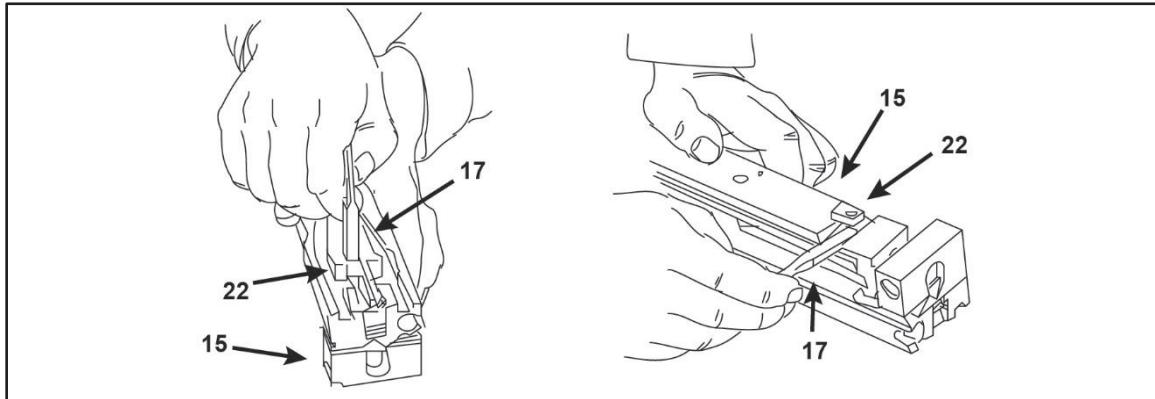
**Figure 3-302. Removal of the accelerator stop lock**

\_1\_ Rotate accelerator stop lock (see figure 3-302, item 21) to center of recess in bolt (see figure 3-302, item 15) using the thin edge of cocking lever (see figure 3-302, item 17).

\_2\_ Pry up accelerator lock and remove.

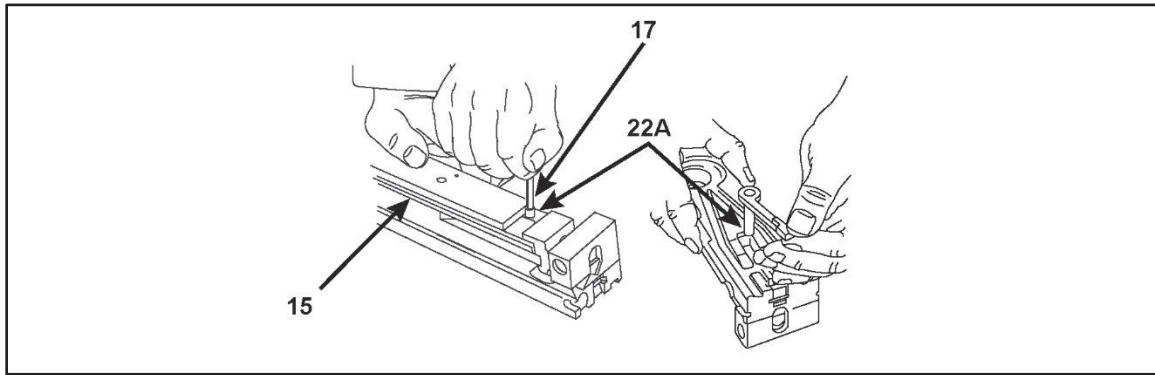
\_3\_ Use the thin edge of cocking lever (see figure 3-302, item 17) to press accelerator stop (see figure 3-302, item 22) from bolt (see figure 3-302, item 15).

\_4\_ Turn bolt over and use thin end of cocking lever (see figure 3-303, item 17) to pry accelerator stop (see figure 3-303, item 22) from bottom of bolt (see figure 3-303, item 15).



**Figure 3-303. Removal of the accelerator stop**

(g) (M2A1) Remove the sear stop and pin. (See figure 3-304.)



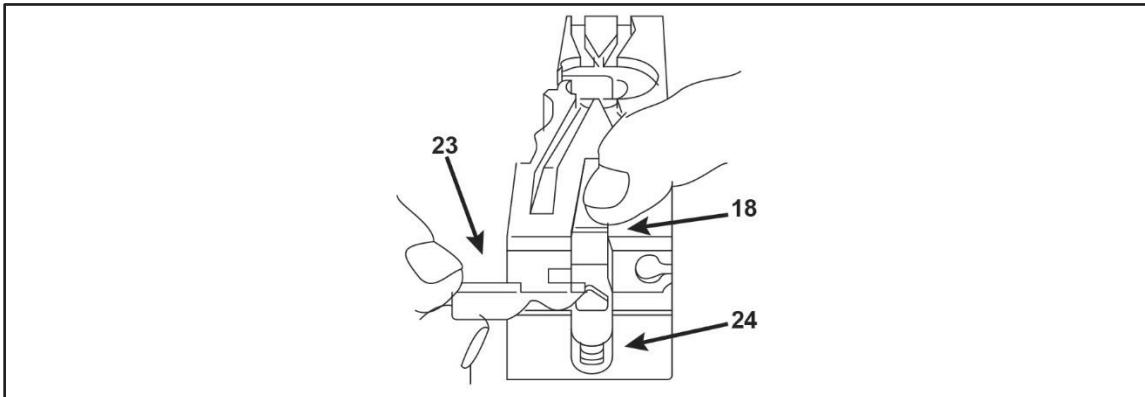
**Figure 3-304. Removal of the sear stop and pin on the M2A1**

\_1\_ Use the thin edge of cocking lever to rotate sear stop and pin to center recess of bolt.

\_2\_ Turn bolt over and use thin end of cocking lever to press sear stop and pin from bottom of bolt.

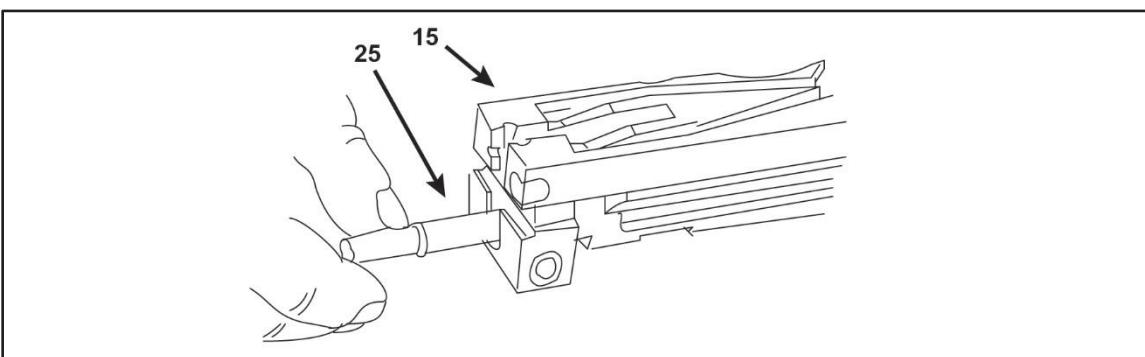
\_3\_ Turn bolt upright and use thin edge of cocking lever to pry up and remove sear stop and pin.

(h) Depress sear (see figure 3-305, item 18, page 3-730) and remove sear slide (see figure 3-305, item 23, page 3-752).



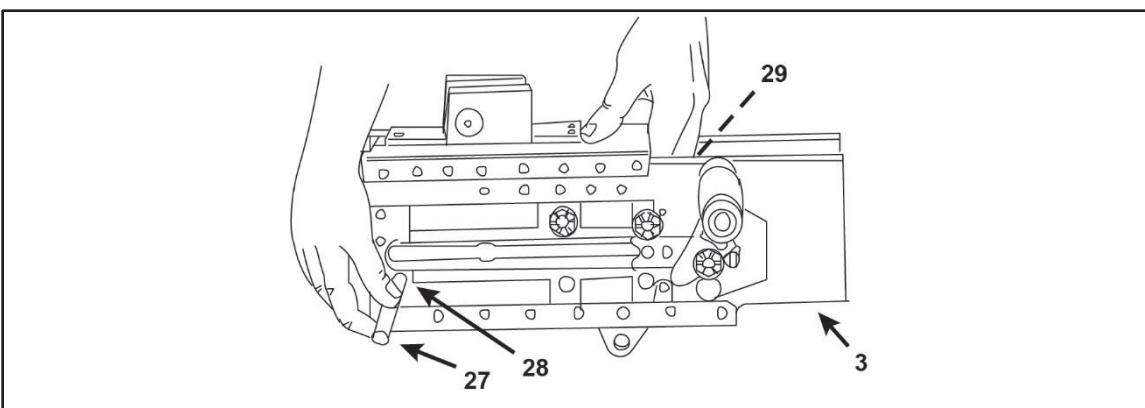
**Figure 3-305. Removal of the sear slide, sear, and sear spring**

- (i) Remove sear (see figure 3-305, item 18) and sear spring (see figure 3-305, item 24).
- (j) Tip the front end of the bolt (see figure 3-306, item 15) upward and remove firing pin extension assembly (see figure 3-306, item 25).

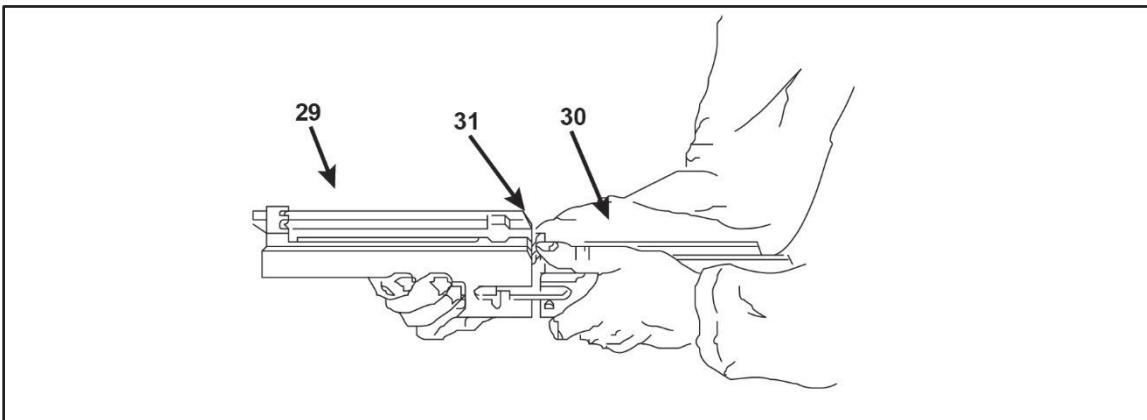


**Figure 3-306. Removal of the firing pin extension assembly**

- (k) Remove firing pin from firing pin extension assembly.
- f. Remove the barrel bugger and barrel extension (see figures 3-307 and 3-308).

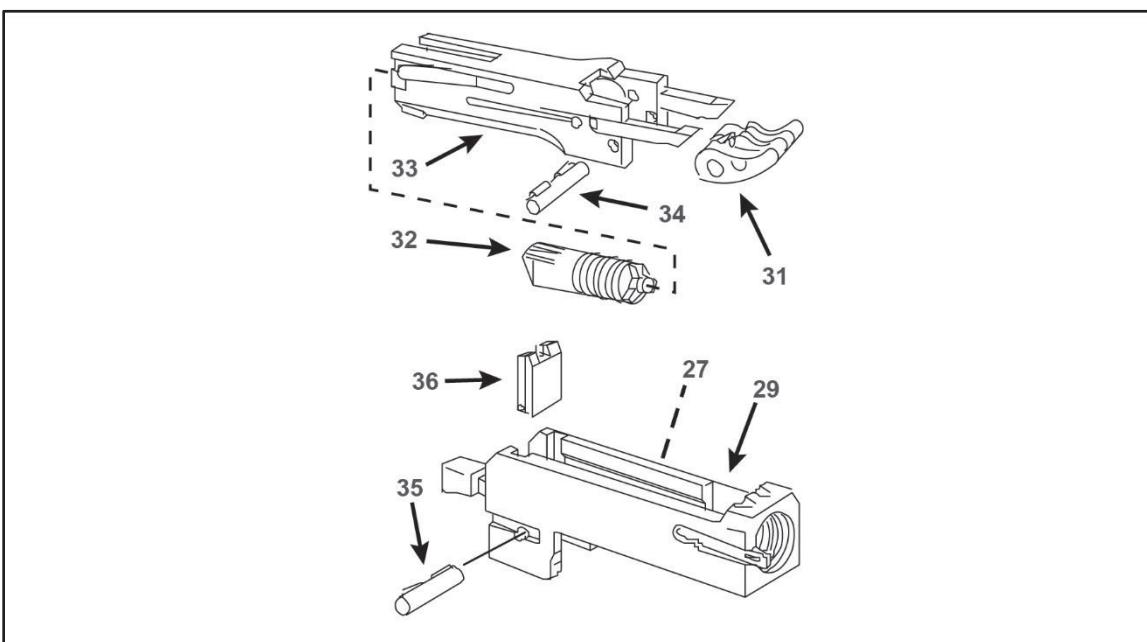


**Figure 3-307. Removal of the barrel buffer and the barrel extension assemblies**



**Figure 3-308. Separation of the barrel buffer and the barrel extension assemblies**

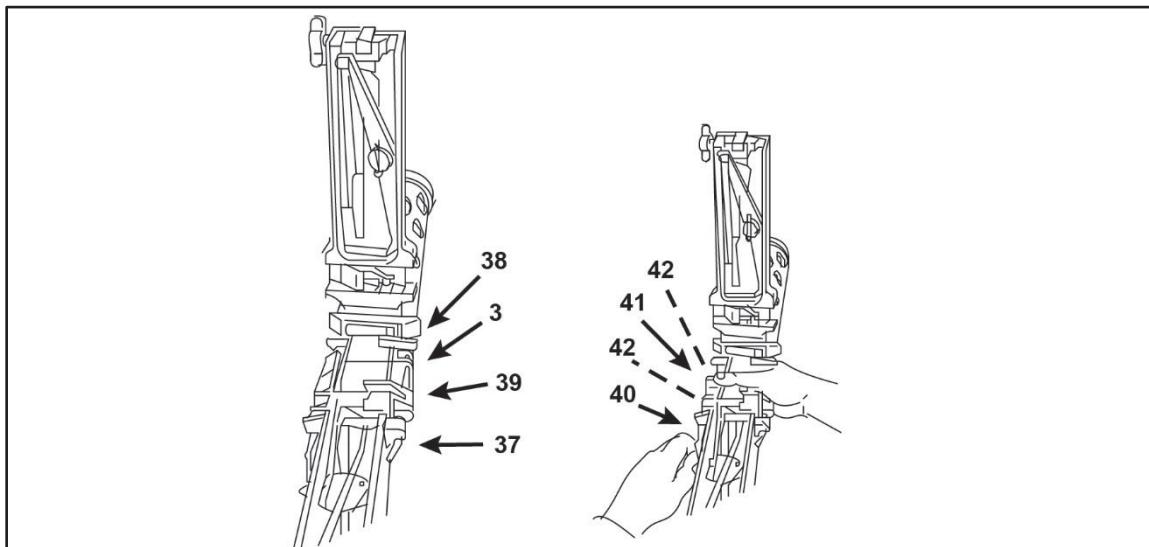
- (1) Insert pointed end of M4 cleaning rod (see figure 3-307, item 27) into hole (see figure 3-307, item 28) in receiver (see figure 3-307, item 3) and depress buffer body lock while applying rearward pressure on barrel extension assembly (see figure 3-307, item 29).
  - (2) Remove barrel buffer assembly (see figure 3-308, item 30) and barrel extension assembly (see figure 3-308, item 29) together.
  - (3) Separate the assemblies by pushing forward on tips of buffer accelerator (see figure 3-308, item 31).
- g. Disassemble the barrel buffer assembly. (See figure 3-309.)



**Figure 3-309. Disassembly of the barrel buffer assembly**

- (1) Remove buffer assembly (see figure 3-309, item 32) by pushing it out rear of barrel buffer body (see figure 3-309, item 33).

- (2) Drive accelerator pin assembly (see figure 3-309, item 34) from barrel buffer body with swab holder.
  - (3) Remove buffer accelerator (see figure 3-309, item 31).
  - (4) (M2) Use pointed end of M4 cleaning rod (see figure 3-309, item 27) to remove breech lock pin assembly (see figure 3-309, item 35) and breech lock (see figure 3-309, item 36) from barrel extension assembly (see figure 3-309, item 29).
- h. Disassemble receiver assembly. (See figure 3-310.)



**Figure 3-310. Removal of the trigger lever pin assembly and trigger lever**

- (1) Remove safety wire or retaining clip from belt holding pawl pin.
- (2) Remove belt holding pawl pin (see figure 3-310, item 37) attaching front cartridge stop (see figure 3-310, item 38) and rear cartridge stop assembly (see figure 3-310, item 39) to receiver (see figure 3-310, item 3).
- (3) Remove front cartridge stop (see figure 3-310, item 38) and rear cartridge stop assembly (see figure 3-310, item 39).
- (4) Remove bolt holding pawl (see figure 3-310, item 40), belt holding pawl assembly (see figure 3-310, item 41), and two springs (see figure 3-310, item 42).

**Note:** Hold down on belt holding pawl assembly to prevent loss of springs.

3. Clean the machine gun.

**CAUTION**

Do not reverse direction of bore brush while in bore in order to prevent damage to the bore brush and bore.

- a. Clean barrel assembly.

- (1) Dip bore brush in RBC and run through chamber of barrel.
- (2) Unscrew bore brush from clearing rods once it present itself at other end.
- (3) Remove rods from bore.
- (4) Rescrew brush to rods and repeat process until clean.
- (5) Dip chamber brush in RBC and clean chamber using clockwise twisting motion.
- (6) Unscrew chamber brush from cleaning rods.
- (7) Remove rods from bore.
- (8) Rescrew chamber brush to rods, and repeat process until clean.
- (9) Remove chamber brush from swab holder section.
- (10) Insert a cleaning swab in slot.
- (11) Run clean swab through bore from chamber end and back.
- (12) Repeat until clean swab is obtained.
- (13) Clean outside surface of barrel with carbon removing compound.
- (14) Wipe all surfaces dry with clean wiping rags.

b. Clean backplate assembly.

**Note:** Do not submerge backplate assembly in any fluid.

- (1) Use clean wiping rags.
  - (2) Remove foreign matter from backplate assembly.
- c. Clean bolt and rod assembly.
- (1) Clean all parts of bolt assembly with a cleaning swab saturated with carbon removing compound.
  - (2) Clean the face of the bolt with a cleaning swab soaked in RBC.
  - (3) Wipe all parts dry with clean wiping rags.
- d. Clean barrel buffer assembly.
- (1) Clean all parts of barrel buffer assembly with a cleaning swab saturated with carbon removing compound.
  - (2) Wipe all parts dry with clean wiping rag.
- e. Clean barrel extension assembly.
- (1) Clean all parts of barrel extension assembly with a cleaning swab saturated with carbon removing compound.

- (2) Wipe all parts dry with clean wiping rag.
  - (3) Ensure locking pins are in place.
  - (4) Check trigger for proper functioning.
  - (5) Check bolt latch release for proper functioning (flex type only).
- f. Clean ammunition.
- (1) Remove foreign matter.
  - (2) Wipe with clean dry rag.
4. Inspect for serviceability.
- a. Inspect bolt and rod assembly.

- (1) Inspect driving spring rod assembly for flat spots and cracks on springs.
- (2) Ensure that springs operate freely and that rod and pin are not cracked, bent, or broken.
- (3) Check movement of cartridge extractor in bolt.

**Note:** Cartridge extractor should raise and lower without binding.

- (4) Check movement of cartridge ejector.
- (5) Inspect cartridge ejector for cracks and burrs.
- (6) Inspect bolt switch, cocking lever pin, cocking lever, accelerator stop lock, accelerator stop, and sear slide for cracks, bends, and burrs.
- (7) Inspect sear for cracks and burrs, and inspect sear notch for wear, chips, or burrs.
- (8) Inspect sear spring for breaks or lack of tension.
- (9) Inspect firing pin for cracks and chipped or sharp tip.

**Note:** Tip should be smooth and well-rounded.

- (10) Check firing pin extension for cracks, burrs, and free movement in bolt.
- (11) Ensure shoulder that engages sear has a sharp angle and is free of chips and burrs.
- (12) Ensure bolt is free of burrs and cracks.

- b. Inspect barrel buffer assembly.

- (1) Inspect buffer body lock for tension, staking, and retention in barrel buffer body.
- (2) Inspect buffer accelerator for broken claws or chipped tips.
- (3) Inspect accelerator pin assembly for broken or missing spring.

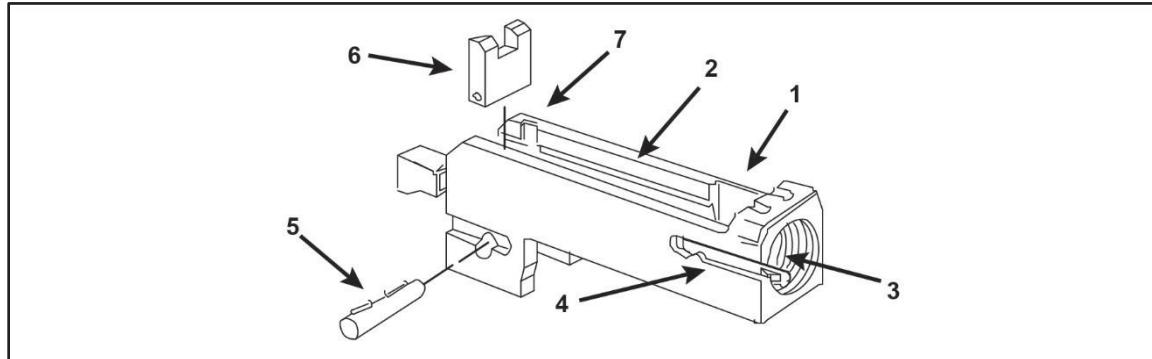
(4) Inspect buffer spring for cracks or breaks.

(5) Inspect breech lock depressors.

**Note:** The breech lock depressors must have slight vertical (up and down) movement and no lateral (side to side) movement.

c. Inspect barrel extension assembly.

(1) (M2) Inspect barrel extension assembly. (See figure 3-311.)



**Figure 3-311. M2 Barrel extension assembly**

- (a) Ensure barrel extension assembly (see figure 3-311, item 1) is not bent and that the bolt guideways (see figure 3-311, item 2) are smooth and free of burrs.
- (b) Inspect threads (see figure 3-311, item 3) of barrel extension assembly (see figure 3-311, item 1) for damage.
- (c) Ensure barrel locking spring (see figure 3-311, item 4) is staked and fully seated in its groove, the locking end of the spring has good tension and the lug is not damaged.
- (d) Inspect the breech lock pin assembly (see figure 3-311, item 5) for broken or missing spring.
- (e) Check breech lock (see figure 3-311, item 6) for smooth movement in guideways (see figure 3-311, item 7) of barrel extension assembly (see figure 3-311, item 1).

**Note:** If breech lock exhibits excessive wear (bolt locking surface and/or mating surfaces appears rounded and/or metal displacement appears cupped), replace breech lock.

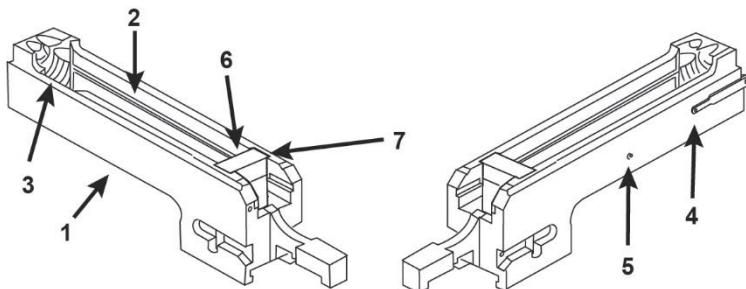
**WARNING**

The M2A1 kit contains unique parts that are used to convert an M2HB to the M2A1 configuration. M2A1 unique parts should NEVER be installed on M2HB weapons at the operator level. The barrel extension assembly and bolt have been serialized to remain together as an assembly with serial number of receiver. If a new barrel extension or bolt is required, servicing the headspace and timing will be necessary.

**CAUTION**

If a new or different barrel extension is required, servicing headspace and timing must be performed. Evacuate to field maintenance.

- (2) (M2A1) Inspect barrel extension assembly. (See figure 3-312.)



**Figure 3-312. Barrel extension assembly**

- Ensure barrel extension assembly (see figure 3-312, item 1) is not bent and that bolt guideways (see figure 3-312, item 2) are smooth and free of burrs.
- Inspect threads (see figure 3-312, item 3) of barrel extension assembly (see figure 3-312, item 1) for damage.

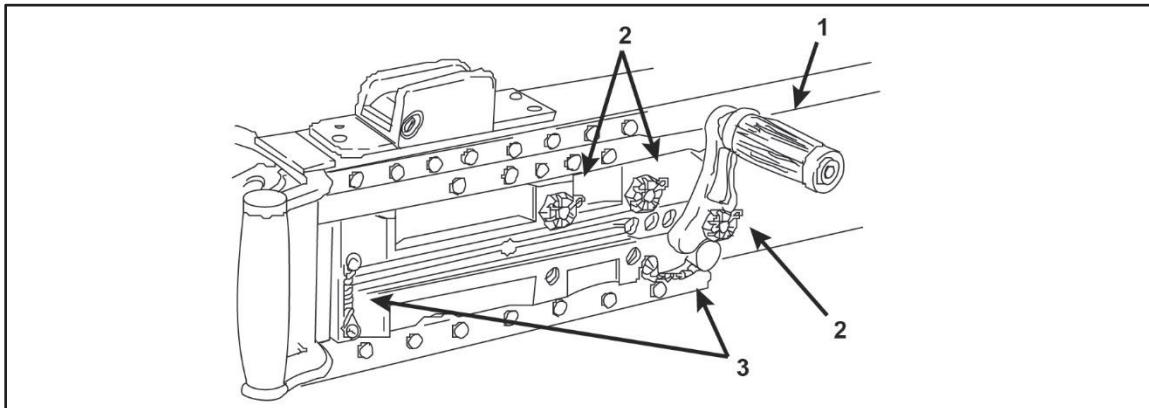
**WARNING**

**During reassembly, the bolt and barrel extension serial numbers must match the last four digits of the receiver serial number to maintain headspace and prevent malfunctions and serious injury.**

- Ensure barrel locking spring (see figure 3-312, item 4) is staked and fully seated in its groove, the locking end of the spring has good tension, and the lug is not damaged.
- Check breech block (see figure 3-312, item 6) for smooth movement in guideways (see figure 3-312, item 7) of barrel extension assembly (see figure 3-312, item 1).

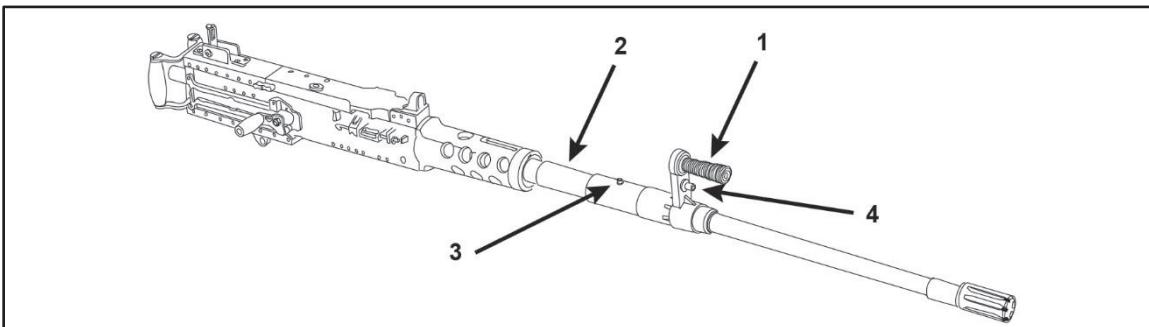
**Note:** If breech lock exhibits excessive wear (bolt locking surface and/or mating surfaces appear rounded and/or metal displacement appears cupped), turn in weapon to field maintenance. Breech lock is pinned to barrel extension and must not be removed at the operator level.

- d. Inspect retracting slide handle. (See figure 3-313.)



**Figure 3-313. M2 retracting slide handle**

- (1) Inspect retracting slide handle (see figure 3-313, item 1) for cracks, weak or broken retracting springs, or other visible damage.
  - (2) Ensure cotter pins (see figure 3-313, item 2) are present and in good condition.
  - (3) Ensure safety wire (see figure 3-313, item 3) is in place and properly laced.
- e. Inspect carrying handle assembly (M2A1). (See figure 3-314.)

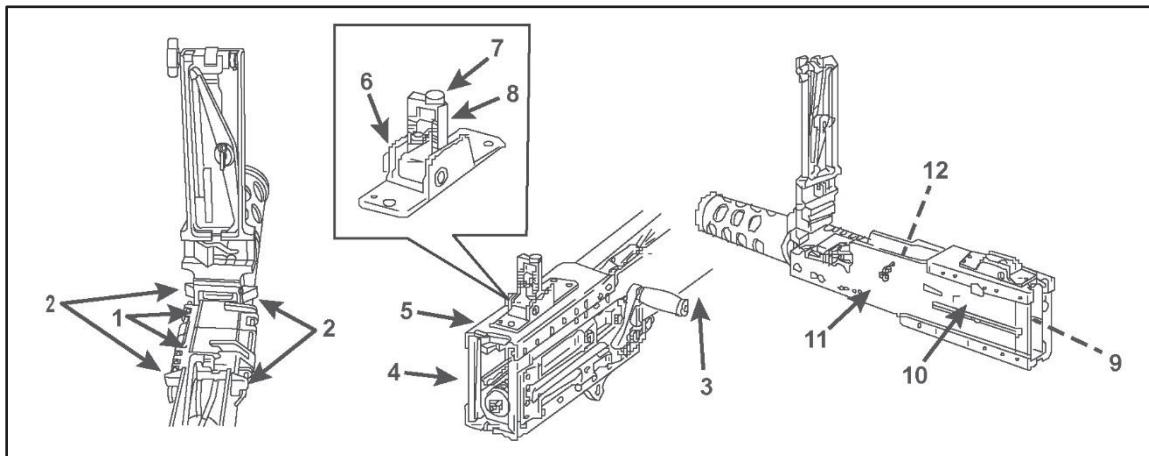


**Figure 3-314. M2A1 carrying handle assembly**

- (1) Press release knob (see figure 3-314, item 4) and remove barrel carrying handle (see figure 3-314, item 1) from barrel assembly (see figure 3-314, item 2).
- (2) Inspect for missing, damaged, or worn parts.
- (3) Install barrel carrying handle (see figure 3-314, item 1) on barrel assembly (see figure 3-314, item 2).
- (4) Align barrel carrying handle (see figure 3-314, item 1) with barrel lock pin (see figure 3-314, item 3).

(5) Press release knob (see figure 3-314, item 4) to secure.

f. Inspect receiver assembly. (See figure 3-315.)



**Figure 3-315. M2 receiver assembly**

- (1) Ensure feedway (see figure 3-315, item 1) is clear of obstructions.
- (2) Inspect belt holding pawl brackets (see figure 3-315, item 2) for looseness, bends, or cracks.
- (3) Inspect side plates (see figure 3-315, item 3) for bends that would affect movement of any internal components.
- (4) Inspect for cracks and burrs at backplate grooves (see figure 3-315, item 4).
- (5) Check operation of rear sight (see figure 3-315, item 5) (flexible type only).
  - (a) Ensure windage screw (see figure 3-315, item 6) and elevation screw (see figure 3-315, item 7) function without binding.
  - (b) Ensure sight assembly (see figure 3-315, item 8) is secured tightly to receiver.
- (6) Ensure trigger lever (see figure 3-315, item 9) moves freely without binding.
- (7) Ensure trigger lever pin (see figure 3-315, item 10) locks in place.
- (8) Ensure cotter pin (see figure 3-315, item 11) is in place on extractor switch.

5. Lubricate the machine gun.

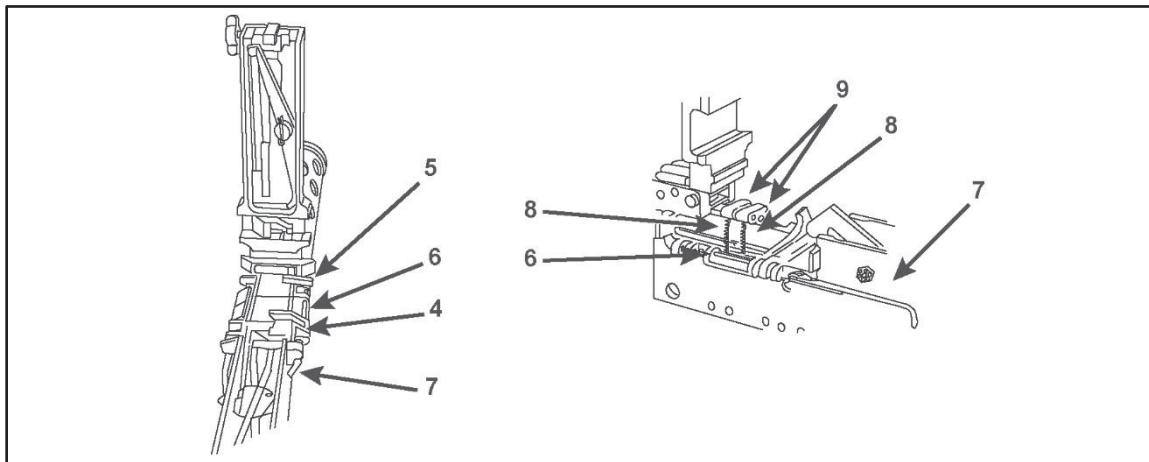
a. Lubricate the barrel assembly.

- (1) Place a clean cleaning swab in swab holder.
- (2) Dip swab in lubricating oil and run through chamber and bore of barrel.

b. Lubricate backplate assembly.

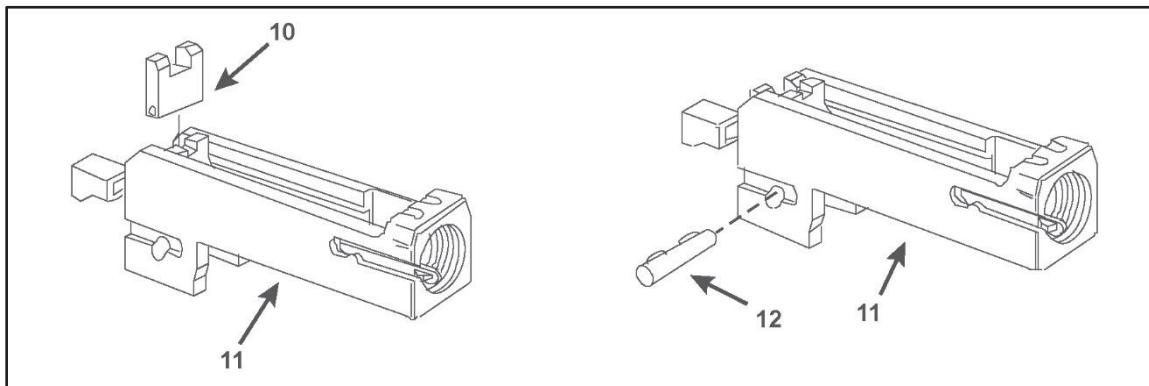
- (1) Use a clean rag saturated with lubricating oil.

- (2) Lubricate exterior of backplate assembly very lightly.
  - c. Lubricate bolt and rod assembly.
    - (1) Use a clean rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
  - d. Lubricate barrel buffer assembly.
    - (1) Use a clean rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
  - e. Lubricate barrel extension assembly.
    - (1) Use a clean rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
  - f. Lubricate retracting slide handle.
    - (1) Use a clean rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
  - g. Lubricate M10 manual charger.
    - (1) Use a clean rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
  - h. Lubricate receiver assembly.
    - (1) Use a clean wiping rag saturated with lubricating oil.
    - (2) Apply light coat of lubricating oil.
6. Assemble the machine gun.
- a. Install receiver assembly. (See figure 3-316, page 3-762.)



**Figure 3-316. Installation of receiver assembly**

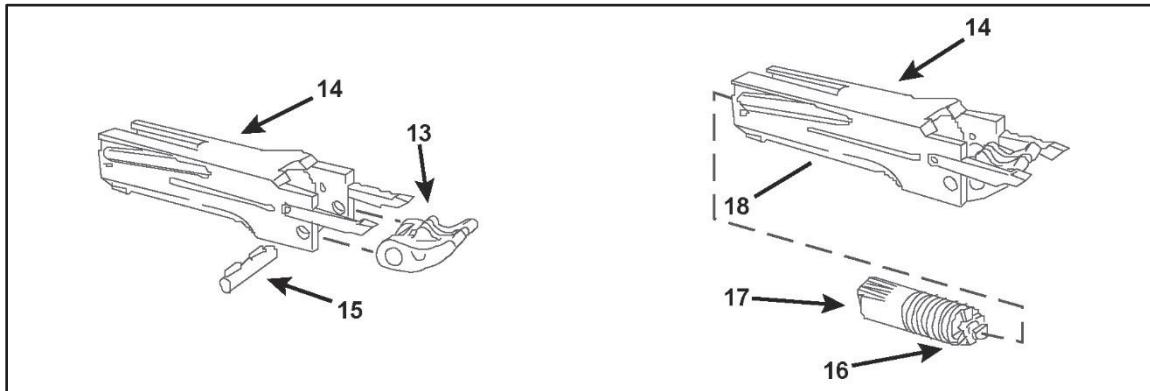
- (1) Place right-hand rear cartridge stop assembly (see figure 3-316, item 4) and front cartridge stop (see figure 3-316, item 5) on belt holding pawl bracket (see figure 3-316, item 6).
  - (2) Install belt holding pawl pin (see figure 3-316, item 7) with hooked end to rear.
  - (3) Install safety wire or retaining clip after belt holding pawl pin.
  - (4) Seat belt holding pawls springs (see figure 3-316, item 8) in place on belt holding pawl bracket (see figure 3-316, item 6).
  - (5) Place belt holding pawl assembly (see figure 3-316, item 9) on belt holding pawl springs (see figure 3-316, item 8).
  - (6) Compress springs and insert belt holding pawl pin (see figure 3-316, item 7).
  - (7) Install lock pin on belt holding pawl pin (see figure 3-316, item 7).
- b. (M2) Install barrel extension assembly. (See figure 3-317.)



**Figure 3-317. Installing breech lock and breech lock pin (M2)**

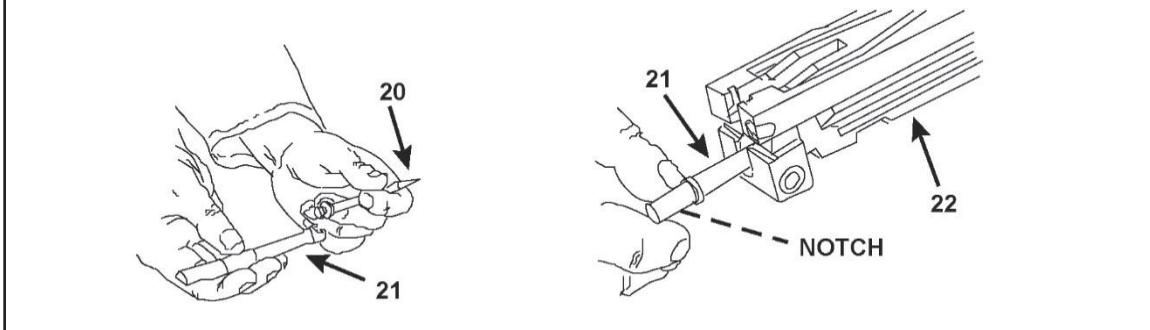
- (1) Install breech lock (see figure 3-317, item 1) in barrel extension assembly (see figure 3-317, item 11) with double-beveled edge up and to the front of barrel extension assembly.

- (2) Install breech lock pin assembly (see figure 3-317, item 12) in barrel extension assembly (see figure 3-317, item 11). Ensure both ends of breech lock pin assembly are flush with sides of barrel extension assembly.
- c. Install barrel buffer assembly. (See figure 3-318.)



**Figure 3-318. Installing the barrel buffer assembly**

- (1) Place buffer accelerator (see figure 3-318, item 1) (tips up) into barrel buffer body (see figure 3-318, item 14), aligning mounting holes.
- (2) Install barrel buffer pin assembly (see figure 3-318, item 15), ensuring that both ends of the barrel buffer pin assembly are flush with the sides of the barrel buffer body.
- (3) Align key (see figure 3-318, item 16) on barrel buffer assembly (see figure 3-318, item 17) with key slot (see figure 3-318, item 18) in barrel buffer body (see figure 3-318, item 14) ensuring the engaging notch is facing up, and slide barrel buffer assembly into barrel buffer body.
- d. Install bolt assembly. (See figure 3-319.)



**Figure 3-319. Attach the firing pin and install the firing pin extension assembly**

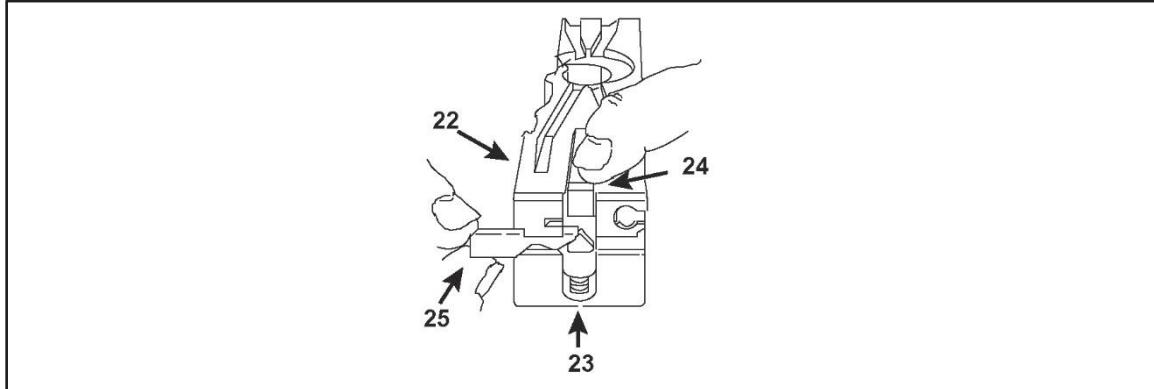
- (1) Attach firing pin (see figure 3-319, item 20) to firing pin extension assembly (see figure 3-319, item 21).
- (2) Place firing pin extension assembly (see figure 3-319, item 21) into bolt (see figure 3-319, item 22) with notch of firing pin extension assembly down.
- (3) Slide firing pin extension assembly (see figure 3-319, item 21) forward so the tip of firing pin protrudes from face of bolt (see figure 3-319, item 22).

**Note:** See figure 3-322 for steps 6d(4)–(6) substeps.

- (4) Place sear spring (see figure 3-320, item 23) in recess on bolt (see figure 3-320, item 22).
- (5) Slide sear (see figure 3-320, item 24) down into vertical grooves at rear of bolt (see figure 3-320, item 22) with wedge-shaped lug pointed outward and upward.

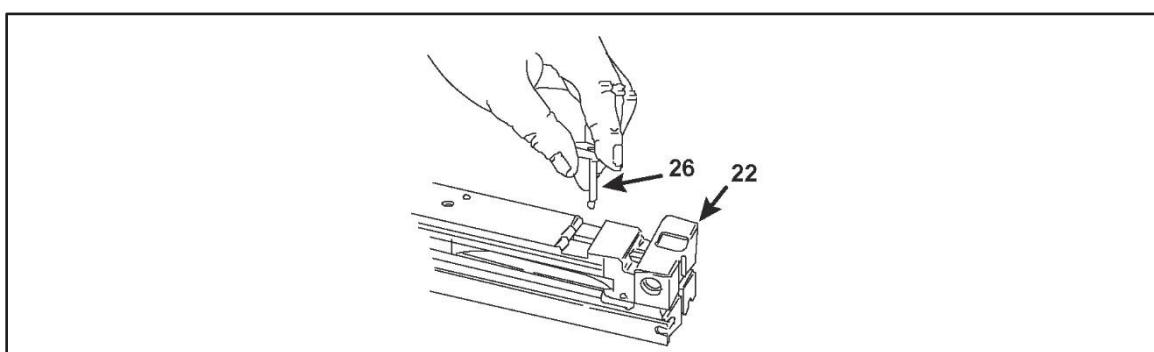
**Note:** Ensure that sear and sear spring engage properly. Sear also has a recess for sear spring.

- (6) Compress sear spring (see figure 3-320, item 23) by pressing down on sear (see figure 3-320, item 24).



**Figure 3-320. Installing the sear slide**

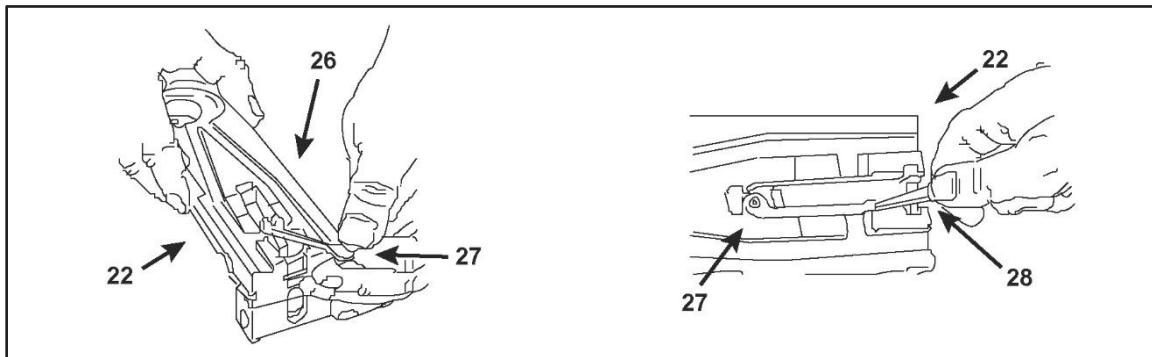
- (7) Install sear slide (see figure 3-320, item 25) from left side of bolt in grooves of bolt (see figure 3-320, item 22) with V-notch down.
- (8) (M2) Install accelerator stop lock.
  - (a) Insert pin end of accelerator stop (see figure 3-321, item 26) through bottom of bolt (see figure 3-321, item 22).



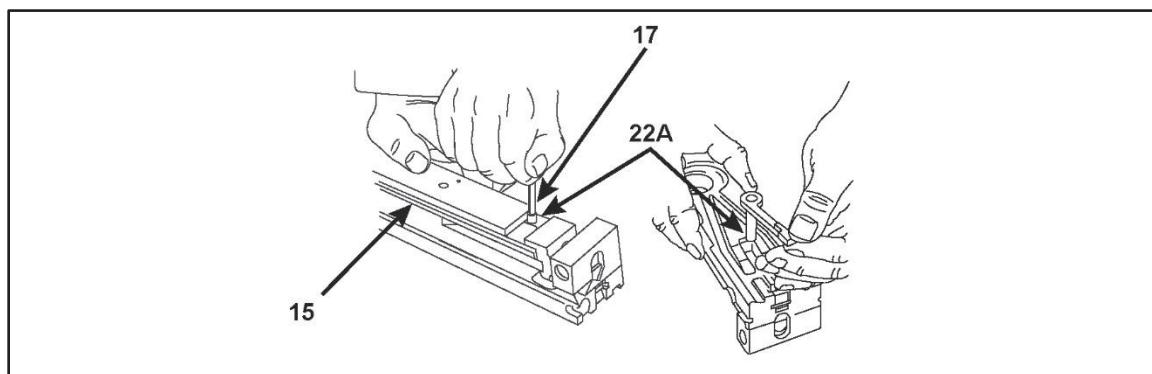
**Figure 3-321. Attachment of the accelerator stop**

- (b) Turn bolt (see figure 3-321, item 22) over and place forked end of accelerator stop lock (see figure 3-321, item 27) on notched end of accelerator stop (see figure 3-321, item 26).

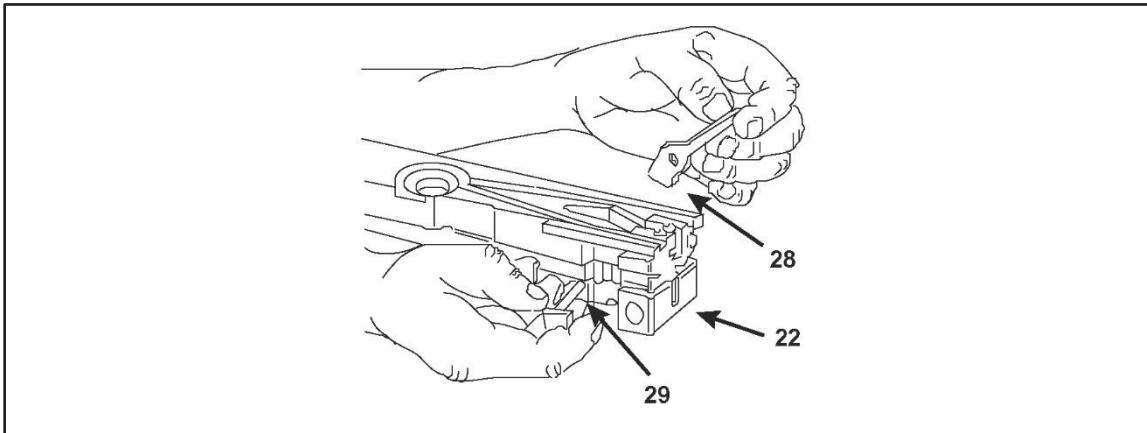
**Note:** Base end of accelerator stop should be installed with long-end forward so beveled edged match.

**Figure 3-322. Attach the accelerator stop lock**

- (c) Using the wedge-shaped end of the cocking lever, press down on the flat end of the accelerator stop lock, and move the cocking lever into the groove on the left side of the bolt. (See figure 3-322.)
- (9) (M2A1) Install sear stop and pin. (See figure 3-323.)

**Figure 3-323. Installing the sear stop and pin on M2A1**

- (a) Insert sear stop and pin (see figure 3-323, item 17) through top of bolt (see figure 3-323, item 22A).
- (b) Using wedge-shaped end of cocking lever, press down on the flat end of the sear stop and pin.
- (c) Swing the sear stop into groove on the left side of the bolt.
- (10) Insert cocking lever (see figure 3-324, item 28, page 3-766), with rounded nose on lower end of lever to rear, into slot in top of bolt (see figure 3-324, item 22, page 3-766).
- (11) Align hole in cocking lever (see figure 3-324, item 28) with holes in the bolt (see figure 3-324, item 22, page 3-766) and insert cocking lever pin (see figure 3-324, item 29, page 3-766) from left side.

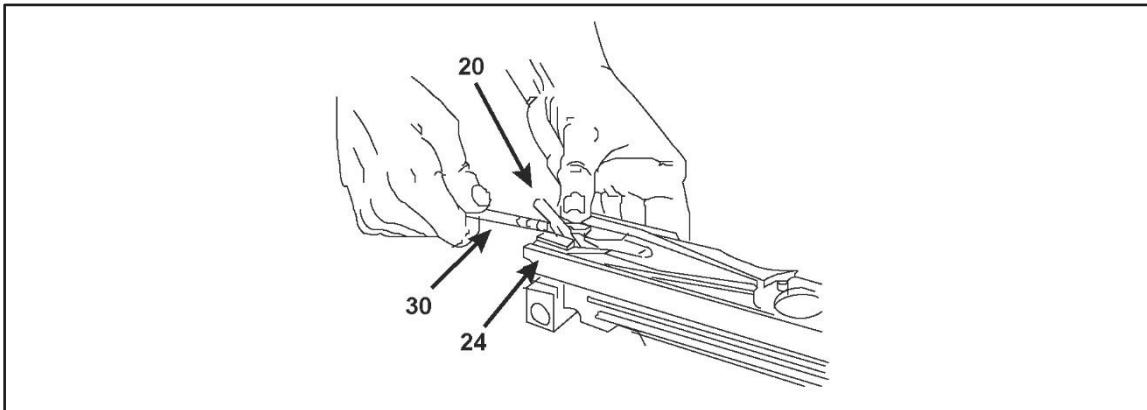


**Figure 3-324. Inserting cocking lever pin**

- (12) Push cocking lever (see figure 3-324, item 28) forward to charge firing pin, then return cocking lever to rearward position.
- (13) Trip firing pin by depressing top of sear (see figure 3-324, item 24) with a swab holder section (see figure 3-324, item 3).

**Note:** A sharp metallic sound indicates firing pin spring is in good condition.

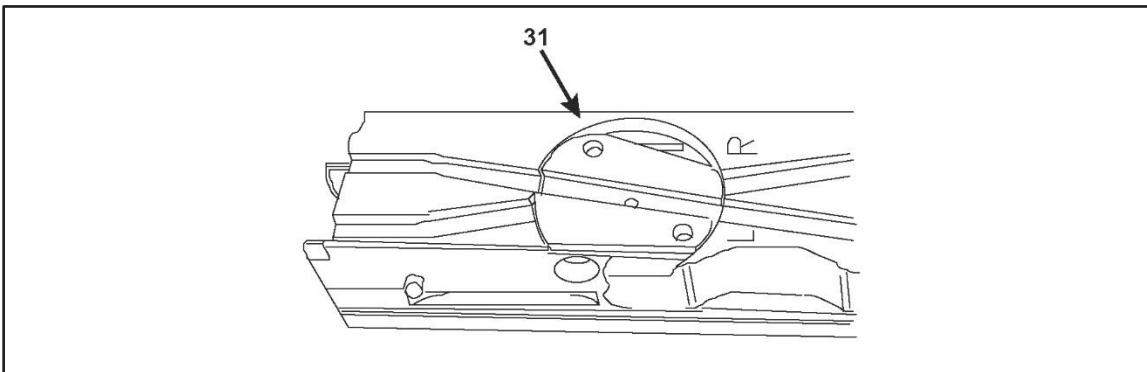
- (14) Place cocking lever (see figure 3-325, item 2) in forward position after testing firing pin release.



**Figure 3-325. Testing the firing pin**

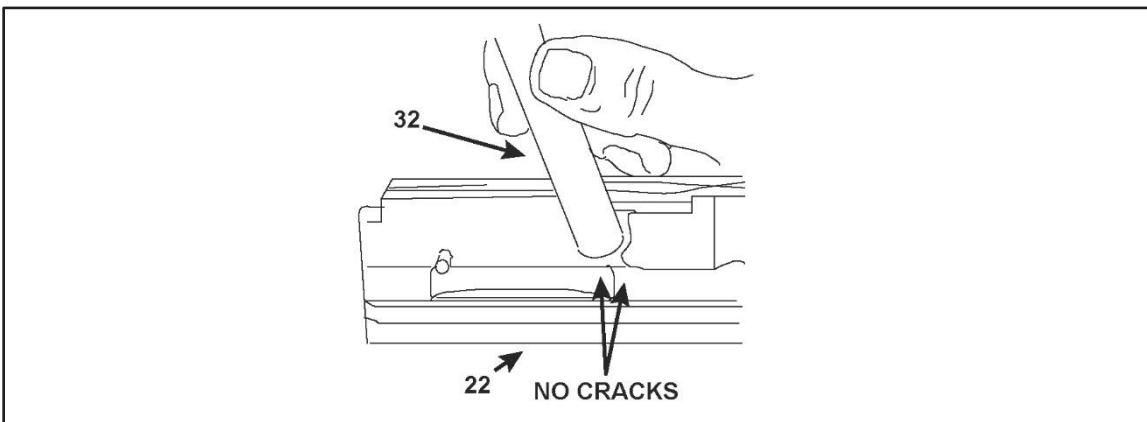
**Note:** Determine direction of feed before installing bolt switch left or right. Left-hand feed is illustrated below.

- (15) Place bolt switch (see figure 3-326, item 31) in position so that the feed groove is continuous for feed direction selected.



**Figure 3-326. Setting the bolt switch**

- (16) Hold cartridge extractor (see figure 3-327, item 32) in vertical position and insert shank end into the left side of the bolt (see figure 3-327, item 22).
- (17) Rotate cartridge extractor (see figure 3-327, item 32) downward to full horizontal position.
- (18) Check that cartridge extractor assembly (see figure 3-327, item 32) has engaged shoulder (see figure 3-327, item 22).
- (19) Ensure flange is not cracked.

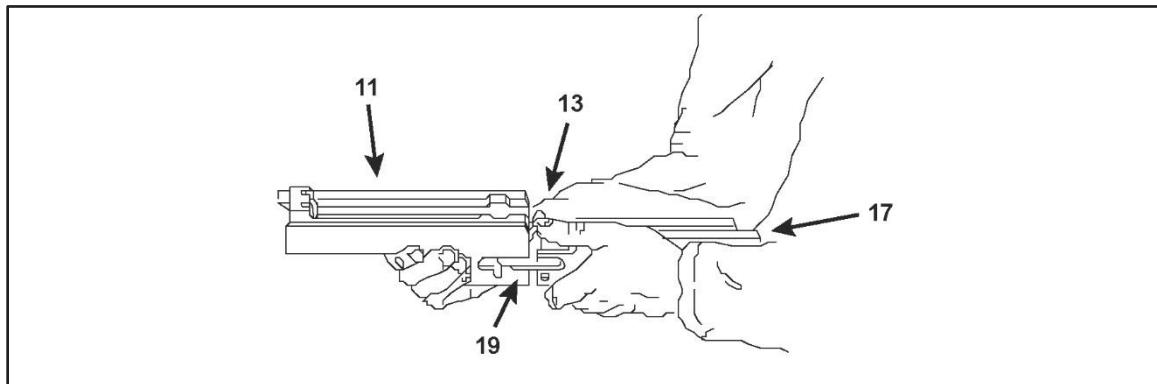


**Figure 3-327. Cartridge extractor**

#### **WARNING**

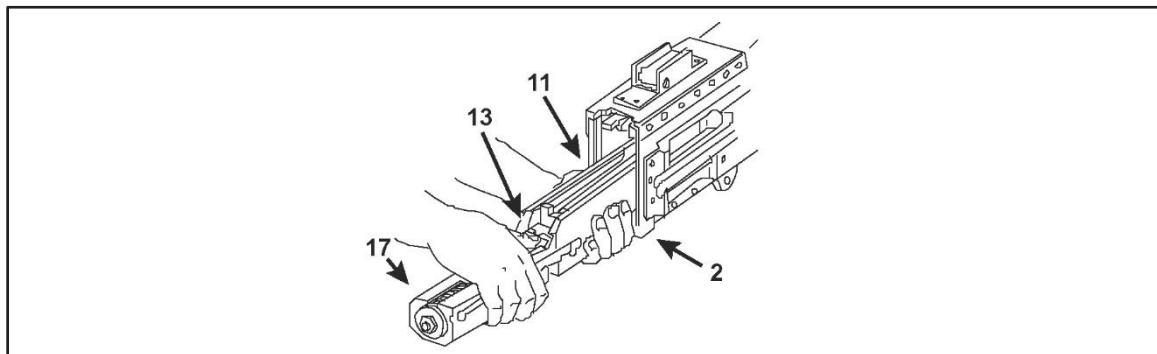
**M2A1: The bolt and barrel extension serial numbers must match the last four digits of the receiver serial number to maintain headspace. Failure to comply may result in injury or death to personnel and/or damage to equipment.**

- (20) Hold barrel buffer assembly (see figure 3-328, item 17, page 3-768) with buffer accelerator (see figure 3-328, item 13, page 3-768) up and engage notch on shank of barrel extension assembly (see figure 3-328, item 11, page 3-768) with cross groove in piston rod of barrel buffer assembly.



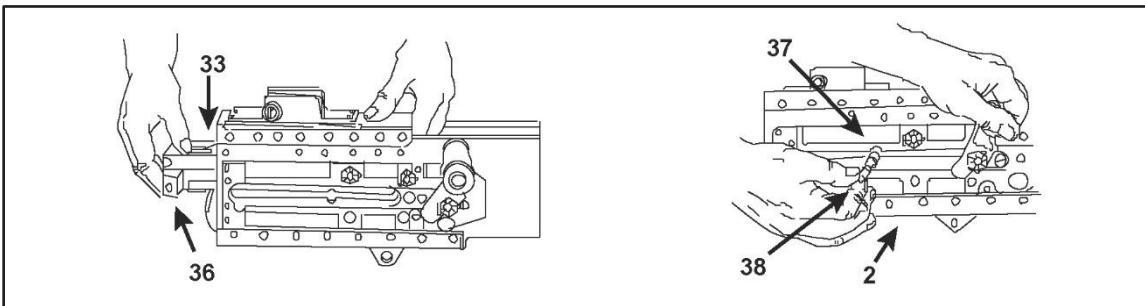
**Figure 3-328. Attaching the barrel buffer and barrel extension assemblies**

- (21) Align breech lock depressors (see figure 3-328, item 19) in grooves of barrel extension assembly (see figure 3-328, item 11) and push barrel buffer assembly (see figure 3-328, item 17) forward.
- (22) Ensure cocking lever (see figure 3-329, item 33) is in forward position.
- (23) Install bolt assembly (see figure 3-329, item 17) into barrel extension and buffer assembly (see figure 3-329, item 34).
- (24) Install the bolt assembly (see figure 3-329, item 17) and barrel extension group assembly (see figure 3-329, item 34) into the receiver (see figure 3-329, item 2).
- (25) Raise the bolt (see figure 3-329, item 33) and push the assembly into receiver.

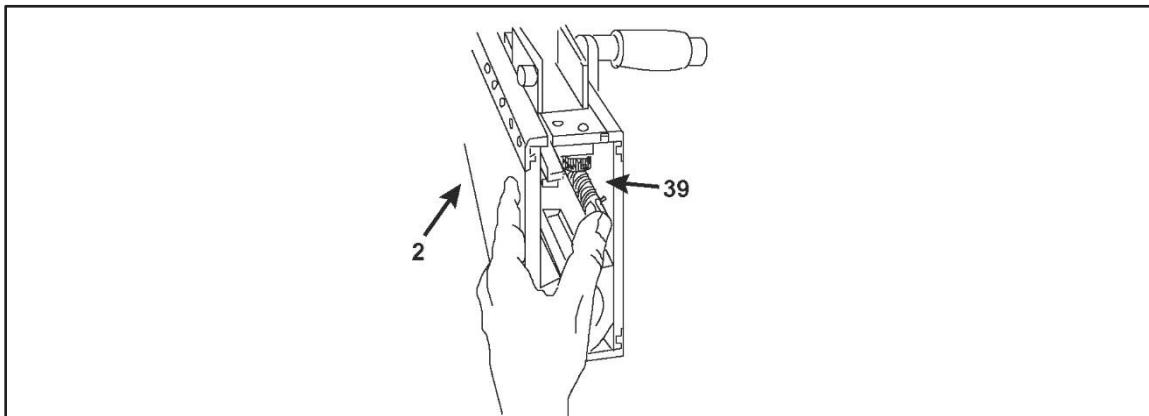


**Figure 3-329. Installing the bolt and barrel extension and buffer assembly into the receiver**

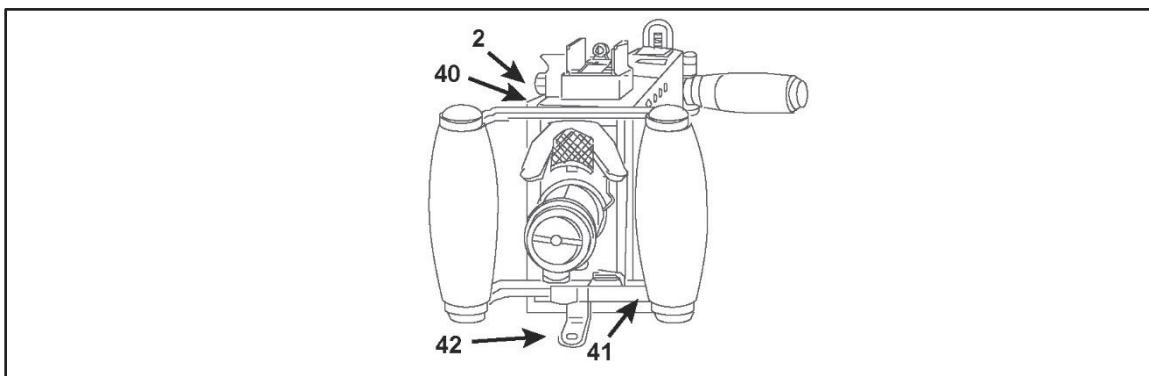
- (26) Align hole (see figure 3-330, item 36) in bolt assembly (see figure 3-330, item 33) with stud assembly hole (see figure 3-330, item 37) in receiver (see figure 3-330, item 2) and install bolt stud (see figure 3-330, item 38) in hold in bolt assembly.

**Figure 3-330. Installation of the bolt assembly**

- (27) Place bolt in forward position.  
e. Install drive spring rod assembly. (See figure 3-331.)

**Figure 3-331. Installation of the driving spring rod assembly**

- (1) Install driving spring rod assembly (see figure 3-331, item 39) in upper right-hand corner of bolt.  
(2) Push forward and to the right until driving spring rod assembly (see figure 3-331, item 39) engages in hole in side plate of receiver (see figure 3-331, item 3) and not in the groove for the backplate.
- f. Install backplate assembly. (See figure 3-332.)

**Figure 3-332. Installation of the backplate assembly**

- (1) Install backplate assembly (see figure 3-332, item 40, page 3-769) in receiver (see figure 3-332, item 2, page 3-769) grooves.
  - (2) Pull backplate latch lock (see figure 3-332, item 41, page 3-769) while lifting up on backplate latch (see figure 3-332, item 42, page 3-769).
  - (3) Lower backplate assembly down until engaged in receiver.
- g. Install the barrel assembly.
- (1) Install barrel assembly on the M2.
    - (a) Retract bolt far enough for barrel locking spring lug to center in barrel locking spring hole on right-hand side of receiver.
    - (b) Install and screw barrel assembly completely into receiver.
    - (c) Ensure barrel is completely installed.
    - (d) Unscrew barrel assembly until two clicks are heard.
    - (e) Adjust headspace and timing.
  - (2) Install barrel assembly on the M2A1. (See figure 3-333.)

**Note:** As long as the wear-limit gage indicates the weapon to be acceptable, the barrel can be changed and fired as required. Once the weapon accepts the wear-limit gage (0.212 inches), notify maintenance for headspace servicing.

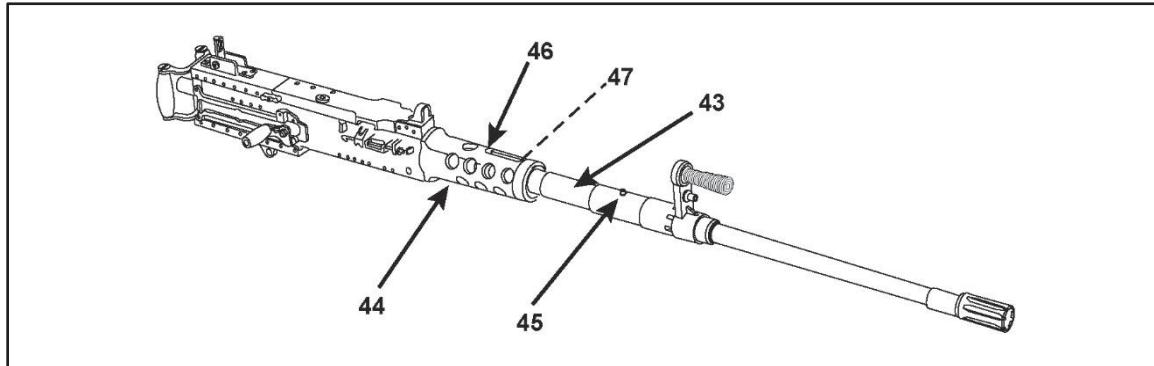


Figure 3-333. M2A1 barrel installation

**WARNING**

**Failure to properly install the M2A1 barrel into the barrel extension may cause injury to personnel and damage to equipment.**

**Improper installation will cause the weapon to malfunction and damage the barrel assembly by shearing the barrel alignment guide pin off the barrel. During barrel installation the square on the barrel extension must NOT be pulled back PAST the 3/8-inch hole on the right side of the receiver. Pulling the square of the barrel extension past the 3/8-inch hole will prevent the barrel from attaching to the barrel extension.**

**Headspace and timing must be verified by the unit armorer or field maintenance prior to issuing. Improper headspace and timing can cause injury to personnel and weapon damage.**

- (a) Grasp retracting slide handle and retract bolt to align barrel locking lug with the 3/8 inch-hole in right side of receiver.
  - (b) Insert barrel into barrel support until barrel alignment pin engages camming slot.
  - (c) Rotate barrel clockwise to secure barrel alignment pin in retention slot.
  - (d) Inspect the barrel and barrel extension to ensure end of barrel protrudes beyond the barrel extension threads.
  - (e) Release retracting slide handle to allow bolt to go forward.
  - (f) Place weapon on automatic fire.
  - (g) Pull the retracting slide handle sever time, to ensure that the barrel moves back and forth freely.
  - (h) Disengage automatic fire.
- (3) Close the cover.
7. Perform a safety/function check.
- a. Perform safety/function check on the fixed M48 turret type, flex type, and fixed-type machine gun.
    - (1) Place safety to S (Safe) position.
    - (2) Move M10 lock selector to the rear.
    - (3) Charge weapon.
    - (4) Move M10 lock selector forward.
    - (5) Pull the charging handle until a click is heard, then ease bolt forward.

- (6) Press trigger.

**Note:** Weapon should not fire.

- (7) Place safety to F (Fire) position.

- (8) Press trigger.

**Note:** Weapon should fire.

- b. Perform a safety/function check on an M2 or M2A1 flex and soft mount machine gun.

**Note:** If weapon fails safety/function check, notify maintenance.

- (1) Place trigger block to S (Safe) position.

**Note:** Bolt should lock to rear in single-shot mode.

- (2) Unlock bolt latch release (rotate clockwise) and place the weapon on semiautomatic fire.

- (3) Pull retracting slide handle to rear to charge machine gun locking the bolt to the rear.

**CAUTION**

Do not dry fire weapon by allowing bolt to slam forward.

- (4) Depress bolt latch release and slowly ease bolt forward with retracting slide handle.

- (5) Press trigger.

**Note:** Weapon should not fire.

- (6) Place trigger block to F (Fire) position.

- (7) Press trigger.

**Note:** Weapon should fire.

- (8) Place weapon in automatic-fire mode.

- (9) Pull the bolt with the retracting slide handle and hold.

**Note:** The bolt should not lock to the rear.

- (10) Ease the bolt forward by releasing pressure on the retracting slide handle.

- (11) Press trigger.

**Note:** Weapon should fire.

Performance Measures	GO	NO-GO
1. Cleared the machine gun.	_____	_____
2. Disassembled the machine gun.	_____	_____
3. Cleaned the machine gun.	_____	_____
4. Inspected for serviceability.	_____	_____
5. Lubricated the machine gun.	_____	_____
6. Assembled the machine gun in the correct sequence.	_____	_____
7. Performed a safety/function check.	_____	_____

References Required	Primary
TC 3-22.50 Heavy Machine Gun M2 Series	TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

**071-022-0012**  
**Mount a Caliber .50 M2-Series Machine Gun on a Vehicle**

**WARNING**

Failure to properly install the M2A1 barrel into the barrel extension may cause injury to personnel and will cause damage to equipment. Improper installation will cause the weapon to malfunction and damage the barrel assembly by shearing the barrel alignment guide pin off the barrel. During barrel installation, the square on the barrel extension must NOT be pulled back PAST the 3/8-inch hole on the right side of the receiver. Pull the square of the barrel extension past the 3/8-inch hole will prevent the barrel from attaching to the barrel extension.

Headspace and timing for the M2A1 must be verified by the unit armorer or unit maintenance prior to issuing. Improper headspace and timing can cause injury to personnel and weapon damage.

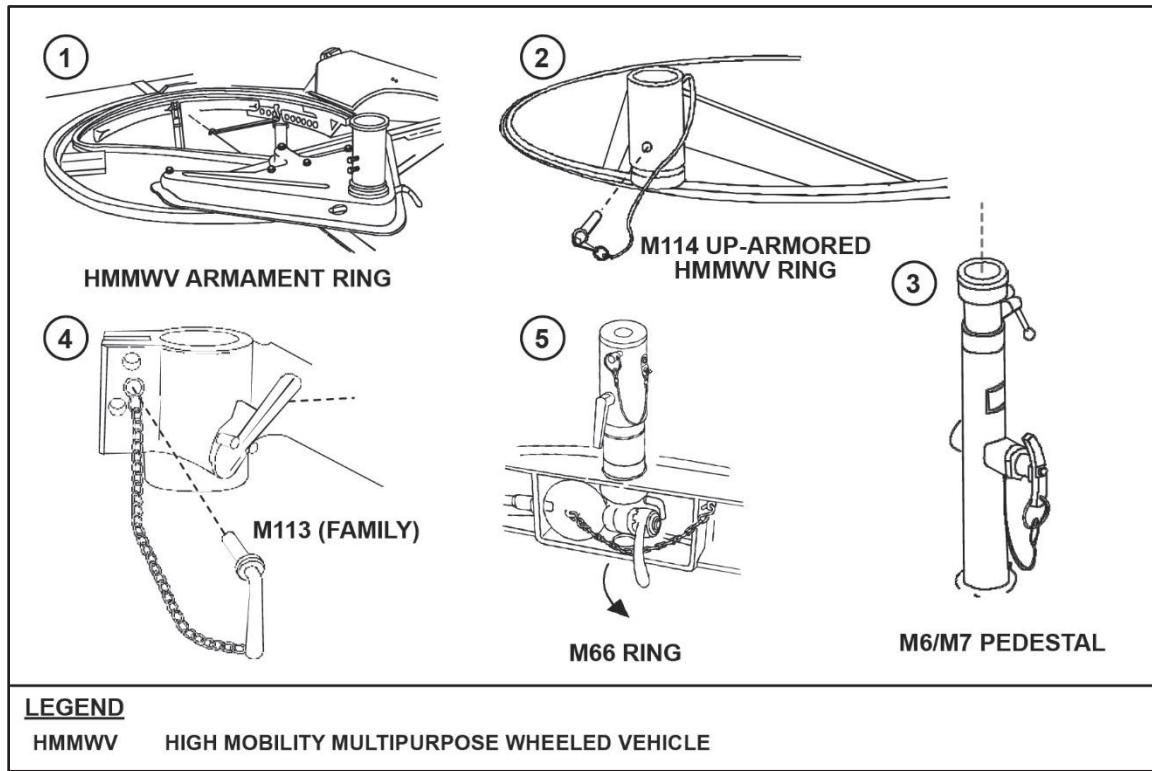
**Conditions:** You are a member squad or team preparing a vehicle for a mission and you have been directed to mount a caliber .50 M2-series machine gun on the vehicle. The vehicle has an appropriate machine gun mount (6650, MK64, or MK93). You have another member of the squad/team to assist. You have an M197 machine gun mount.

**Standards:** Clear the caliber .50 M2-series machine gun, identify the type of pintle socket on the vehicle, identify the type of weapon mount, lock the ring brake assembly on the vehicle, prepare the pintle socket, mount the 6650, MK64, or MK93 weapon mount into the pintle socket, install the .50 caliber mounting adapter to the M2-series machine gun, install the weapon into the 6650, MK64, or MK93 weapon mount on the vehicle, and attach the catch back assembly to carriage and cradle assemble.

**Performance Steps**

1. Clear the machine gun.
2. Identify the type of pintle socket that is on the vehicle (see figure 3-334.)

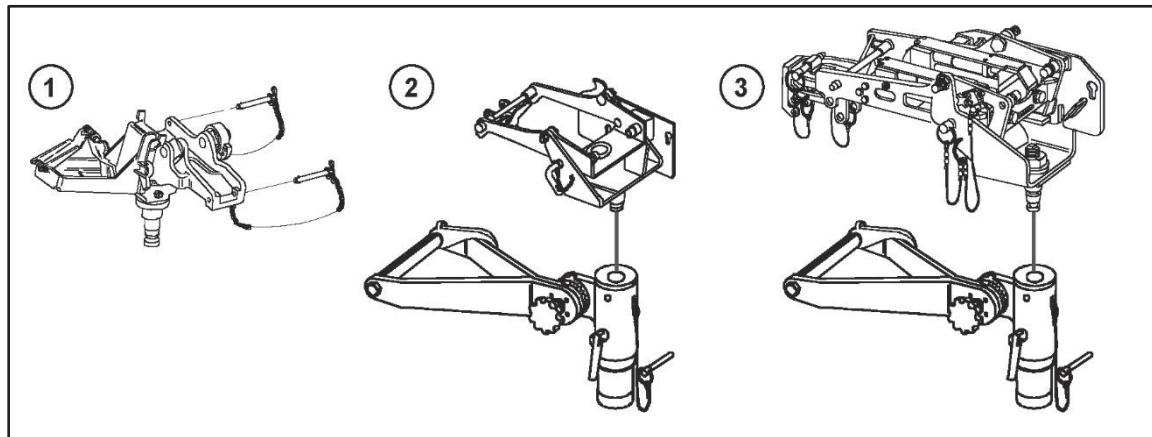
**Note:** The type of mount a vehicle has varies considerably; however, the diameters of the pintle sockets are the same. Additionally the method to lock the pintle into the pintle socket varies from screws, a retarding pin, or a lever.



**Figure 3-334. Mount and pintle socket variation**

- Identify the type of weapon mount (see figure 3-335).

**Note:** Three mounts are covered in this task: the 6650, MK64, and MK93 machine gun mounts.



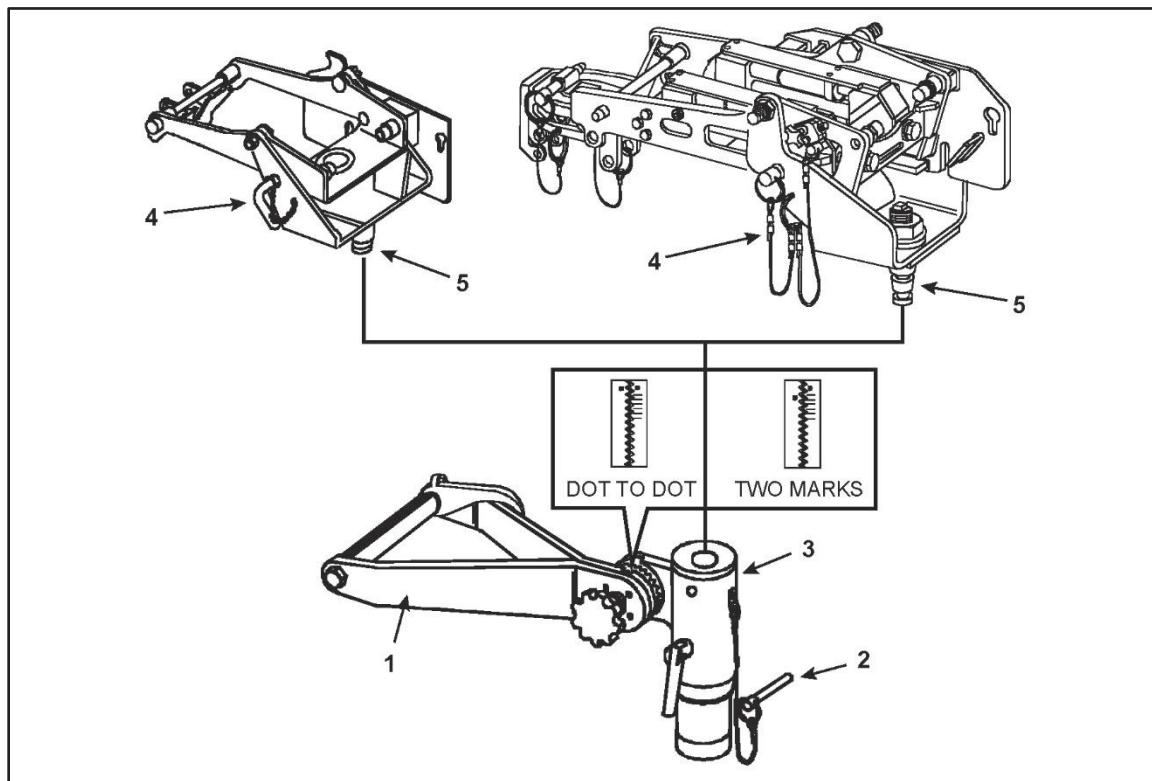
**Figure 3-335. Weapon mounts: 1) 6650 mount, 2) MK64 mount, and 3) MK93 mount**

- Lock the ring brake assembly on the vehicle.

**Note:** This is done if installing on a ring to prevent the ring from traversing.

- Prepare the pintle socket.

- a. Loosen the four lock screws.
    - (1) Use a 3/8-inch open-end box wrench.
    - (2) Turn counterclockwise.
    - (3) Ensure threaded ends are flush with pedestal socket's inner wall.
  - b. Remove the pintle locking pin.
  - c. Loosen pintle locking lever.
6. Install the weapon mount in the pintle socket on the vehicle.
    - a. Mount the 6650 weapon mount into the pintle socket on the vehicle.
      - (1) Insert M142 weapon mount pintle into the pintle socket.
      - (2) Secure the weapon mount pintle to the pintle socket.
        - (a) Tighten the four locking screws until mount will not pull out of socket, or
        - (b) Insert the pintle locking pin, or
        - (c) Tighten pintle locking lever.
      - (3) Pull up on weapon mount to ensure pintle lock is engaged.
    - b. Mount the MK64 or MK93 weapon mount into the pintle socket on the vehicle (see figure 3-336).



**Figure 3-336. MK64 mount (left) and MK93 mount (right)**

- (1) Mount the universal pintle adapter (known as UPA) to the pintle socket on the vehicle.
  - (a) Loosen the manual control handle on the UPA.
  - (b) Insert the pintle of the UPA into the pintle socket on the vehicle.
  - (c) Secure the UPA to the pintle socket.
    - \_1\_ Tighten the four locking screws.
    - \_2\_ Insert the pintle locking pin.
    - \_3\_ Tighten pintle locking lever.
  - (d) Tighten the manual control handle on the UPA.
  - (e) Pull up on UPA to ensure pintle lock is engaged.
  - (f) Loosen thumbscrew on the UPA.
  - (g) Rotate traverse arm assembly upward two marks above normal “dot to dot” stowed position.
- (2) Mount the MK64 carriage and cradle to the UPA.
  - (a) Remove quick release pin from UPA.

- (b) Ensure the carriage and cradle front retainer pin (see figure 3-336, item 4) is inserted.

**Note:** This is done to prevent movement of the carriage and cradle.

- (c) Insert carriage pintle (see figure 3-336, item 5) into top of the UPA socket.

- (d) Insert the UPA quick release pin into UPA.

- (e) Pull up on carriage and cradle to ensure pintle lock is engaged.

- (f) Twist carriage and cradle assembly to ensure it traverses freely left and right.

- (3) Mount the MK93 carriage and cradle to the UPA.

- (a) Remove quick release pin from UPA.

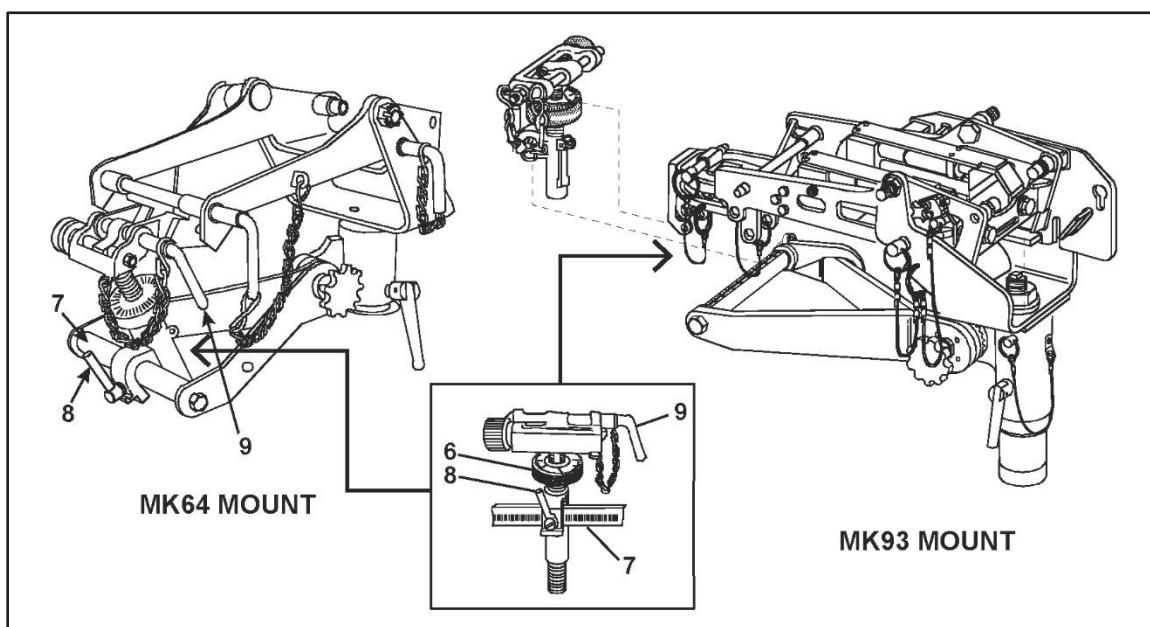
- (b) Insert carriage pintle (see figure 3-336, item 5) into top of the UPA socket.

- (c) Insert the UPA quick release pin into UPA.

- (d) Pull up on carriage and cradle to ensure pintle lock is engaged.

- (e) Twist carriage and cradle assembly to ensure it traverses freely left and right.

- (4) Mount the traverse and elevation (known as T&E) mechanism onto the MK64 or MK93 carriage and cradle (see figure 3-337).



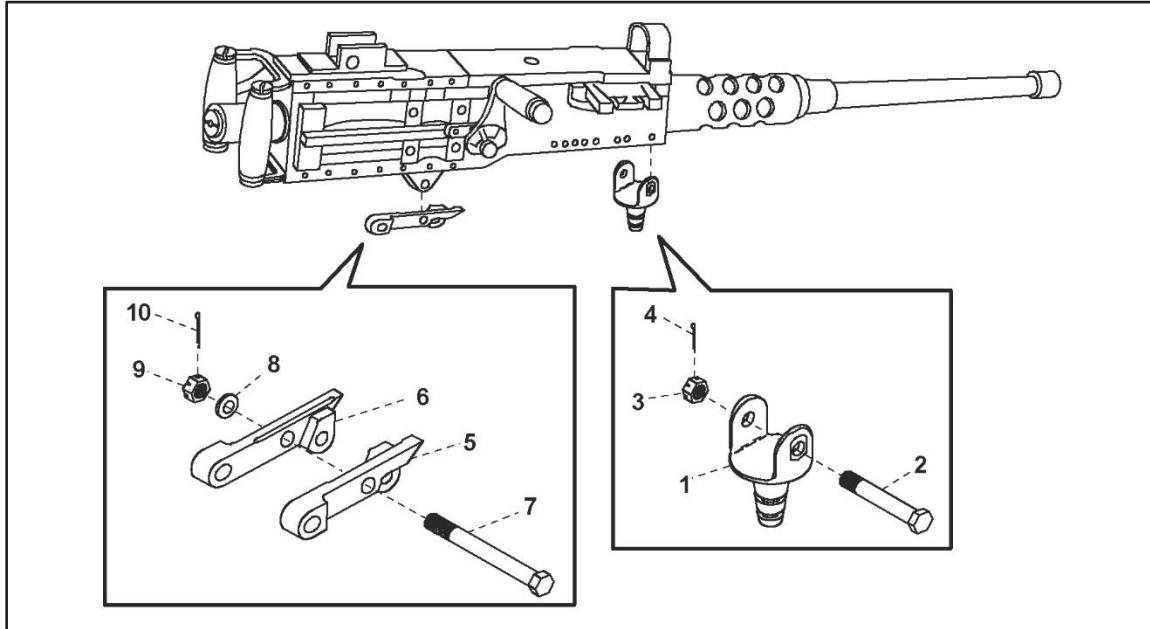
**Figure 3-337. Mounting traverse and elevation mechanism to MK64 (left) or MK93 (right) mounts**

- (a) Rotate elevating hand-wheel (see figure 3-337, item 6) of T&E mechanism assembly.

**Note:** The T&E should be near the fully compressed (short) length with no more than five threads showing.

- (b) Lock T&E mechanism to cradle by aligning the mounting holes and inserting the quick release handle (see figure 3-337, item 9).
7. Install the .50 caliber mounting adapter to the M2 machine gun (MK64 only) (see figure 3-338).

**Note:** The .50 caliber mounting adapter must be attached to the M2 machine gun to enable it to be mounted to the carriage and cradle assembly. The adapter assembly consists of a tripod pintle with hexagon head machine bolt, hex slotted plain nut, and cotter pin a left-hand adapter and right-hand adapter, and a drill shank bolt, flat washer hex slotted plain nut, and cotter pin.



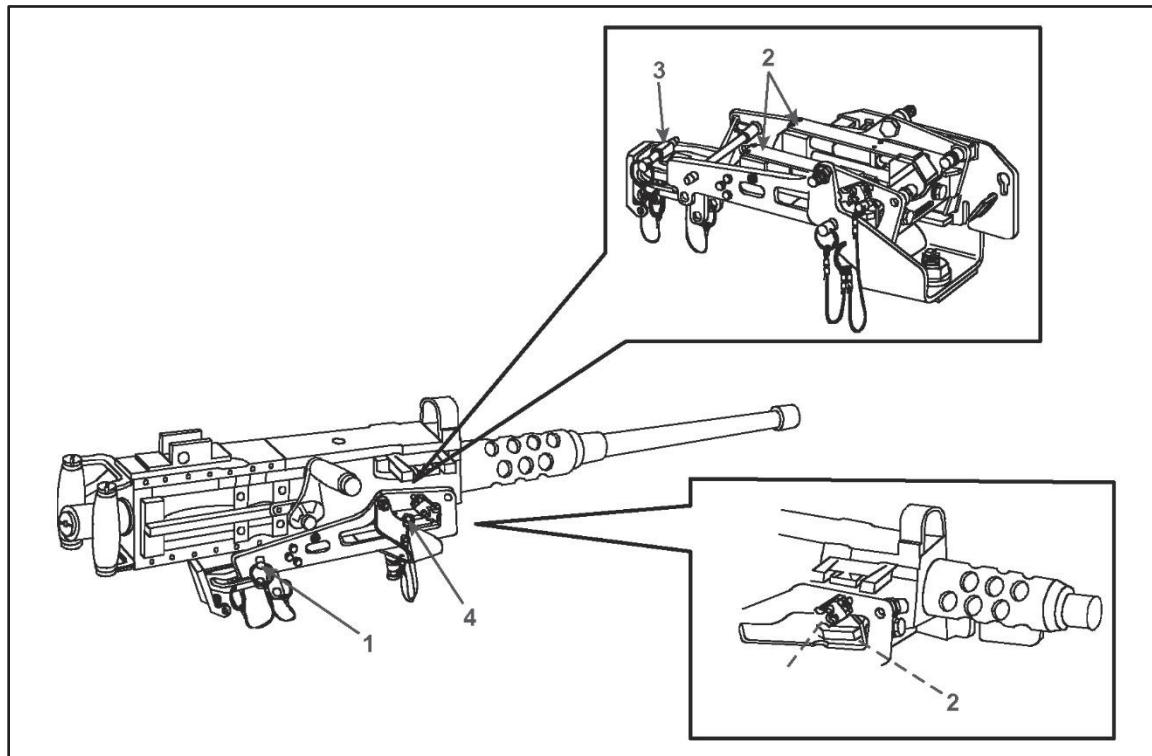
**Figure 3-338. Installing a .50 caliber mounting adapter**

- Lay the weapon down.
- Uninstall the pintle to the weapon.
  - Align holes in the pintle (see figure 3-338, item 1) with the holes in the weapon.
  - Insert machine bolt (see figure 3-338, item 2) from left to right.
  - Install slotted plain nut (see figure 3-338, item 3) on machine bolt (see figure 3-338, item 2).
  - Tighten using two wrenches.
  - Secure the pintle to the weapon.
    - Insert cotter pin (see figure 3-338, item 4) through slotted plain nut (see figure 3-338, item 3).
    - Spread legs of the cotter pin.
    - Bend cotton pin around the slotted plain nut.
- Remove the left and right adapter assemblies from the weapon.

- (1) Align the center holes.
    - (a) Ensure the holes on the two adapter assemblies align with the receiver mounting hole.
    - (b) Ensure the angular ends (see figure 3-338, items 5 and 6) point toward the muzzle.
  - (2) Insert machine bolt (see figure 3-338, item 7) from left to right.
  - (3) Install washer (see figure 3-338, item 8) on machine bolt (see figure 3-338, item 7).
  - (4) Install slotted plain nut (see figure 3-338, item 9) on machine gun (see figure 3-338, item 7).
  - (5) Tighten using two wrenches.
  - (6) Secure the pintle to the weapon.
    - (a) Insert the cotter pin (see figure 3-338, item 10) through slotted plain nut (see figure 3-338, item 9).
    - (b) Spread legs of the cotter pin.
    - (c) Bend the cotter pin around slotted plain nut.
8. Install the weapon into the 6650, MK64, or MK93 weapon mount on the vehicle.
- a. Install M2 to the 6650 weapon mount.
    - (1) Place weapon in the cradle, aligning the front and rear mounting points of the receiver to the mounting holes of the cradle.
    - (2) Insert two quick release pins, making sure they are completely through the gun and both sides of the cradle.
  - b. Install M2 to the MK64 weapon mount.
    - (1) Prepare the cradle by reaching under the cradle and pulling up on release cam.
    - (2) Hoist the weapon into the cradle, with help of an assistant, ensuring the pintle slides into the cradle's pintle bushing.
  - c. Install M2 to the MK93 weapon mount (see figure 3-339).

**Note:** One person may install the M2 machine gun by standing behind the carriage and cradle assembly and grasping the weapon by the barrel and control grips. The weapon is then lowered into the cradle.

- (3) Lower the release cam.
- (4) Align front adapter holes with the cradle's quick release pinholes.
- (5) Secure the weapon to the cradle by insert quick release pin and rotating the handle downward to the locked position.

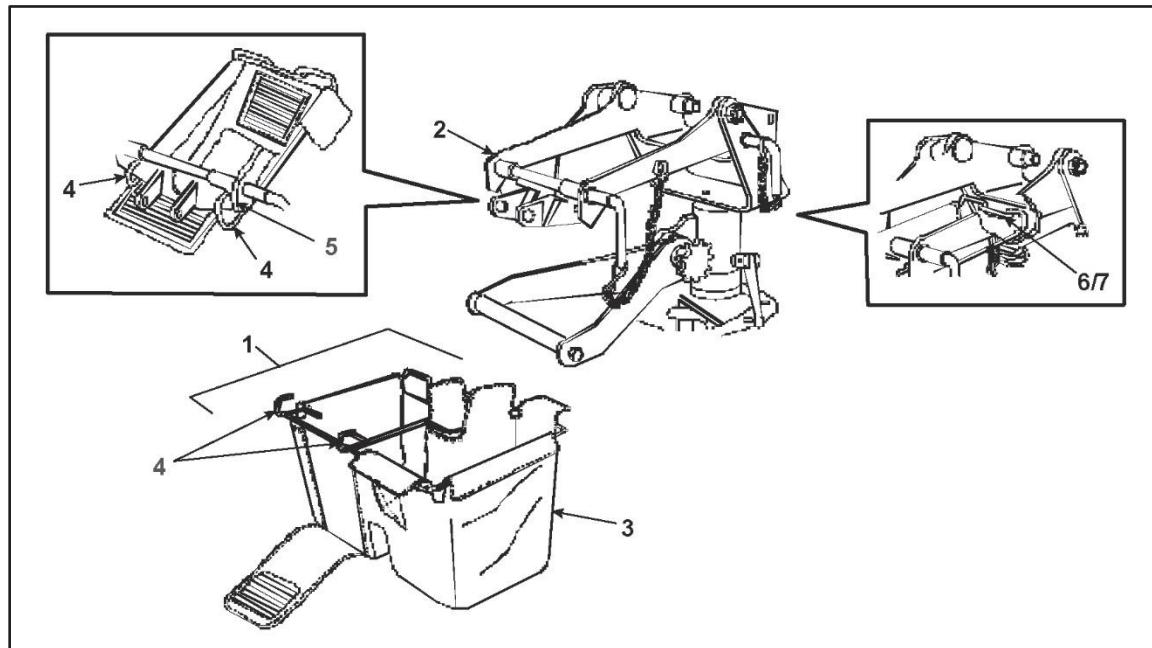


**Figure 3-339. Install M2 machine gun to MK93 mount**

- (1) Remove rear slider quick release pin (see figure 3-339, item 1).
- (2) Ensure shocks (see figure 3-339, item 2) and slider (see figure 3-339, item 3) are turned up.
- (3) Remove front quick release pin (see figure 3-339, item 4).
- (4) Hoist the weapon into the cradle, with help of an assistant, ensuring the front mounting holes of weapon align with holes on shocks (see figure 3-339, item 2).

**Note:** One person may install the M2 machine gun by standing behind the carriage and cradle assembly and grasping the weapon by the barrel and control grips. The weapon is then lowered into the cradle.

- (5) Insert front quick release pin (see figure 3-339, item 4).
  - (6) Lower rear of weapon until rear mounting lugs align with hole in slider.
  - (7) Insert rear quick release pin (see figure 3-339, item 1).
9. Attach catch bag assembly to carriage and cradle assembly (see figure 3-340, page 3-782).



**Figure 3-340. Installing catch bag assembly**

- a. Open front and rear closure flaps of catch bag.
- b. Slide catch bag assembly (see figure 3-340, item 1) from front to back onto traverse arm assembly (see figure 3-340, item 2) so that traverse arm assembly is inside the cartridge catch bag (see figure 3-340, item 3).
- c. Insert the two catch bag frame rear hooks (see figure 3-340, item 4) into the holes in the rear of the carriage and cradle assembly (see figure 3-340, item 5).
- d. Insert the bent notch (see figure 3-340, item 6) in the front of the catch bag frame into the mounting bar (see figure 3-340, item 7) of the carriage.
- e. Assemble to the catch bag frame.
  - (1) Slide rear closure flap to the inside of the azimuth indicator.
  - (2) Attach the two hook-and-loop fastener tabs on the rear closure flap to the inside and rear of bag.
- f. Attach the front closure flap of catch bag to the frame.

**Note:** This ensures the traverse arm assembly thumbscrew is on the outside of the cartridge catch bag.

Performance Measures	GO	NO-GO
1. Cleared the caliber .50 M2 machine gun.	_____	_____
2. Identified the type of pintle socket that is on the vehicle.	_____	_____
3. Identified the type of weapon mount.	_____	_____
4. Locked the ring brake assembly on the vehicle.	_____	_____
5. Prepared the pintle socket.	_____	_____
6. Installed the weapon mount in the pintle socket on the vehicle.	_____	_____
7. Installed the .50 caliber mounting adapter to the M2 machine gun (MK64 only).	_____	_____
8. Installed the weapon into the 6650, MK64, or MK93 weapon mount on the vehicle.	_____	_____
9. Attached catch bag assembly to carriage and cradle assembly.	_____	_____

**References  
Required**

TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

**Primary**

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)

**071-022-0013****Dismount a Caliber .50 M2-Series Machine Gun from a Vehicle**

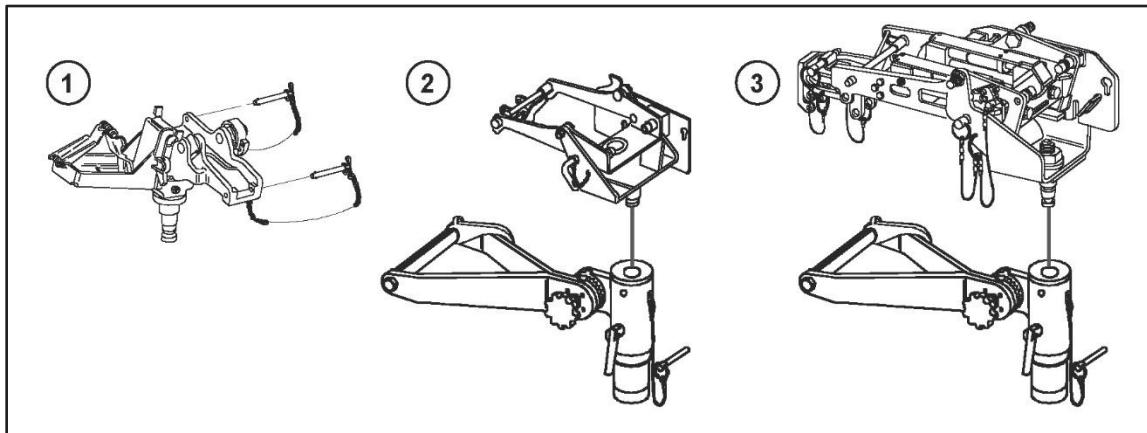
**Conditions:** You are a gunner of a caliber .50 M2 machine gun mounted on a vehicle and have been directed to dismount the machine gun. The machine gun is mounted on the vehicle using a 6650, MK64, or MK93 mount.

**Standards:** Clear the caliber .50 M2 machine gun, identify the type of weapon mount, and lock the ring brake assembly on the vehicle. Remove the catch bag assembly from carriage and cradle assembly. Remove the machine gun from the weapon mount. Dismount the weapon from the pintle socket, and uninstall the caliber .50 mounting adapter from the machine gun (MK64 only).

**Performance Steps**

1. Clear the caliber .50 M2 machine gun.
2. Identify the type of weapon mount (see figure 3-341).

**Note:** Three mounts are covered in this task: the 6650, MK64, and MK93 machine gun mounts. Then mount the M2 machine gun and (for the MK64 and MK93) the MK19 grenade machine gun into a pintle socket located on a vehicle. The 6650 mount consists of a cradle, pintle, ammunition box tray, and securing pins or latches. The MK64 mount consists of a carriage and cradle assembly, a universal pintle adapter (known as UPA), an elevation mechanism assembly, a machine gun mount cover, a catch bag assembly, and multipurpose ammunition can bracket assembly. The MK64 mount consists of a carriage and cradle assembly, UPA, traverse and elevation (known as T&E) mechanism, catch bag assembly, mounting bracket, and .50 caliber ammunition holder assembly.

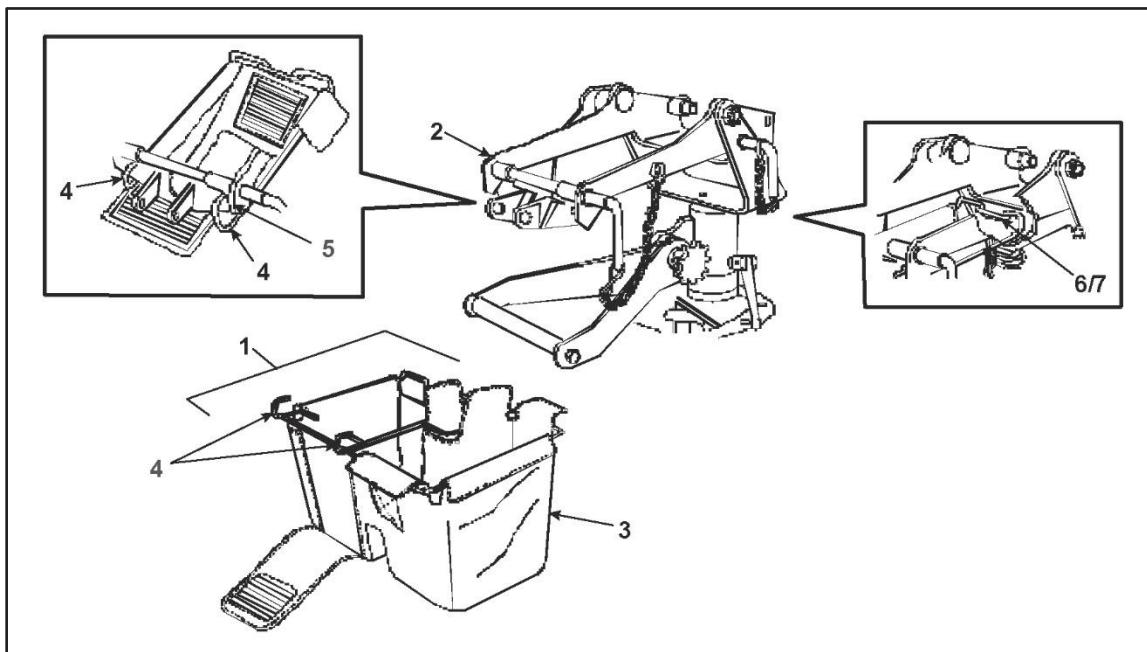


**Figure 3-341. Weapon mounts: (1) 6650 mount, (2) MK64 mount, and MK93 mount**

3. Lock the ring brake assembly on the vehicle.

**Note:** This is done if dismounting from a vehicle equipped with a ring, to prevent the ring from traversing.

4. Remove the catch bag assembly from carriage and cradle assembly (see figure 3-342).



**Figure 3-342. Catch bag assembly**

- a. Detach the front closure flap of catch bag from the frame.
  - b. Disassemble the catch bag frame by disconnecting the two hook-and-loop fastener tabs on the rear closure flap from the two hook-and-loop fastener tabs on the rear of bag.
  - c. Disconnect the bent notch (see figure 3-342, item 6) in the front of catch bag frame the mounting bar (see figure 3-342, item 7) of the carriage.
  - d. Disconnect the two catch bag frame rear hooks (see figure 3-342, item 4) from the holes in the rear of the carriage and cradle assembly (see figure 3-342, item 5).
  - e. Slide catch bag assembly (see figure 3-342, item 1) from back to front of the traverse arm assembly (see figure 3-342, item 2).
5. Remove the machine gun from the 6650, MK64, or MK93 weapon mount.
- a. Remove the M2 from the 6650 weapon mount.
    - (1) Remove the two quick release pins.
    - (2) Lift the weapon from the cradle.
    - (3) Reinsert two quick release.
  - b. Remove the M2 from the MK64 weapon mount.
    - (1) Remove the quick release pin.
    - (2) Hoist the weapon from the cradle, using an assistant.

**Note:** One person may uninstall the M2 machine gun by standing behind the carriage and cradle assembly and grasping the weapon by the barrel and control grips. The weapon is then lifted from the cradle.

- (3) Reinsert the quick release pin.
- c. Remove M2 from the MK93 weapon mount.
  - (4) Remove rear slider quick release pin.
  - (5) Remove front quick release pin.
  - (6) Hoist the weapon from the cradle, using an assistant.

**Note:** One person may uninstall the M2 machine gun by standing behind the carriage and cradle assembly and grasping the weapon by the barrel and control grips. The weapon is then lifted from the cradle.

- (7) Reinsert front quick release pin.
- (8) Reinsert rear quick release pin.
6. Dismount the weapon mount from the pintle socket on the vehicle.
  - a. Disengage the pintle socket locking mechanism.
    - (1) Loosen the four lock screws.
      - (a) Use a 3/8-inch open-end box wrench.
      - (b) Turn the pintle socket locking mechanism counterclockwise.
      - (c) Ensure threaded ends are flush with pedestal socket's inner wall.
    - (2) Remove the pintle locking pin.
    - (3) Loosen pintle locking lever.
  - b. Dismount the 6650 weapon mount from the pintle socket on the vehicle by lifting it out of the pintle socket.
  - c. Dismount the MK64 or MK93 weapon mount from the pintle socket on the vehicle.
    - (1) Remove the T&E mechanism from the MK64 or MK93 carriage and cradle.
      - (a) Disconnect the T&E from the traversing bar by loosening the traversing slide lock lever.
      - (b) Disconnect the T&E from the carriage and cradle by removing the quick release pin.
      - (c) Remove the T&E mechanism assembly.
      - (d) Place T&E on left side of azimuth indicator.
      - (e) Reinsert the quick release pin.
    - (2) Remove the MK64 or MK93 carriage and cradle from the UPA.

- (a) Remove quick release pin from UPA.
  - (b) Lift the MK64 or MK93 carriage and cradle from the UPA.
  - (c) Reinsert the UPA quick release pin into UPA.
- (3) Remove the UPA from the pintle socket on the vehicle.
- (a) Loosen the manual control handle on the UPA.
  - (b) Remove the UPA from the pintle socket on the vehicle.
  - (c) Tighten the manual control handle on the UPA.
- d. Re-engage the pintle socket locking mechanism.
- (1) Tighten the four locking screws until mount will not pull out of socket.
  - (2) Insert the pintle locking pin.
  - (3) Tighten pintle locking lever.
7. Uninstall the caliber .50 mounting adapter from the machine gun (MK64 only).
- Note:** The caliber .50 mounting adapter is attached to the M2 machine gun to enable it to be mounted to the carriage and cradle assembly. The adapter assembly consists of a tripod pintle with hexagon head machine bolt, hex slotted plain nut, and cotter pin a left-hand adapter and right-hand adapter, and a drill shank bolt, flat washer hex slotted plain nut, and cotter pin.
- a. Lay the weapon upside down.
  - b. Uninstall the pintle to the weapon.
    - (1) Remove the cotter pin from slotted plain nut.
    - (2) Loosen the nut using two wrenches.
    - (3) Remove the slotted plain nut and machine bolt.
    - (4) Reconnect the cotter pin, slotted plain nut and machine bolt to the pintle to prevent loss of items.
  - c. Remove the left and right adapter assemblies from the weapon.
    - (1) Remove the cotter pin from slotted plain nut.
    - (2) Loosen the nut using two wrenches.
    - (3) Remove the slotted plain nut, washer, and machine bolt.
    - (4) Separate the adapter assemblies from the receiver.
    - (5) Reconnect the cotter pin, slotted plain nut, washer, and machine bolt to the two adapter halves to prevent loss of items.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the caliber .50 M2 machine gun.	_____	_____
2. Identified the type of weapon mount.	_____	_____
3. Locked the ring brake assembly on the vehicle.	_____	_____
4. Removed the catch bag assembly from carriage and cradle assembly.	_____	_____
5. Removed the machine gun from the 6650, MK64, or MK93 weapon mount.	_____	_____
6. Dismounted the weapon mount from the pintle socket on the vehicle.	_____	_____
7. Uninstalled the caliber .50 mounting adapter from the machine gun (MK64 only).	_____	_____

**References  
Required**

TC 3-22.50 Heavy Machine Gun M2 Series

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)

**Primary**

TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

**071-022-0003**  
**Load a Caliber .50 M2-Series Machine Gun**

**WARNING**

**Failure to properly install the M2A1 barrel into the barrel extension may cause injury to personnel and will cause damage to equipment. Improper installation will cause the weapon to malfunction and damage the barrel assembly by shearing the barrel alignment guide pin off the barrel.**

**During barrel installation the square on the barrel extension must NOT be pulled back PAST the 3/8 inch hole on the right side of the receiver. Pulling the square of the barrel extension past the 3/8 inch hole will prevent the barrel from attaching to the barrel extension.**

**Headspace and timing for the M2A1 must be verified by Unit Armorer or Field Maintenance prior to issuing. Improper headspace and timing can cause injury to personnel and weapon damage.**

**Conditions:** You are a gunner for a .50 caliber M2-series machine gun and must load it in preparation for use. The machine gun is mounted on a tripod or vehicle. You have been issued the linked .50 caliber ammunition. The weapon has been cleared.

**Standards:** Load the .50 caliber machine gun in preparation for use.

**Performance Steps**

1. Ensure the correct front and rear cartridge stops are installed.

**Note:** If using blank ammunition, the cartridge guide for the M19 blank firing attachment replaces the front cartridge stop.

2. Ensure the bolt is forward.
3. Ensure weapon is on S (Safe) with cover closed.
4. Select automatic or single-shot mode.
5. Load the machine gun.
  - a. Load machine gun in automatic mode.
    - (1) Insert the double-loop end of the ammunition belt into the feedway until the first round is engaged by the belt-holding paw.
    - (2) Pull the retracting slide handle rearward, retracting the bolt all the way to the rear.
    - (3) Release handle.
    - (4) Pull the retracting handle to the rear for a second time to fully load the gun.

(5) Release handle.

**Note:** The machine gun is now loaded.

b. Load the machine gun in single-shot mode.

(1) Insert the double-loop end of the ammunition belt into the feedway until the first round is engaged by the belt-holding paw.

(2) Pull the retracting handle rearward, retracting the bolt all the way to the rear.

(3) Place the retracting handle to the fully forward position.

(4) Depress the bolt latch release.

**Note:** The machine gun is now half-loaded. A round is not in the chamber.

(5) Pull the retracting handle to the rear for a second time to fully load the gun.

(6) Return the retracting slide handle to the fully forward position.

(7) Depress the bolt latch release.

**Note:** The machine gun is now loaded.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the correct front and rear cartridge stops were installed.	_____	_____
2. Ensured the bolt was forward.	_____	_____
3. Ensured the weapon was on S (Safe) with cover closed.	_____	_____
4. Selected the automatic or single-shot mode.	_____	_____
5. Loaded the machine gun.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY)	TC 3-22.50 Heavy Machine Gun M2 Series

<b>References Required</b>	<b>Primary</b>
--------------------------------	----------------

Machine Gun, Caliber .50: M2A1 with Fixed  
Headspace and Timing, Flexible (NSN 1005-01-642-  
7437) (NAVY)

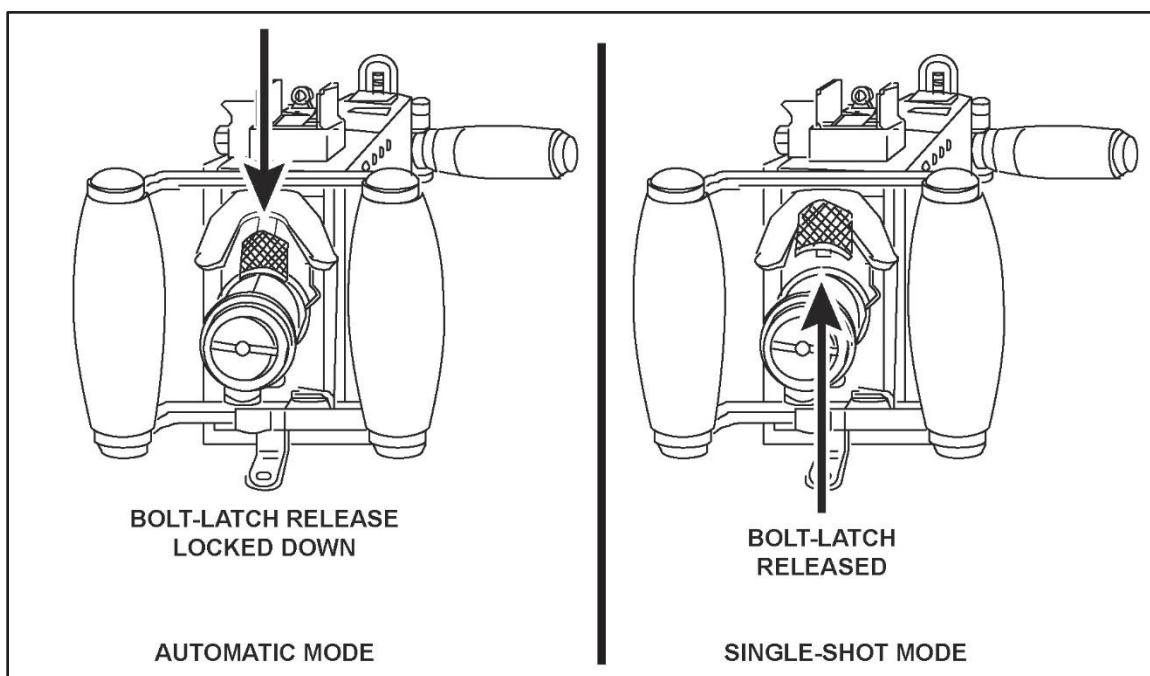
**071-022-0004**  
**Unload a Caliber .50 M2-Series Machine Gun**

**Conditions:** You are a gunner and have a requirement to unload your .50 caliber M2-series machine gun. The machine gun is mounted on a tripod or vehicle.

**Standards:** Remove all ammunition and links from the .50 caliber M2-series machine gun. Correctly clear the weapon and verify the chamber is empty.

**Performance Steps**

1. Remove all ammunition and links from the machine gun.
  - a. Ensure weapon is in the single-shot mode (see figure 3-343).



**Figure 3-343. Firing mode**

- b. Place trigger block on S (Safe).
  - c. Unlock the bolt latch release.
  - d. Raise the cover.
  - e. Lift the cartridge extractor.
  - f. Remove the ammunition belt from the feedway.
  - g. Place cartridge extractor down.
  - h. Close the cover.
2. Clear the machine gun.

- a. Pull the retracting slide handle to the rear, locking the bolt to the rear.

**Note:** The chambered round should drop free from the bolt face. If it does not, you will need to physically remove the round by gently tapping it.

- b. Open the cover.

### WARNING

**Chamber may be hot. Use caution while inspecting the T-slot.**

- c. Visually inspect the chamber and T-slot for rounds.
- d. Grasp the retracting slide handle.
- e. Press the bolt latch release.
- f. Ease the bolt forward with retracting slide handle.
- g. Close the cover.
- h. Press the trigger.

Performance Measures	GO	NO-GO
1. Removed all ammunition and links from the machine gun.	_____	_____
2. Cleared the machine gun.	_____	_____

### References Required

TC 3-22.50 Heavy Machine Gun M2 Series

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159)

### Primary

TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

<b>References Required</b>	<b>Primary</b>
--------------------------------	----------------

MK93 MOD 0 Machine Gun Mount (USMC ONLY)  
(1005-01-383-2949) MK93 MOD 1 Machine Gun  
Mount 1005-01-383-2757) MK93 MOD 2 Machine  
Gun Mount (1005-01-502-7547)

**071-313-3454**  
**Engage Targets with a Caliber .50 M2-Series Machine Gun**

**Conditions:** You are a member of a squad or team engaged in active ground combat. You have a mounted M2-series heavy machine gun and have identified potential threats. You have additional ammunition and an assistant gunner on hand.

**Standards:** Acquire the target. Assume appropriate firing position. Engage the target and reload the weapon, if necessary.

**Performance Steps**

1. Acquire target.
  - a. Detect potential threats.
  - b. Identify threat as friend, foe, or noncombatant.
  - c. Prioritize the threat(s) based on the level of danger they present.
- Note:** The standard prioritization of targets establishes the order of engagement. Targets are prioritized by threat level based on the danger they present. Similar threats are engaged based on the following guidelines: near before far, frontal before flank, and stationary before moving.
- d. Determine range to target.
- Note:** Rapidly determining an accurate range to target is critical to the success of the Soldier at mid and extended ranges. There are several range determination methods gunners should be confident in applying to determine the proper hold-off for pending engagements. Employing a laser range finder, observing a target and the amount of detail seen at various ranges, or simply observing and adjusting fire are all suitable methods.
- e. Set the elevation to the appropriate range mark.
- f. Determine the method of engagement.

**Note:** The rate of fire and class of fire (see figure 3-344 on page 3-796; figure 3-345 on page 3-797; and figure 3-346 on page 3-798) will be determined by the gunner or gun team leader based on the target type, exposure, and movement.

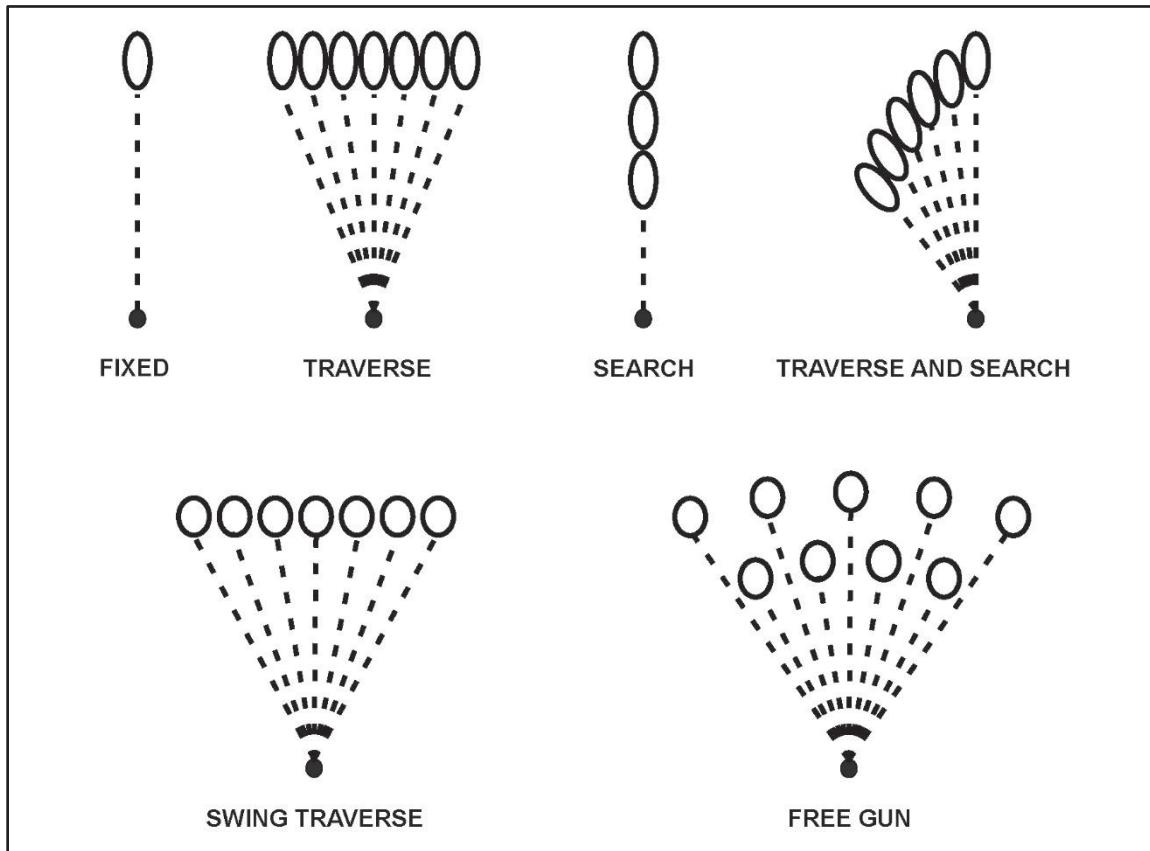


Figure 3-344. Classes of fire with respect to the gun

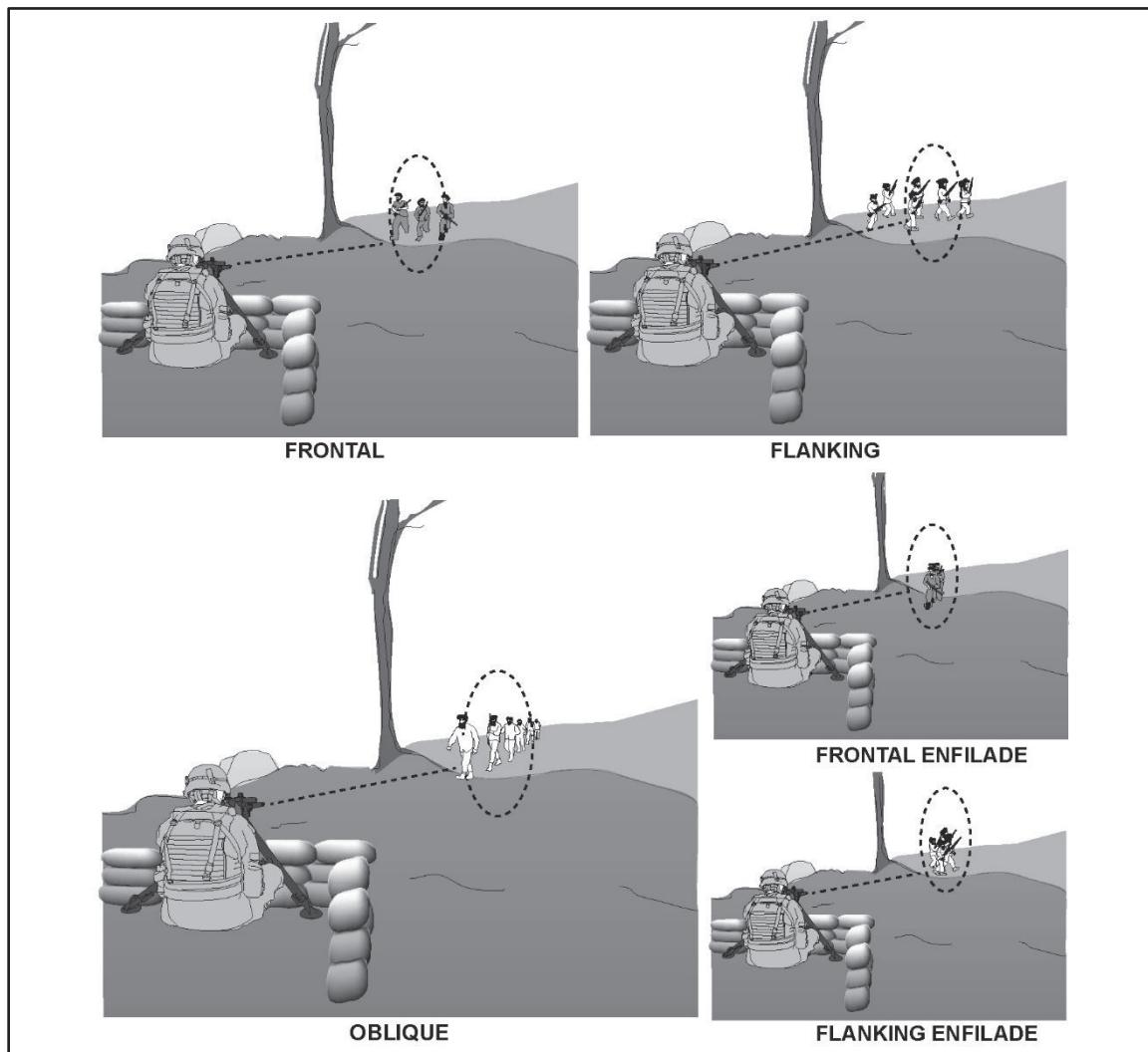
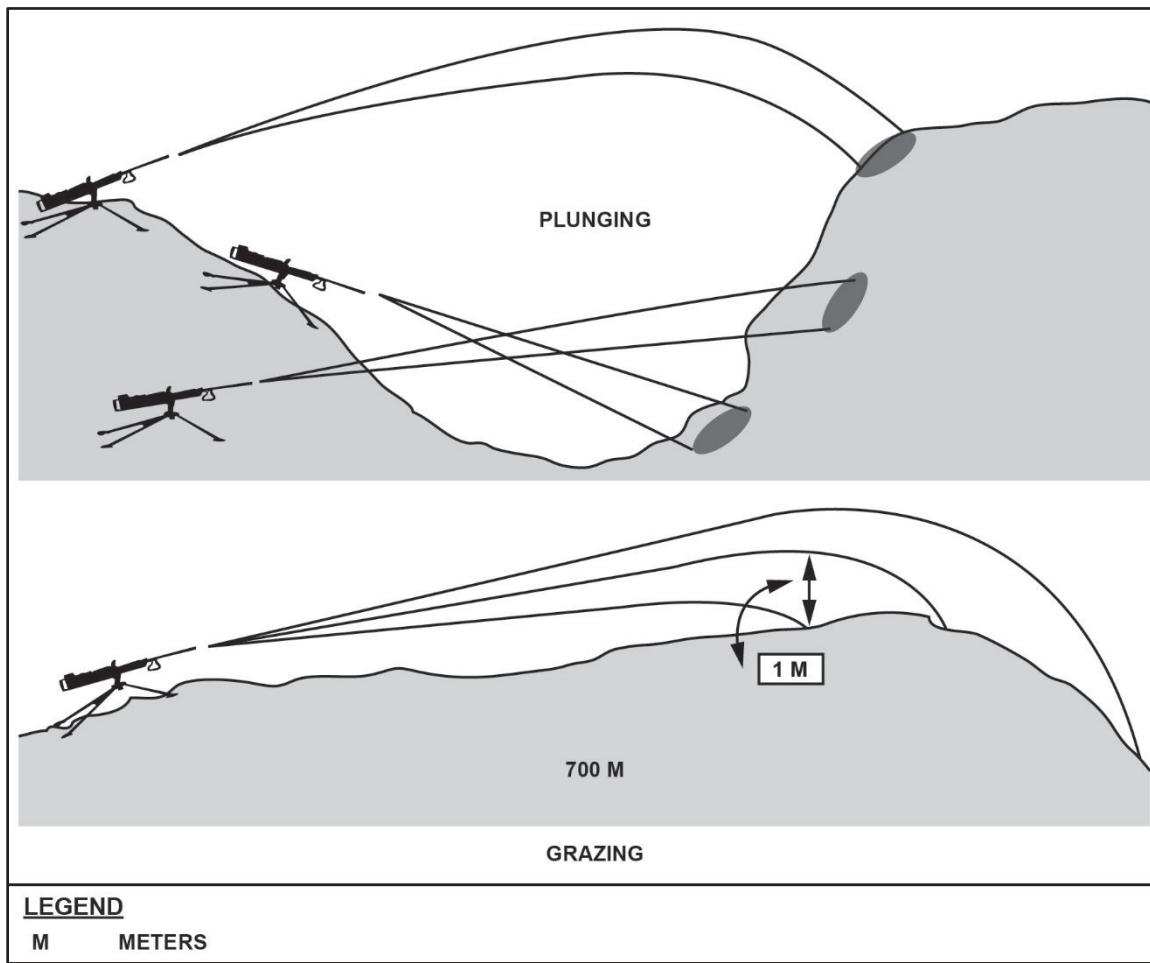


Figure 3-345. Classes of fire with respect to the target



**Figure 3-346. Classes of fire with respect to the ground**

- (1) Select a rate of fire.
  - (2) Select a class of fire.
2. Assume appropriate firing position.

**Note:** Due to the nature of combat, you will not always be able to assume a particular firing position. You need to become proficient in firing your weapon from a variety of positions, including appropriate variations. The variation of the standing, seated, and prone positions will be determined by threat prioritization, the platform of the mounted weapon system, and the availability of cover.

- a. Select a suitable firing position or stance.

**Note:** Your situation should affect your physical positioning and firing stance. Your position should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire. Your position may vary based on the platform the mounted weapon system is deployed on.

- b. Stabilize the weapon.

**Note:** When assuming a stable firing position movement, muscle tension, breathing, and other natural activities within your body will be transferred to the weapon and must be compensated for. Stability provides a window of opportunity to maintain sight alignment and sight picture for the most accurate shot.

- (1) Control the movement of the barrel.
- (2) Adequately support the weapon system.

**Note:** Support can be natural or artificial or a combination of both. Natural support comes from a combination of the gunner's bones and muscles. Artificial support comes from objects outside the gunner's body. The more support a particular position provides, the more stable the weapon. The placement or arrangement of sandbags, equipment, or structures that directly provide support to the weapon to provide increased stability. This includes the use of a tripod, traverse and elevation mechanism, and bone-and muscle support provided by the gunner to stabilize the machine gun.

- (3) Achieve natural point of aim.

**Note:** The natural point of aim is the point where the barrel naturally orients when your muscles are relaxed and support is achieved.

3. Engage the target.

- a. Determine wind hold, if necessary.

**Note:** Soldiers must be comfortable and confident in their ability to judge the effects of the wind to consistently make accurate and precise shots. To estimate the effects of the wind on the shot, determine the three windage factors: velocity, direction, and value (See figure 3-347, page 3-800).

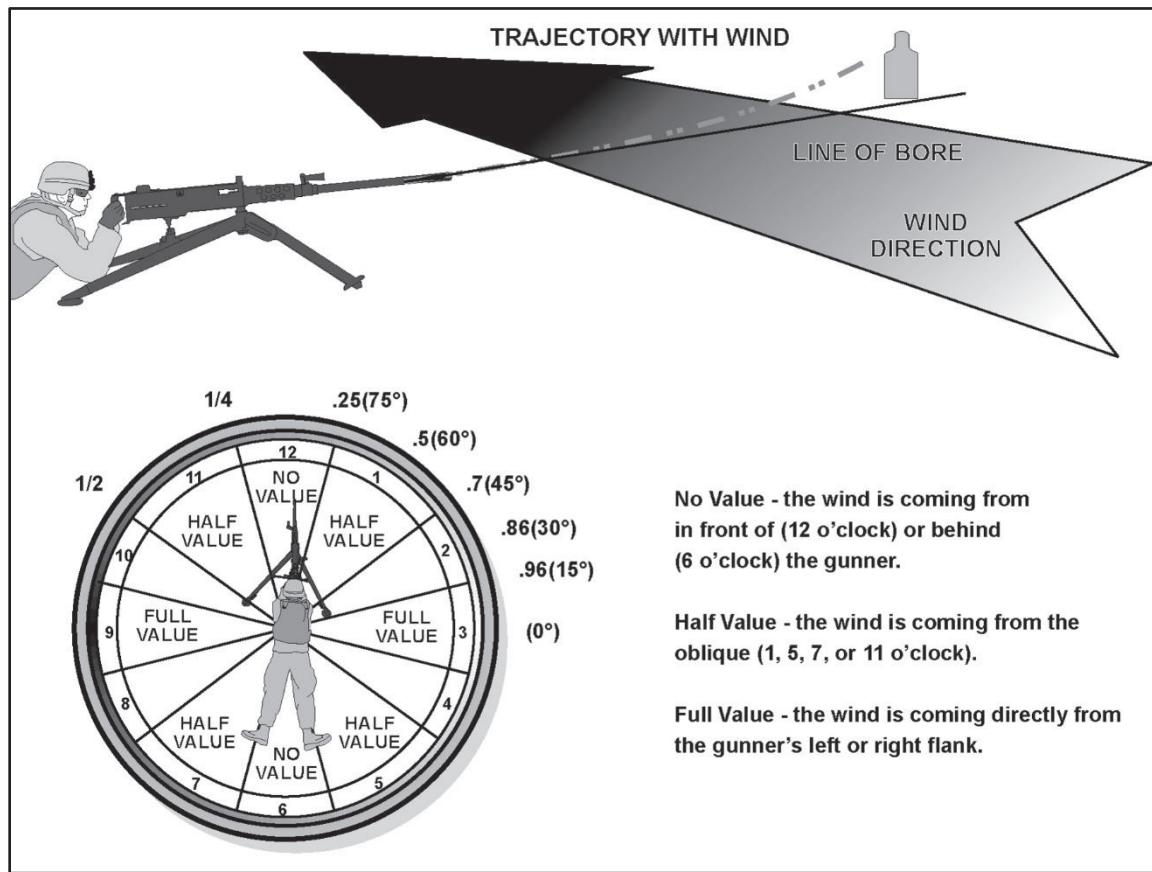


Figure 3-347. Wind effects

- Disengage the manual safety.
- Ensure sights are aligned on the target.

**Note:** The human eye can only focus clearly on one object at a time. To achieve proper and effective aim, focus your eye on the front sight post or reticle.

- Press the trigger straight down by applying smooth, continuous pressure without disturbing sight alignment.

**Note:** The rate of fire will be determined by the gunner or gun team leader based on the target type. Control the rate of fire to deliver consistent, lethal, and precise fires against the threat.

- Smoothly release the trigger, just far enough for it to reset.

**Note:** Focus on the sights while resetting the trigger.

- Assess effects on target.
  - Continue engagement if target is not destroyed or an additional target is identified.
    - Adjust point of aim, as needed.
    - Re-engage target.

- (2) Cease fire if target is/targets are destroyed, suppressed, or you receive an order to cease fire.
- Fully release the trigger.
  - Engage the manual safety.
4. Reload the weapon, if necessary.

**Note:** Reloading can be performed anytime during the engagement process.

Performance Measures	GO	NO-GO
1. Acquired target.	_____	_____
2. Assumed appropriate firing position.	_____	_____
3. Engaged the target.	_____	_____
4. Reloaded the weapon, if necessary.	_____	_____

References Required	Primary
TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)	TC 3-22.50 Heavy Machine Gun M2 Series

<b>References Required</b>	<b>Primary</b>
--------------------------------	----------------

TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

**071-022-0005**  
**Correct Malfunctions of a Caliber .50 M2-Series Machine Gun**

**WARNING**

**Do not open cover while performing immediate action. Keep the weapon pointed downrange. Never remove the backplate assembly until the chamber has been cleared. Depending on climate condition, do not leave live rounds laying on top of hot expended brass.**

**Failure to properly install the M2A1 barrel into the barrel extension may cause injury to personnel and will cause damage to equipment. Improper installation will cause the weapon to malfunction and damage the barrel assembly by shearing the barrel alignment guide pin off the barrel.**

**During barrel installation the square on the barrel extension must NOT be pulled back PAST the 3/8-inch hole on the right side of the receiver. Pulling the square of the barrel extension past the 3/8-inch hole will prevent the barrel from attaching to the barrel extension.**

**Headspace and timing for the M2A1 must be verified by the unit armorer or field maintenance prior to issuing. Improper headspace and timing can cause injury to personnel and weapon damage.**

**Conditions:** You are gunner engaging targets and your caliber .50 machine gun malfunctions. The machine gun is mounted on a tripod or vehicle. You have all basic issue items for the machine gun and an assistant gunner.

**Standards:** Identify the type of stoppage or malfunction, apply corrective action, as needed. Report the weapon's status to your immediate supervisor.

**Performance Steps**

1. Identify type of stoppage or malfunction.

**Note:** A stoppage is any interruption in the cycle of operation caused by the faulty action of the gun or ammunition. Stoppages are classified as: failure to feed, failure to chamber, failure to lock, failure to fire, failure to unlock, failure to extract, failure to eject, failure to cock.

A malfunction is any failure of the gun to function satisfactorily. Examples of malfunctions are failure to function freely or uncontrolled automatic fire.

**WARNING**

**Do not open cover while performing immediate action. Keep the weapon pointed downrange.**

**Never remove the backplate assembly until the chamber has been cleared.**

**Depending on climate condition, do not leave live rounds laying on top of hot expended brass.**

2. Apply immediate action.

a. Apply immediate action to a cool weapon.

**Note:** For this task, a cool weapon is defined as a weapon that has fired less than 200 rounds in 2 minutes.

(1) Hold the weapon on target.

(2) Wait 10 seconds in case the weapon has a hang fire.

(3) Pull the retracting handle to the rear.

(4) Observe that the round or fired case is ejected.

(a) If a round or fired case ejects, go to next step.

(b) If round or fired case does not eject and remains seated in the chamber, proceed to step 3 (apply remedial action).

(5) Return the retracting slide handle to its forward position.

(6) If the bolt locks to the rear, depress the bolt latch to return the bolt to the forward position.

(7) Re-engage the target.

(a) If the weapon fires, proceed to step 4.

(b) If the weapon fails to fire, continue to next step.

(8) Wait 10 seconds.

(9) Pull the retracting slide handle to the rear, ensuring it locks in the rearward position (engage with bolt latch).

(10) Return the retracting slide to its forward position.

(11) Perform remedial action (step 3).

**WARNING**

**The climatic temperature of various global regions will make a difference as to what constitutes a hot gun. A cook-off can occur within 50 rounds when the weapon and ammunition have been exposed for a prolonged period in the sun.**

- b. Apply immediate action to a hot weapon.

**Note:** For this task, a hot weapon is defined as a weapon that has fired 200 or more rounds in 2 minutes.

- (1) Hold the weapon on target.
  - (2) Pull the retracting slide handle to the rear.
  - (3) Observe that the round or fired case is ejected.
    - (a) If a round or fired case ejects, go to next step.
    - (b) If round or fired case does not eject and remains seated in the chamber, proceed to step 3 (apply remedial action).
  - (4) Release the retracting slide handle.
  - (5) Re-engage the target.
    - (a) If the weapon fires, proceed to step 4.
    - (b) If the weapon fails to fire, continue to next step.
  - (6) Ensure the bolt is in the forward position and place the weapon in single action mode.
  - (7) Evacuate the immediate area.
  - (8) Wait 30 minutes.
  - (9) Apply remedial action (step 3).
- c. Apply immediate action to stop uncontrolled automatic fire (runaway gun).
- (1) Keep the gun laid on target.
  - (2) Attempt to twist the ammunition belt in order to induce a stoppage.
  - (3) Wait 5 minutes to allow the weapon to cool and guard against a cook off.
  - (4) Once the weapon has cooled, proceed to step 3 (apply remedial action).

**DANGER**

**Never open the cover assembly on a hot weapon. An open cover cook-off could damage the weapon and, more importantly, could result in serious injury or death.**

**WARNING**

**Keep the weapon pointed downrange while performing remedial action procedures.**

3. Apply remedial action.

- a. Open the cover assembly and remove ammunition belt.
  - (1) Check for faulty ammunition.
  - (2) Check for an obstruction in the barrel assembly and chamber.
- b. Pull the retracting slide handle to the rear.
- c. Observe round or fired case ejection.
  - (1) If a round or fired case ejects, proceed to step 3d.
  - (2) If a round is not ejected, lock the bolt to the rear and return the retracting slide handle forward.
  - (3) Visually inspect for round or fired case in chamber.
    - (a) If a round or fired case is not present in the chamber, proceed to step 3d.
    - (b) If a round is present in the chamber, insert cleaning rod into muzzle end of machine gun and gently tap the round or fired case from the chamber.
- d. Return the bolt to the forward position.

**Note:** The weapon is now clear.

- e. Reload the weapon.
- f. Re-engage the target.
  - (1) If weapon fires, continue engagement.
  - (2) If weapon does not fire, perform troubleshooting procedures in accordance with TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010.

4. Report weapon status.

Performance Measures	GO	NO-GO
1. Identified type of stoppage or malfunction.	_____	_____
2. Applied immediate action.	_____	_____
3. Applied remedial action.	_____	_____
4. Reported weapon status.	_____	_____

**References  
Required**

TC 3-22.50 Heavy Machine Gun M2 Series

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)

**Primary**

TM 9-1005-213-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, Caliber .50: M2A1 With Fixed Headspace and Timing (NSN 1005-01-511-1250) (EIC: 4AZ) Machine Gun, Caliber .50: M2, Heavy Barrel, Flexible, with Equipment (NSN 1005-00-322-9715) (EIC: 4AG) Fixed M48 Turret Type (NSN 1005-00-957-3893) (EIC: 4BB) Flexible Without Equipment (NSN 1005-00-726-5636) (NAVY/USMC) Up Gunned Weapons Station (UGWS) (NSN 1005-01-362-6237) (USMC) Navy Variant (NSN 1005-01-343-0747) (NAVY) Machine Gun, Caliber .50: M2A1 with Fixed Headspace and Timing, Flexible (NSN 1005-01-642-7437) (NAVY)

**071-030-0009**  
**Mount an MK19 Grenade Machine Gun on a Vehicle**

**Conditions:** You are a gunner on a tactical vehicle and must mount the MK19 grenade machine gun on the vehicle. You have a universal pintle adapter (known as UPA), MK64 or MK93 machine gun mount, and another Soldier to assist, as needed. The vehicle has an installed pintle socket.

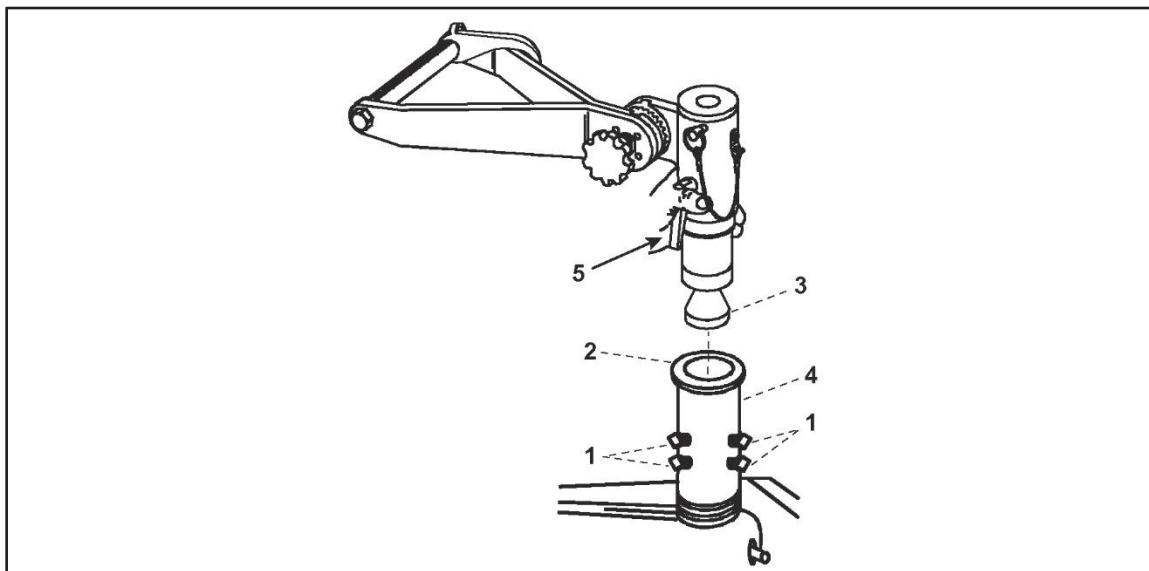
**Standards:** Install the MK19 grenade machine gun on the vehicle using the MK64 or MK93 machine gun mount.

**Performance Steps**

1. Install the UPA. (See figures 3-348 and 3-349.)

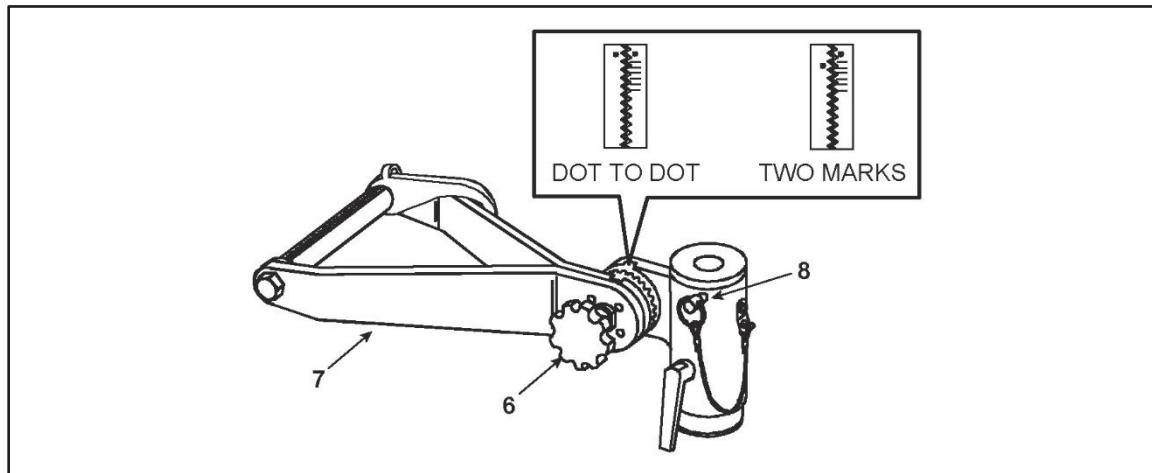
**Note:** The UPA has a large pintle for mounting into the sockets of pedestal, rings, or vehicle sockets.

- a. Lock the ring brake assembly on the vehicle, if applicable, to prevent the ring from traversing.



**Figure 3-348. Universal pintle adapter**

- b. Use a 3/8-inch open-end box wrench to loosen the four lock screws (see figure 3-348, item 1) on the pedestal by turning counterclockwise until threaded ends are flush with pedestal's inner wall (see figure 3-348, item 2).
- c. Insert UPA (see figure 3-348, item 3) into the pedestal (see figure 3-348, item 4).
- d. Tighten manual control handle (see figure 3-348, item 5).
- e. Pull upward on the UPA to ensure it is secured in place.



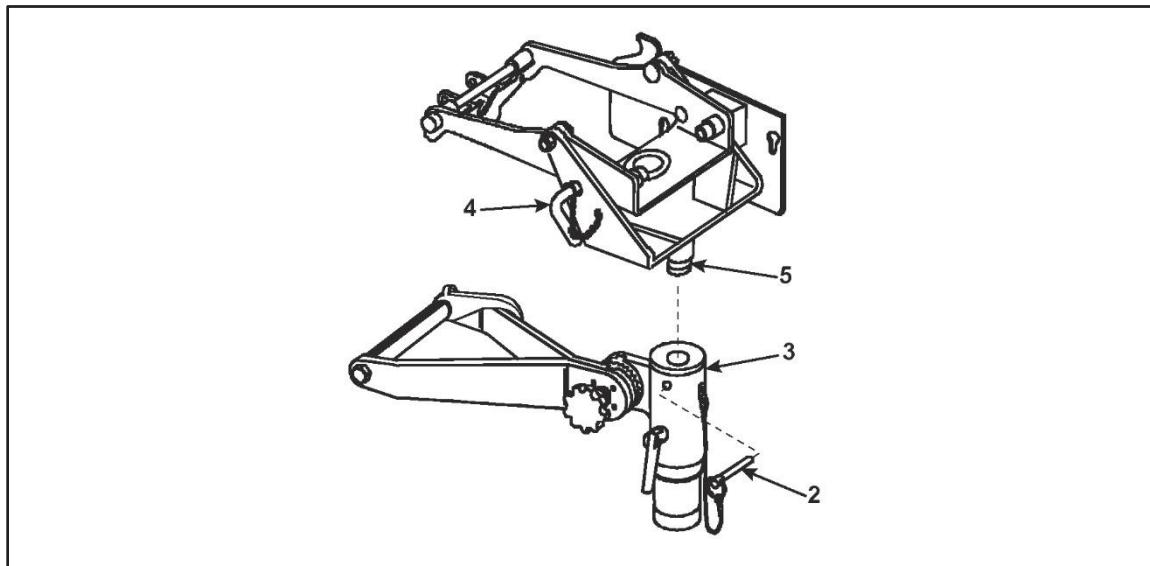
**Figure 3-349. Traverse arm assembly**

- f. Loosen thumbscrew (see figure 3-349, item 6) and, rotate traverse arm assembly (see figure 3-349, item 7) upward two marks above normal “dot to dot” stowed position.
  - g. Remove the quick release pin (see figure 3-349, item 8) from the UPA.
2. Install the machine gun mount.

**DANGER**

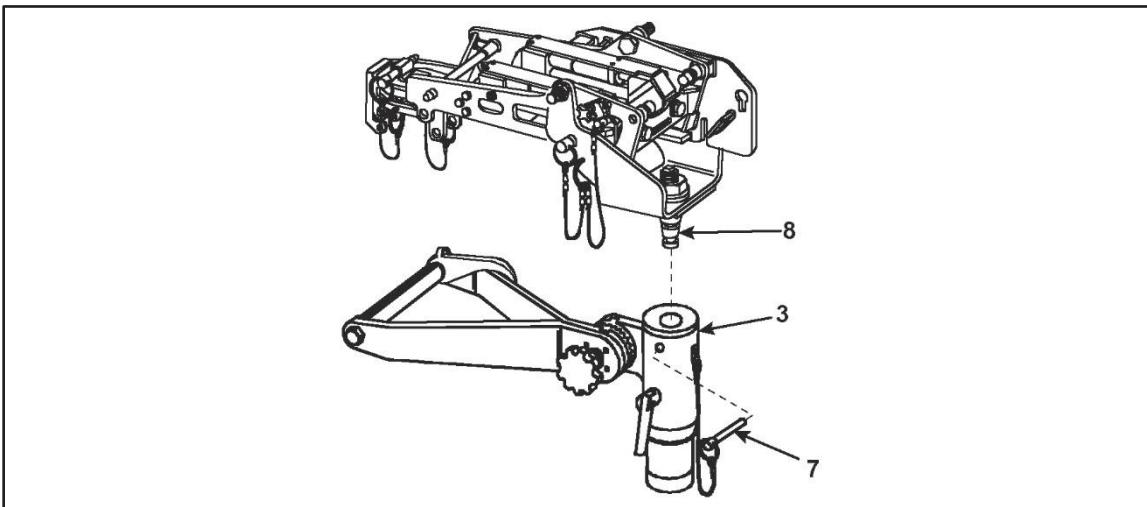
**The depression stop (plain hexagon nut and hexagon head machine bolt) must be in place when firing the MK19. If the depression stop is not installed, the weapon can be depressed below the safety limit of 200-meters elevation, thus endangering personnel.**

- a. Mount the MK64 machine gun mount. (See figure 3-350, page 3-810.)



**Figure 3-350. MK64 machine gun mount**

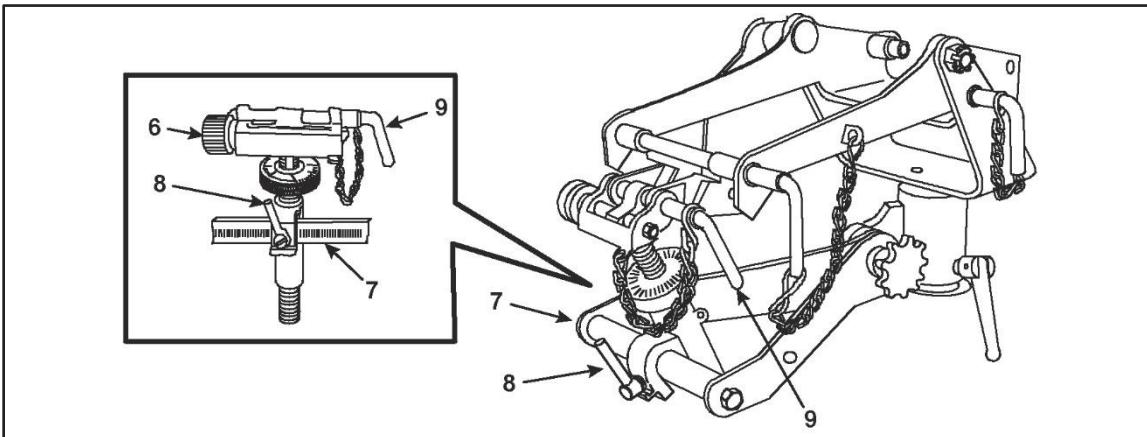
- (1) Insert the front retainer pin (see figure 3-350, item 4) to prevent movement of the carriage and cradle.
- (2) Insert carriage pintle (see figure 3-350, item 5) into top of the UPA (see figure 3-350, item 3).
- (3) Insert the quick release pin (see figure 3-350, item 2) into the UPA (see figure 3-350, item 3).
- (4) Pull upward and twist carriage and cradle assembly to ensure it is locked into the UPA but traverses freely left and right.
- (5) Ensure that the depression stop is install and set correctly.
- (6) Install and/or adjust the depression stop, if required.
  - (a) Use an open-end wrench to install the nut on the depression stop bolt.
  - (b) Use two open-end wrenches to screw the depression stop bolt with nut into the underside of the carriage.
  - (c) Depress machine gun's muzzle and aim at the lowest point you are allowed to fire (MK19 MOD 0 – 310 meters/328 yards minimum).
  - (d) Use two open-end wrenches to adjust depression stop bolt and nut until machine gun muzzle cannot be depressed below the safety limit.
- b. Mount the MK93 machine gun mount. (See figure 3-351.)



**Figure 3-351. MK93 machine gun mount**

- (1) Insert carriage pintle (see figure 3-351, item 8) into top of the UPA (see figure 3-351, item 3).
  - (2) Insert the quick release pin (see figure 3-351, item 7) into the UPA (see figure 3-351, item 3).
  - (3) Pull upward and twist MK93 mount to ensure it is locked into the UPA but traverses freely left and right.
3. Install the traverse and elevation (known as T&E) mechanism assembly.

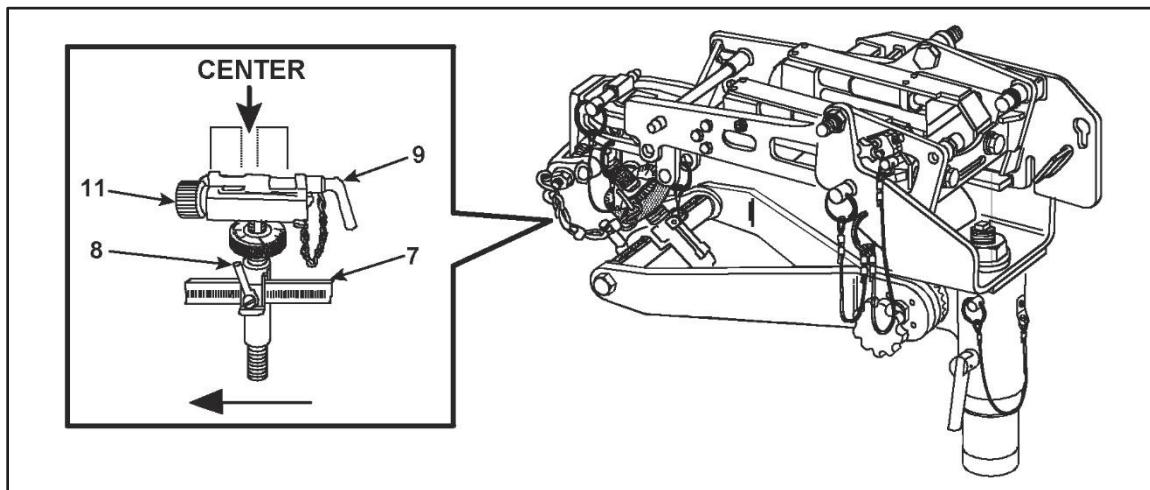
- a. Install T&E on the MK64 mount. (See figure 3-352.)



**Figure 3-352. Traverse and elevation on the MK64 mount**

- (1) Rotate the elevating hand-wheel (see figure 3-352, item 6) of the T&E mechanism assembly until the T&E is near the fully compressed (short) length (no more than 5 threads showing).
- (2) Place the T&E on left side of azimuth indicator (see figure 3-352, item 7) and loosely clamp with traversing slide lock lever (see figure 3-352, item 8).
- (3) Pin the T&E to cradle with handle (see figure 3-352, item 9).

b. Install the T&E on the MK93 mount. (See figure 3-353.)



**Figure 3-353. Traverse and elevation on the MK93 mount**

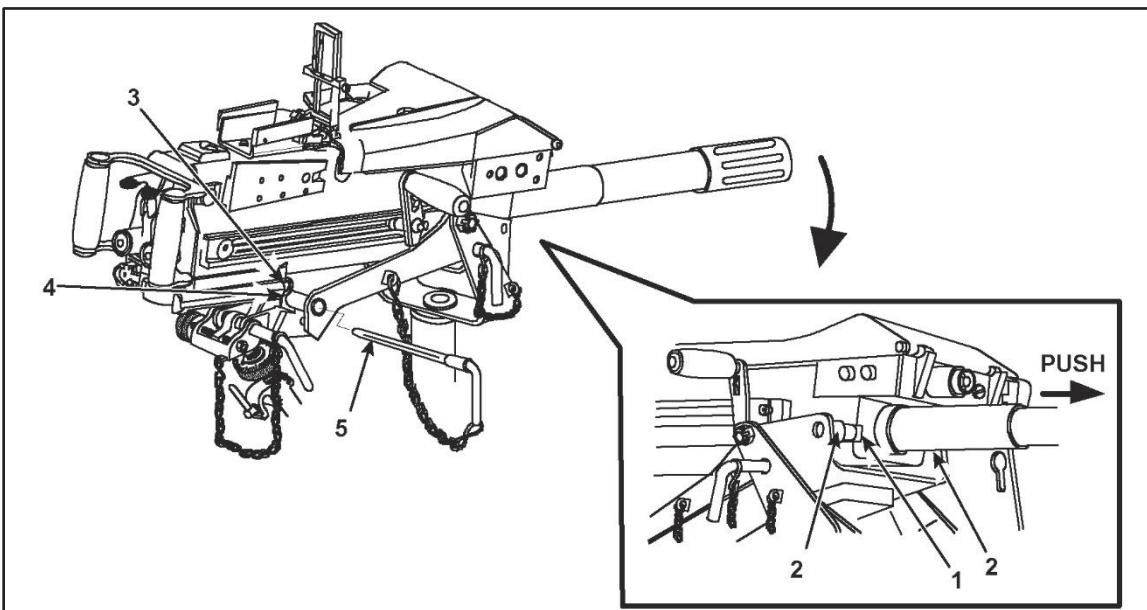
- (1) Rotate the elevating hand-wheel (see figure 3-353, item 6) of the T&E mechanism assembly until the T&E is near the fully compressed (short) length (no more than 5 threads showing).
- (2) Place the T&E on left side of azimuth indicator (see figure 3-353, item 7) and loosely clamp with traversing slide lock lever (see figure 3-353, item 8).
- (3) Pin the T&E to cradle with handle (see figure 3-353, item 9).
- (4) Center traversing adjustment of the T&E using traversing hand-wheel (see figure 3-353, item 11).
- (5) Pull the handle (figure 3-353, item 9) halfway out and loosen traversing slide lock lever (see figure 3-353, item 8) on the T&E.
- (6) Slide the T&E to the left side of azimuth indicator (see figure 3-353, item 7).

**WARNING**

**The MK19 grenade machine gun is a two-man lift.**

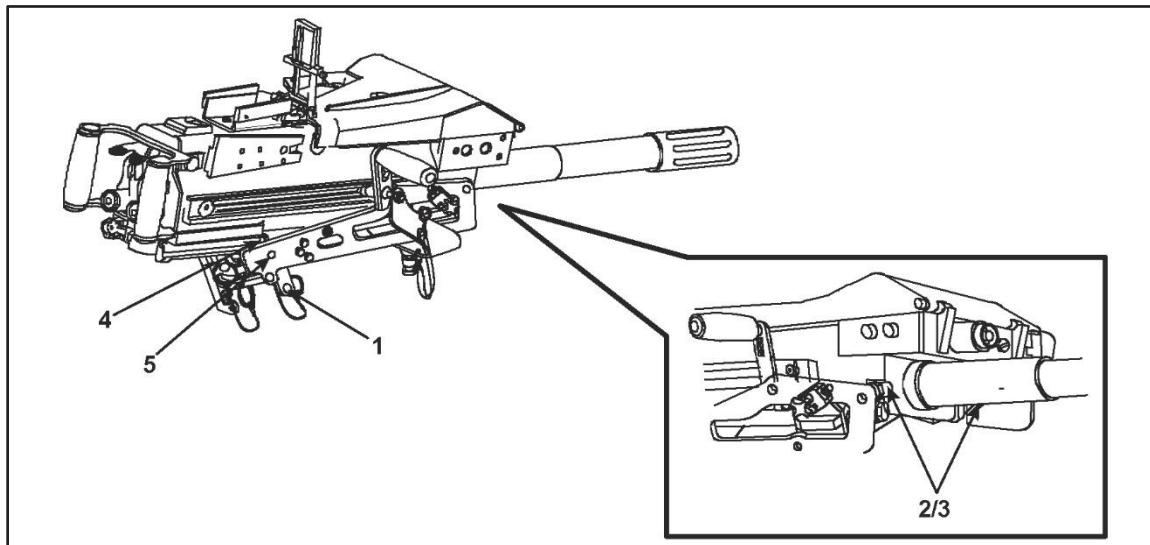
4. Install the MK19 in the mount.

a. Mount the MK19 in the MK64 mount. (See figure 3-354.)



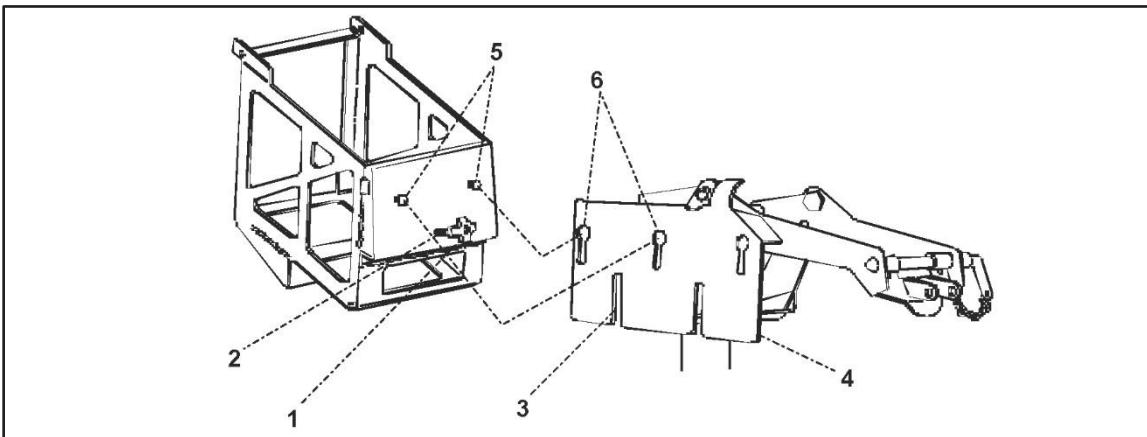
**Figure 3-354. MK19 in the MK64 mount**

- (1) Ensure weapon is clear.
  - (2) Hoist the weapon onto the carriage and cradle assembly.
  - (3) Lower the muzzle slightly below horizontal.
  - (4) Align the receiver's two locking channels (see figure 3-354, item 1) with the two forward self-locking screws (see figure 3-354, item 2) on the carriage and cradle assembly.
  - (5) Push the weapon forward, and slide the self-locking screws (see figure 3-354, item 2) into the locking channels (see figure 3-354, item 1).
  - (6) Align holes in the weapon's rear assembly (see figure 3-354, item 3) with the upper rear holes (see figure 3-354, item 4) in the carriage and cradle assembly.
  - (7) Insert the carriage and cradle assembly's rear quick release pin (see figure 3-354, item 5) and rotate the handle downward to the locked position.
- b. Mount the MK19 in the MK93 mount. (See figure 3-355, page 3-814.)



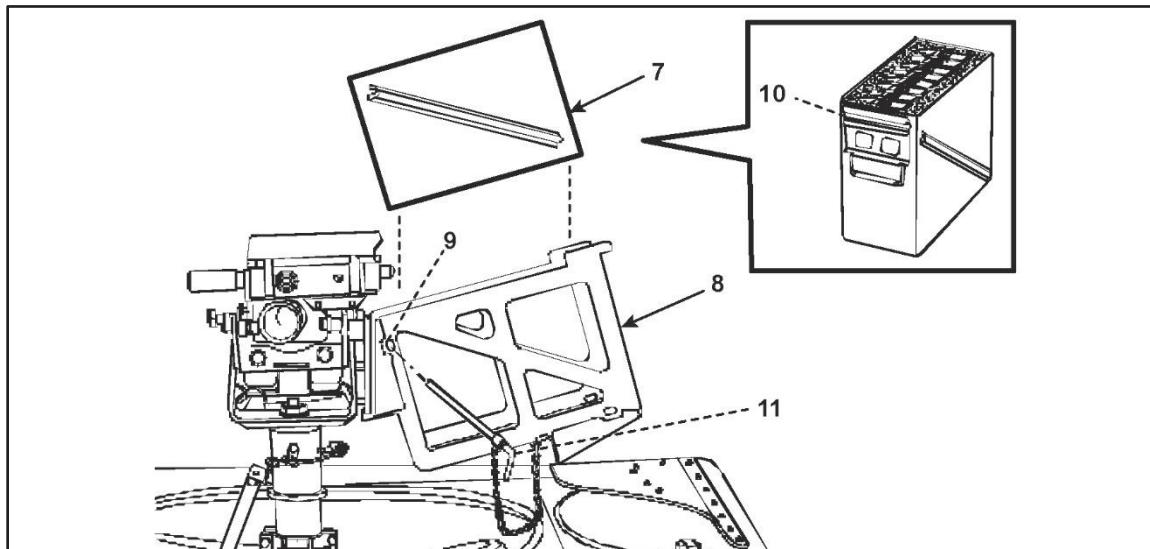
**Figure 3-355. MK19 on the MK93 mount**

- (1) Ensure weapon is clear.
  - (2) Remove the rear quick release pin (see figure 3-355, item 1) from the carriage and cradle.
  - (3) Ensure shocks are rotated down.
  - (4) Hoist the weapon onto the carriage and cradle assembly.
  - (5) Lower the muzzle slightly below horizontal.
  - (6) Align the receiver's two locking channels (see figure 3-355, item 2) with the two forward headless shoulder pins (see figure 3-355, item 3) on the carriage and cradle assembly.
  - (7) Push the weapon forward, and slide the headless shoulder pins (see figure 3-355, item 3) into the locking channels (see figure 3-355, item 2).
  - (8) Align holes in the weapon's sear assembly (see figure 3-355, item 4) with the rear holes (see figure 3-355, item 5) in the carriage and cradle assembly.
  - (9) Insert the carriage and cradle assembly's rear quick release pin (see figure 3-355, item 1).
5. Mount the multipurpose ammunition can bracket assembly. (See figure 3-356 and figure 3-357, page 3-816.)



**Figure 3-356. Multipurpose ammunition can bracket assembly**

- a. Partially unscrew the knob (see figure 3-356, item 1) on bracket assembly threaded stud (see figure 3-356, item 2).
- b. Align knob (see figure 3-356, item 1) on the threaded stud (see figure 3-356, item 2) of multipurpose ammunition can bracket assembly with forward groove (see figure 3-356, item 3) in the cradle's side plate (see figure 3-356, item 4).
- c. Slide threaded stud (see figure 3-356, item 2) upward onto the forward groove (see figure 3-356, item 3) to allow the two welded pins (see figure 3-356, item 5) to seat in the two forward slots (see figure 3-356, item 6).
- d. Slide the multipurpose ammunition can bracket assembly downward in the slots.
- e. Ensure the multipurpose ammunition can bracket assembly is seated in the forward two slots (see figure 3-356, item 6) in the cradle's side plate (see figure 3-356, item 4), and knob (see figure 3-356, item 1) is now located behind the cradle side plate.
- f. Reach behind the cradle side plate (see figure 3-356, item 4) and tighten the knob (see figure 3-356, item 1).
- g. Ensure the multipurpose ammunition can bracket assembly is securely locked into the cradle side plate (see figure 3-356, item 4).
- h. Push the ammunition can (see figure 3-357, item 7, page 3-816) into the multipurpose ammunition can bracket assembly (see figure 3-357, item 8, page 3-816).



**Figure 3-357. Multipurpose ammunition can bracket assembly**

- i. Align the hole (see figure 3-357, item 9) in the multipurpose ammunition can bracket assembly (see figure 3-357, item 8) with the groove (see figure 3-357, item 10) in the ammunition can (see figure 3-357, item 7) and insert headed shoulder pin (see figure 3-357, item 11). Rotate the headed shoulder pin (see figure 3-357, item 11) downward to lock into position.
  
  6. Attach catch bag assembly, if required.
- | Performance Measures   | GO                       | NO-GO                    |
|--|--------------------------|--------------------------|
| 1. Installed the UPA.  | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Installed the machine gun mount.                          | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Installed the T&E mechanism assembly.                     | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Installed the MK19 in the mount.                          | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Mounted the multipurpose ammunition can bracket assembly. | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Attached catch bag assembly, if required.                 | <input type="checkbox"/> | <input type="checkbox"/> |

**References Required**

TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192

**Primary**

TM 9-1010-230-10/TO 11W2-6-3-161/TM 1005-10/1/SW360-AW-OPI-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513

<b>References Required</b>	<b>Primary</b>
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Machine Gun Tripod (1005-01-503-0141) M3  
Machine Gun Tripod (1005-00-322-9716) (EIC:  
4EA) M142 Machine Gun Mount (1005-00-854-  
4463) 6650, .50 Caliber, Machine Gun Mount (1005-  
00-704-6650) M197 Machine Gun Mount (1005-01-  
413-4098) MK64 Machine Gun Mount MOD 5  
(1010-01-180-9319); MOD 9 (1010-01-412-3159)  
MK93 MOD 0 Machine Gun Mount (USMC ONLY)  
(1005-01-383-2949) MK93 MOD 1 Machine Gun  
Mount 1005-01-383-2757) MK93 MOD 2 Machine  
Gun Mount (1005-01-502-7547)

**071-030-0010**  
**Dismount an MK19 Grenade Machine Gun from a Vehicle**

**Conditions:** You are a vehicle crewmember and have been directed to remove the MK19 grenade machine gun from the vehicle. The MK19 is mounted using an MK64 or MK93 machine gun mount. You have another crewmember to assist.

**Standards:** Clear the weapon, lock the ring brake assembly, and remove the MK19 and mount from the vehicle.

**Performance Steps**

1. Clear the weapon.
2. Lock the ring brake assembly on the vehicle.  
**Note:** This is done if dismounting from a vehicle equipped with a ring, to prevent the ring from traversing.
3. Remove the catch bag assembly from carriage and cradle assembly.
  - a. Detach the front closure flap of catch bag from the frame.
  - b. Disassemble the catch bag frame.
    - (1) Disconnect the two hook-and-loop fastener tabs on the rear closure flap.
    - (2) Disconnect the two hook-and-loop fastener tabs on the rear of bag.
  - c. Disconnect the bent notch in the front of the catch bag frame from the mounting bar of the carriage.
  - d. Disconnect the two catch bag frame rear hooks from the holes in the rear of the carriage and cradle assembly.
  - e. Slide catch bag assembly off the traverse arm assembly.

4. Remove the feed throat assembly to feeder.
  - a. Squeeze the spring-loaded pins on the feed throat assembly.
  - b. Pull the feed throat assembly away from the receiver.

**WARNING**

**MK19 requires a two-man lift.**

5. Remove the MK19 from the weapon mount.
  - a. Remove MK19 from the MK64 weapon mount.
    - (1) Remove the carriage and cradle assembly's rear quick release pin.
    - (2) Remove the weapon by pulling the weapon rearward and lifting up with help from an assistant.

- (3) Reinstall the carriage and cradle assembly's rear quick release pin.
- b. Remove MK19 from the MK93 weapon mount.
  - (1) Remove the rear quick release pin from the carriage and cradle.
  - (2) With assistance, lift up on the weapon and pull rearward, disengaging the two forward headless shoulder pins.
  - (3) Reinstall the rear quick release pin from the carriage and cradle.
6. Dismount the weapon mount from the pintle socket on the vehicle.
  - a. Disengage the pintle socket locking mechanism by doing one of the following:

**Note:** There are three types of pintle locking mechanisms.

    - (1) Loosen the four lock screws, using a 3/8-inch wrench, until the screw ends are flush with the pedestal socket's inner wall.
    - (2) Remove the pintle locking pin.
    - (3) Loosen the pintle locking lever.
  - b. Remove the traverse and elevation (known as T&E) mechanism from the carriage and cradle.
    - (1) Disconnect the T&E from the traversing bar by loosening the traversing slide lock lever.
    - (2) Disconnect the T&E from the carriage and cradle by removing the quick release pin.
    - (3) Remove the T&E mechanism assembly.
    - (4) Place T&E on left side of azimuth indicator.
    - (5) Reinsert the quick release pin.
  - c. Remove the carriage and cradle from the universal pintle adapter (known as UPA).
    - (1) Remove quick release pin from the UPA.
    - (2) Lift the MK64 or MK93 carriage and cradle from the UPA.
    - (3) Reinsert the UPA quick release pin into the UPA.
  - d. Remove the UPA from the pintle socket on the vehicle.
    - (1) Loosen the manual control handle on the UPA.
    - (2) Remove the UPA from the pintle socket on the vehicle.
    - (3) Tighten the manual control handle on the UPA.
  - e. Re-engage the pintle socket locking mechanism by doing one of the following:
    - (1) Tighten the four locking screws until mount will not pull out of socket.

(2) Insert the pintle locking pin.

(3) Tighten pintle locking lever.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the weapon.	_____	_____
2. Locked the ring brake assembly on the vehicle.	_____	_____
3. Removed the catch bag assembly from carriage and cradle assembly.	_____	_____
4. Removed the feed throat assembly.	_____	_____
5. Removed the weapon from MK64 or MK93 weapon mount on the vehicle.	_____	_____
6. Dismounted the weapon mount from the pintle socket on the vehicle.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.19 Grenade Machine Gun MK 19 MOD 3	TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts; Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)
TM 9-1010-230-10 TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	

**071-030-0001**  
**Maintain an MK19 Grenade Machine Gun**

**Conditions:** You are assigned an MK19 grenade machine gun and must maintain the weapon system. You have TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010, all basic issue items, and cleaning material required to perform maintenance.

**Standards:** Clear, disassemble, clean, inspect, lubricate, assemble, and perform a function check on the MK19 grenade machine gun. Perform all maintenance in accordance with the technical manual.

**Performance Steps**

1. Clear the MK19 machine gun.
  - a. Clear the bolt.
    - (1) Place the safety switch to S (Safe).
    - (2) Remove the case catch bag, if applicable.
    - (3) Charge the weapon.
      - (a) Lower both charger handles.
      - (b) Pull both charger handles to the rear, ensuring the bolt locks to the rear.
      - (c) Return both charger handles to the forward position.
      - (d) Rotate only one charger handle up.
    - (4) Remove live round or cartridge case from the bolt, if present.
      - (a) Insert the tip of a cleaning rod through the receiver rail as close to the bolt face as possible.
      - (b) Place the tip of the cleaning rod on top of the live round or cartridge case, as close to the bolt face as possible.
      - (c) Position one hand beneath the weapon to catch the round as it falls out.
      - (d) Force the live round off the bolt face and out the bottom of the gun by pushing down on the cleaning rod.
      - (e) Catch the live round as it falls out.
    - (f) Dispose of the live round as per unit standard operating procedures.
  - b. Clear the feeder.

**WARNING**

**Do not reuse a live round that has been cycled through the weapon and removed from the bolt.**

- (1) Open the top cover assembly.
- (2) Remove linked rounds, if present.
  - (a) Reach beneath the feed tray with one hand.
  - (b) Press and hold both the primary and secondary positioning pawls.
  - (c) Slide the linked rounds out of the feeder and out the feed throat.
  - (d) Return the linked rounds to the ammunition can.
- c. Return the bolt to the forward position.
  - (1) Place the safety switch on F (Fire).
  - (2) Hold one charger handle to the rear.
  - (3) Ride the bolt forward by squeezing the trigger and easing the bolt forward.
  - (4) Ensure both charger handles are forward and in the up position.
  - (5) Place the safety switch on S (Safe).

2. Disassemble the MK19 machine gun.

a. Remove the feed throat assembly.

- (1) Squeeze the two sets of grip pins together.
- (2) Pull grip pins straight out.

**WARNING**

**The bolt must be in the forward position before you remove the backplate pin assembly to prevent injury.**

b. Remove the bolt and backplate assembly.

- (1) Ensure the bolt is in the forward position.
- (2) Place the weapon on F (Fire).
- (3) Open the top cover.
- (4) Pull the backplate pin straight out using the rim of a spent cartridge.
- (5) Lift up slightly on the backplate assembly.
- (6) Pull the bolt and backplate assembly out of the receiver.
- (7) Support the bolt with one hand.

(8) Maintain a control grip with the other hand.

(9) Lift the bolt up slightly.

(10) Pull back on bolt.

(11) Remove the bolt.

**CAUTION**

Do not rest the vertical cam assembly on its chromed surface.

c. Remove the primary drive lever and vertical cam assembly.

(1) Reach under the top of the receiver.

(2) Locate the drive lever lock on the vertical cam assembly.

(3) Slide the lock rearward about 1/4 inch.

(4) Press down on the primary drive lever's pivot post to release the primary drive lever and vertical cam assembly.

**CAUTION**

Do not allow the vertical cam to be damaged by allowing it to hit the inside of the receiver.

(5) Pull out the vertical cam (to the rear) and the primary drive lever from the receiver.

d. Remove secondary drive lever.

(1) Raise top cover.

(2) Push down on the pivot post from the outside top cover to release the secondary drive lever.

(3) Lift out the secondary drive lever from the top cover.

e. Remove the feed slide assembly.

(1) Pivot the tray that holds the feed slide assembly out of the top cover.

(2) Move the feed slide assembly to line up the tabs with the slots in the tray.

(3) Lift upward on the feed slide assembly.

**CAUTION**

Use fingers only, not pliers, to remove the top cover pins. Forcing the pin could break the small cross pin on the rod.

f. Remove the top cover assembly and feed tray.

**Note:** The feed tray must be down for you to remove the top cover pins.

- (1) Hold the top cover straight up to align the cross pin end.
- (2) Pull straight out on the pins.
- (3) Lift off the top cover.
- (4) Lift the tray out of the feeder.

g. Remove the alignment guide assembly.

- (1) Depress the flat leaf spring by using a cartridge link toggle (male end) or a small tool.
- (2) Slide the alignment guide toward the feeder mouth.
- (3) Pull rearward on the alignment guide.
- (4) Lift alignment guide out.

h. Remove the round positioning block.

- (1) Remove alignment guide.
- (2) Push in round positioning block.
- (3) Slide round positioning block toward muzzle end of gun.
- (4) Pull the round positioning block away from wall of receiver.

i. Remove the ogive plunger.

- (1) Remove alignment guide.
- (2) Pull out ogive plunger.

j. Remove the charging assemblies.

- (1) Rotate the charger handle up.
- (2) Using either your fingers or a spent case.
- (3) Lift up on the lock plunger to retract it.
- (4) Slide the charger assembly all the way to the rear.

- (5) Pull the charger assembly away from the receiver.
- k. Remove the receiver sear assembly.
  - (1) Turn the receiver on its top.
  - (2) Put the safe/fire switch in F position.
  - (3) Lift up slightly on the lock pin with your fingers using a cartridge link.
  - (4) Squeeze the receiver sear (underneath the safety).
  - (5) Rotate the sear housing assembly approximately 15 degrees in either direction.

**Note:** Squeezing the receiver sear and rotating the sear housing assembly must be performed simultaneously.

- (6) Press down on the sear housing assembly.
- (7) Rotate the assembly until it stops (90 degrees from its original position).
- (8) Press the receiver sear and safety together.
- (9) Place safe/fire switch on SAFE.
- (10) Lift out the sear housing assembly.

### 3. Clean the MK19 machine gun.

**Note:** Do not reverse the direction of the bore brush while it is in the bore.

- a. Clean receiver assembly.

**Note:** The chamber is the worst carbon build-up area and eventually gets pitted from the carbon. To clean it, your bore brush must be soaked in rifle bore cleaner (known as RBC) and ran through the muzzle into the chamber. The process must be repeated until the muzzle is clean. When cleaning these parts, use a brush or rag dipped in a small amount of solvent.

- (1) Wipe or brush away dirt from all parts, especially the interior of receiver housing, receiver rails, and feeder.
- (2) Apply dry cleaning solvent to wiping rag or bore cleaning brush.
- (3) Swab out bore and chamber, using a bore cleaning brush and RBC.

**CAUTION**

Do not immerse sear housing assembly in solvent. Solvent may dilute the lubricant inside the sear housing.

- b. Clean sear assembly.

**Note:** Only use dry cleaning solvent on a wiping rag or bore cleaning brush.

- c. Clean alignment guide assembly.

**Note:** Wipe or brush off dirt and dry.

- d. Clean ogive plunger assembly and round positioning.

- e. Clean charger assemblies left and right sides.

- (1) Apply dry cleaning solvent to a wiping rag or bore cleaning brush.

- (2) Wipe or brush off dirt.

- f. Clean vertical cam assembly and primary drive lever.

- g. Clean secondary drive lever.

- h. Clean feed slide assembly and feed tray.

- i. Clean top cover assembly.

- j. Clean bolt and backplate assembly.

4. Inspect the MK19 machine gun for serviceability.

- a. Inspect receiver assembly.

- (1) Check receiver housing for cracks and rust.

- (2) Check receiver rails for burrs and cracked welds.

- (3) Check feeder pawls for spring action, burrs, and pin retention.

- (4) Check the bore and chamber of the barrel for carbon build-up and pitting.

- (5) Check flash suppressor for dents, cracks, or erosion.

- (6) Ensure minimal movement is maintained.

- (7) Check rear sight parts for rust, binding, broken, or bent.

- (8) Check dovetail bracket for cracks.

- b. Inspect the sear assembly for burrs or other damage.

c. Inspect alignment guide assembly.

(1) Check alignment guide spring to see if it is deformed, cracked, or loose.

(2) Check the pin to see if it is cracked or broken.

d. Inspect ogive plunger assembly and round positioning block.

(1) Check ogive plunger head for burrs and broken parts.

(2) Check the round positioning block for weak spring action, bent, or burred posts.

(3) Ensure pins turn but do NOT have side to side or outward movement.

e. Inspect charger assemblies left and right sides.

(1) Check for grooved edges, burred, or bent.

(2) Check latches for spring action on detents.

(3) Check entire charger assembly for cracks, burrs, bent, or chipped.

f. Inspect vertical cam assembly and primary drive lever.

(1) Check vertical cam assembly for bends, burrs, pits, scratches, aluminum build-up on chromed surface.

(2) Check drive lever lock for loose or binding.

(3) Check primary drive lever for burrs.

g. Inspect secondary drive lever.

(1) Check retaining ring to see if it is missing from pivot post.

(2) Check pivot post for burrs.

(3) Check forked end for burrs.

h. Inspect feed slide assembly and feed tray.

(1) Check feed pawls for burrs or binding.

(2) Check feed tray for burrs or binding.

(3) Check guide rails for burrs.

(4) Check springs for excessive wear, collapsing, or elongation.

(5) Ensure spring is properly installed.

i. Inspect top cover assembly.

(1) Check top cover for cracks and rust.

- (2) Check latch for binding or loose or broken parts.
- (3) Check cover pin for sheared or broken cross pin.
- j. Inspect bolt and backplate assembly.
  - (1) Check cocking lever for broken, chipped, or burred parts.
  - (2) Check guide rods for bending or binding.
  - (3) Check recoil springs for weak spring action.
  - (4) Check backplate pin to see if retaining spring is missing.
  - (5) Ensure that the safety wire is present and not loose or broken.
  - (6) Ensure that nylon tipped screws in bolt face are tight.
  - (7) Ensure that the left and right hand cover screws are tight.

**CAUTION**

Never lubricate the MK19 with cleaner, lubricant, and protectant.

5. Lubricate the MK19 machine gun.

**Note:** When lubricating, give extra attention to the feed pawls, cocking lever rails, pivot posts on the primary drive lever, and the bolt assembly. Generous lube is heavy enough to spread with your fingers. Light lube is barely visible to the eye.

- a. Lubricate receiver assembly.
- b. Lubricate sear assembly.
- c. Lubricate alignment guide assembly.
- d. Lubricate ogive plunger assembly and round.
- e. Lubricate the left and right side of charger assembly.

**Note:** Do not apply lubricates to the handles or grooved edges of rails.

- f. Lubricate vertical cam assembly and primary drive lever.
- g. Lubricate secondary drive lever.
- h. Lubricate feed slide assembly and feed tray.
- i. Lubricate top cover assembly.

- j. Lubricate bolt and backplate assembly.
6. Assemble the MK19 machine gun.
    - a. Install the charger assemblies.
      - (1) Turn the receiver upright.
      - (2) Rotate the charger handles to the straight-up position.
      - (3) Line up the lugs on the charger with the slots in the receiver rail.
      - (4) Insert the charger lugs into the slots.
      - (5) Hold the charger tightly against the rail.
      - (6) Slide the charger forward until it locks into place.
    - b. Install the round positioning block.
      - (1) Insert the blocks into the slots with the tang end forward.
      - (2) Push against the block and slide it toward the rear until the block locks into place.
    - c. Insert the ogive plunger assembly into the opening.
    - d. Insert the alignment guide assembly.
      - (1) Position the alignment guide assembly so that the pin is lined up with the slot in the feeder wall.
      - (2) Hold the alignment guide against the front wall.
      - (3) Slide the alignment guide into the receiver until it clicks.
    - e. Install the feed tray and feed slide assembly.
      - (1) Place the tray in the top of the feeder, recessed side up.
      - (2) Lineup the pinholes on the tray with the lugs on the receiver.
      - (3) Position the feed slide assembly so that the tabs are lined up with the slots on the tray.
      - (4) Insert the tabs into the slots.
      - (5) Drop the feed slide assembly into the tray.
      - (6) Move the feed slide assembly slightly to ensure engagement.
    - f. Attach the top cover assembly.
      - (1) Ensure the feed tray is in the proper place in the receiver.
      - (2) Place the top cover on the receiver with the pinholes in line with the receiver lug end feed tray pinholes.

- (3) Hold the top cover straight up.
- (4) Insert the top cover pins on both sides.

**CAUTION**

Fully insert the cross pin into the receiver before closing the top cover.  
This will prevent breaking the cross pin.

- (5) Ensure the cross pin is fully inserted.
  - (6) Rotate the top cover so that is fully open.
- g. Engage the secondary drive lever.
- (1) Rotate the feed slide assembly and tray upward.
  - (2) Engage the forked end of the secondary drive lever with the feed slide pin.
  - (3) Press the raised pivot post through the hole in the stop cover.
  - (4) Ensure that bearing washer is correctly installed.

**CAUTION**

Engage the secondary drive lever with the feed slide pin, or the gun will not fire.

- (5) Press the secondary drive lever against the top cover until it locks into place.
- h. Install the vertical cam assembly.
- (1) Slide the vertical cam assembly through the rear of the receiver.
  - (2) Engage the forked end in the notch.
- i. Engage the primary lever.
- (1) Hold the vertical cam assembly in place.
  - (2) Slide the primary drive lever into the receiver.
  - (3) Slide the primary drive lever lock to the rear.
  - (4) Engage the pivot post lever through the holes in the receiver and vertical cam.
  - (5) Slide the drive lever lock forward.

**Note:** The primary drive lever lock is located on the vertical cam just beneath the top of the receiver.

- j. Install the bolt and backplate assembly (with sear on weapon).
  - (1) Place the safe/fire switch in the F position.
  - (2) Press the receiver sear using your thumbs or the rim of a cartridge case.
  - (3) Ensure the cocking lever is cocked and forward.
  - (4) Slide the bolt and backplate assembly all the way forward.
  - (5) Insert the backplate pin to lock the assembly in place.

**CAUTION**

Before closing the top cover, always make sure the secondary drive lever engages the feed slide pin, the feed slide assembly is to the left, and the bolt is forward. Never try to force the top cover closed. Doing so could damage the weapon.

- (6) Close the cover.

**Note:** The cocking lever should be in the forward position before inserting the bolt and backplate.

- k. Install the bolt and backplate assembly (without sear on weapon).
  - (1) Ensure cocking lever is cocked forward.
  - (2) Insert bolt and backplate assembly into receiver.
  - (3) Insert backplate pin to lock assembly in place.
  - (4) Close cover.

- l. Install the receiver sear assembly.

- (1) Turn the receiver over on its top.
- (2) Place the sear housing on the receiver.
- (3) Line up the sear housing assembly at a right angle to the barrel center line.
- (4) Put the safe/fire switch on FIRE position.
- (5) Press down the housing assembly.
- (6) Rotate the housing assembly until it stops.

**Note:** Pressing down the housing assembly and rotating the housing assembly must be done simultaneously.

- (7) Press up on the sear.

- (8) Rotate the sear until it locks into place.

**Note:** Pressing up on the sear and rotating on it must be done simultaneously.

- m. Attach the feed throat assembly.

- (1) Squeeze the plunger.
- (2) Align pins with the holes in the receiver.
- (3) Release the plunger to reattach the feed throat.

**WARNING**

**Before performing any procedure, ensure the weapon is clear of any ammunition.**

7. Perform a function check.

- a. Check functioning with safety on SAFE, then on FIRE.
  - (1) Put safety in SAFE position, with top cover closed.
  - (2) Pull bolt to rear.
  - (3) Push charger handles back to forward position.
  - (4) Rotate charger handles up.
  - (5) Press trigger.

**Note:** Bolt should not go forward.

- (6) Put safety in FIRE position.
- (7) Press trigger.

**Notes:** Bolt should spring forward.

The weapon should be stored with firing pin protruding or uncocked so that the firing pin spring does not stay compressed for extended periods of time. This causes weakening of the firing pin spring, which results in premature failure.

However, the bolt is under spring pressure, do not release it any more than necessary to test functioning of firing pin. Dry firing causes wear on internal components.

- (8) Put safety in SAFE position.
  - (9) Leave bolt in forward position and continue.
- b. Check feed slide assembly and feeder.

(1) Move secondary drive lever back and forth.

**Note:** Feed slide assembly should move freely.

(2) Press the pawls to check spring action.

(3) Inspect link guide for roughness and galling.

### **CAUTION**

Before closing top cover, always be certain the secondary drive lever is engaged with feed slide pin, feed slide assembly is to the left, and bolt is forward. Never attempt to force top cover closed. Equipment damage could result. Do not slam cover shut.

(4) Close top cover.

Performance Measures	GO	NO-GO
1. Cleared the MK19 machine gun.	____	____
2. Disassembled the MK19 machine gun.	____	____
3. Cleaned the MK19 machine gun.	____	____
4. Inspected the MK19 machine gun for serviceability.	____	____
5. Lubricated the MK19 machine gun.	____	____
6. Assembled the MK19 machine gun.	____	____
7. Performed function check.	____	____

References Required	Primary
TC 3-22.19 Grenade Machine Gun MK 19 MOD 3	TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513

**071-030-0008**  
**Correct Malfunctions of an MK19 Grenade Machine Gun**

**Conditions:** You are a gunner with an MK19 grenade machine gun that has malfunctioned while firing. You have the weapons basic issue items, technical manual, and unit standard operating procedures (SOPs) on hand.

**Standards:** Take immediate actions to correct a failure to fire, a runaway weapon, and perform remedial actions on the MK19 grenade machine gun. Report deficiencies not correctable at operator level to supervisor.

**Performance Steps**

1. Take immediate action.

a. Take immediate action to correct a failure to fire.

- (1) Hold weapon on target.
- (2) Pull the bolt to the rear.
- (3) Catch live round as it ejects.
- (4) Push the charger handles forward to the UP position.
- (5) Place the weapon safety on Safe (S).
- (6) Check for bore obstruction.

- (a) If bore is clear, go to next step, 1a(7).
- (b) If a bore obstruction is present, perform remedial action.

(7) Move safety to Fire (F).

- (8) Attempt to fire.

(a) If weapon fires, continue engagement.

(b) If weapon does not fire:

\_1\_ Move safety to Safe (S).

\_2\_ Wait 10 seconds.

\_3\_ Perform remedial action.

b. Take immediate action to secure a runaway weapon.

**Note:** A runaway weapon or uncontrolled fire is when the weapon continues to fire after the trigger has been released.

- (1) Keep the weapon oriented on the target area.
- (2) Allow all remaining rounds in the loaded belt to fire or stop the ammunition feed by pressing the charger handle locks and lowering the charging handle(s) to disrupt the cycle of firing.

- (3) Place the gun on Safe.
  - (4) Clear weapon.
  - (5) Report the condition to the supervisor.
2. Perform remedial action, if required.
- a. Open the cover assembly.
  - b. Remove the ammunition belt.
  - c. Pull the charging handle to the rear.
    - (1) If round is ejected, go to step 2e.
    - (2) If a round is not ejected, perform the following:
      - (a) Lock the bolt to the rear and return charging handle forward.
      - (b) Place round removal tool collar over end of flash suppressor.
      - (c) Screw five cap screws into slots of the suppressor.
      - (d) Attach either end of handle to the end of the threaded rod.
      - (e) Position cup of threaded rod over ogive.
      - (f) Screw threaded rod into barrel to remove the round.
      - (g) Direct the assistant to catch the round with both hands as it is forced from the barrel.
      - (h) Carefully hand carry round to nearby designated disposal area or dispose of based on unit SOPs.
    - (3) Once the weapon is clear, return the bolt to the forward position.

d. Reload the weapon.

e. Attempt to fire.
    - (1) If the weapon fires, continue engagement.
    - (2) If weapon fails to fire, continue to next step.

3. Conduct troubleshooting procedure using the technical manual, as necessary.

    - a. Correct any operator-level deficiencies.
    - b. Record any identified fault that cannot be corrected at operator level.
    - c. Report weapon status to your supervisor.
    - d. Turn-in the MK19 for repair, if required.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Took immediate action to correct a failure to fire or a runaway weapon.	_____	_____
2. Performed remedial action, if required.	_____	_____
3. Conducted troubleshooting, if necessary.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TC 3-22.19 Grenade Machine Gun MK 19 MOD 3

**071-030-0007**  
**Perform a Function Check on an MK19 Grenade Machine Gun**

**Conditions:** You are assigned as a gunner for an MK19 grenade machine gun and must ensure it is operating correctly in preparation for use. The MK19 is mounted on a tripod or vehicle.

**Standards:** Clear the MK19 machine gun, conduct safe and fire position checks, conduct firing pin and bolt checks, conduct feed slide assembly and feeder checks, and report deficiencies, if found, to your supervisor.

**Note:** A function check is the final step of maintaining your MK19. It is also performed anytime the proper operation of an MK19 is in question. Stop a function check at any time the MK19 does not function properly and turn in the malfunctioning MK19 as per unit standard operating procedure.

**Performance Steps**

1. Clear the MK19 machine gun.
2. Conduct S (Safe) position checks.
  - a. Ensure the top cover is closed.
  - b. Place the MK19 safety in the S position.
  - c. Lock the bolt to the rear.
    - (1) Pull the charger handles to the rear, locking the bolt to the rear.
    - (2) Return the charger handles to the FORWARD and UP position.

3. Conduct F (Fire) position checks.

- a. Place the MK19 gun safety in the F position.

**CAUTION**

Do not release bolt under pressure more than necessary to test functioning of firing pin.

- b. Squeeze the trigger (bolt should spring forward).
  - c. Place the MK19 safety in the S position.

4. Conduct firing pin and bolt checks.

- a. Open the top cover.
  - b. Verify the firing pin protrudes from the bolt.

**Note:** If firing pin does not protrude, then charge and fire the weapon one time. If the firing pin still does not protrude, then note this as a fault and notify unit maintenance personnel.

- c. Verify the bolt face is lubricated, not dry, pitted, or corroded.
5. Conduct feed slide assembly and feeder checks.
  - a. Verify the feed slide assembly moves freely by moving the secondary drive lever back and forth.
  - b. Press the feed pawls to verify spring action.

**CAUTION**

Before closing top cover, always be certain the secondary drive lever is engaged with feed slide pin, feed slide assembly is to the left, and bolt is forward.

- c. Close the top cover.
6. Report deficiencies, if found, to your supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the MK19 machine gun.	_____	_____
2. Conducted S (Safe) position checks.	_____	_____
3. Conducted F (Fire) position checks.	_____	_____
4. Conducted firing pin and bolt checks.	_____	_____
5. Conducted feed slide assembly and feeder checks.	_____	_____
6. Reported deficiencies, if found, to supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.19 Grenade Machine Gun MK 19 MOD 3	TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513

**071-030-0005**  
**Load an MK19 Grenade Machine Gun**

**WARNING**

**Before performing any procedure, ensure the weapon is clear of any ammunition.**

**Use only ammunition authorized for use with the MK19 machine gun.**

**Do not allow the top cover to slam shut from raised position when loading. Hand injury or equipment damage may result.**

**Conditions:** You are assigned as a gunner for an MK19 grenade machine gun and must load it in preparation for use. The MK19 is mounted on a tripod or vehicle. You have been issued 40-millimeter grenade ammunition.

**Standards:** Clear the machine gun, attach feed throat to feeder, insert a round, and load the first round.

**Performance Steps**

1. Clear the MK19 machine gun.

a. Clear the bolt.

(1) Place the safety switch on SAFE.

(2) Remove the case catch bag, if applicable.

(3) Charge the weapon.

(a) Grasp both charger handles.

(b) Press the charger handle locks and rotate the charger handles down.

(c) Pull both charger handles to the rear, ensuring the bolt locks to the rear.

(d) Return both charger handles to the forward position.

(e) Rotate only one charger handle up.

(4) Remove live round or cartridge case from the bolt, if present.

(a) Insert the tip of a cleaning rod section through the receiver rail as close to the bolt face as possible.

(b) Place the tip of the cleaning rod section on top of the live round or cartridge case, as close to the bolt face as possible.

(c) Position one hand beneath the machine gun to catch the round as it falls out.

(d) Pull up on the cleaning rod and force the live round off the bolt face and out the bottom of the machine gun.

(e) Catch the live round as it falls out.

**WARNING**

**Do not reuse a live round that has been cycled through the weapon and removed from the bolt.**

(f) Dispose of the live round as per unit standard operating procedures.

b. Clear the feeder, if present.

(1) Open the top cover.

(2) Remove linked rounds, if present.

(a) Reach beneath the feed tray with one hand.

(b) Press and hold both the primary and secondary positioning pawls.

(c) Slide the linked rounds out of the feeder.

(d) Return the linked rounds to the ammunition can.

c. Return the bolt to the forward position.

(1) Place the safety switch on FIRE.

(2) Grasp the charger handle that is in the DOWN position.

(3) Pull and hold the charger handle to the rear.

(4) Press the trigger and ease the bolt forward.

(5) Ensure both charger handles are forward in the UP position.

(6) Place the safety switch on SAFE.

2. Attach feed throat to feeder.

**Note:** The feed throat prevents the linked rounds from twisting as they pass from the ammunition can into the MK19 receiver during firing. The major contributor to the MK19 jamming is ammunition being separated by twisting the ammunition belt, causing the ammunition link to become misaligned. After the ammunition belt has been separated, the ammunition link should be aligned evenly and touching the copper band all around the ammunition.

a. Squeeze the spring-loaded pins on the feed throat.

b. Insert the feed throat into the slots on both sides of the feeder.

3. Insert a round.

**Note:** When using a vehicle mount, attach ammunition can bracket and can. When using a ground tripod mount, feed the ammunition directly from the can.

- a. Insert the round through the feed throat, female link first, into the feeder.
- b. Push the round across the first set of feeder pawls.
- c. Ensure the round is straight and firmly seated against the bolt.
- d. Push the secondary drive lever to the right.

**Note:** This moves the feed slide to the left.

- e. Close the top cover.
4. Load the first round.
  - a. Charge the weapon.
    - (1) Grasp the charger handles.
    - (2) Press the charger handle locks and rotate the charger handles down.
    - (3) Pull both charger handles to the rear ensuring the bolt locks to the rear.
    - (4) Return both charger handles to the FORWARD position.
    - (5) Rotate both charger handles up to the LOCKED position.
  - b. Place the safety switch on FIRE.
  - c. Press the trigger allowing the bolt to slam forward.
  - d. Rotate both charger handles down.
  - e. Pull both charging handles to the rear.
  - f. Place the safety switch on SAFE.
  - g. Return both charging handle to the FORWARD and UP position.

Performance Measures	GO	NO-GO
1. Cleared the MK19 machine gun.	_____	_____
2. Attached feed throat to feeder.	_____	_____
3. Inserted a round.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
4. Loaded the first round.	—	—
<b>References Required</b>	<b>Primary</b>	
TC 3-22.19 Grenade Machine Gun MK 19 MOD 3	TM 9-1010-230-10/TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	

**071-030-0006**  
**Unload an MK19 Grenade Machine Gun**

**Conditions:** You are the gunner on an MK19 grenade machine gun. The MK19 is loaded and mounted on a tripod or vehicle. You have been directed to unload the weapon. Some iterations of this task should be performed in mission-oriented protective posture 4.

**Standards:** Clear the bolt and clear the feeder. Return the bolt to the forward position.

**Performance Steps**

1. Clear the bolt.

- a. Place the safety switch on SAFE.
- b. Remove the case catch bag, if applicable.
- c. Charge the weapon.
  - (1) Grasp both charger handles.
  - (2) Press the charger handle locks and rotate the charger handles down.
  - (3) Pull each charger handles to the rear, ensuring the bolt locks to the rear.
  - (4) Return each charger handles to the FORWARD position.
  - (5) Rotate only one charger handle up.
- d. Remove live round or cartridge case from the bolt, if present.
  - (1) Insert the tip of a cleaning rod section through the receiver rail as close to the bolt face as possible.
  - (2) Place the tip of the cleaning rod section on top of the live round or cartridge case, as close to the bolt face as possible.
  - (3) Position one hand beneath the machine gun to catch the round as it falls out.
  - (4) Pull up on the cleaning rod and force the live round off the bolt face and out the bottom of the machine gun.
  - (5) Catch the live round as it falls out.

**WARNING**

**Do not reuse a live round that has been cycled through the weapon and removed from the bolt.**

- (6) Dispose of the live round as per unit standard operating procedures.
2. Clear the feeder.

- a. Open the top cover.
- b. Remove linked rounds, if present.
  - (1) Reach beneath the feed tray with one hand.
  - (2) Press and hold both the primary and secondary positioning pawls.
  - (3) Slide the linked rounds out of the feeder.
  - (4) Return the linked rounds to the ammunition can.
3. Return the bolt to the forward position.
  - a. Place the safety switch on FIRE.
  - b. Grasp the charger handle that is in the DOWN position.
  - c. Pull and hold the charger handle to the rear.
  - d. Press the trigger and ease the bolt forward.
  - e. Ensure both charger handles are forward in the UP position.
  - f. Place the safety switch on SAFE.
  - g. Close the top cover.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the bolt.	_____	_____
2. Cleared the feeder.	_____	_____
3. Returned the bolt to the FORWARD position.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.19 Grenade Machine Gun MK 19 MOD 3	TM 9-1010-230-10/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513

**071-030-0004**  
**Engage Targets with an MK19 Grenade Machine Gun**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation. Treat all weapons as if they are loaded and prepared to fire. Keep thumbs off of the trigger until ready to fire. Ensure positive identification of target, backstop and beyond.**

**Conditions:** You are a member of a squad or team engaged in active ground combat. You have a mounted MK19 grenade machine gun and have identified potential threats. You have additional ammunition and an assistant gunner on hand.

**Standards:** Acquire the target. Assume appropriate firing position. Engage the target and reload the weapon, if necessary.

**Performance Steps**

1. Acquire target.
  - a. Detect potential threats.
  - b. Identify threat as friend, foe, or noncombatant.
  - c. Prioritize the threat(s) based on the level of danger they present.

**Note:** The standard prioritization of targets establishes the order of engagement. Targets are prioritized by threat level based on the danger they present. Similar threats are engaged based on the following guidelines: near before far, frontal before flank, stationary before moving.

- d. Determine range to target.

**Note:** Rapidly determining an accurate range to target is critical to the success of the Soldier at mid and extended ranges. There are several range determination methods gunners should be confident in applying to determine the proper hold-off for pending engagements. Employing a laser range finder, observing a target and the amount of detail seen at various ranges, or simply observation and adjustment of fire are all suitable methods.

- e. Set the elevation to the appropriate range mark.
- f. Determine the method of engagement.

**Note:** The rate of fire and class of fire (see figure 3-358 on page 3-846; figure 3-359 on page 3-847; and figure 3-360 on page 3-848) will be determined by the gunner or gun team leader based on the target type, exposure, and movement.

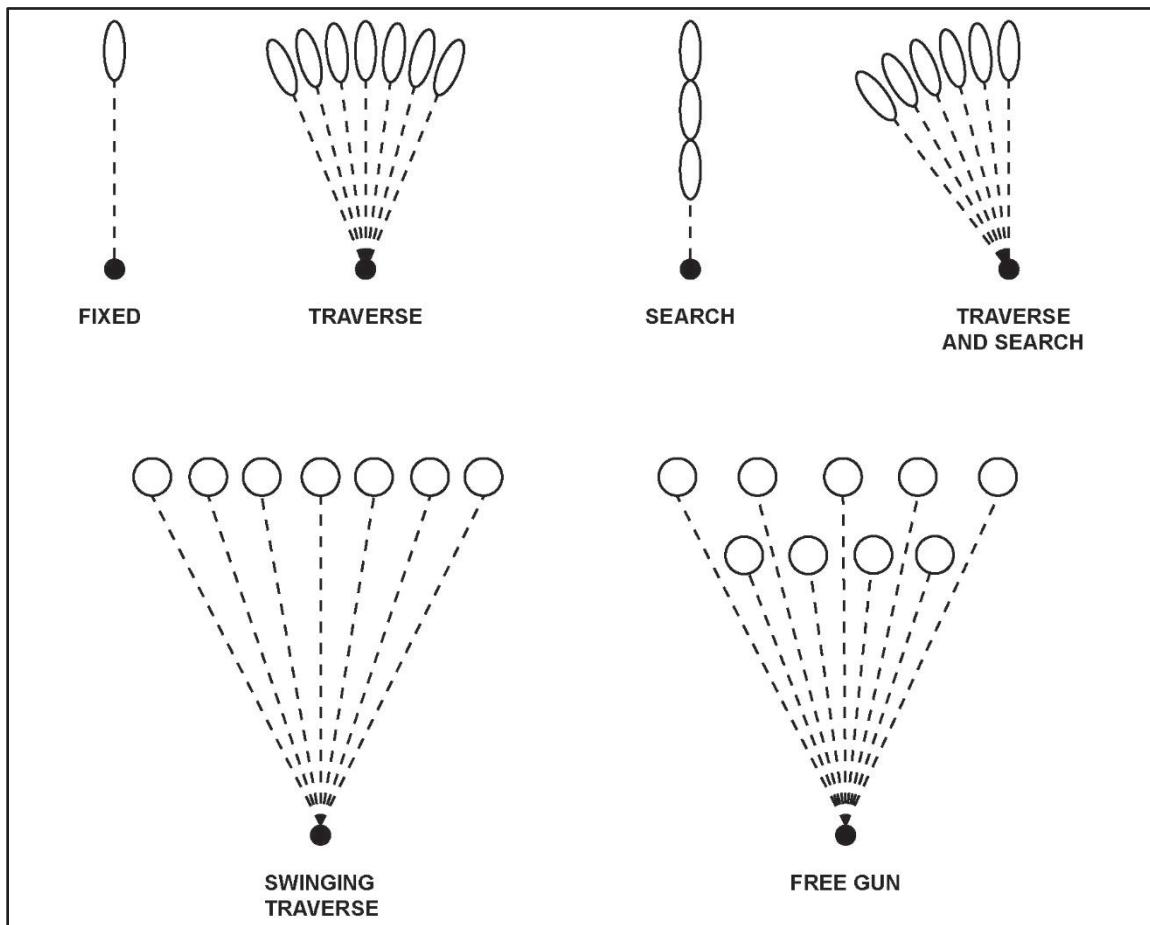


Figure 3-358. Classes of fire with respect to the gun

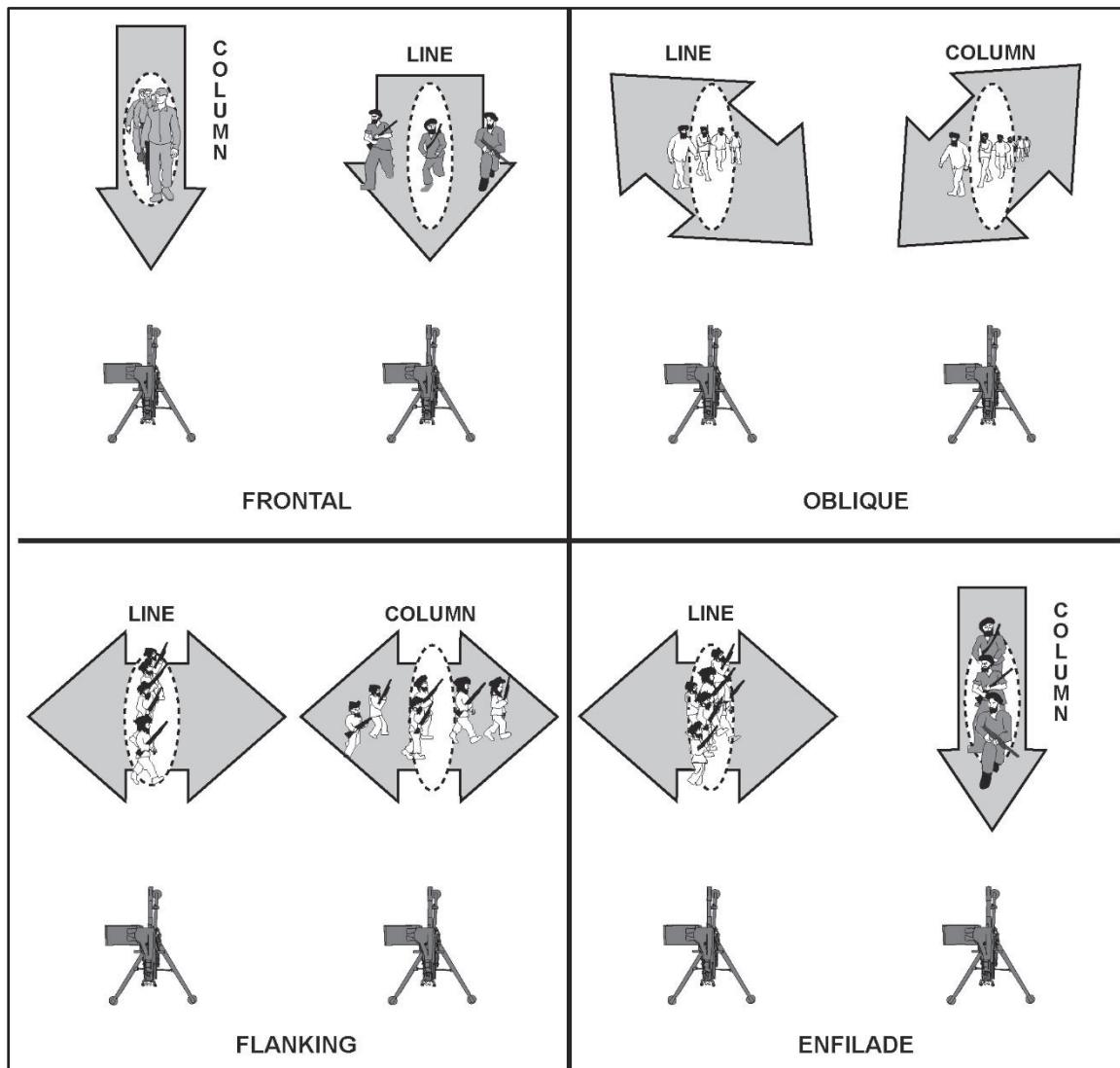
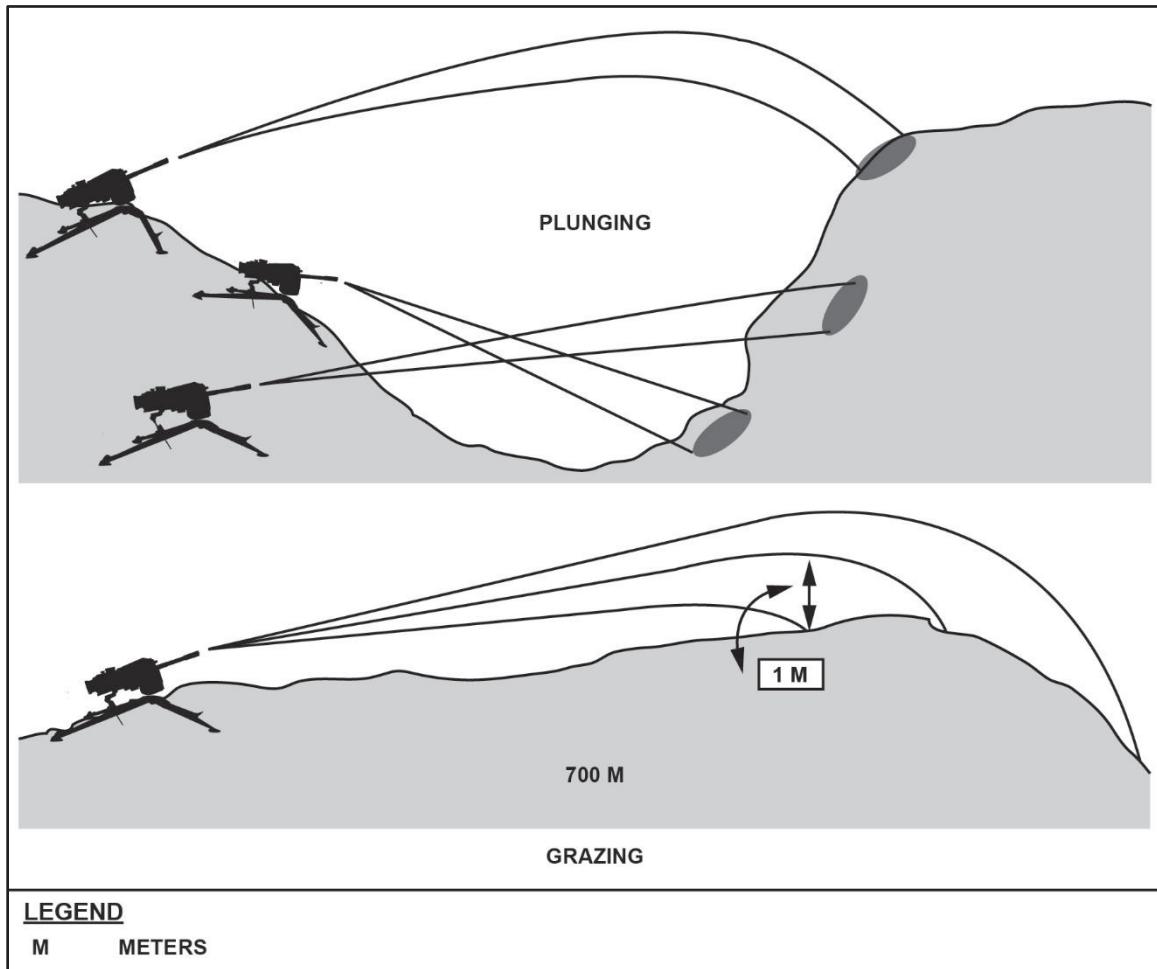


Figure 3-359. Classes of fire with respect to the target



**Figure 3-360. Classes of fire with respect to the ground**

- (1) Select a rate of fire.
  - (2) Select a class of fire.
2. Assume appropriate firing position.
- Note:** Due to the nature of combat, you will not always be able to assume a particular firing position. You need to become proficient in firing your weapon from a variety of positions, including appropriate variations. The variation of the standing, seated, and prone positions will be determined by threat prioritization, the platform of the mounted weapon system, and the availability of cover.
- a. Select a suitable firing position or stance.
  - Note:** Your situation should affect your physical positioning and firing stance. Your position should protect you from enemy fire and observation, yet allow you to place effective fire on targets in your sector of fire. Your position may vary based on the platform the mounted weapon system is deployed on.
  - b. Stabilize the weapon.

**Note:** When assuming a stable firing position movement, muscle tension, breathing, and other natural activities within your body will be transferred to the weapon and must be compensated for. Stability provides a window of opportunity to maintain sight alignment and sight picture for the most accurate shot.

- (1) Control the movement of the barrel.
- (2) Adequately support the weapon system.

**Note:** Support can be natural or artificial or a combination of both. Natural support comes from a combination of the gunner's bones and muscles. Artificial support comes from objects outside the gunner's body. The more support a particular position provides, the more stable the weapon. The placement or arrangement of sandbags, equipment, or structures that directly provide support to the weapon to provide increased stability. This includes the use of a tripod, traverse and elevation (known as T&E) mechanism, and bone-and muscle support provided by the gunner to stabilize the machine gun.

- (3) Achieve natural point of aim.

**Note:** The natural point of aim is the point where the barrel naturally orients when your muscles are relaxed and support is achieved.

### 3. Engage the target.

- a. Determine wind hold, if necessary (see table 3-11).

**Note:** Soldiers must be comfortable and confident in their ability to judge the effects of the wind to consistently make accurate and precise shots. To estimate the effects of the wind on the shot, determine the three windage factors: velocity, direction, and value (see figure 3-361, page 3-850).

**Table 3-11. Impact shift from constant crosswind**

<b>Truck Targets</b>				
	5 mph	10 mph	15 mph	20 mph
500 meters	0.69 meters	1.38 meters	2.08 meters	2.77 meters
1000 meters	3.10 meters	6.20 meters	9.30 meters	12.41 meters
1500 meters	7.83 meters	15.65 meters	23.47 meters	31.28 meters
<b>Dismounted Targets</b>				
	2 mph	3 mph	4 mph	5 mph
100 meters	0.01 meters	0.01 meters	0.02 meters	0.02 meters
200 meters	0.04 meters	0.06 meters	0.08 meters	0.10 meters
300 meters	0.10 meters	0.14 meters	0.19 meters	0.24 meters
400 meters	0.17 meters	0.26 meters	0.34 meters	0.43 meters
500 meters	0.27 meters	0.41 meters	0.55 meters	0.69 meters

**Legend:** mph – miles per hour

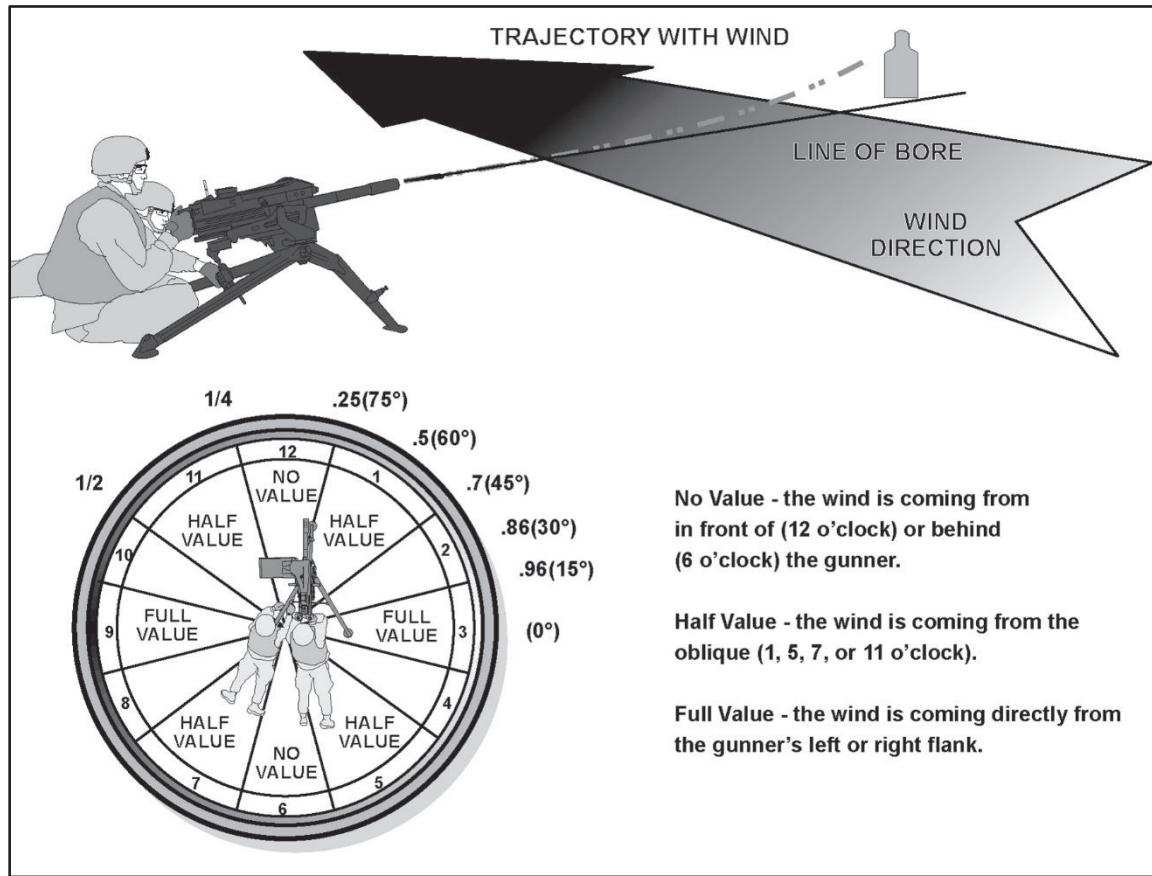


Figure 3-361. Wind effects

b. Disengage the manual safety.

c. Ensure sights are aligned on the target.

**Note:** The human eye can only focus clearly on one object at a time. To achieve proper and effective aim, focus your eye on the front sight post or reticle.

d. Press the trigger straight down by applying smooth, continuous pressure without disturbing sight alignment.

**Note:** The rate of fire will be determined by the gunner or gun team leader based on the target type. Control the rate of fire to deliver consistent, lethal, and precise fires against the threat.

e. Smoothly release the trigger, just far enough for it to reset.

**Note:** Focus on the sights while resetting the trigger.

f. Assess effects on target.

(1) Continue engagement if target is not destroyed or an additional target is identified.

(a) Adjust point of aim, as needed.

(b) Re-engage target.

- (2) Cease fire if target is/targets are destroyed, suppressed, or you receive an order to cease fire.
- (a) Fully release the trigger.
  - (b) Engage the manual safety.
4. Reload the weapon, if necessary.

**Note:** Reloading can be performed anytime during the engagement process.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Acquired target.	_____	_____
2. Assumed appropriate firing position.	_____	_____
3. Engaged the target.	_____	_____
4. Reloaded the weapon, if necessary.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1010-230-10 TO 11W2-5-16-1/TM 08521A-OR/1/SW 363-C3-MMM-010 Machine Gun, 40 MM, MK19 MOD 3, NSN 1010-01-126-9063 (EIC 4AE) Machine Gun, 40 MM, MK19 MOD 3, With Sight Bracket NSN 1010-01-490-9697 Machine Gun, 40 MM, MK19, Upgunned Weapons Station (UGWS) NSN 1010-01-362-6513	TC 3-22.19 Grenade Machine Gun MK 19 MOD 3

**071-031-0004**  
**Maintain an M320 Grenade Launcher**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.  
Treat all weapons as if they are loaded and prepared to fire. Keep  
thumbs off of the trigger until ready to fire. Ensure positive  
identification of target, backstop and beyond.**

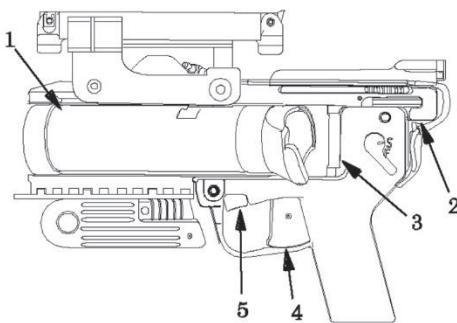
**Conditions:** You are assigned an M320 grenade launcher in a mounted or stand-alone configuration and must perform maintenance on the weapon to ensure proper operation. You have all basic issue items for the M320, a complete cleaning kit, TM 9-1010-232-10, and DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*).

**Standards:** Ensure the weapon is clear. Perform preventive maintenance checks and services (PMCS) and clean the M320 and major components. Annotate any deficiencies found on DA Form 2404 or DA Form 5988-E and turn form in to your immediate supervisor.

#### Performance Steps

1. Ensure weapon is clear.
2. Perform PMCS on the M320 in accordance with the technical manual.
3. Clean the M320 (see figure 3-362).

**Note:** If doing a major cleaning, all parts are rinsed with cleaning solvent, thoroughly scrubbed with a nylon bristled brush, and dried prior to performing normal cleaning.



**Figure 3-362. Cleaning the M320**

- a. Press barrel release (see figure 3-362, item 5) and allow barrel (see figure 3-362, item 1) to pivot to open position.

**Note:** Equipment is not ready if the barrel has any dents, bulges, burrs, or signs of corrosion.

- b. Apply a liberal amount of cleaner, lubricant, and preservative (known as CLP) to bristles of bore cleaning brush and scrub bolt face (see figure 3-362, item 3).
- c. Clean bore and chamber of barrel with bore cleaning brush, bore brush thong, and CLP.

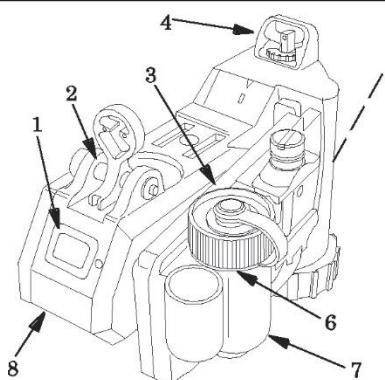
- d. Use wiping rag to remove visible dirt, debris, and fouling from exterior and interior of receiver (see figure 3-362, item 2).
- e. Remove any foreign debris from trigger (see figure 3-362, item 4) using small arms cleaning brush and rag.
- f. Lightly scrub top of trigger group area with small arms cleaning brush and CLP.
- g. Wipe all remaining parts with rag dampened with CLP.

**Note:** Equipment is not ready if rubber barrel stop is missing or damaged.

**CAUTION**

Use of gun cleaning agents containing perchloroethylene or methylene chloride may permanently damage the day/night sight (known as DNS).

- 4. Clean the DNS (see figure 3-363).



**Figure 3-363. Cleaning the day/night sight**

- a. Wipe battery compartment (see figure 3-363, item 7) with rag.
- b. Thoroughly clean battery cap (see figure 3-363, item 3) and O-ring (see figure 3-363, item 6) by wiping with a rag.
- c. Periodically lubricate O-ring with silicone compound.
- d. Remove any large particles of foreign material or loose dirt from liquid crystal display (see figure 3-363, item 1) and laser apertures (see figure 3-363, item 5) using a rag.

**CAUTION**

Avoid excessive force to avoid scratching of lens.

- e. Use lens paper to do fine cleaning of laser apertures (see figure 3-363, item 5).

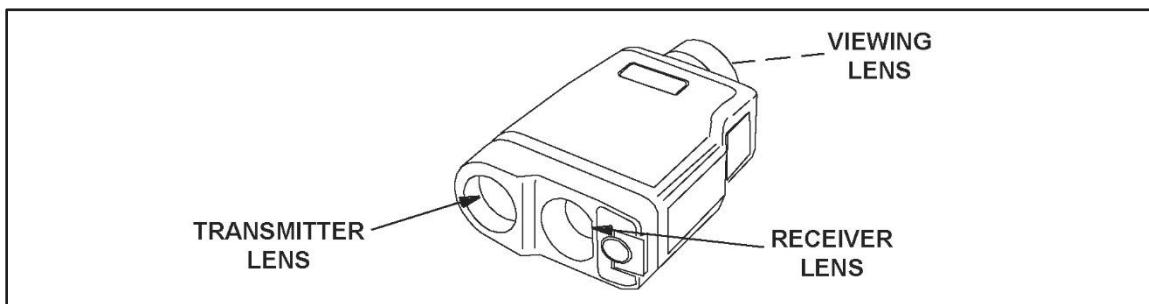
- f. Use lens paper dampened with clean water or isopropyl alcohol to remove stubborn stains.

**Note:** Equipment is not ready if receiver and/or adapter have any cracks, dents, burrs, bulges, or signs of corrosion.

- g. Apply CLP to front sight (see figure 3-363, item 4, page 3-854).
- h. Apply silicone compound to rear sight windage screw (see figure 3-363, item 2, page 3-854).
- i. Wipe DNS housing (see figure 3-363, item 8, page 3-854) with damp rag.

**Note:** Equipment is not ready if locking lever does not pivot in and out of receiver, binds or sticks in either position, or does not lock into position.

5. Clean the laser range finder (LRF). (See figure 3-364).



**Figure 3-364. Cleaning the laser range finder**

**CAUTION**

Using a coarse cloth or unnecessary rubbing may scratch the lens surface, causing permanent damage.

- a. Gently blow away any dust or debris on the lenses.

**Note:** Equipment is not ready if the trigger displays cracks.

- b. Clean lenses using rag dampened with isopropyl alcohol.
- c. Wipe LRF housing with damp rag.

**Note:** Equipment is not ready if trigger spring displays loss of tension.

6. Annotate any deficiencies, if found, on DA Form 2404 or DA Form 5988-E.
7. Turn in DA Form 2404 or DA Form 5988-E to immediate supervisor.

Performance Measures	GO	NO-GO
1. Ensured weapon is clear.	_____	_____
2. Performed PMCS on the M320 in accordance with the technical manual.	_____	_____
3. Cleaned the M320.	_____	_____
4. Cleaned the DNS.	_____	_____
5. Cleaned the LRF.	_____	_____
6. Annotated any deficiencies, if found, on DA Form 2404 or DA Form 5988-E.	_____	_____
7. Turned in the DA Form 2404 or DA Form 5988-E to immediate supervisor.	_____	_____

References Required	Primary
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-1010-232-10 Operator's Manual for Grenade Launcher, 40 MM, M320, W/E NSN 1010-01-566-9083 Grenade Launcher, 40 MM, M320A1, W/E 1010-01-557-2542
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**071-031-0005**  
**Zero an M320 Grenade Launcher**

**DANGER**

**Do not point muzzle in direction of personnel when loading, clearing, zeroing, or firing grenade launcher as this will result in injury to, or death of, personnel.**

**Be sure safety is in safe position after loading grenade launcher.**

**Do not squeeze trigger and remove safety at the same time.**

**Hearing protection is required for the user and all adjacent personnel on firing range.**

**Do not zero the M320 using a target closer than 100 meter (330 feet).**

**WARNING**

**Ensure that the muzzle is clear of all objects prior to firing. Failure to do so can result in serious injury to equipment and personnel.**

**Conditions:** You are assigned an M320 grenade launcher in either the stand-alone configuration or mounted to an M16-series rifle or M4-series carbine and have been directed to zero the M203. You have ten rounds of 40-millimeter (mm) ammunition and targets at the range of 200 meters.

**Standards:** Zero the day/night sight (known as DNS) or the leaf sights so that two consecutive rounds per sight hit within 5 meters (16 feet) of the point of aim at a distance of 200 meters.

**Performance Steps**

1. Zero using the DNS iron sight.
  - a. Identify zero target.
  - b. Turn DNS mode select switch to day mode.
  - c. Set DNS range adjustment knob so display indicates 200 meters.
  - d. Fire a round at the target.
  - e. Compare point of impact (known as POI) with the point of aim (known as POA).
  - f. Make adjustments to the DNS if round does not impact/fall within 5 meters (16 feet) of the POI.
  - g. Fire another round to verify zero.
  - h. Continue zero process until round impacts within 5 meters (16 feet) of the POA.
2. Zero using the leaf sight assembly.

**WARNING**

**Do not attempt to fire grenade launcher in stand-alone mode without buttstock attached. The grenade launcher should always be either mounted on a host weapon or fitted with buttstock before attempting to fire.**

- a. Position grenade launcher on a rest.

**Note:** If grenade launcher is to be operated in stand-alone mode, install buttstock.

- b. Identify zero target.
- c. Raise and extend front sight and rear sight.
- d. Ensure grenade launcher is horizontally positioned so that sights are not vertically canted from side-to-side.
- e. Align and center front sight post in rear leaf 200-meter aperture recess.
- f. Fire a round at the target.
- g. Make adjustments to sight if the round does impact/fall within 5 meters (16 feet) of the POA.

**Note:** Sight is adjusted using the 3-mm end of stowed hexagon key wrench.

- (1) Make elevation adjustments.

**Note:** One complete revolution of elevation adjustment screw moves the POI 34 centimeters (cm) (13.4 inches) at 100 meters.

- (a) Turn elevation adjustment screw counterclockwise if the POI is low.
- (b) Turn elevation adjustment screw clockwise if the POI is high.

- (2) Make windage adjustments.

**Note:** One complete revolution of windage adjustment screw moves the POI 34 cm (13.4 inches) at 100 meters.

- (a) Turn the windage adjustment screw counterclockwise if the POI is left of the POA.
  - (b) Turn the windage adjustment screw clockwise if the POI is right of the POA.
- h. Continue zero process until round impacts within 5 meters (16 feet) of the POA.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Zeroed using the DNS iron sight.	_____	_____
2. Zeroed using the leaf sight assembly.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1010-232-10 Operator's Manual for Grenade Launcher, 40 MM, M320, W/E NSN 1010-01-566-9083 Grenade Launcher, 40 MM, M320A1, W/E 1010-01-557-2542	

**071-031-0002**  
**Load an M320 Grenade Launcher**

**DANGER**

**Do not point muzzle in direction of personnel when loading or firing grenade launcher as this may result in injury or death to personnel.**

**Weapon must be carried in closed and locked position with selector lever on S (Safe).**

**Conditions:** You are a member of a squad or team conducting dismounted operations. You have an M320 grenade launcher in either the stand-alone configuration or mounted on an M16-series rifle or M4-series carbine, 40-millimeter ammunition, and individual combat/personal protective equipment. You have been directed to load the M320.

**Standards:** Point muzzle of weapon in a safe direction and ensure selector lever is in the S (Safe) position. Remove the muzzle cap, press barrel release, and pivot barrel out from receiver. Insert a cartridge into barrel, ensuring it is fully seated, and pivot barrel into receiver until the barrel locking lever engages barrel.

**Performance Steps**

1. Point muzzle of weapon in a safe direction.
2. Ensure selector lever is in S (Safe) position.
3. Remove the muzzle cap.
4. Press barrel release and pivot barrel out from receiver.
5. Insert cartridge into barrel.
6. Ensure cartridge is seated fully forward in rear of barrel.
7. Pivot barrel into receiver until barrel locking lever engages barrel.

**Note:** There should be an audible click when the barrel locking lever engages barrel.

Performance Measures	GO	NO-GO
1. Pointed muzzle of weapon in a safe direction.	____	____
2. Ensured selector lever is in S (Safe) position.	____	____
3. Removed the muzzle cap.	____	____
4. Pressed barrel release and pivot barrel out from receiver.	____	____
5. Inserted cartridge into barrel.	____	____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
6. Ensured cartridge is seated fully forward in rear of barrel.	_____	_____
7. Pivoted barrel into receiver until barrel locking lever engages barrel.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

**071-031-0003**  
**Unload an M320 Grenade Launcher**

**WARNING**

**Keep hands, fingers, and other potential obstructions clear of the barrel. Short-barrel length of the grenade launcher increases the risk of barrel obstruction. Injury to personnel can result if barrel is obstructed.**

**Conditions:** You are a member of a squad or team and are armed with an M320 grenade launcher in either the stand-alone configuration or mounted on an M16-series or M4-series rifle, loaded with an unfired round or an expended cartridge. You have been directed to unload it.

**Standards:** Keep weapon pointed in safe direction. Place the selector lever on safe and remove the round. Ensure selector lever remains in safe position.

**Performance Steps**

1. Keep the weapon pointed in a safe direction, with trigger finger outside trigger guard.
2. Place selector lever in S (Safe) position.
3. Press upward on barrel release lever and pivot barrel out from receiver.
4. Remove any round or cartridge case by hand.
  - a. Grasp rim of round or cartridge case.
  - b. Pull rearward to remove round or cartridge case from the barrel.
5. Pivot barrel into receiver until barrel release lever engages barrel.
6. Ensure selector lever remains in S (Safe) position.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Pointed muzzle of weapon in a safe direction, with trigger finger outside trigger guard.	_____	_____
2. Placed selector lever in S (Safe) position.	_____	_____
3. Pressed upward on barrel release lever.	_____	_____
4. Removed any round or cartridge case by hand.	_____	_____
5. Pivoted barrel into receiver until barrel release lever engages barrel.	_____	_____
6. Ensured the selector lever remained in S (Safe) position.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1010-232-10 Operator's Manual for Grenade Launcher, 40 MM, M320, W/E NSN 1010-01-566-9083 Grenade Launcher, 40 MM, M320A1, W/E 1010-01-557-2542

**071-031-0001**  
**Engage Targets with an M320 Grenade Launcher**

**WARNING**

**Hearing protection is required for the user and all adjacent personnel within 3 meters (10 feet) of weapon during training.**

**Do not look into laser beams through binoculars or telescopes.  
Do not point laser beams at mirror-like surfaces. Do not shine laser beams into another person's eyes.**

**Ensure that the muzzle is clear of all objects prior to firing. Failure to do so can result in serious injury to equipment and personnel.**

**Conditions:** You are a member of a squad or team that is conducting a mission and you have identified enemy target(s) within range of your M320 grenade launcher. You have a laser range finder and sufficient ammunition. The M320 may be in stand-alone configuration or mounted on an M16-series rifle or M4-series carbine.

**Standards:** Determine the range of the target(s), engage, and destroy or disable enemy target(s) using the M320 grenade launcher without causing injury or death to friendly personnel.

**Performance Steps**

1. Determine the range of target(s) using the laser range finder.
2. Select range on day/night sight (known as DNS) to the nearest range in 5-meter increments.

**WARNING**

**Do not attempt to fire grenade launcher in stand-alone mode without buttstock attached. The grenade launcher should always be either mounted on a host weapon or fitted with buttstock before attempting to fire.**

**Keep hands, fingers, and other potential obstructions clear of the barrel. Short-barrel length of grenade launcher increases the risk of barrel obstruction. Injury to personnel can result if barrel is obstructed.**

3. Align and center post of front sight in aperture window of rear sight of DNS on target.
4. Placed the selector lever to the F (Fire) position.
5. Press trigger rearward using an even and consistent pressure until the weapon fires.
6. Assess damage to target(s).
  - a. Observe impact of round.
  - b. Assess damage to target(s).

- c. Determine if re-engagement is necessary.
7. Reload the weapon.
  - a. Place selector lever on S (Safe) position.
  - b. Press upward on barrel release lever and pivot the barrel out from the receiver.
  - c. Remove the expended casing.
  - d. Inset the appropriate round for the target(s) into the breech of the weapon.
  - e. Pivot barrel into receiver until barrel locking lever engages barrel.

**Note:** There should be an audible click when the barrel locking lever engages barrel.

8. Re-engage target(s), if necessary.
9. Place safety selector lever to the S (Safe) position, once engagement is complete.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Determined the range of target(s) using the laser range finder.	_____	_____
2. Selected range on DNS to the nearest range in 5-meter increments.	_____	_____
3. Aligned and center post of front sight in aperture window of rear sight of DNS on target.	_____	_____
4. Placed the safety selector to the F (Fire) position.	_____	_____
5. Pressed trigger rearward using an even and consistent pressure until the weapon fired.	_____	_____
6. Assessed damage to target(s).	_____	_____
7. Reloaded the weapon.	_____	_____
8. Re-engaged target(s), as necessary.	_____	_____
9. Placed safety selector lever to the S (Safe) position.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1010-232-10 Operator's Manual for Grenade Launcher, 40 MM, M320, W/E NSN 1010-01-566-9083 Grenade Launcher, 40 MM, M320A1, W/E 1010-01-557-2542

**071-056-1120****Load an M41 Improved Target Acquisition System while in the Mounted Configuration on an M1167 TOW Carrier****CAUTION**

Handle the tube launched, optically tracked, wire guided (TOW) missile with extreme care to avoid damage to the plastic diaphragm at each end. If a TOW missile with a damaged diaphragm is loaded, it could misfire.

**Conditions:** You are a gunner on an M1167 TOW carrier with an M41 improved target acquisition system (known as ITAS) mounted. You have been directed to load the M41 ITAS with a TOW missile.

**Standards:** Prepare the launcher and direct the assistant gunner to prepare the missile. Load the missile into the launcher.

**Performance Steps**

1. Prepare the launcher.
  - a. Ensure the backblast area is clear.
  - b. Ensure the launcher is level.
  - c. Lock the launcher in the 8-degree down position.
  - d. Rotate the turret until the rear of the turret is on the driver's side of the vehicle.
  - e. Lock the turret.
  - f. Ensure the traversing unit elevation limiter is up and pinned.
  - g. Unlock bridge clamp.
  - h. Open bridge clamp.
  - i. Lower the rear plate of the turret.
    - (1) Unlatch the right-side retaining strap.
    - (2) Secure the right handle with your right hand.
    - (3) Unlatch the left-side retaining strap.
    - (4) Lower the rear plate until it is in the down position.
  - j. Lower the side plate of the turret.
    - (1) Grasp the top of the side plate with your left hand.
    - (2) Pull the plate retaining pin to the left with your right hand.

(3) Lower the plate until it is in the down position.

2. Direct assistant gunner to prepare the missile.

a. Secure an encased TOW missile.

(1) Open cargo shell door.

(2) Remove a stowed missile.

b. Inspect the missile.

(1) Check for cracks or dents in the launch container.

(2) Check for tears in the detent boot.

(3) Secure another missile if cracks, dents, or tears are present.

c. Inspect the electrical connector and rear diaphragm.

(1) Remove and store the electrical connector protective cover.

(2) Verify that the rubber O-ring remains inside of the protective cover and is not affixed to the missile electrical connector.

(3) Check for broken parts.

(4) Check for dirt or cracks in the seal of the electrical connector.

(5) Check for tears or punctures in the rear diaphragm.

(6) Verify the humidity indicator on the rear diaphragm is blue or white.

**Note:** Humidity indicator should be blue or white.

(7) Secure another missile, if appropriate.

d. Release the quick-release clamp.

e. Remove the forward handling ring.

f. Place forward handling ring, quick-release clamp, and protective cover in a secure location for use again if missile is not fired.

**WARNING**

**Do not load a TOW missile if the diaphragm is damaged, the electrical connector is damaged, or if humidity indicator on the rear diaphragm is pink as it may hangfire.**

3. Load the missile into the launcher.

- a. Direct assistant gunner to hand you the missile with electrical connector facing up.
- b. Place the indexing lugs on the forward end of the missile case on top of the launch tube, with the electrical connector facing up.
- c. Lift the aft end of the encased missile at about a 45-degree angle.
- d. Slide the encased missile forward into the guide slots on the launch tube until indexing lugs are fully forward.
- e. Lower aft end of encased missile until the missile is fully seated in the traversing unit.
- f. Raise the side plate and secure it with the locking bar.
- g. Raise the rear plate and secure it with both locking straps.

**CAUTION**

If abnormal force is required to lock the missile locking handle, remove the missile and inspect it for damage. If the missile is damaged, dispose of it in accordance with unit standard operating procedures and load a serviceable missile into the launch tube.

- h. Pull down on the bridge clamp handle with your right hand to lock the encased missile in the launch tube.
- i. Unlock the turret.
- j. Rotate the turret to the 12 o'clock position.
- k. Direct assistant gunner to close the cargo shell door.

Performance Measures	GO	NO-GO
1. Prepared the launcher.	____	____
2. Directed assistant gunner to prepare the missile.	____	____
3. Loaded the missile into the launcher.	____	____

<b>References Required</b>	<b>Primary</b>
TM 9-1425-923-10 Operator's Manual for TOW Improved Target Acquisition System (ITAS) M41A3 Part No. 13480670-3 NSN 5865-01-556-1363 (EIC: PGD) M41A4 Part No. 13480670-4 NSN 1425-01-559-8728 (EIC: PGE) M41A7 Part No. 13480670-7 NSN 5865-01-606-3354 (EIC: PGF)	TC 3-22.32 M41 Improved Target Acquisition System (ITAS) and Tube-Launched, Optically Tracked, Wire-Guided/Wireless (TOW) Missile

**071-056-1121****Unload an M41 Improved Target Acquisition System while in the Mounted Configuration on an M1167 TOW Carrier**

**Conditions:** You are a gunner on an M1167 tube launched, optically tracked, wire guided (TOW) carrier with an M41 improved target acquisition system (known as ITAS). A fired or unfired TOW missile is loaded in the M41 ITAS, and you have been directed to unload it. The assistant gunner is prepared to assist.

**Standards:** Prepare the launcher. Remove the missile container (either empty or unfired) from the launch tube and direct assistant gunner to take possession of the missile container.

**Performance Steps**

1. Prepare the launcher.

- a. Lock the launcher in the 8-degree down position.
- b. Rotate the turret until the rear of the turret is on the driver's side of the vehicle.
- c. Lock the turret.
- d. Check the position of the arming lever.
  - (1) (Fired missile) Maintain the arming lever in the raised position.
  - (2) (Unfired missile) Lower the arming lever.

**Note:** When unloading a fired missile container, do not lower arming lever before opening bridge clamp as the command-link wires will not be cut.

**Note:** When unloading an unfired missile, lower arming lever before opening bridge clamp as this will prevent the command-link wires from being cut and rendering the unfired missile nonuseable.

e. Unlock bridge clamp.

f. Open the bridge clamp.

**Note:** This action will cut the command-link wires if the arming lever is still in the raised position. This action also turns off the xenon tracker in the target acquisition system.

g. Lower the rear plate of the turret, if necessary.

(1) Unlatch the right-side retaining strap.

(2) Secure the right handle with your right hand.

(3) Unlatch the left-side retaining strap.

(4) Lower the rear plate until it is in the down position.

h. Lower the side plate of the turret, if necessary.

(1) Grasp the top of the side plate with your left hand.

(2) Pull the plate retaining pin to the left with your right hand.

(3) Lower the plate until it is in the down position.

2. Remove the missile container (either fired or unfired) from the launch tube.

a. (Fired missile only) Remove command-link wires if they are caught inside the tube.

**Note:** This will happen if the arming lever was lowered on a fired missile before the bridge clamp was opened.

(1) Wrap the wires around a stick or other locally available material.

(2) Pull the command-link wires out from the missile container.

b. Lift the aft end of the launch container.

c. Pull missile container back and out of the launch tube.

3. Direct the assistant gunner to take possession of the missile (fired or unfired) container.

a. Direct assistant gunner to open cargo shell door.

b. Hand the assistant gunner the missile container.

c. (Fired missile) Direct assistant gunner to dispose of the fired missile container.

d. (Unfired missile) Direct assistant gunner to stow an unfired missile.

(1) Inspect the TOW missile.

(a) Inspect the nose and rear diaphragms for damage.

(b) Inspect the humidity indicator to see if the color is pink.

**Note:** The humidity indicator should be blue or white.

(c) Inspect the electrical connector for damage.

(2) Replace the protective cover.

(a) Position the protective cover on the electrical connector so that the grooves on the protective cover line up with the notches on the electrical cover.

(b) Turn inside portion of protective cover fully clockwise.

(3) Replace forward handling ring and quick-release clamp.

(a) Position the quick-release clamp and forward handling ring onto the missile.

(b) Lock the quick-release clamp.

(4) Tag encased missile with date opened, unit, and gunner's or assistant gunner's name.

(5) Place the TOW missile into the appropriate stowage slot.

- e. Direct assistant gunner to close cargo shell door.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Prepared the launcher.	_____	_____
2. Removed the missile container (either empty or unfired) from the launch tube.	_____	_____
3. Directed assistant gunner to take possession of the missile (fired or unfired) container.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1425-923-10 Operator's Manual for TOW Improved Target Acquisition System (ITAS) M41A3 Part No. 13480670-3 NSN 5865-01-556-1363 (EIC: PGD) M41A4 Part No. 13480670-4 NSN 1425-01-559-8728 (EIC: PGE) M41A7 Part No. 13480670-7 NSN 5865-01-606-3354 (EIC: PGF)	TC 3-22.32 M41 Improved Target Acquisition System (ITAS) and Tube-Launched, Optically Tracked, Wire-Guided/Wireless (TOW) Missile

## 071-060-0003

### Maintain a Javelin

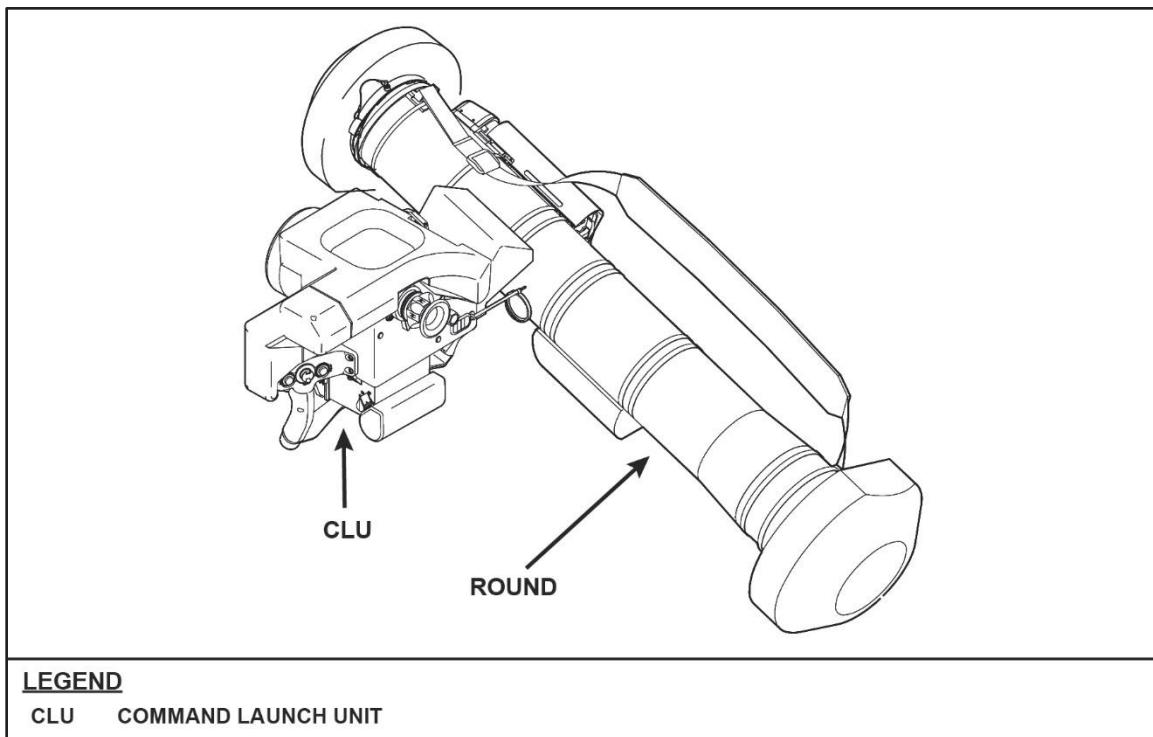
**Conditions:** You are a member of a squad or section preparing for a mission and you have been directed to perform preventive maintenance checks and services (PMCS) on the M98 Javelin weapon system. You have TM 9-1425-1687-10/TM 09397D-OR, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), and all basic issue items for the system.

**Standards:** Inventory the Javelin and conduct PMCS in accordance with TM 9-1425-1687-10/TM 09397D-OR. Notify your squad/team leader of PMCS results.

#### Performance Steps

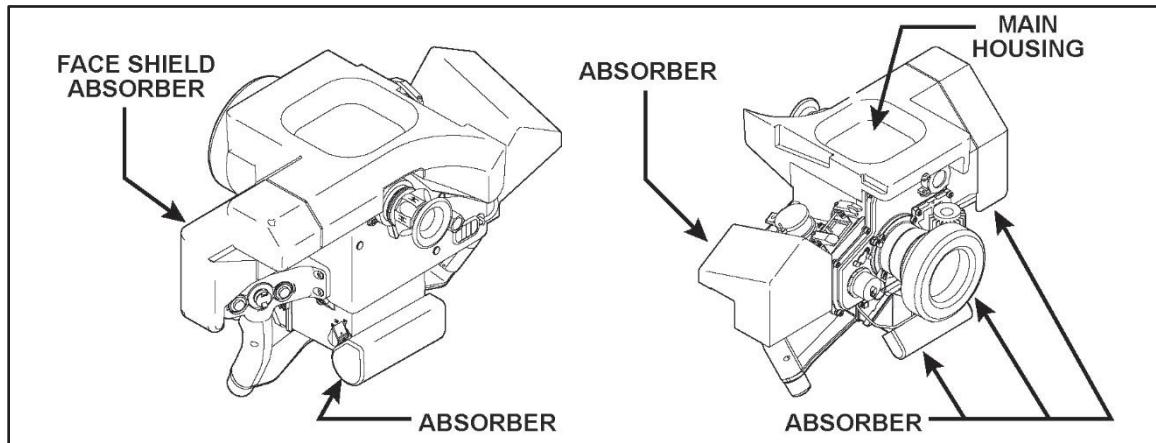
1. Inventory the Javelin components (see figure 3-365).

**Note:** See the technical manual for the component list.



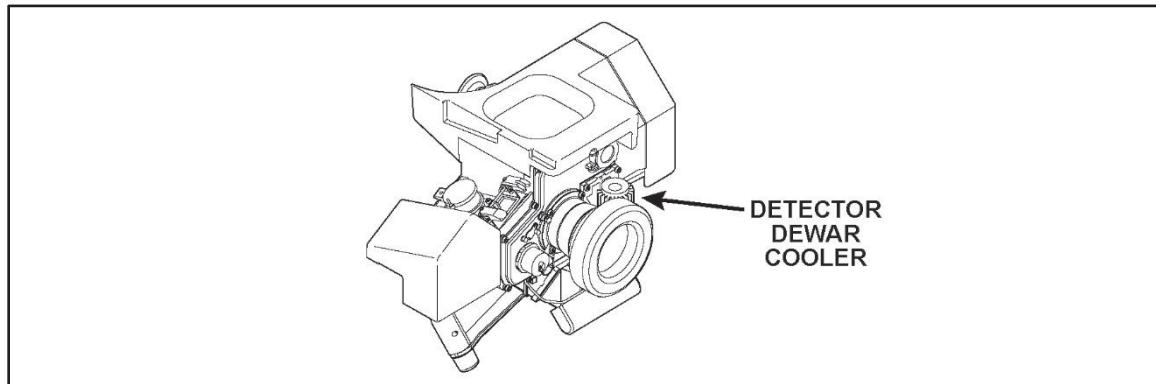
**Figure 3-365. Javelin components**

2. Inspect the command launch unit (known as CLU) (see figure 3-366).

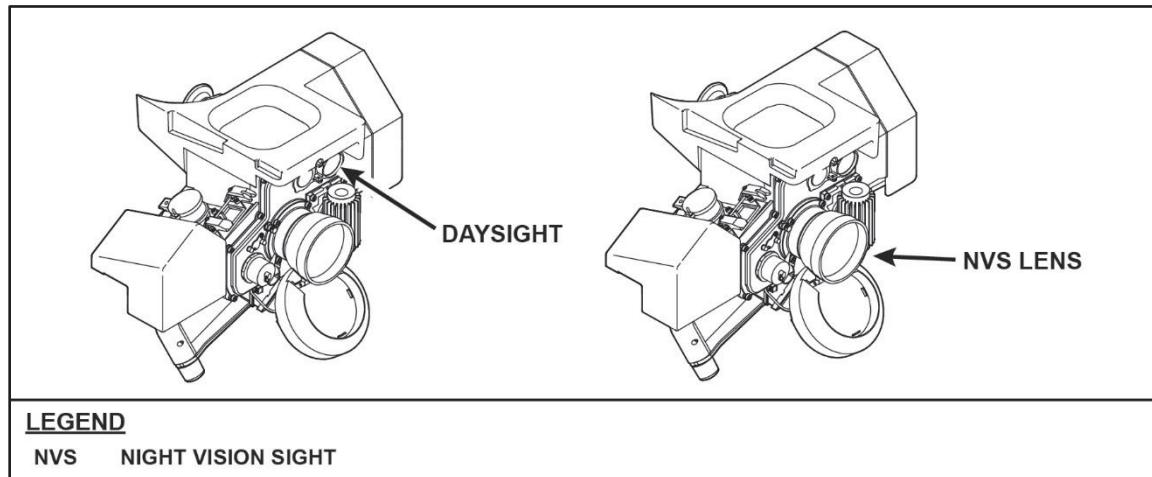
**Figure 3-366. Main Housing and absorbers**

- a. Inspect main housing for scratches, dents, or cracks.
- b. Inspect absorbers for damage.
- c. Inspect the detector dewar cooler (known as DDC) fins for scratches, dents, cracks, or missing fins (see figure 3-367).

**Note:** The DDC is still useable when the fins contain cracks as long as the CLU still reaches cool down and the image is still viewable.

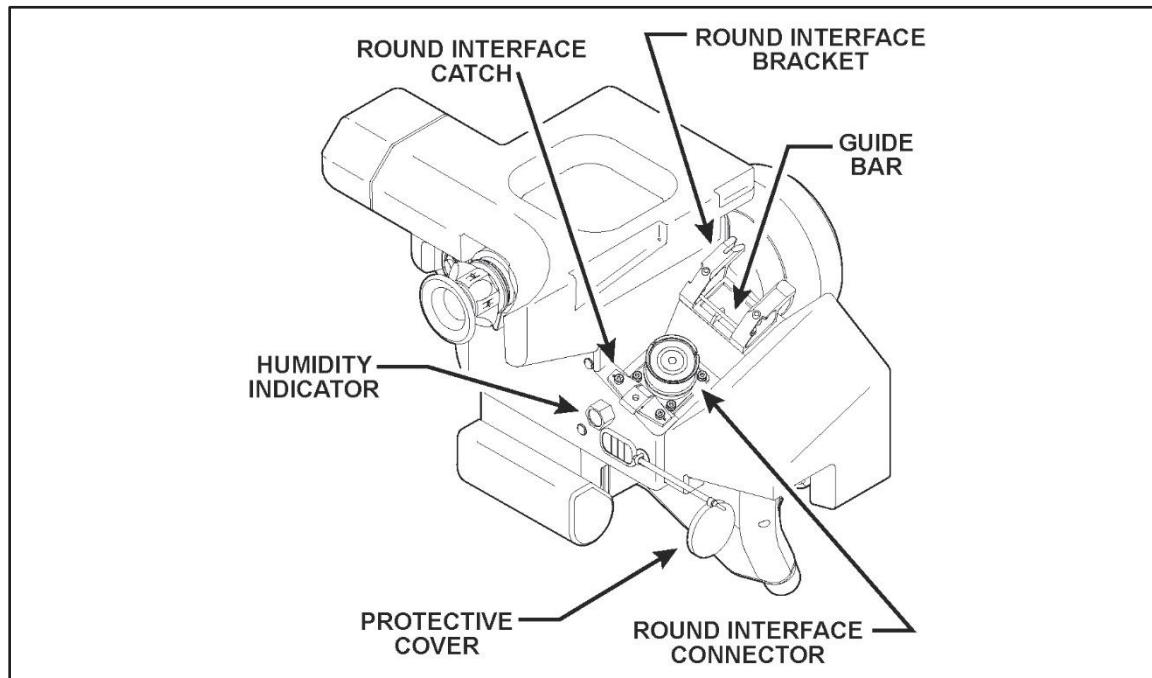
**Figure 3-367. Detector dewar cooler**

- d. Inspect daysight and night vision sight (known as NVS) lenses for damage (see figure 3-368, page 3-874).

**Figure 3-368. Day and night sights**

- (1) Open daysight and NVS lens covers, and depress eyecup.
  - (2) Inspect lenses for damage or scratches.
  - (3) Close daysight and NVS lens covers.
- e. Inspect round interface connector boot for dirt, corrosion, or damage (see figure 3-369).

**Note:** Some CLUs may or may not have a boot installed. A CLU without a boot installed is not a deficiency.

**Figure 3-369. Round interface connector**

- (1) Remove protective cover and inspect round interface connector for dirt, corrosion, or damage.

- (2) Inspect area around connector for cracks.

**Note:** Do not use if round interface connector is damaged (CLU and round will not connect).

- (3) Inspect top of inner ring of the connector for chips, which expose pins.

**Note:** Do not use if connector pins are exposed.

- f. Inspect round interface bracket, round interface catch, and guide bar for damage.

**Note:** Do not use if damage is found (CLU and round will not connect).

- g. Inspect desiccant plug for cracks.

### CAUTION

CLU display indicators could become damaged if eyepiece is exposed to direct sunlight while eyecup is missing or damaged.

- h. Inspect eyepiece assembly (see figure 3-370).

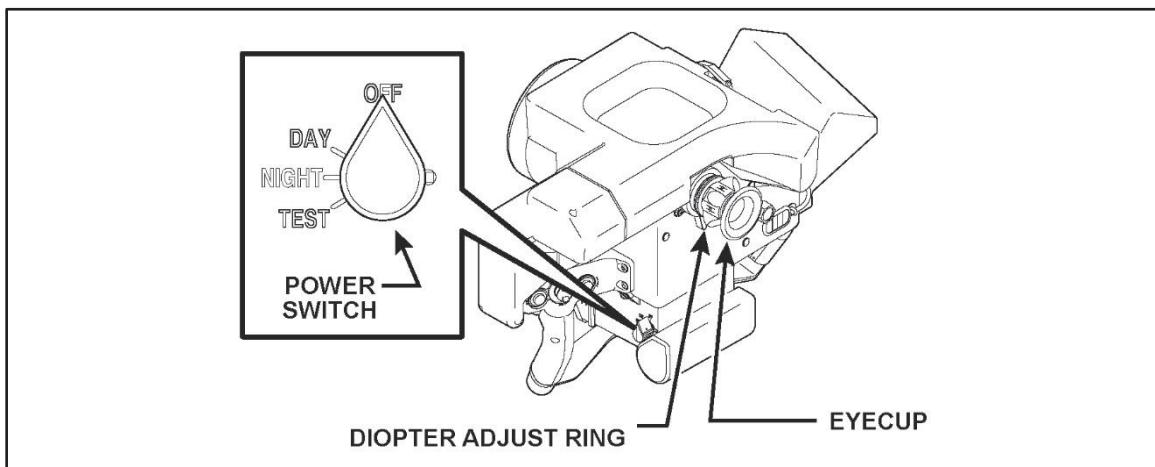


Figure 3-370. Eyecup assembly

### CAUTION

If the eyecup is missing or damaged, avoid exposing eyepiece to direct sunlight. Failure to do so could result in damage to CLU display indications.

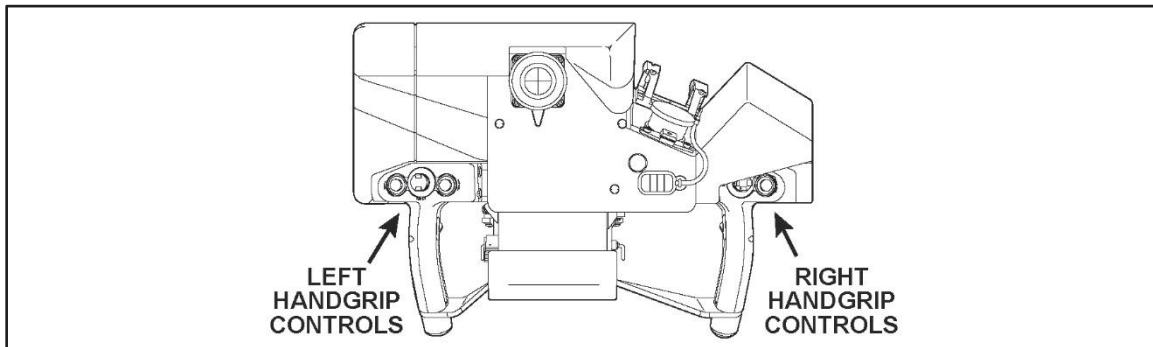
- (1) Inspect eyecup for cracks or tears.

- (2) Inspect diopter adjust ring for damage.

- (3) Rotate diopter adjust ring for full range of motion.

- i. Inspect left and right handgrip controls for damage (see figure 3-371, page 3-876).

**Note:** Do not use if controls will not function.



**Figure 3-371. Left and right handgrip controls**

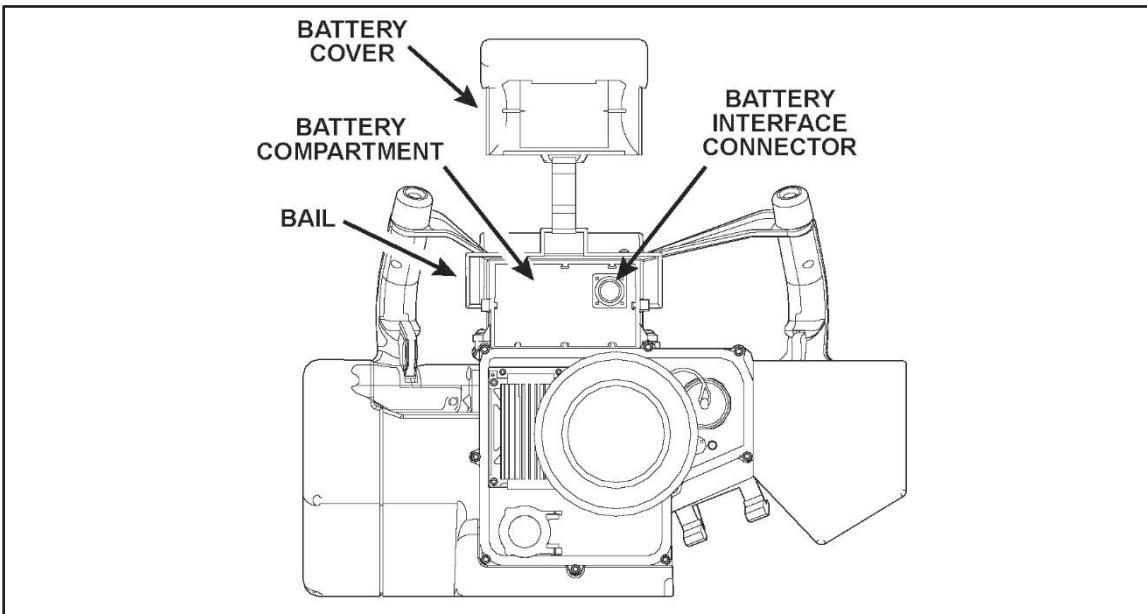
- j. Inspect seeker trigger and trigger guard for damage.
- k. Inspect fire trigger for damage.
- l. Inspect power switch for damage (see figure 3-371).

**WARNING**

**Power down the CLU upon hearing a hissing/popping sound (battery venting). Leave the area until any smell (rotten eggs) or signs of leaking gas have been cleared from the area.**

**Batteries, which show signs of a damaged discharge switch, may be unstable and could result in violent battery venting during handling or disposal. Turn in to supply personnel to dispose of batteries as hazardous waste.**

- m. Inspect battery compartment (see figure 3-372).



**Figure 3-372. Battery compartment**

- (1) Release bail from battery cover.
- (2) Raise battery cover.
- (3) Inspect battery interface connector for bent pins or corrosion.

**Note:** Do not use if battery interface connector pins are bent or broken.

**WARNING**

**Batteries, which show signs of a damaged discharge switch, may be unstable and could result in violent battery venting during handling or disposal. Turn in to supply personnel to dispose of batteries as hazardous waste.**

n. Install battery.

- (1) Ensure power switch is set to OFF.
- (2) Inspect battery.
  - (a) Remove white tape from electrical connector on battery.
  - (b) Inspect electrical connector for broken or loose terminals and signs of corrosion.
  - (c) Inspect battery case for cracks, dents, leakage, and external corrosion.
  - (d) Shake the battery.

**Note:** Due to the chemical characteristics of the BA-5590/U CLU battery, if the battery sits for any extended period of time, a passivation (oxidation) layer will develop between cells. This passivation layer can be removed by shaking the BA-5590/U battery. If this layer is not removed, it may initially inhibit the start-up of the CLU.

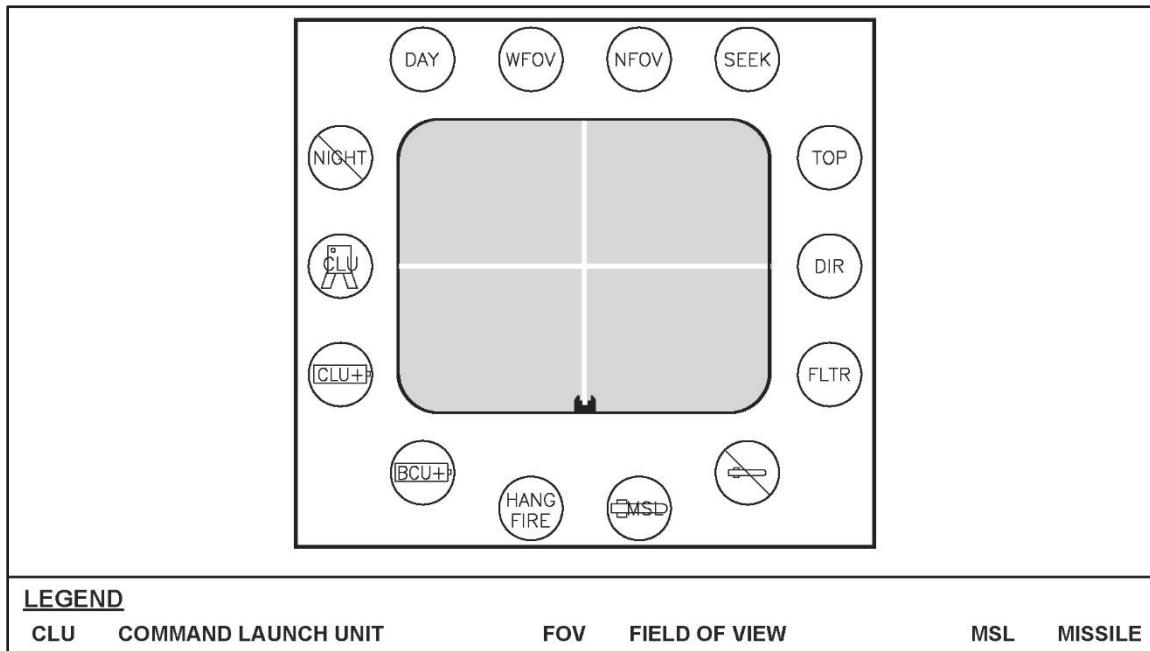
- (3) Slide the battery into the battery compartment, ensuring that the battery engages with the battery interface connector.
- (4) Replace the battery cover on battery compartment.
- (5) Fasten battery compartment bail.

o. Perform CLU built-in-test (known as BIT) (see figure 3-373).

**Notes:** CLU BIT cannot be performed with round attached.

If the CLU indicator lights immediately, turn the power switch OFF, then back to NIGHT to clear the BIT failure. If the CLU indicator does not clear, turn in the CLU for maintenance.

During cold weather operations, CLU indicators may flash on and off during initial power up. This indicates that the battery needs time to warm up before CLU can power up properly. Power up the CLU in the DAY position for 30 to 60 seconds. Turn power switch to the OFF position for 1 second, then back to the DAY position. If indicators continue to flash, repeat the process. If indicators continue to flash after repeated power-down and power-up, replace the CLU battery.



**Figure 3-373. Indicator lights**

- (1) Open the CLU daysight lens cover.
- (2) Set power switch to NIGHT position.
- (3) Adjust diopter adjust ring for best clarity of CLU display.
- (4) Verify that the green POWER LED is lit.

**Note:** If the red CLU FAIL LED illuminates immediately, turn the power switch to OFF, then back to NIGHT to clear BIT failure.

- (5) Turn power switch to TEST position and release.
- (6) Observe green POWER LED and red CLU BIT LED are lit for approximately 12–15 seconds.
- (7) Listen for the flipper mirror to move from DAY position to NIGHT position.
- (8) Observe status indicator test screen.

**Note:** Do not use if any indicator remains lit after 5 seconds.

- (9) Verify that red CLU BIT LED goes out.
- (10) Operate switches as prompted.

**Note:** There is a 10-second "window" to respond. Once begun, failure to complete switch test results in CLU BIT error.

- (11) Observe the CLU BIT indicator goes OFF upon exiting BIT.
  - (12) Observe BIT results screen for PASS or FAIL results.
- p. Perform CLU operational checkout.
- (1) Verify the CLU daysight lens cover is open.
  - (2) Open the CLU NVS lens cover.
  - (3) Adjust diopter adjust ring for best clarity of CLU display.
  - (4) Set power switch to DAY position.
  - (5) Verify CLU operates in day mode and that the POWER LED is green.
  - (6) Set power switch to NIGHT position.
  - (7) Allow approximately 2.5 to 3.5 minutes for NVS to cool down.
  - (8) Press SGT SEL switch.
  - (9) Observe that WFOV video appears and WFOV indicator is lit.
  - (10) Press SGT SEL switch.
  - (11) Observe that WFOV indicator changes to NFOV and that NFOV video appears.
  - (12) Press up on FOCUS switch and hold until NFOV indicator begins to flash.
  - (13) Press down on FOCUS switch and hold until NFOV indicator begins to flash.
  - (14) Select a target in CLU display and adjust focus, contrast, and brightness for clear video using FOCUS switch.

**Note:** Contrast is adjusted by moving the GATE ADJ/CTRS & BRT switch left and right. Brightness is adjusted by moving the GATE ADJ/CTRS & BRT switch up and down.

- (15) Press the FLTR and ATTK SEL switches simultaneously.
  - (a) Use the GATE ADJ/CTRS and BRT switch to navigate the menu.
  - (b) Use the FLTR switch to activate an option.
  - (c) Activate the Image Reset.
  - (d) Activate the Filter.
  - (e) Observe that CLU display becomes darker and the FILTER indicator is lit.
  - (f) Deactivate the Filter.
  - (g) Observe that CLU display brightens and the FILTER indicator is not lit.
  - (h) Activate CLU Sleep mode.
  - (i) Press the SGT SEL switch to deactivate sleep mode.
  - (j) Exit menu mode.
- (16) Press the FLTR switch.
- (17) Observe CLU electronic zoom 2X activates and E-ZOOM 2X indicator is lit.
- (18) Press the FLTR switch.
- (19) Observe CLU electronic zoom returns to normal and E-ZOOM OFF indicator is lit.
- (20) Press the ATTK SEL switch.
- (21) Observe CLU polarity changes and BLACK HOT indicator is lit.
- (22) Press the ATTK SEL switch.
- (23) Observe CLU polarity changes and WHITE HOT indicator is lit.
- (24) Press SGT SEL switch.
- (25) Observe that NFOV indicator goes out and day FOV appears.
- (26) Return to OFF. Prior to turning power switch to OFF, leave power switch in DAY position for at least 1 second to allow flipper mirror to move into day position.
- (27) Close daysight and NVS lens covers.

q. Remove battery.

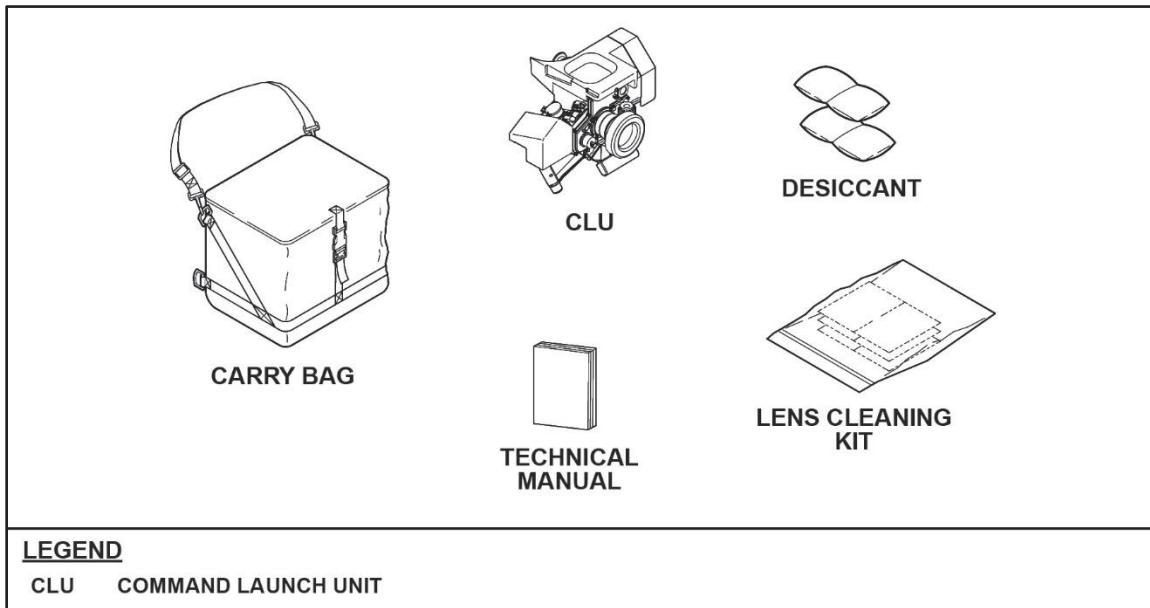
- (1) Ensure power switch is set to OFF position.
- (2) Release bail from battery cover.

- (3) Raise battery cover.
- (4) Remove battery from battery compartment.
- (5) Replace the battery cover on battery compartment.
- (6) Fasten battery compartment bail.

**CAUTION**

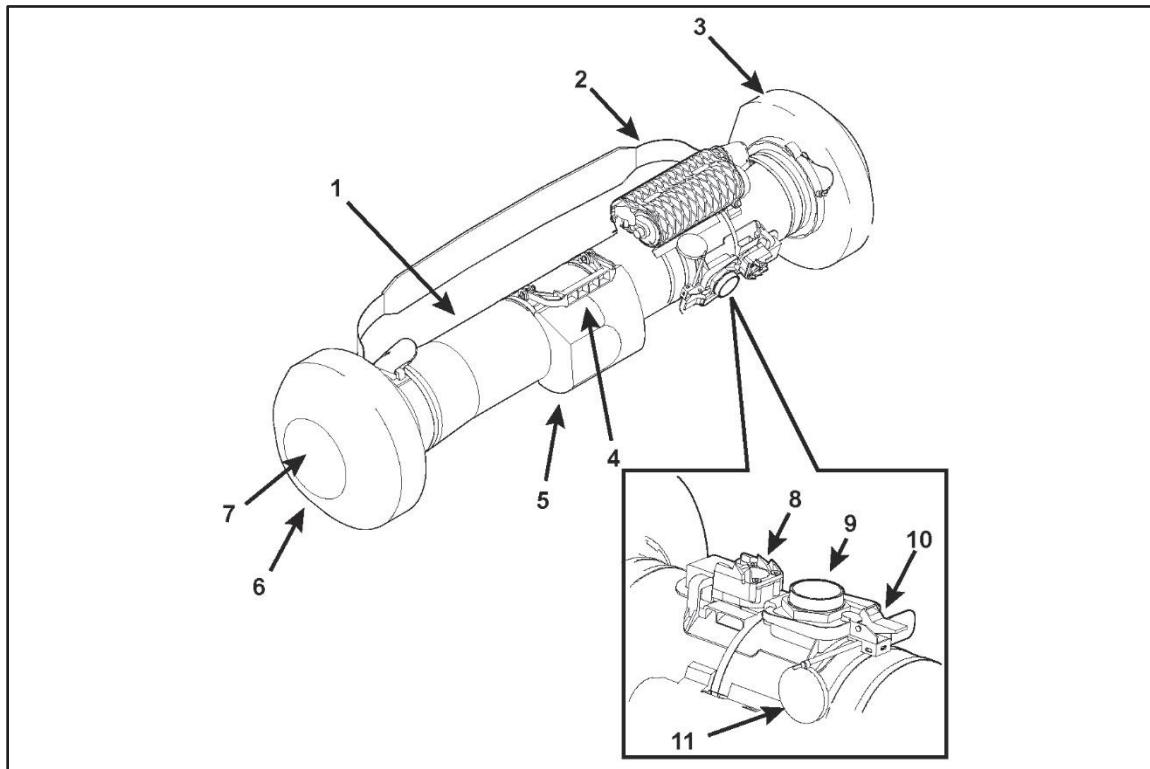
To prevent discoloration or damage to carry bag, do not use chlorine bleaches or cleaning fluids when washing. Do not attempt to dry carry bag in direct sunlight. Never machine wash or machine dry carry bag. Do not attempt to dry carry bag.

- r. Inspect carry bag and components (see figure 3-374).



**Figure 3-374. Carry bag with accessories**

- (1) Ensure lens cleaning kit is present. Replace if missing.
  - (2) Inspect carry bag straps and fittings for wear and missing hardware.
  - (3) Ensure technical manual is present.
3. Inspect Javelin round (see figure 3-375, page 3-882).



**Figure 3-375. M98 Javelin**

a. Ensure forward end cap (see figure 3-375, item 3) is present.

b. Inspect forward end cap for broken or missing hardware.

c. Inspect area around seeker dome.

(1) Remove forward end cap (see figure 3-375, item 3).

(a) Place the round on the ground with flat portion of end caps facing down.

(b) Remove the locking pin from the forward end cap by pulling out on the wire rope.

(c) Rotate the forward end cap latch counterclockwise.

(d) Slide the forward end cap off of the round.

**Note:** If the forward end cap does not come off the round, press the manual release button until the hissing stops.

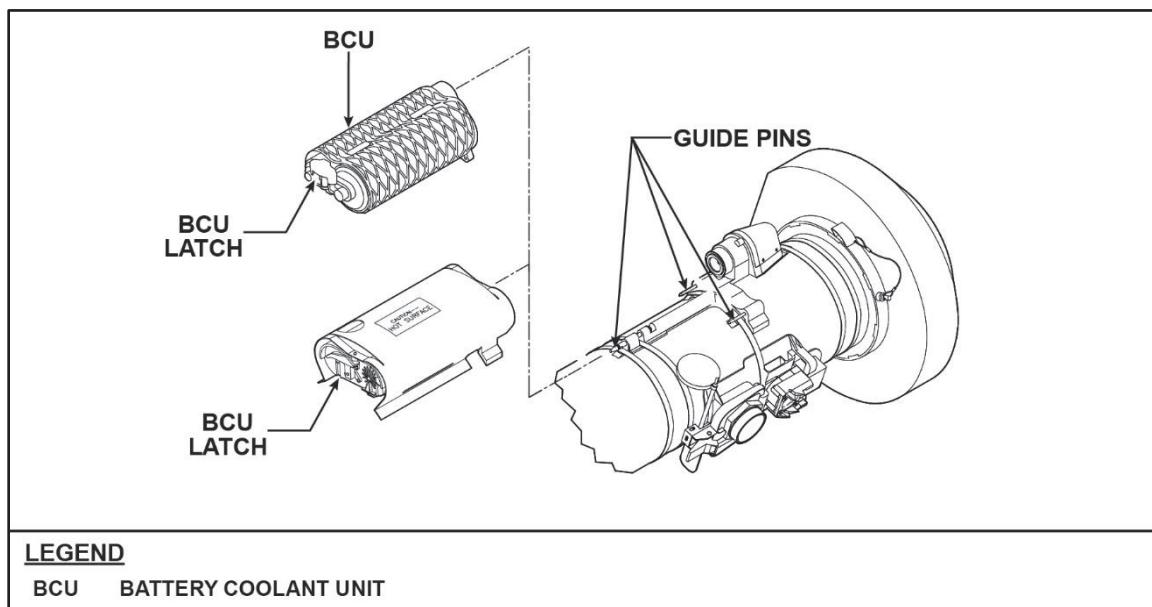
(2) Inspect area around seeker dome for dirt or debris. Tip end of round down to allow debris to fall out.

**Note:** Do not use if debris remains in launch tube assembly.

(3) Replace forward end cap.

(a) Check to ensure that the forward end cap latch is in the open position.

- (b) Align the forward end cap latch handle with the battery coolant unit (known as BCU) pylon.
- (c) Slide the forward end cap down onto the round until it is seated.
- (d) Rotate the forward end cap latch clockwise to engage the locks.
- (e) Reinstall the locking pin into the hole in the forward end cap.
- d. Inspect the latch release (see figure 3-375, item 10, page 3-882) and alignment fork (see figure 3-375, item 8, page 3-882) for dirt, corrosion, or damage.
- e. Remove protective cover (see figure 3-375, item 11, page 3-882). Inspect CLU interface connector (see figure 3-375, item 9, page 3-882) for damage, dirt, or corrosion.
- f. Inspect the BCU.
  - (1) Inspect BCU for damage.
  - (2) Check BCU status indicator.
  - (3) Remove BCU (see figure 3-376).



**Figure 3-376. Battery coolant unit**

- (a) Grasp the BCU shroud and lift up on the BCU latch (BCU P/N 13303250) or press down on the BCU latch (BCU P/N 13303844).
- (b) Slide BCU toward aft end of round to release it from the guide pins.
- (4) Inspect pylon and guide pins for damage.
- (5) Replace BCU.
  - (a) Align BCU with guide pins on round pylon.

- (b) Slide BCU onto guide pins until BCU latch snaps into place.
- (c) Grasp BCU housing and pull toward rear of pylon to ensure BCU completely connected.
- g. Inspect shoulder pad (see figure 3-375, item 5, page 3-882) for damage.
- h. Inspect carry handle (see figure 3-375, item 4, page 3-882) for dirt or damage.
- i. Inspect shoulder strap (see figure 3-375, item 2, page 3-882) for dirt or damage.
- j. Inspect launch tube assembly for dirt or damage.

**Note:** Do not use if dents, cracks, or splits are visible on outer surface.

- k. Inspect aft end cap (see figure 3-375, item 6, page 3-973) and aft end cap membrane (see figure 3-375, item 7, page 3-882) for damage.

**Note:** If aft end cap is punctured, turn back in to supervisor.

- l. Perform Javelin-connect check to CLU.
  - (1) Set power switch on CLU to OFF position.
  - (2) Place round on the ground with latch assembly facing up.
  - (3) Remove protective covers on round interface connector and CLU interface connector.
  - (4) Open NVS lens cover.
  - (5) Place round interface bracket in round hooks.
  - (6) Slide forward and press down on CLU to engage CLU and round interface connectors.

**Note:** Round and CLU are connected correctly when latch release snaps into place.

- (7) Press latch release and disconnect CLU from round.
- (8) Close NVS lens cover.
- (9) Replace protective covers on round interface connector and CLU interface connector.

4. Clean CLU and round in accordance with TM 9-1425-1687-10/TM 09397D-OR.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Inventoried the Javelin components.	_____	_____
2. Inspected the CLU.	_____	_____
3. Inspected the Javelin round.	_____	_____
4. Cleaned CLU and round in accordance with TM 9-1425-1687-10/TM 09397D-OR.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.37 Javelin-Close Combat Missile System, Medium	TM 9-1425-1687-10/TM 09397D-OR Operator's Manual for the Javelin Weapon System M98A2 (NSN 1430-01532-8900)(EIC: NA)

**071-060-0004**  
**Prepare an M98 Javelin for Firing**

**WARNING**

The BA-5590/U battery contains pressurized lithium sulfur dioxide gas. It is highly toxic. Do not handle the battery in any way, which may cause the battery to rupture.

Power down the command launch unit (known as CLU) if the battery or battery compartment becomes hot to the touch. Wait at least 60 minutes before attempting to remove the battery.

Do not discharge batteries, which show signs of bulging or cracks. Turn in to supply personnel to dispose of batteries as hazardous waste.

Power down the CLU upon hearing a hissing/popping sound (battery venting). Leave the area until any smell (rotten eggs) or signs of leaking gas have been cleared from the area.

Batteries, which show signs of a damaged discharge switch, may be unstable and could result in violent battery venting during handling or disposal. Turn in to supply personnel to dispose of batteries as hazardous waste.

**Conditions:** You are a member or a team or squad conducting tactical operations and your squad/team leader has directed you to prepare an M98A2 Javelin to engage a target.

**Standards:** Inspect the major components, prepare the CLU, assemble the Javelin, and power up the CLU.

**Note:** The Javelin is a medium range, manportable, recoilless, antitank assault weapon and is capable of defeating current and projected enemy armor, and hovering enemy helicopters. The Javelin can be used during the day, night, or degraded weather conditions. The Javelin is made up of a one-time expendable round and a CLU.

**Performance Steps**

1. Inspect major components of the Javelin.
  - a. Inspect CLU and round surfaces for heavy coating of dirt or mud.
    - (1) Dust if slightly dirty.
    - (2) Rinse area with clean water if very dirty.
    - (3) Clean all metal parts on the CLU and round with clean dry cloth.
    - (4) Clean rubber or synthetic parts using water.
    - (5) Dry all parts with clean dry cloth.
  - b. Inspect daysight and night vision sight (known as NVS) lens.

**CAUTION**

Do not touch the lens with your hands or fingers. Wash hands before cleaning lenses. Natural oils produced by the skin are corrosive to lens coatings.

- (1) Open daysight and NVS lens covers.

**CAUTION**

Do not scrub lens surface. Optical coating may be damaged.

- (2) Pour clean water, repeatedly over lens until all dirt or mud is removed.

- (3) Dry lens with a clean dry cloth.

- (4) Secure a lens cleaning paper.

- (5) Wipe the lens.

- (a) Begin at center of lens.

- (b) Apply light pressure with fingers.

- (c) Wipe in an expanding circular motion (spiral) to edge of lens.

- (6) Close daysight and NVS lens covers.

- c. Inspect the round interface connectors for dirt or mud.

- (1) Dust if slightly dirty.

- (2) Rinse area with clean water if very dirty.

- (3) Dry all wet parts with a clean dry cloth.

2. Prepare the CLU.

- a. Ensure the power switch is in the OFF position.

- b. Install the CLU battery.

- (1) Release the bail from the battery cover.

- (2) Raise the battery cover.

- (3) Clean the battery compartment of dirt or loose objects.

- (4) Remove the white tape from the electrical connector.

(5) Shake the battery.

**Note:** This ensures the battery has not developed an oxidation layer between cells.

(6) Slide battery into battery compartment, making sure battery engages with battery interface connector.

(7) Replace the battery compartment cover.

(8) Secure the bail to the battery cover.

3. Assemble the Javelin.

a. Place the round on the ground with the flat sides of the end caps down and latch assembly facing up.

b. Kneel on the left side of the round, at the forward end, facing forward.

c. Remove the protective covers from the CLU interface connectors.

(1) Pull on tab of lanyard to snug protective cover against side of the round.

(2) Position protective cover so that no interference will exist when round is connected.

d. Remove the protective covers from the round interface connectors.

(1) Pull on tab of lanyard to snug protective cover against side of the CLU.

(2) Position protective cover so that no interference will exist when CLU is connected.

e. Open daysight and NVS lens covers on the CLU.

f. Place round interface bracket in round hooks.

g. Engage the CLU and round interface connectors by sliding forward and press down on the CLU.

**Note:** Round and the CLU are connected correctly when latch release snaps into place.

h. Ensure that the round and CLU are connected.

(1) Rock the CLU from side to side.

(2) Pick up the Javelin.

i. Remove the forward end cap.

(1) Remove the locking pin by pulling straight up on the wire rope.

(2) Turn the forward end cap latch release counterclockwise.

**Note:** If the forward end cap does not come off, press manual release button to relieve pressure.

**CAUTION**

With forward end cap removed, seeker dome is exposed. Use caution when tipping end of round down to avoid foreign material (rocks, mud, and so on) coming in contact with seeker dome.

- (3) Remove forward end cap by lifting the Javelin way from the forward end cap.
- j. Position open end of round on forward end cap.
4. Power up the CLU.
  - a. Select a firing position that best meets your situation.
  - b. Set power switch to the NIGHT position.
  - c. Wait approximately 2.5 to 3.5 minutes for NVS to cool down.
  - d. Verify the CLU indicators are lit.

**Note:** The CLU has four modes of operation: off, day, night (infrared surveillance), and test.

**Note:** CLU indicators may flash on and off during initial power up. This indicates that the battery needs time to warm up before CLU can power up properly.

  - (1) If indicators are lit, continue to step 4e.
  - (2) If indicators are flashing, perform battery warm-up procedures as follows:
    - (a) Turn the power switch to the DAY position for 30 to 60 seconds.
    - (b) Turn the power switch to the OFF position, then back to the NIGHT position.
    - (c) Repeat warm-up if indicators continue to flash.
  - e. Adjust diopter adjust ring for best clarity of CLU display.

**Note:** The Javelin is now prepared to engage a target.

Performance Measures	GO	NO-GO
1. Inspected major components of the Javelin.	_____	_____
2. Prepared the CLU.	_____	_____
3. Assembled the Javelin.	_____	_____
4. Powered up the CLU.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.37 Javelin-Close Combat Missile System, Medium	TM 9-1425-1687-10/TM 09397D-OR Operator's Manual for the Javelin Weapon System M98A2 (NSN 1430-01532-8900)(EIC: NA)

**071-060-0005**  
**Engage Targets with a Javelin**

**DANGER**

**Power down the command launch unit (known as CLU) upon hearing a hissing sound (battery venting). Leave the area until any smell or signs of leaking gas have been cleared from the area.**

**WARNING**

**Keep body at a 30-degree angle away from the round when launching a missile from the prone position. Injury may occur if body is extended into backblast area.**

**Conditions:** You are a Javelin gunner and have a stationary or moving target within your sector of fire. You have already prepared the M98A2 Javelin for operation and have on required hearing protection.

**Standards:** Select an appropriate firing position. Acquire the target using the CLU. Determine if target is in range and verify it as enemy. Fire the Javelin at target by activating the seeker, obtaining seeker lock-on, and launching the missile.

**Performance Steps**

1. Assume an appropriate firing position.

**Note:** Your position should protect you from enemy fire and observation, yet allow you to place effective fire on your target. Your physical position may vary from a fixed location to a temporary location during movement.

- a. Select a physical position that provides cover and concealment.
- b. Determine the most appropriate firing position (see figure 3-377, page 3-892).

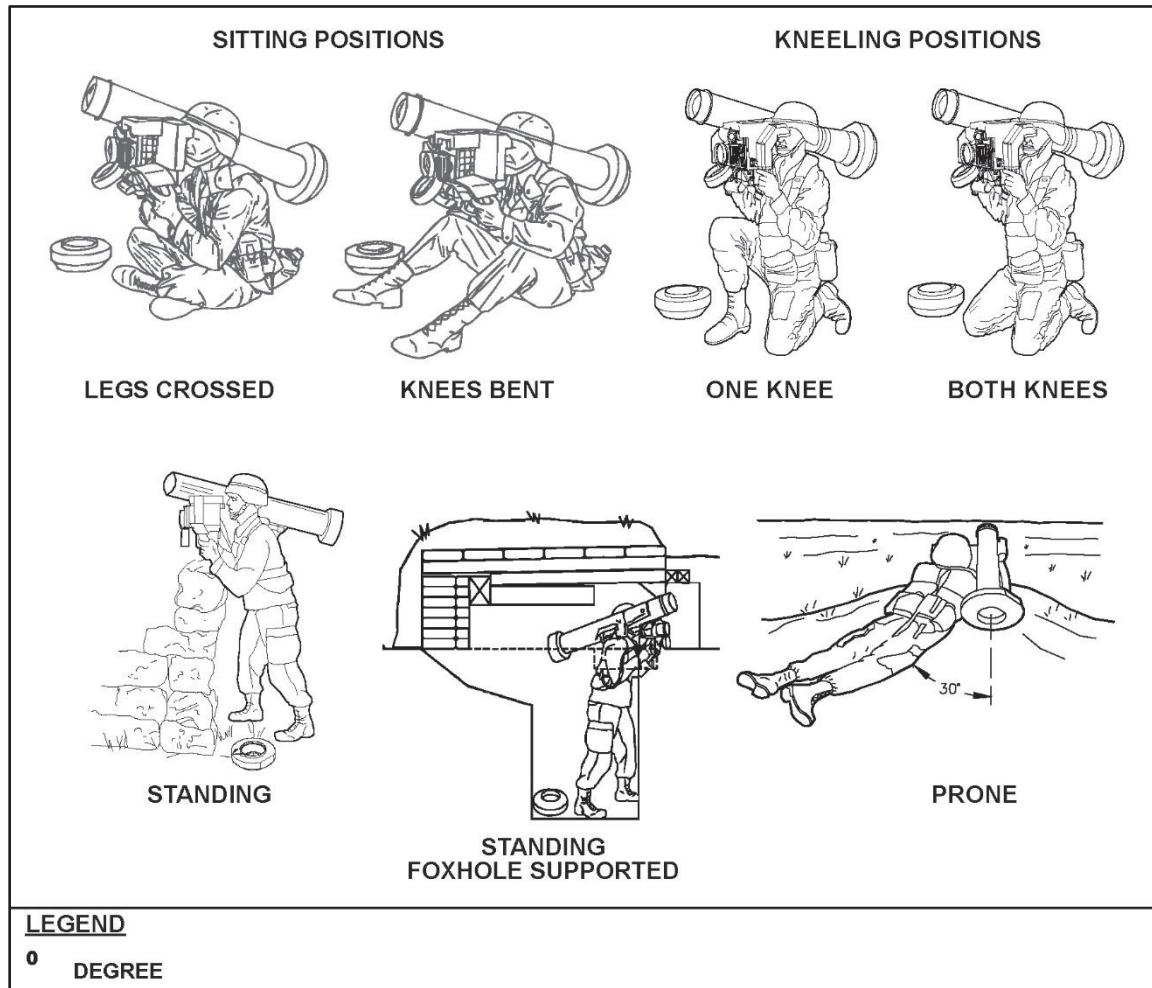


Figure 3-377. Javelin firing positions

- c. Check the overhead flight path between the target and the firing position.
- d. Ensure the forward end cap is on the ground out of the backblast area.
- 2. Acquire the target using the CLU.
  - a. Set the SGT SEL (sight select) switch to wide field of view (known as WFOV) or narrow field of view (known as NFOV).

**Note:** WFOV is usually best to initially acquire a target, while NFOV is best to track, identify, and engage the target.

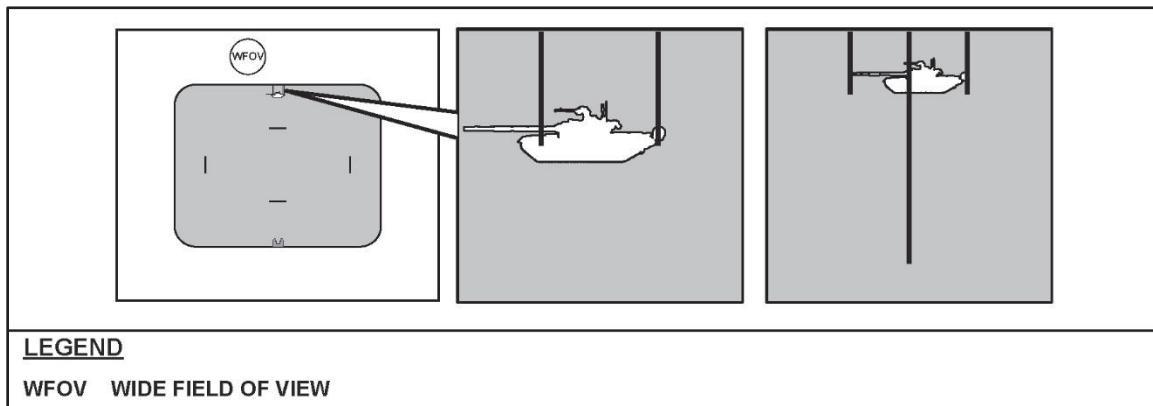
- b. Adjust the CLU for best view.
  - (1) Press the FOCUS switch up and down to adjust the infrared video.
  - (2) Adjust the contrast by moving the GATE ADJ/CTRS & BRT switch left or right.
  - (3) Adjust the brightness is by moving the GATE ADJ/CTRS & BRT switch up or down.

- c. Scan for target using WFOV.
- 3. Determine if target is in range.

**Note:** The gunner uses the stadia in the CLU display to determine if a target is in range of the Javelin missile.

- a. Determine if the target is in range using full stadia method (see figure 3-378).

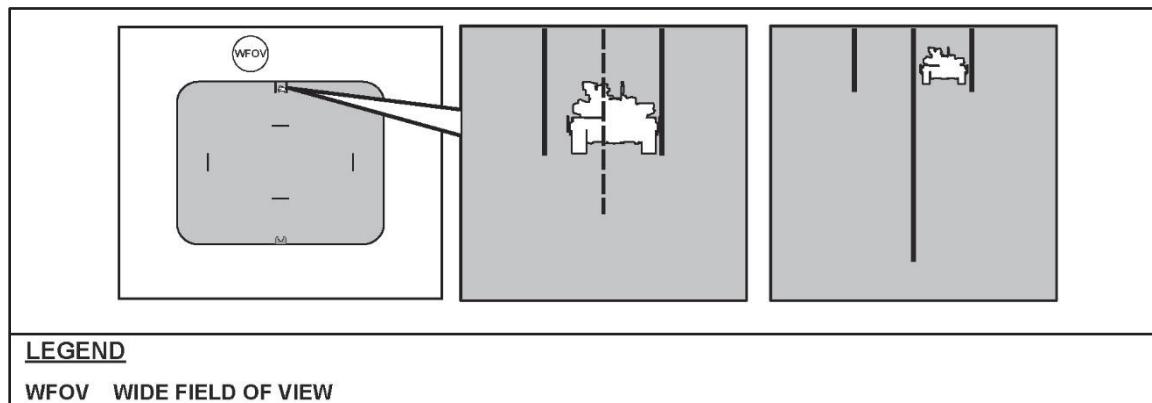
**Note:** The process is the same for both WFOV and NFOV. However, in NFOV, the upper reticle line extends between the stadia lines but is ignored for measuring purposes.



**Figure 3-378. Wide field of view stadia (left), wide field of view target in-range (center), narrow field of view target out-of-range (right)**

- (1) Move the stadia lines to the target, keeping the target between the stadia lines.
  - (2) Place one of the stadia on one edge of the target.
  - (3) The target is in range if the opposite edge of the target touches or exceeds the other stadia.
- b. Determine if target is in range using the half-stadia method (see figure 3-379, page 3-894).

**Note:** The process is the same for both WFOV and NFOV. However, in NFOV, the upper reticle line extends between the stadia lines and can be used for measuring purposes.



**Figure 3-379. Narrow field of view stadia (left), wide field of view target in-range (center), narrow field of view target out-of-range (right)**

- (1) Move the stadia to the target, keeping the target between the stadia lines.
  - (2) Place one of the stadia lines on one edge of the target.
  - (3) Visualize a line running halfway between the two WFOV stadia lines (use the reticle line if in NFOV).
  - (4) The target is in range if the opposite edge of the target touches or exceeds the visualized line of reticle line.
- c. Switch to NFOV.
4. Verify target is enemy.
  5. Activate the seeker.

**Note:** The battery coolant unit (known as BCU) has a limited battery life. Once the BCU is activated, the gunner will have approximately 4 minutes to launch the missile. The BATTERY COOLANT UNIT LOW indicator is located at the bottom of the CLU display at the far left. During system operation, after seeker activation, the indicator will flash to indicate the BCU has approximately 30 seconds (or more, depending on the ambient temperature) of operating time remaining. When it lights solid, the BCU is spent, the CLU reverts to the last CLU field of view (known as FOV), all missile functions stop, and the missile cannot be launched.

- a. Recenter target in the FOV.
- b. Lift the seeker trigger guard on the left handgrip.
- c. Squeeze the seeker trigger until the seek indicators to lights.

**Note:** The NFOV indicator will remain lit. Remember to listen for the BCU squib sound when the seeker is activated. Once the BCU is activated, the gunner will have approximately 4 minutes to launch the missile. The BCU indicator flashes when the BCU has approximately 30 seconds of operating time remaining.

- d. Release the seeker trigger after the seek indicator lights.
- e. Observe the activation of the seeker.

**Note:** The activation of the seeker takes approximately 10–15 seconds, indicated by the NFOV and battery indicators going out and the TOP indicator and flashing track gates coming on.

- f. Select direct attack mode, as required.

**Note:** Top attack is the default attack mode for the missile. Direct attack mode is used if the target is under a protective structure or overhead cover. Attack mode can be changed between top attack and direct attack any time before seeker lock by pressing ATTK SEL switch. Select the attack mode most appropriate to the target.

- (1) Press ATTK SEL switch.
  - (2) Observe that DIR indicator lights and TOP indicator is off.
6. Activate seeker lock-on.
- a. Position track gates around outer edge of target by pressing gate ADJ/CTRS & BRT switch, up, down, right, or left.
    - (1) Press GATE ADJ/CTRS & BRT switch up or down to open or closes track gates vertically.
    - (2) Press GATE ADJ/CTRS & BRT switch left or right to open or close track gates horizontally.
  - b. Squeeze and hold the seeker trigger.
  - c. Observe for seeker lock-on indicators.
    - (1) Ensure for track gates to stop flashing.
    - (2) Ensure for appearance of solid crosshairs on CLU display.
  - d. Break target lock if wrong target is locked on or lock-on quality is poor.
    - (1) Release the seeker trigger.
    - (2) Return to step 6 (activate seeker lock-on).
  - e. Continue to squeeze and hold the seeker trigger.

### WARNING

Avoid looking downrange during initial missile launch without proper protection. Debris from the rocket motor may cause serious injury.

Do not launch missile at targets closer than minimum effective range, 65 meters (211 feet). Warhead will not be armed and a dud will result.

7. Launch the missile.

- a. Center crosshairs on target.
- b. Squeeze and hold fire trigger until missile launches.

- c. Release fire and seeker triggers when missile launches.

**Note:** The CLU display will return to FOV used to activate the seeker and the associated FOV indicator will be on if the missile launches.

- d. Place Javelin on the ground with CLU handgrips facing up.
- e. Press latch release and disconnect CLU from empty launch tube assembly (known as LTA).
- f. Discard empty LTA.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Assumed an appropriate firing position.	_____	_____
2. Acquired the target using the CLU.	_____	_____
3. Determined if target was in range.	_____	_____
4. Verified target was enemy.	_____	_____
5. Activated the seeker.	_____	_____
6. Activated seeker lock-on.	_____	_____
7. Launched the missile.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.37 Javelin-Close Combat Missile System, Medium	TM 9-1425-1687-10/TM 09397D-OR Operator's Manual for the Javelin Weapon System M98A2 (NSN: 1430-01532-8900)(EIC: NA)

## 071-060-0006

### React to Javelin that Fails to Fire

**Conditions:** You are engaging a target using an M98-series Javelin and it has failed to fire. There is a MISFIRE or HANGFIRE message flashing, and an indicator (=) has appeared, in the command launch unit (known as CLU) display.

**Standards:** Keep the Javelin pointed in a safe direction and determine if you have a misfire or hangfire. Perform the immediate action required to correct the misfire or hangfire. Inform your supervisor of the misfire/hangfire.

#### Performance Steps

1. Keep Javelin pointed in direction of enemy.
2. Determine if you have had a misfire or hangfire.
  - a. If MISFIRE message is flashing and indicator (=) appears on the CLU display, perform immediate action procedures for a misfire.
  - b. If HANGFIRE message is flashing and indicator (=) appears on in the CLU display, perform immediate action procedures for a hangfire.
3. Perform immediate action procedures on the Javelin.
  - a. Perform immediate action for a misfire.
    - (1) Attempt to engage the target again.
      - (a) Release the seeker and fire triggers.
      - (b) Acquire the target, if necessary.
      - (c) Lock-on the target.
      - (d) Squeeze the fire trigger.
    - \_1\_ If the Javelin fires, continue mission.
    - \_2\_ If the Javelin fails to fire, go to next step (3a[2]).
  - (2) Disconnect and reconnect CLU from the round.
    - (a) Turn OFF the CLU.
    - (b) Close daysight and night vision sight (known as NVS) lens covers.
    - (c) Set the Javelin on ground, pointed in direction of enemy target, with the CLU handgrips facing up.
    - (d) Keep backblast area clear.

- (e) Press the latch release and disconnect the CLU from the round.
  - (f) Check for dirt and debris.
  - (g) Reconnect the CLU to the same round.
  - (h) Turn ON the CLU.
- (3) Attempt to engage the target.
- (a) If the Javelin fires, continue mission.
  - (b) If the Javelin fails to fire, go to next step (3a[4]).

**WARNING**

**The battery coolant unit (known as BCU) will be hot. Do not touch unshrouded BCU surfaces.**

- (4) Replace the BCU, if available.
- (5) Attempt to re-engage target.
  - (a) If the Javelin fires, continue mission.
  - (b) If Javelin fails to fire, go to next step (3a[6]).
- (6) Replace the round.
  - (a) Turn OFF the CLU.
  - (b) Close daysight and NVS lens covers.
  - (c) Place the Javelin on the ground, pointing toward the enemy.
  - (d) Disconnect the CLU from the round.
  - (e) Move 25 meters away or move the round 25 meters from the firing position.
  - (f) Stay clear of the forward and aft ends of the round at all times.
  - (g) Obtain a replacement round.
  - (h) Connect CLU to new round.

**Note:** If the misfire continues on the new round, obtain a new CLU.

- (i) Continue the mission.

b. Perform immediate action for a hangfire.

(1) Release the seeker and fire triggers.

(2) Continue to point missile in the direction of enemy target for 60 seconds.

(3) Turn OFF the CLU.

**Note:** Prior to turning power switch to OFF, leave power switch in DAY position for at least one second to allow flipper mirror to move into day position.

(4) Close daysight and NVS lens covers.

(5) Set the Javelin on ground, pointed in direction of the enemy target, with the CLU handgrips facing up.

(6) Ensure backblast area remains clear.

(7) Disconnect the CLU from the round.

(8) Move 25 meters away or move the round 25 meters away from the firing position.

(9) Stay clear of the forward and aft ends of the round at all times.

(10) Obtain a replacement round.

(11) Connect CLU to new round.

(12) Continue mission.

4. Notify supervisor of the misfire or hangfire.

a. Indicate Javelin did not fire.

b. Provide the location of the round.

Performance Measures	GO	NO-GO
1. Kept the Javelin pointed in direction of enemy.	_____	_____
2. Determined if you had a misfire or hangfire.	_____	_____
3. Performed immediate action procedures on the Javelin.	_____	_____
4. Notified supervisor of the misfire or hangfire.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.37 Javelin-Close Combat Missile System, Medium	TM 9-1425-1687-10/TM 09397D-OR Operator's Manual for the Javelin Weapon System M98A2 (NSN: 1430-01532-8900)(EIC: NA)

071-318-2250

**Perform Preventive Maintenance Checks and Services on an 84-millimeter Recoilless, M3 Rifle**

**DANGER**

**To prevent injury or death always ensure the weapon is clear before performing preventive maintenance checks and services (PMCS).**

**Conditions:** You are assigned as a gunner for an 84-millimeter recoilless M3 rifle and must perform PMCS to ensure completeness and operational readiness of the weapon. You have the weapons basic issue items, DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*), and TM 9-1015-262-10.

**Standards:** Ensure the weapon is unloaded and perform the required PMCS according to TM 9-1015-262-10. Correct any operator-level deficiencies and annotate all higher-level deficiencies, if found, on DA Form 2404 or DA Form 5988- E. Report status of the weapon to your supervisor.

**Note:** Quarterly PMCS and cleaning should be performed on the M3 rifle if it is being stored. However, if the unit armorer detects corrosion on the rifle prior to the end of the 90-day period, PMCS and cleaning should be performed immediately.

**Performance Steps**

1. Ensure the weapon is unloaded.
2. Perform required operator PMCS in accordance with the technical manual.
3. Correct all operator-level deficiencies, as required.
4. Record deficiencies not correctable at operator level, if found, on DA Form 2404 or DA Form 5988-E.
5. Report status of the M3 rifle to your immediate supervisor.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Ensured the weapon is unloaded.	_____	_____
2. Performed the required operator PMCS in accordance with the technical manual.	_____	_____
3. Corrected all operator-level deficiencies.	_____	_____
4. Recorded deficiencies not correctable at operator level, if found, on DA Form 2404 or DA Form 5988-E.	_____	_____
5. Reported status of the M3 rifle to your immediate supervisor.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	

**071-318-2251**  
**Maintain an 84-millimeter Recoilless, M3 Rifle**

**DANGER**

**To prevent injury or death, always ensure the weapon is clear before performing maintenance.**

**WARNING**

**Mainspring is under extreme pressure. Use caution when installing. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.**

**Conditions:** You are assigned as a gunner of an 84-millimeter (mm) recoilless M3 rifle and must perform operator maintenance on the rifle. You have the weapons basic issue items, TM 9-1015-262-10, and the required cleaning material. The assistant gunner is available to assist.

**Standards:** Clear and perform operator maintenance on the M3 in accordance with the technical manual. Once maintenance is complete, perform a function check to ensure the M3 is fully operational.

**Performance Steps**

1. Clear the M3 rifle.
  - a. Push cocking lever forward fully.
  - b. Set safety catch to S (Safe) position.
  - c. Move venturi locking lever forward and open venturi.
  - d. Inspect chamber for live round or empty shell casing to ensure weapon is clear.
  - e. Close venturi ensuring locking lever is engaged fully.
  - f. Place safety catch to F (Fire) position and pull trigger to relieve spring tension.
2. Disassemble the M3 rifle.
  - a. Remove telescopic sight assembly, if installed.
  - b. Remove bipod, if installed.
  - c. Remove carrying sling, if installed.
  - d. Remove front cap and mainspring.

(1) Dry fire weapon to release mainspring pressure, if weapon is cocked.

(2) Use hand force when loosening front cap.

- (3) Hold hand over front cap and unscrew until mainspring tension is released.
  - (4) Remove front cap and mainspring from mechanism tube.
  - e. Remove cocking lever.
    - (1) Use 3/16-inch flat-tip screwdriver.
    - (2) Unscrew two screws to remove the cocking lever.
  - f. Remove firing rod assembly.
    - (1) Ensure selector switch is on F and press the trigger.
    - (2) Push firing rod assembly forward until it protrudes through the front of the mechanism tube.
    - (3) Withdraw firing rod assembly.
  - g. Remove rear cap and firing pin.
    - (1) Insert 3/16 flat-tip screwdriver into angled slot on top of the firing pin.
    - (2) Lift firing pin from housing.
  - h. Remove extractor spring.
    - (1) Use 3/16-inch flat-tip screwdriver.
    - (2) Unscrew the flathead extractor screw.
3. Clean the M3 rifle.
- a. Clean the barrel.
    - (1) Assemble the cleaning rod, cleaning assembly tool, and cleaning brush.
    - (2) Open the venturi.
    - (3) Insert cleaning brush into the breech.
    - (4) Push brush through bore and out the muzzle.
    - (5) Repeat steps 3a(3) to 3a(4) as necessary to remove the carbon from the barrel.
    - (6) Replace the cleaning brush with the oiling brush.
    - (7) Insert oiling brush into the breech.
    - (8) Push brush through bore and out muzzle.
    - (9) Clean exterior portion of the barrel and all nonmetal parts with isopropyl alcohol.
    - (10) Apply a thin film of cleaner, lubricant, and preservative (known as CLP) on the metal parts.
    - (11) Wipe external parts with a clean dry cloth.

- b. Clean the venturi.
    - (1) Wipe off with a rag.
    - (2) Apply thin film of CLP on the venturi using a rag.
  - c. Clean metal parts of weapon.
    - (1) Clean with a CLP dampened rag or swabs until clean.
    - (2) Lubricate by applying apply a fresh, light film of CLP with new rag or swab.
  - d. Clean all nonmetal parts with isopropyl alcohol on a rag or cleaning swab.
  - e. Dry all external components with dry clean cloth.
4. Inspect the M3 rifle.
- a. Check that front cap has an O-ring and is not damaged.
  - b. Check mainspring for signs of damage.
  - c. Check the cocking lever for damage.
  - d. Check the firing rod for signs of cracks, burrs, or obvious signs of damage.
  - e. Check the rear cap for damage and that O-ring is present.
  - f. Check the firing pin for signs of cracks, burrs, dents, or obvious signs of damage.
  - g. Check the extractor spring for signs of cracks, burrs, or obvious signs of damage.
  - h. Inspect the barrel.
    - (1) Check the barrel interior for corrosion, pitting, cracks, dents, or any other notable damage.
    - (2) Check exterior surface for the damage to hook-and-loop fastener windings (yellow in color) used in mounting projections to barrel.
    - (3) Check exterior surface for damage to carbon fiber laminate (black in color).
    - (4) Inspect clearance between venturi and barrel.
      - (a) Insert feeler gauge between venturi and base of barrel.
      - (b) Ensure clearance is less than 0.25 mm (0.01 inches).
- Note:** If clearance is more than 0.25 mm (0.01 inches), notify field maintenance.
- i. Check for lack of proper lubrication.
  - j. Check for presence of corrosion or degradation of surface.
5. Reassemble the 84-mm recoilless, M3 rifle.

- a. Install extractor spring.
    - (1) Place extractor spring on extractor.
    - (2) Install flathead extractor screw by using 3/16-inch (5.5 mm) flat-tip screwdriver.
  - b. Install firing pin.
    - (1) Insert firing pin into housing and push in as far as possible.
    - (2) Ensure firing pin groove aligns with guide in housing.
  - c. Install rear cap hand-tight.
  - d. Install firing rod assembly.
    - (1) Insert firing rod assembly into the mechanism tube.
    - (2) Ensure inclined surface of cam plate is positioned towards barrel.
    - (3) Ensure selector is in F position.
    - (4) Squeeze trigger to allow firing rod assembly to pass sear.
    - (5) Push firing rod rearward fully.
    - (6) Ensure firing rod cam plate engages firing pin.
  - e. Install cocking lever.
    - (1) Ensure curved side of cocking lever is facing rear of weapon.
    - (2) Align cocking lever screw threads prior to installation.
    - (3) Install the two flathead cocking lever screw by using 3/16-inch (5.5 mm) flat-tip screwdriver.
  - f. Install mainspring and front cap.
  - g. Mount the telescopic sight assembly, if required.
  - h. Attach bipod, if required.
  - i. Attach the carrying sling, if required.
6. Perform a function check on the M3 rifle.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the M3 rifle.	_____	_____
2. Disassembled the M3 rifle.	_____	_____
3. Cleaned the M3 rifle.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
4. Inspected the M3 rifle.	_____	_____
5. Reassembled the M3 Rifle.	_____	_____
6. Performed a function check on the M3 rifle.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

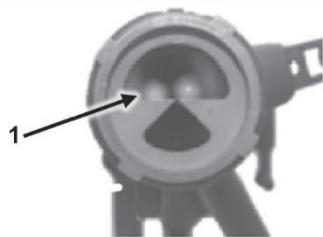
**071-318-2253**  
**Boresight an 84-millimeter Recoilless, M3 Rifle**

**Conditions:** You are a gunner of an 84-millimeter recoilless, M3 rifle and must boresight the weapon in preparation for use. You have front and rear boresight discs, a screwdriver, and a stand or sandbags for support. The assistant gunner is available to assist.

**Standards:** Boresight the open and telescopic sights on the M3 rifle by using a clearly defined aiming point at least 200 meters away.

**Performance Steps**

1. Boresight the open sights.
  - a. Ensure the weapon is clear.
  - b. Charge the weapon and place it on safe.
  - c. Insert the front boresight disc into the muzzle so the straight edges of boresight disc are horizontal. (See figure 3-380.)



**Figure 3-380. Front boresight disc in muzzle**

- d. Open the venturi.
    - (1) Place rear boresight disc into chamber. (See figure 3-381.)
- A black and white photograph showing the rear sight assembly of the M3 rifle. A circular boresight disc is visible inside the open venturi. The venturi is shown in an open position.
- Figure 3-381. Rear boresight disc**
- (2) Close venturi.
  - e. Rotate front and rear sights to open position.
  - f. Loosen locking screw on bottom of the rear sight assembly using 3/16-inch flat-tip screwdriver.
  - g. Set rear sight to zero by turning the range knob counterclockwise to align the middle of white index mark with zero.
  - h. Identify distant object at minimum range of 200 meters for boresight target.
- 3-908**
- STP 17-19D1-SM-TG**
- FOR OFFICIAL USE ONLY**
- 14 January 2021**

**Notes:** Gunner should not be touching the weapon other than to make necessary adjustments to align sights with distant object.

Assistant gunner should keep weapon stabilized.

Object must be at least 200 meters away when boresighting.

- i. Have the assistant gunner grasp the weapon by venturi and look through the small hole in the center of the rear boresight disc and align front and rear discs with the distant object.
  - j. Have the assistant gunner maintain alignment with the distant object and keep you informed during adjustments.
  - k. Adjust for elevation by turning rear sight elevation knob clockwise or counterclockwise until the rear sight aperture is aligned horizontally with the distant object.
  - l. Adjust the azimuth by moving the aperture sight left or right to align with the distant object.
  - m. Tighten the locking screw when the sight aperture is properly aligned.
  - n. Have the assistant gunner verify open sights alignment with the boresight discs by switching positions.
2. Boresight the telescopic sight.

- a. Loosen locking screws on the telescopic sight elevation and azimuth drums.

**CAUTION**

Range drum must be set to zero before adjusting setting on the picatinny fire control device (known as PFCD). The range setting knob must be pushed in completely and ammunition indicator rings are not visible. Failure to observe this caution will result in damage to equipment.

- b. Set range drum on the PFCD to zero.
  - c. Identify distant object at minimum range of 200 meters for boresight target.
- Note:** Gunner should not be touching the weapon other than to make necessary adjustments to align sights with distant object.
- d. Have the assistant gunner grasp the weapon by venturi and look through the small hole in the center of the rear boresight disc and align the front and rear discs with the distant object.
  - e. Have the assistant gunner maintain alignment with the distant object and keep you informed during adjustments.
  - f. Look through the telescope and adjust the reticle by turning elevation and azimuth drums to align the reticle with the distant object.
  - g. Tighten locking screws on elevation and azimuth drums.
  - h. Loosen the elevation scale clamping screw by using 3/16-inch flat-tip screwdriver.

(1) Slip elevation scale to zero.

**Note:** Zero index mark should be aligned with the white temperature index.

(2) Tighten the elevation scale clamping screw.

i. Have the assistant gunner verify telescopic sight alignment with the boresight discs by switching positions.

j. Remove the boresight discs.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Boresighted the open sights.	_____	_____
2. Boresighted the telescopic sight.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

**071-318-2257**  
**Load an 84-millimeter Recoilless, M4 Rifle**

**Conditions:** You are an assistant gunner of an M3, 84-millimeter (mm) recoilless rifle, and there is a target within range of the weapon. The gunner has assumed a firing position and announced LOAD AMMO (TYPE AND DIRECTION).

**Standards:** Ensure the gunner is positioned correctly and load the type round identified by the gunner.

**Performance Steps**

1. Ensure gunners are holding the weapon horizontally on their right shoulder with the support bipod.
2. Select the type round announced by the gunner.
3. Hold the 84-mm round on the right or left forearm with the round facing downrange.
4. Wait for the gunner to direct you to load ammunition.
5. Move venturi locking lever forward and open venturi.
6. Look into the barrel to ensure that venturi, chamber, and bore are free from foreign objects.
7. Insert the round fully into the chamber, using the right hand as a guide and the left hand to align recess in the cartridge case with the cartridge case guide.
8. Use your right hand to close venturi and flick the venturi locking lever to the rear.
9. Keep your right hand hovering over venturi locking lever.
10. Keep your left hand on the gunner's back.
11. Announce AMMO LOADED.
12. Wait for gunner to announce READY TO FIRE.
13. Clear back blast area and announce BACK BLAST AREA IS CLEAR.

Performance Measures	GO	NO-GO
1. Ensured gunners were holding the weapon horizontally on their right shoulder with the support bipod.	_____	_____
2. Selected the type round announced by the gunner.	_____	_____
3. Held the 84-mm round on the right or left forearm with the round facing downrange.	_____	_____
4. Waited for the gunner to direct you to load ammunition.	_____	_____
5. Moved venturi locking lever forward and opened venturi.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
6. Looked into the barrel to ensure that venturi, chamber, and bore were free from foreign objects.	_____	_____
7. Inserted the round fully into chamber, using the right hand as a guide and the left hand to align recess in the cartridge case with the cartridge case guide.	_____	_____
8. Used your right hand to close venturi and flick the venturi locking lever to the rear.	_____	_____
9. Kept your right hand hovering over venturi locking lever.	_____	_____
10. Kept your left hand on the gunner's back.	_____	_____
11. Announced AMMO LOADED.	_____	_____
12. Waited for gunner to announce READY TO FIRE.	_____	_____
13. Cleared back blast area and announced BACK BLAST AREA IS CLEAR.	_____	_____

<b>References Required</b>	<b>Primary</b>
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TM 9-1015-262-10 Operator Manual for Rifle, 84  
MM Recoilless, M3 NSN 1015-01-314-1770 (EIC:  
7RR)

**071-318-2258**  
**Unload an 84-millimeter Recoilless, M3 Rifle**

**Conditions:** You are an assistant gunner for an 84-millimeter (mm) recoilless, M3 rifle, and the gunner has just engaged a target or requires a different type of round be loaded.

**Standards:** Unload the 84-mm recoilless, M3 rifle when directed by the gunner.

**Performance Steps**

1. Ensure the gunner keeps the weapon pointed in a safe direction.
2. Wait for the gunner to direct you to unload or reload.
3. Announce UNLOADING.
4. Move venturi locking lever forward and open venturi.
5. Flick venturi locking lever forward to force the round/cartridge case to extract rearward.
6. Remove the round/cartridge case from the weapon.
7. Place round/cartridge case on the ground.
8. Load a new round and announce RELOAD, if required.
9. Close venturi.
10. Announce CLEAR if unloaded or AMMO RELOADED" if round was loaded.

Performance Measures	GO	NO-GO
1. Ensured the gunner kept the weapon pointed in a safe direction.	_____	_____
2. Waited for the gunner to direct you to unload or reload.	_____	_____
3. Announced UNLOADING.	_____	_____
4. Moved venturi locking lever forward and opened venturi.	_____	_____
5. Flicked venturi locking lever forward to force the round/cartridge case to extract rearward.	_____	_____
6. Removed the round/cartridge case from the weapon.	_____	_____
7. Placed round/cartridge case on the ground.	_____	_____
8. Loaded a new round and announce RELOAD, if required.	_____	_____
9. Closed venturi.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
10. Announced CLEAR if unloaded or AMMO RELOADED" if round was loaded.	_____	_____
<b>References Required</b>	<b>Primary</b>	
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)		

**071-318-2254**  
**Engage Targets with an 84-millimeter Recoilless, M3 Rifle**

**DANGER**

Do not fire the M3 from trenches, foxholes, or enclosures. The M3 is intended for free field use and is restricted from being fired when significant reflective surfaces are closer than 10 meters (33 feet) from the firing position (such as walls, vehicles, structures). No significant reflective surfaces (other than the ground) should be located within the back-blast area. Personnel within 9 meters (30 feet) of the weapon must wear properly inserted foam earplugs, as well as properly fitting ear muffs (both required). Using other types of inserted ear protection are not authorized and can result in permanent loss of hearing. Personnel more than 9 meters (30 feet) to 319 meters (1,045 feet) of the weapon MUST wear single hearing protection. Danger zone for personnel behind the weapon is limited to the sector with a radius of 100 meters (328 feet) and angle of 45 degrees to either side of the rear of venturi. Failure to comply with this warning could result in injury or death to personnel. Danger zone A = 40-meter area affected by backblast, heat, and flying debris. Obstacles, such as barriers, big trees, or other large vertical objects, must not be in this zone because of risk of debris ricocheting.

Danger zone B (includes zone A) = 100 meters (328 feet) area affected by backblast and flying debris. No personnel allowed. The gunner, assistant gunner, and nearby personnel within a 100-meter (328 feet) radius MUST wear approved body armor, helmet, and eye protection to protect against radiant energy (flame/heat) and flying debris. The gunner and assistant gunner will keep uniform sleeves rolled down and collars turned up. Ammunition firing restrictions for ammunition type and firing position apply to both gunner and assistant gunner. Exceeding allowable number of rounds and/or improper firing position when employing the M3 may cause injury or death to personnel due to excess exposure to overpressure. See TM 9-1015-262-10 for firing restrictions and additional warning and cautions.

**Conditions:** You are a gunner with an 84-millimeter recoilless, M3 rifle and have identified a stationary target within your sector of fire. The telescopic sight is mounted and you have ammunition for the type of target. The assistant gunner is ready to assist.

**Standards:** Use the M3 rifle to engage enemy target.

Performance Steps

**DANGER**

**When in a seated position, the gunner must have legs and feet crisscrossed. Do not sit with feet out front of muzzle; this can cause burns to the lower legs.**

**When in the prone position, the angle between gunner's body and weapon must be more than 30 degrees and the right foot must be placed over the left ankle to ensure the right leg is out of backblast area.**

**WARNING**

**When in the kneeling or sitting position, avoid bone to bone contact (elbow to knee).**

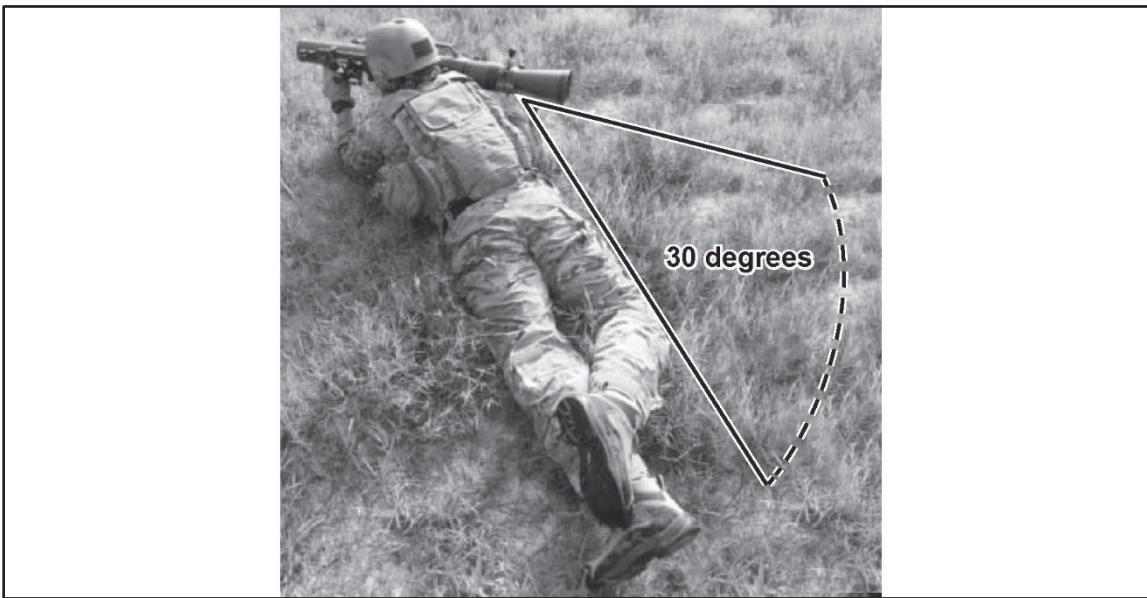
1. Assume a proper firing position. (See figures 3-382, 3-383, and 3-384.)

**Note:** The weapon can be fired, with or without the bipod attached, from a standing, kneeling, sitting, or prone position.

The assistant gunner will always be on the right side of the gunner with left hand on gunner's back, for additional stabilization, and right hand resting on venturi locking lever knob for safety.



**Figure 3-382. Standing position**



**Figure 3-383. Prone position**



**Figure 3-384. Kneeling and sitting position**

- a. Ensure position is stable and comfortable.
  - b. Ensure it is a suitable position for conditions and target engagement.
  - c. Press weapon against shoulder.
  - d. Support elbows against ground, body, or combat equipment on body.
2. Prepare the M3 rifle for engagement.

- a. Push the cocking handle fully forward.
  - b. Rotate the safety catch to S (Safe).
  - c. Have the assistant gunner load a round by announcing LOAD, AMMUNITION TYPE, AND SPECIFIC AMMUNITION REACTION-IMPACT OR DELAY.
  - d. Wait for assistant gunner to announce AMMO LOADED, ROUND TYPE, AND SPECIFIC AMMUNITION REACTION-IMPACT OR DELAY.
3. Acquire target with the telescopic sight or open sight.
- a. Acquire target with the telescopic sight.
    - (1) Estimate the range to the stationary target.
    - (2) Set estimated range on the range drum.
    - (3) Position eye to the rear of the telescope.
    - (4) Move head forward or backward until a full view of the target is obtained.
    - (5) Place the pointer or appropriate lead mark on the center of the visible mass of the target (see figure 3-385).



**Figure 3-385. Telescopic sight center mass**

- b. Acquire target with the open sight.
  - (1) Fold the front and rear sights out from their position against the barrel.
  - (2) Set the estimated range using the correct temperature mark.
  - (3) Aim with center post at center mass of the target. (See figure 3-386.)



**Figure 3-386. Open sight center mass**

4. Engage the target.
  - a. Rotate safety catch to F (Fire) and announce READY TO FIRE.
  - b. Wait for the assistant gunner to announce BACK BLAST AREA CLEAR.
  - c. Fire the weapon after announcing ON THE WAY! by pulling the trigger when the "Y" is pronounced.
  - d. Observe flight and strike of the projectile.

**Note:** Loader must visually verify the back blast area is clear and maintain hand above venturi locking lever until the M3 is fired.
5. Recock the weapon.
6. Rotate the safety catch to S.
7. Direct assistant gunner to unload or reload, as appropriate.
  - a. Announce UNLOAD if the target is destroyed.
  - b. Announce RELOAD if the target is not destroyed and repeat steps 2–4.

Performance Measures	GO	NO-GO
1. Assumed a proper firing position.	_____	_____
2. Prepared the M3 for engagement.	_____	_____
3. Acquired target with the telescopic sight or open sight.	_____	_____
4. Engaged the target.	_____	_____

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
5. Recocked the weapon.	_____	_____
6. Rotated the safety catch to S.	_____	_____
7. Directed assistant gunner to unload or reload.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

**071-318-2255****Perform Misfire Procedures on an 84-millimeter Recoilless, M3 Rifle**

**Conditions:** You are engaging a target using the 84-millimeter recoilless, M3 Rifle and it fails to fire when the trigger is pulled.

**Standards:** Perform the immediate action necessary to correct the misfire and engage the target with the M3 rifle. Perform troubleshooting procedures, if misfire cannot be corrected.

**Performance Steps**

1. Keep aim on target.
2. Announce MISFIRE.
3. Wait 5 seconds.
4. Re-engage target (1<sup>st</sup> attempt).
  - a. Recharge firing mechanism.
  - b. Aim on the target.
  - c. Announce ON THE WAY.
  - d. Pull the trigger.
    - (1) If weapon fires, continue operations.
    - (2) If weapon does not fire—
      - (a) Keep aim on target.
      - (b) Announce MISFIRE.
      - (c) Recharge firing mechanism.
      - (d) Go to next step.
5. Direct assistant gunner to check the venturi lock.
6. Re-engage target (2<sup>nd</sup> attempt) once assistant gunner announces VENTURI LOCK CHECKED.
  - a. Aim on the target.
  - b. Announce ON THE WAY.
  - c. Pull the trigger.
    - (1) If weapon fires, continue operations.
    - (2) If weapon does not fire—
      - (a) Keep aim on target.

- (b) Announce MISFIRE.
  - (c) Rotate the safety catch to S (Safe).
  - (d) Recharge firing mechanism.
  - (e) Go to next step.
7. Maintain firing position and wait 2 minutes.
8. Direct assistant gunner to load a new round.
- Note:** The assistant gunner will inspect the misfired round. If the percussion cap on misfired round was impacted by firing pin, the misfired round is to be treated as a dud and handled in accordance with range or unit standard operating procedures. If the percussion cap was not impacted, the firing pin and firing mechanism should be checked.
9. Re-engage target (3<sup>rd</sup> attempt).
- a. Aim on the target.
  - b. Announce ON THE WAY.
  - c. Pull the trigger.
- (1) If weapon fires, continue operations.
  - (2) If weapon does not fire—
    - (a) Keep aim on target.
    - (b) Announce MISFIRE.
    - (c) Rotate the safety catch to S (Safe).
    - (d) Direct assistant gunner to unload round.
    - (e) Go to next step.
10. Perform troubleshooting on the M3 rifle.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Kept aim on target.	_____	_____
2. Announced MISFIRE.	_____	_____
3. Waited 5 seconds.	_____	_____
4. Re-engaged target (1 <sup>st</sup> attempt).	_____	_____
5. Directed assistant gunner to check the venturi lock.	_____	_____

Performance Measures	GO	NO-GO
6. Re-engaged target (2 <sup>nd</sup> attempt) once assistant gunner announced VENTURI LOCK CHECKED.	_____	_____
7. Maintained firing position and waited 2 minutes.	_____	_____
8. Directed assistant gunner to load a new round.	_____	_____
9. Re-engaged target (3 <sup>rd</sup> attempt).	_____	_____
10. Performed troubleshooting on the M3 rifle.	_____	_____

References Required	Primary
TM 9-1015-262-10 Operator Manual for Rifle, 84 MM Recoilless, M3 NSN 1015-01-314-1770 (EIC: 7RR)	

**071-025-0001**  
**Maintain an M240-Series Machine Gun**

**DANGER**

**Always be aware of a weapon's condition and muzzle orientation.**

**Treat all weapons as if they are loaded and prepared to fire.**

**Always keep weapon pointed downrange.**

**Be sure to clear weapon before disassembling, cleaning, inspecting, transporting, or storing.**

**Do not interchange barrel assembly or bolt assembly from one machine gun to another without being headspaced/gauged. Doing so may result in injury to, or death of, personnel.**

**CAUTION**

Charging the weapon with the safety in the S (Safe) position can cause damage to the weapon.

**Conditions:** Your platoon is conducting maintenance operations, and you have been directed to perform operator maintenance on the M240-series machine gun. You have all the basic issue items for the M240 machine gun, a complete cleaning kit, TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010, and DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet*). The M240 has already been removed from the platform, mount, or tripod.

**Standards:** Verify the machine gun is clear. Disassemble, clean, inspect, and lubricate the machine gun. Assemble and perform a function check on the machine gun. Correct any operator-level deficiencies found and report any uncorrected deficiencies on DA Form 2404 or DA Form 5988-E, as necessary.

**Performance Steps**

1. Verify the machine gun is clear.
  - a. Move the safety switch to the F (Fire) position.
  - b. Lock the bolt to the rear.
    - (1) Pull the cocking handle (M240B or M240L) or charging cable (M240C) to the rear.
    - (2) Ensure that the bolt locks to the rear.
  - c. Return the cocking handle or charging cable to its forward position.
  - d. Move the safety switch to the S (Safe) position.
  - e. Push in latches to open cover assembly.
  - f. Remove ammunition belt.

- g. Raise feed tray.
- h. Look into chamber to make sure it is empty.
- i. Lower feed tray.
- j. Place safety to F (Fire) position.
- k. Pull and hold the cocking handle or charging cable to the rear.
- l. Press the trigger and ease the bolt forward to close and lock.
- m. Release the trigger.

**Note:** Safety must not be able to be moved to the safe position.

- n. Close cover assembly.
  - o. Make sure it locks shut.
2. Disassemble the machine gun.
    - a. Remove the barrel.
      - (1) Depress the barrel locking latch and hold.
      - (2) Turn the barrel release left to the upright position.
      - (3) Pull the barrel straight out of the receiver.
      - (4) Remove heat shields, if present.
    - b. Remove the trigger housing assembly.
      - (1) Depress spring pin and remove.
      - (2) Rotate the trigger housing down and back to remove.
      - (3) (M240 or M240C only) Pull the charging cable through the cable guide.

**WARNING**

**Do not stand behind the weapon while removing the buffer, as the driving spring may be released, striking you or others.**

- c. Remove the buttstock and buffer assembly.
  - (1) Depress the backplate latch.
  - (2) Lift the buffer straight up.
- d. Remove the drive-spring assembly.

- (1) Press the drive-spring forward and up with your thumb.
  - (2) Pull rearward on the drive-spring rod assembly, removing it from the receiver.
- e. Raise the cover assembly.
  - f. Remove the bolt and the operating rod assembly.
    - (1) Pull the cocking handle or charging cable to the rear slowly.
    - (2) Pull the bolt and the operating rod out of the receiver.
- g. Remove the cover assembly.
    - (1) Depress and remove the spring pin.
    - (2) Lift the cover up and off the receiver.
    - (3) Remove the feed tray.
- h. (M240B or M240L only) Extend bipod legs to down and locked position.

3. Maintain the machine gun in accordance with TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010.

**Note:** Maintaining the machine gun includes inspecting all parts for dirt, debris, cleanliness, and serviceability.

4. Assemble the machine gun.
  - a. Install the feed tray and cover assembly.
    - (1) Place feed tray on receiver.
    - (2) Place cover assembly on receiver.
    - (3) Push cover assembly forward.
    - (4) Close cover assembly.
    - (5) Insert the cover spring pin from the right side.
  - b. Open the cover assembly.
  - c. Install the bolt and operating rod.
    - (1) Ensure that the bolt and operating rod are fully extended.
    - (2) Insert the bolt and operating rod into the rear of the receiver.
    - (3) Push the entire bolt and operating rod assembly into the receiver as far forward as possible.
    - (4) Close cover assembly and ensure it locks.
  - d. Install the driving spring assembly.

- (1) Insert the drive-spring rod assembly into the receiver.
  - (2) Push in and lower the drive-spring rod assembly to engage the retaining stud into the hole located on the bottom of the receiver.
- e. Install the buffer assembly.
- (1) Position the bottom recess grooves of the buttstock onto the top of the receiver recess grooves.
  - (2) Slide the buttstock down until it locks in place on the receiver.
- f. Install the trigger housing.
- (1) Place trigger housing safety to F (Fire) position.
  - (2) (M240 or M240C only) Slide the charger cable through cable guide.
  - (3) Insert the holding notch on the front of the trigger housing into the forward recess on the bottom of the receiver.
  - (4) Rotate the rear of the trigger housing upwards and align the holes of the trigger housing with the mounting bracket on the receiver.
  - (5) Position trigger housing assembly into place.
  - (6) Insert the spring pin into the hole, securing the assembly to the receiver.
- g. Install the barrel.
- (1) Insert the barrel into the socket.
  - (2) Push the barrel release to the right.
  - (3) Install heat shields.
5. Correct any operator-level deficiencies, as needed.
6. Perform a function check.
- a. Move the safety switch to the F (Fire) position.
  - b. Charge the weapon by pulling the cocking handle rearward until the bolt is locked in the rear position.
  - c. Return the cocking handle to the forward position.
  - d. Move the safety switch to the S (Safe) position.
  - e. Press the trigger.
- Note:** Bolt should not go forward. If bolt does go forward, annotate deficiency on DA Form 2404 or DA Form 5988-E.
- f. Move the safety switch to the F (Fire) position.
  - g. Pull the cocking handle to the rear.

- h. Press the trigger while manually riding the bolt forward.
  - i. Close the ejection port cover.
7. Report any uncorrected deficiencies, if found, on DA Form 2404 or DA Form 5988-E.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Verified the machine gun was cleared.	_____	_____
2. Disassembled the machine gun.	_____	_____
3. Maintained the machine gun.	_____	_____
4. Assembled the machine gun.	_____	_____
5. Corrected any operator-level deficiencies, as needed.	_____	_____
6. Performed a function check.	_____	_____
7. Reported any uncorrected deficiencies, if found, on DA Form 2404 or DA Form 5988-E.	_____	_____

<b>References Required</b>	<b>Primary</b>
DA Form 2404 Equipment Inspection and Maintenance Worksheet	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010
DA Form 5988-E Equipment Maintenance and Inspection Worksheet	Machine Gun, 7.62MM, M240 (NSN 1005-01-025-8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359-2714, M240N (1005-01-493-1666)

**071-025-0006**  
**Zero an M240B or M240L Machine Gun**

**Conditions:** You are assigned an M240B or M240L machine gun and have been directed to zero the weapon. You have loose or linked 7.62-millimeter ammunition and a basic machine gun target located 10 meters from the firing position or a target located 300 to 700 meters from the firing position. The M240 is mounted on a tripod.

**Standards:** Zero the M240 to ensure the point of aim and the strike of the rounds impact at the same point on the target.

**Performance Steps**

1. Zero the M240 using the 10-meter zero technique.

**Note:** The 10-meter zero applies only to firing at the 10-meter basic machine gun target. Zeroing for combat is done at the 300- to 700-meter range.

- a. Set elevation scale at 500 meters.
- b. Assume a firing position.
- c. Establish a shot group.
  - (1) Load the M240.
  - (2) Fire three single rounds (one round at a time) at the center base of the aiming point on the basic machine gun target.

**Notes:** The same sight alignment and sight picture must be used for each round fired.

Do not adjust sights until all three rounds are fired.

The shot group should be within a 4-centimeter circle or smaller to establish the center of the shot group in relation to the center base of the aiming post.

- d. Adjust sights if necessary.
  - (1) Correct for windage if the center of the shot group is to the left or right of the point of aim.
    - (a) Unlock the front sight retaining strap and rotate it up.
    - (b) Turn the adjusting screws on the front sight assembly in the direction of the desired change.
  - (2) Correct for elevation if the center of the shot group is above or below the point of aim.
    - (a) Unlock the front sight retaining strap and rotate it up.
    - (b) Turn the front sight post in the direction (up or down) of the desired change.

**Note:** At 10-meter range, 10 clicks on the adjusting screw of the front sight assembly in either direction moves the strike of the round left or right 1 centimeter.

- (2) Correct for elevation if the center of the shot group is above or below the point of aim.
  - (a) Unlock the front sight retaining strap and rotate it up.
  - (b) Turn the front sight post in the direction (up or down) of the desired change.

**Note:** At 10-meter range, one complete turn on the front sight blade moves the strike of the round up or down 1 centimeter.

- e. Fire another three-shot group.
  - (1) If shot group is centered on point of aim, weapon system is zeroed.
  - (2) If shot group is not centered on point of aim, continue zero procedures starting with step 1d.
2. Field zero (combat zero) the weapon at 300 to 700 meters.
  - a. Select a target at a range between 300 and 700 meters.
  - b. Adjust rear sight elevation to match target range.
  - c. Assume a firing position.
  - d. Fire a five- to seven-round burst at the center base of the target.
  - e. Observe impact of rounds.
  - f. Adjust sights to move center of beaten zone to point of aim on the target.
    - (1) Correct for windage if the center of the shot group is to the left or right of the point of aim.  
**Note:** One click or 1-mil adjustment at 1,000 meters moves the point of aim 1 meter. For example, if the center of the beaten zone is 1 meter to the left of a 500-meter target, the windage knob should be turned two clicks to the right.
      - (a) Unlock the front sight retaining strap and rotate it up.
      - (b) Turn the adjusting screws on the front sight assembly in the direction of the desired change.
    - (2) Correct for elevation if the center of the shot group is high or low of the point of aim.
      - (a) Unlock the front sight retaining strap and rotate it up.
      - (b) Turn the front sight post in the direction (up or down) of the desired change.
  - g. Fire a five to seven-round burst.
    - (1) If shot group is centered on point of aim, weapon system is zeroed.
    - (2) If shot group is not centered on point of aim, continue zeroing procedures starting with step 2f.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Zeroed the M240 using the 10-meter zero technique.	_____	_____
2. Field zeroed (combat zero) the weapon at 300 to 700 meters.	_____	_____

References Required	Primary
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)

**071-025-0003**  
**Load an M240B or M240L Machine Gun**

**Conditions:** You are assigned an M240B or M240L machine gun (mounted on bipod, tripod, or vehicle) and must load it in preparation for operation. You have linked 7.62-millimeter ammunition.

**Standards:** Load linked ammunition in the feed tray groove so that when the cover is closed, a round remains in the tray groove.

**Performance Steps**

1. Clear the weapon.
  - a. Place safety to the F position.
  - b. Charge the weapon.
    - (1) Pull the cocking handle to the rear, locking the bolt in the rear position.
    - (2) Push the cocking handle to the forward and locked position.
  - c. Place safety to the S position.
  - d. Open the cover assembly.
    - (1) Press in and hold the feed cover latches.
    - (2) While holding the latches, lift up on the cover assembly.
  - e. Remove any ammunition if it is present.
  - f. Raise the feed tray.
  - g. Inspect the chamber to ensure no ammunition is present.
  - h. Lower the feed tray.
  - i. Place safety to the F position.
  - j. Pull and hold cocking handle to the rear.
  - k. While holding the cocking handle to the rear, depress the trigger and ease the bolt forward to the closed and locked position.
2. Load ammunition.
  - a. Position the open side of links in the down position.
  - b. Place link belt on feed tray with the first round against the cartridge stop and tip of round pointing towards the barrel.
  - c. Close the cover assembly.
  - d. Ensure the latches lock into place.

- e. Make sure round does not move away from cartridge stop during closing and latching of cover.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared weapon.	_____	_____
2. Loaded ammunition.	_____	_____
<b>References Required</b>		<b>Primary</b>
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)	

**071-025-0004**  
**Unload an M240B or M240L Machine Gun**

**Conditions:** You have an M240B or M240L machine gun loaded with linked 7.62-millimeter ammunition and have a requirement to unload it.

**Standards:** Remove all ammunition and links from the weapon. Clear the weapon, ensure the chamber is empty, and the safety is on F (Fire).

**Performance Steps**

1. Remove ammunition from the machine gun.

- a. With palm up, pull the cocking handle to the rear, ensuring that the bolt locks to the rear.
- b. Return the cocking handle to its forward position.
- c. Place the safety lever on S (Safe).
- d. Raise the cover and remove ammunition belt.
- e. Remove any ammunition, links, or brass from the chamber area.

2. Clear the machine gun.

- a. Confirm that no ammunition remains in the chamber.
- b. Close the cover.
- c. Place the safety on F (Fire).

**CAUTION**

The bolt must be eased forward to prevent damage to the feed tray assembly and operating rod assembly.

d. With palm up, pull the cocking handle to the rear and hold it.

e. Pull the trigger, allowing the bolt to ease forward.

**Performance Measures**

1. Removed ammunition from the machine gun.
2. Cleared the machine gun.

**GO**

**NO-GO**

\_\_\_\_

References Required	Primary
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)

**071-025-0002**

## **Perform a Function Check on an M240B or M240L Machine Gun**

### **WARNING**

**Before performing a task on any weapon, always check to ensure that the weapon is clear.**

**Conditions:** You have just completed maintenance on the M240B or M240L machine gun and must ensure it is functioning correctly. The M240 was cleared during maintenance.

**Standards:** Conduct a function check of the M240B or M240L machine gun to ensure it is correctly assembled and functions properly.

### **Performance Steps**

1. Place safety lever to the F position.
2. Lock the bolt to the rear position by pulling the cocking handle to the rear.
3. Push cocking handle to the forward position until it locks in the forward position.
4. Place safety lever to the S position.
5. Depress the trigger.

**Note:** The bolt should not fall.

- a. If the bolt falls the machine gun is inoperative, notify your supervisor.
- b. If the bolt does not fall, continue to the next step.
6. Place safety lever to the F position.
7. Pull and hold the cocking handle to the rear.
8. While holding the cocking handle to the rear, depress the trigger, and ease the bolt to the forward and locked position.
9. Close the ejection port cover.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Placed the safety lever to the F position.	_____	_____
2. Locked the bolt to the rear position.	_____	_____
3. Pushed the cocking handle to the forward locking position.	_____	_____
4. Placed the safety lever to the S position.	_____	_____

Performance Measures	GO	NO-GO
5. Depressed the trigger.	_____	_____
6. Placed the safety lever to the F position.	_____	_____
7. Pulled and held the cocking handle to the rear position.	_____	_____
8. Depressed the trigger and eased the bolt to the forward and locked position.	_____	_____
9. Closed the ejection port cover.	_____	_____

References Required	Primary
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)

**071-025-0007**  
**Engage Targets with an M240B or M240L Machine Gun**

**Conditions:** You are a member of a squad conducting dismounted operations and have been assigned a sector of fire by your leader. You have an M240B or M240L machine gun and individual combat/personal protective equipment.

**Standards:** Assume an appropriate firing position and identify targets in the assigned sector of fire. Fire the machine gun using appropriate aiming and engagement techniques to ensure each target is hit or suppressed.

**Performance Steps**

1. Assume a suitable firing position.

**Notes:** The fighting position should allow you to observe and engage targets, yet minimize your exposure to enemy fire.

Firing from the bipod is the most stable and accurate firing position and should be used whenever able.

2. Identify targets in your designated sector of fire.

3. Align the sights on the target.

a. Obtain sight alignment by centering the front sight blade in the aperture of the rear sight with the top of the front sight blade even with the top of the rear sight slide.

b. Obtain a sight picture by centering the target over the front sight blade so that it appears to rest on top of the front sight blade and on top of the rear sight slide.

4. Engage targets using correct firing techniques.

a. Select proper fire engagement technique based on target types.

(1) Use fixed fire against a point target when only one aiming point is necessary to cover the target with fire.

(2) Use traversing fire to distribute fire on wide targets by successive changes in direction.

(a) Tripod-mounted gun—make changes in 2- to 6-mil increments on the traversing hand wheel between bursts.

(b) Bipod-mounted gun—

  \_1\_ Make minor changes by shifting your shoulders to the right or left to select successive aiming points throughout the width of the target area.

  \_2\_ Make major changes by moving your elbows and align your body to remain directly behind the gun.

(3) Use searching fire to distribute fire on deep targets by successive changes in elevation.

(a) Tripod-mounted gun—make changes in 2- to 6-mil increments on the traversing handwheel between bursts.

- (b) Bipod-mounted gun—move your elbows closer together to lower the muzzle or farther apart to raise the muzzle.
- (4) Use traversing and searching to distribute fire on wide and deep targets by successive changes in direction and elevation.
- (5) Use swinging traverse fire to deliver fire against targets too wide to cover with the traversing handwheel or against fast moving targets.

**Note:** Use this fire engagement technique only when M240B or M240L are in a tripod-mounted configuration.

- (a) Loosen the traversing slide lock lever and make changes in direction by moving the muzzle left or right.
- (b) Make changes in elevation by turning the elevating handwheel.
- (6) Use free gun fire (tripod- or vehicle-mounted gun only) against targets requiring rapid major changes in direction and elevation.

**Note:** To deliver this type of fire, the traverse and elevation mechanism is removed from the receiver to allow the gun to be moved in any direction.

b. Use proper application of fire to engage specific types of targets.

- (1) Point target—engage with fixed fire.
- (2) Area target—
  - (a) Initially aim at the midpoint of the target area.
  - (b) Traverse and search to either flank, then back to the opposite flank.
- (3) Linear target—
  - (a) Initially aim at the midpoint of the target.
  - (b) Traverse fire to one flank and then to the other to cover the entire target.
- (4) Deep target—
  - (a) Initially aim at the midpoint of the target unless, another portion of the target is more critical or presents a greater threat.
  - (b) Search down to one aiming point in front of the near end and back up to one aiming point beyond the far end.
- (5) Linear target with depth—
  - (a) Initially aim at the midpoint of the target, unless another portion of the target is more critical or presents a greater threat.
  - (b) Traverse and search to the flank closest to your position, then back to the other to cover the entire target.
- (6) Moving target—

- (a) Estimate the speed of the target and the lead required to fire and hit it.
  - (b) Fire and track the target as it moves.
  - (c) Adjust the lead by observing tracers and the strike of the bullets.
- c. Adjust fire to place effective fire on the target, based on time, range, and amount of adjustment, using one of the following methods:
- (1) Sight correction method.

**Note:** This method is used when the initial burst is not correctly placed; adjust elevation and windage as required. This method is time-consuming.

- (2) Adjusted aiming point method.

**Note:** The adjusted aiming point method is used to quickly adjust fires without making a sight adjustment. If the initial burst misses the target, rapidly select a new aiming point the same distance from the target as the center of impact of the initial burst.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Assumed a suitable firing position.	_____	_____
2. Identified targets in designated sector of fire.	_____	_____
3. Aligned the sights on the target.	_____	_____
4. Engaged targets using correct M240 firing techniques.	_____	_____

<b>References Required</b>	<b>Primary</b>
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025-8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359-2714), M240N (1005-01-493-1666)

**071-025-0005**  
**Correct Malfunctions of an M240B or M240L Machine Gun**

**Conditions:** You are engaging targets with your M240B or M240L machine gun and the weapon stops firing, continues to fire after the trigger is released, or begins to fire sluggishly.

**Standards:** Perform the actions required to correct the identified M240 machine gun malfunction.

**Performance Steps**

1. Take immediate action to correct a failure to fire.

**Notes:** Immediate action is performed to reduce a stoppage without seeking the cause.

The machine gun remains on your shoulder while performing immediate action procedures.

The mnemonic POPS will help you remember the steps for immediate action.

- a. Pull the cocking handle (right hand/palm up) to the rear.
- b. Observe the ejection port to see if a cartridge case, belt link, or round ejects.
  - (1) If a cartridge, belt link, or round ejects, continue to the next step (step 1c).
  - (2) If nothing ejects—
    - (a) Lock the bolt to the rear.
    - (b) Proceed to remedial action.
- c. Push the cocking handle forward.
- d. Press the trigger.
  - (1) Continue the mission if the weapon fires.
  - (2) Proceed to remedial action if the weapon does not fire.

2. Take remedial action to correct a failure to fire.

**Note:** Remedial action is taken only if immediate action fails to correct the malfunction. The most common stoppage or malfunction is ammunition obstructing the chamber, which can normally be solved very quickly. If this is not the cause, then a more detailed search for the cause is required. Once, the cause of the stoppage or malfunction is identified, take the necessary steps to correct it.

- a. Place the machine gun on safe.
- b. Ensure the cocking handle is forward.
- c. Keep the machine gun oriented on the target area.

**DANGER**

**A weapon that has fired 200 successive rounds or more is considered a 'hot' weapon and can "cook off" additional rounds without any action by the firer.**

- d. Wait the appropriate amount of time.

**Notes:** No wait time, if the weapon is cold (fired less than 200 rounds in 2 minutes).

Five-second wait time, if the weapon is hot (fired more than 200 rounds in 2 minutes) and you are in a combat environment.

Fifteen-minute wait time, if the weapon is hot (fired more than 200 rounds in 2 minutes) and you are in a training environment.

- e. Correct an obstructed chamber.

- (1) Ensure your face is not directly over the feed tray cover.
- (2) Open the feed tray cover.
- (3) Remove the ammunition belt, all spent brass, links and loose rounds.
- (4) Raise the feed tray assembly.
- (5) Remove all spent brass, links or loose rounds.
- (6) Visually inspect the chamber for obstructions.
- (7) Remove obstructions.
  - (a) Remove single rounds by angling the ejection port downward and shaking the machine gun.
  - (b) Remove jammed rounds by using a pointed object to loosen jammed rounds and then shaking them out.
  - (c) Remove a round/cartridge case that is stuck in the chamber by using a cleaning rod, without the swab holder attached, to push it out.
- (8) Reload the machine gun.
- (9) Attempt to re-engage the target.
  - (a) Continue the mission if the machine gun fires.
  - (b) Perform immediate action a second time if the machine gun again fails to fire.
  - (c) Proceed to correct a mechanical malfunction if the machine gun fails to fire after the second immediate action is performed.

- f. Correct a mechanical malfunction.

- (1) Clear the machine gun.
- (2) Disassemble the machine gun.
- (3) Inspect for missing or broken parts.

**Note:** If missing, worn, burred or broken parts are identified, then record the information, and replace the parts or turn in for repair.

- (4) Clean dirty or corroded parts.
- (5) Lubricate the machine gun.
- (6) Assemble the machine gun.
- (7) Perform a function check.
- (8) Load the machine gun.
- (9) Engage targets.

3. Perform corrective actions to secure a runaway weapon.

**Note:** A runaway weapon or uncontrolled fire is when the weapon continues to fire after the trigger has been released.

- a. Take immediate action to secure a runaway weapon.
  - (1) Keep the machine gun oriented on the target area.
  - (2) Stop the ammunition feed by breaking or twisting the ammunition belt.
  - (3) Allow all remaining rounds in the loaded belt to fire.
- b. Take corrective action to secure a runaway weapon.
  - (1) If the machine gun is suspected of being overheated—
    - (a) Wait 5 minutes to allow the machine gun to cool.
    - (b) Load the machine gun.
    - (c) Engage targets.
  - (2) If the machine gun is suspected of having a mechanical malfunction—
    - (a) Clear the machine gun.
    - (b) Disassemble the machine gun.
    - (c) Inspect the machine gun.

**Note:** If missing, worn, burred or broken parts are identified, then record the information and replace the parts or turn in for repair. The following deficiencies are commonly associated with a runaway weapon: broken,

worn, burred, or stuck sear; worn sear notch on the piston assembly; carbon buildup in the gas system; or missing or broken parts.

- (d) Clean dirty or corroded parts.
- (e) Lubricate the machine gun.
- (f) Assemble the machine gun.
- (g) Perform a function check.
- (h) Load the machine gun.
- (i) Engage targets.

4. Correct sluggish operation of the machine gun.

- a. Clear the machine gun.
- b. Disassemble the machine gun.
- c. Inspect the machine gun.

**Note:** If missing, worn, burred or broken parts are identified, then record the information and turn the machine gun in for repair.

- d. Clean dirty or corroded parts.
- e. Lubricate the machine gun.
- f. Assemble the machine gun.
- g. Perform a function check.
- h. Load the machine gun.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Took immediate action to correct a failure to fire.	_____	_____
2. Took remedial action to correct a failure to fire.	_____	_____
3. Performed corrective actions to secure a runaway weapon.	_____	_____
4. Corrected sluggish operation of the machine gun.	_____	_____

References Required	Primary
TC 3-22.240 Medium Machine Gun	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)

**071-025-0008**

## **Construct a Fighting Position for an M240B or M240L Machine Gun**

**Conditions:** You are a member of an M240 machine gun crew. You are equipped with an M240B or M240L machine gun; tripod; traverse and elevation mechanism; entrenching tool and pioneer tools (shovel, axe); overhead cover materials (such as logs and boards); personal protective gear; and appropriate camouflage material. You have been assigned a defensive position; primary and secondary sectors of fire; a final protective line (FPL) or principal direction of fire (known as PDF); and are required to construct a fighting position for the machine gun.

**Standards:** Construct an M240 fighting position with frontal, side, rear protection, overhead cover and camouflage, which allows the engagement of targets in the entire sector of fire.

**Notes:** The tripod is used on the side with the primary sector of fire, and the bipod legs are used on the side with the secondary sector. When changing from primary to secondary sectors, the machine gun is moved but the tripod stays in place.

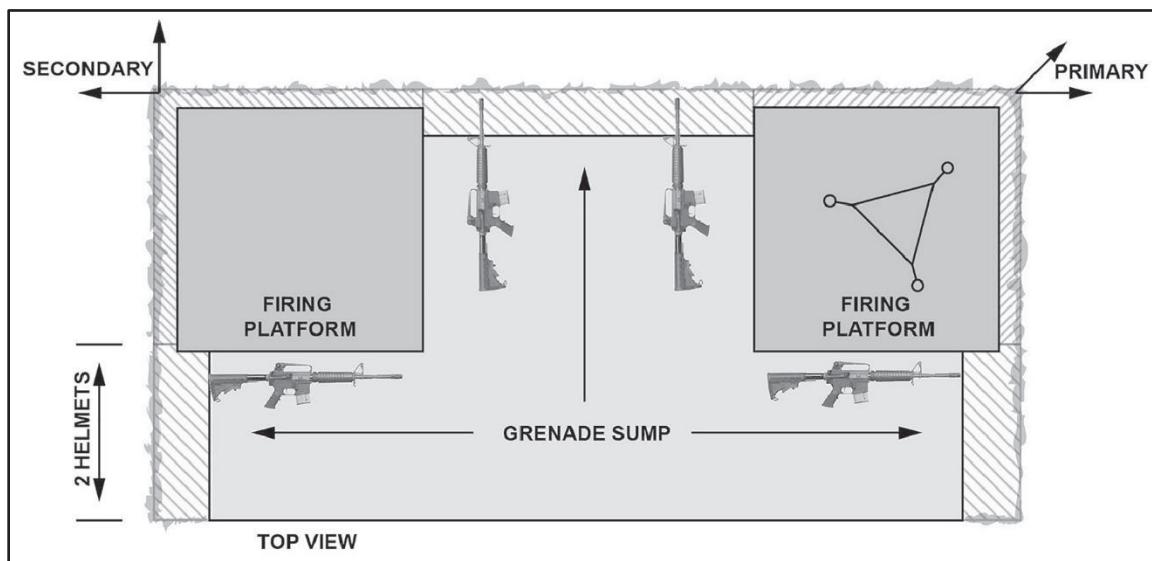
The degree of fighting position completion depends upon the time available.

### **Performance Steps**

1. Construct stage 1.
  - a. Identify sector(s) of fire (primary and secondary).
  - b. Identify FPL or PDF.
  - c. Position the gun on the tripod so the muzzle points in the direction of the FPL or PDF.
  - d. Check fields of fire from the prone position.
  - e. Mark the position of the tripod legs.
  - f. Position the gun using the bipod so the muzzle points in the direction of the secondary sector of fire.
  - g. Emplace aiming and limiting stakes (secondary sector only).
  - h. Emplace grazing fire logs or sandbags to achieve grazing fire (secondary sector only).
  - i. Decide whether to build overhead cover up or down.
- j. Trace the outline of the fighting position on the ground (see figure 3-387).

**Note:** Overhead cover may be built up or down. Built-up overhead cover is constructed on top of the parapets up to 18 inches (46 centimeters) and provides for maximum room inside the fighting position and adequate space between the end walls of the fighting position and the overhead cover. Built-down overhead cover is constructed at or below ground level and should not exceed 12 inches (30 centimeters). This lowers the profile of the fighting position, which aids in avoiding detection. However, it restricts the space fighting space between the end walls of the fighting position and the overhead cover. To account for this restricted space, the width of the fighting position should be extended an additional M16 length.

**Note:** Outline a position in the shape of an inverted T with the shaft of the T pointed in the direction of fire and the top of the T longer than the shaft of the T. When an M240 machine gun is assigned only one sector of fire, dig only half of the position (one firing platform) and build overhead cover off to its flank.



**Figure 3-387. Outline of M240 fighting position**

- k. Clear primary and secondary (if applicable) fields of fire.
- 2. Construct stage 2.
  - a. Emplace overhead cover supports to front and rear of position.
  - b. Ensure you have at least 12 inches (30 centimeters), which is about 1-helmet length distance, from the edge of the hole to the beginning of the overhead cover supports.
  - c. Dig a firing platform 4 to 6 inches deep on the primary sector of fire side of the position.
  - Note:** The gun's height is reduced by digging the tripod platform down as much as possible. However, the platform is dug to keep the gun traversable across the entire sector of fire. Return the machine gun and tripod to cover the primary sector of fire after you have dug the primary sector of fire firing platform.
  - d. Dig a trench for the M240's bipod on the secondary sector firing platform.
  - e. Construct parapet retaining walls.
    - (1) Construct front retaining wall—at least 10-inches (25 centimeters) high, (two filled sandbags) deep, and two M16s long.
    - (2) Construct rear retaining wall—at least 10-inches (25 centimeters) high and one M16 long.
    - (3) Construct flank retaining walls—at least 10-inches (25 centimeters) high and one M16 long.
  - f. Verify parapets are high enough to cover your head.
  - g. Remove the top layer of dirt from the hole.
    - (1) Set aside grass or foliage for camouflage.
    - (2) Use soil to fill sandbags for walls.

**3. Construct stage 3.**

- a. Dig position with vertical walls to a maximum depth of armpit deep (if soil conditions permit).

**Note:** If site soil properties cause unstable soil conditions, consider sloping walls or construct revetments. For sloped walls, first dig a vertical hole, and then slope walls at 1:4 ratio (move 12 inches [30 centimeters] horizontally for each 4 feet [1.22 meters] vertically).

- b. Build frontal, flank, and rear cover (parapets) with dirt dug from the position.

**Note:** Frontal cover should be built first. The rest of the dirt should be used to build flank and rear cover. All cover should be at least 18-inches thick and high enough to hide the helmet of the Soldiers in the fighting position. Sand bags should be used if available.

- c. Verify you can fire to the front, oblique, and cover the entire sector of fire from this position.

**Note:** The position must be deep enough to protect the crew and allow the gunner to place effective fire on the assigned sector (armpit deep). It must also be wide enough to permit the crew to move about with ease while wearing personal protective gear.

- d. Dig three grenade sumps in the floor (one on each end of the T).

**Note:** Grenade sumps are as wide as the entrenching tool blade, at least as deep as an entrenching tool and as long as the position floor is wide.

- e. Slope the floor toward the grenade sumps.

- f. Dig a storage compartment in the bottom of the back wall; the size of the compartment depends on the amount of equipment and ammunition to be stored.

- g. Install revetments, if required, to prevent wall collapse/cave-in.

- h. Emplace stringers for overhead cover.

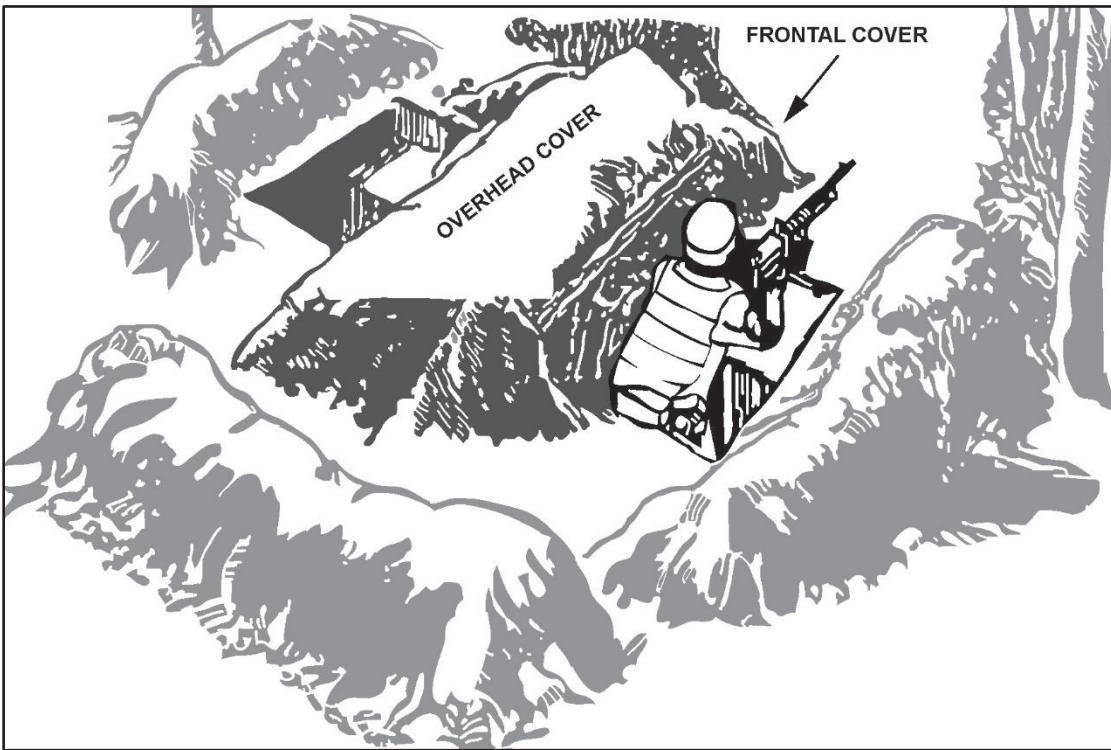
- (1) Use 2x4s, 4x4s, limbs (4 to 6 inches in diameter) or pickets ("U" facing down).

- (2) Make overhead cover stringers standard length, which is 8 feet (2.4 meters).

**4. Construct stage 4.**

- a. Install overhead cover across the center of the position (see figure 3-388).

**Note:** Overhead cover must blend naturally with the terrain. Overhead cover should extend to cover both firing platforms when a position has a primary and a secondary firing platform. Failure to properly construct overhead cover can result in reduced fields of fire, inability to mount night vision devices, or problems in reloading.



**Figure 3-388. Overhead cover**

- (1) Emplace dustproof layer—typically 4 foot x 4 foot sheets of  $\frac{3}{4}$ -inch plywood centered over dug position.
- (2) Nail plywood dustproof layer to stringers.
- (3) Emplace at least 18 inches (46 centimeters) of sand-filled sandbags for overhead burst protection (four layers).

**Note:** As a minimum, these sandbags must cover an area that extends to the sandbags used for the front and rear retaining walls.

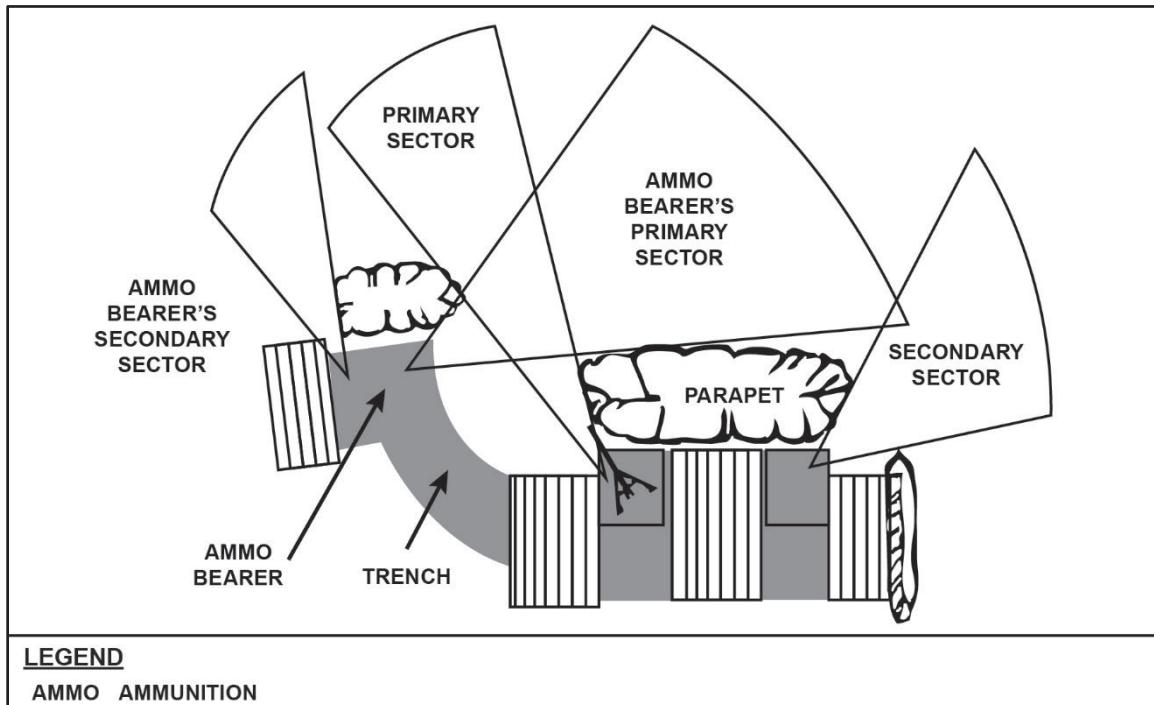
- (4) Use plastic or a poncho for waterproofing layer.
- (5) Fill center cavity with soil from dug hold and surrounding soil.

b. Camouflage the fighting position.

- (1) Mold the overhead cover and parapets to blend with the surrounding terrain.
- (2) Camouflage the position with natural materials that do not have to be replaced (rocks, logs, live bushes, grass), available materials (grass, clumps, foliage) to make the position blend with surroundings or camouflage screen systems.
- (3) Verify that the position is concealed to an observer from out in front of the position.

5. Construct the ammunition bearers fighting position (see figure 3-389, page 3-950.).

**Note:** With a three-Soldier crew for a machine gun, the (ammunition bearer) digs a one-Soldier fighting position to the flank. From this position, the ammunition bearer can see and shoot to the front and oblique. Usually, ammunition bearers are on the same side as the FPL or PDF. This allows them to cover the machine gun's secondary sector and to observe the gunner and assistant gunner. The ammunition bearer's position is connected to the gun position by a crawl trench so the bearer can transport ammunition or replace one of the gunners.



**Figure 3-389. Ammunition bearer's position**

- a. Dig a one-man fighting position to the flank.
- b. Dig a crawl trench between the machine gun position and the ammunition bearer position.
- c. Camouflage the ammunition bearer's fighting position and trench.

Performance Measures	GO	NO-GO
1. Constructed stage 1.	_____	_____
2. Constructed stage 2.	_____	_____
3. Constructed stage 3.	_____	_____
4. Constructed stage 4.	_____	_____
5. Constructed the ammunition bearer's fighting position.	_____	_____

<b>References Required</b>	<b>Primary</b>
ATP 3-21.8 Infantry Platoon and Squad	TC 3-21.75 The Warrior Ethos and Soldier Combat Skills
TC 3-22.240 Medium Machine Gun	
TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)	

**071-025-0009**

## **Lay an M240B or M240L Machine Gun Using Field Expedients**

**Conditions:** You are a gunner with an M240 machine gun and have a requirement to construct field expedient firing aids for the machine gun. You have a sector of fire, tools, and materials (stakes, sticks, logs, or boards) required to construct the firing aid. You may have a tripod for the M240; however, a traverse and elevation (known as T&E) mechanism is not available for use.

**Standards:** Determine the basic design of the field-expedient firing aid. Construct a grazing fire board/log and emplace sector and aiming stakes as needed.

**Note:** Typically, field expedients are emplaced so that either the front of the weapon pivots while the rear swings left or right or the rear of the weapon pivots while the front swings left or right. Additionally either the bipod legs are down and used or the barrel is kept up by a grazing fire log or by being mounted on a tripod. If the T&E mechanism is functioning, then field expedients are not needed; however, if the T&E mechanism is not available, then the tripod should still be used.

### **Performance Steps**

1. Determine the type of the field expedient to be used.

- a. Tripod-supported grazing fire board or log.
- b. Bipod-supported grazing fire board or log.
- c. Sector stakes and aiming stakes only (bipod mode).

2. Construct a grazing fire board or log.

a. Construct a grazing fire board or log for a tripod without T&E.

- (1) Acquire a log or board, 2 to 4 inches in diameter or width.
- (2) Ensure at least one side of the log or board has a relatively flat and smooth surface.
- (3) Select two sturdy straight stakes.

**Note:** Tree limbs 1 to 1.5 inches in diameter or pieces of an ammunition box about 18 inches long make good sector stakes.

(4) Ensure the bottom end of each stake is pointed.

- (5) Lay the M240, mounted on the tripod, in the center of its firing location and secure the legs of the tripod.
- (6) Place the grazing fire log or board beneath the barrel of the weapon.

**Note:** This allows the barrel to freely slide across the log/board to the left and right limits.

(7) Adjust the height of the log or board by digging a trench or building up a berm to achieve grazing fire.

b. Construct a grazing fire board or log for M240 without a tripod (bipod mode).

(1) Acquire a log or board, 2 to 4 inches in diameter or width.

- (2) Ensure at least one side of the log or board has a relatively flat and smooth surface.
- (3) Select two sturdy straight stakes.

**Note:** Tree limbs 1 to 1.5 inches in diameter or pieces of an ammunition box about 18 inches long make good sector stakes.

- (4) Select one sturdy forked tree limb 12 to 14 inches long (or two more straight stakes to make an 'X') to serve as the pivot stake.
- (5) Ensure the bottom end of each stake is pointed.
- (6) Lay the M240 in the center of its firing location.
- (7) Determine whether the grazing fire log or board will be under the barrel or under the stock.
  - (a) Mark the location of the log or board under the barrel or stock.
  - (b) Mark the pivot point at the opposite end of the weapon (stock or barrel).
- (8) Place the grazing fire log or board beneath the barrel or stock of the weapon.

**Note:** This allows the weapon to freely slide across the log/board to the left and right limits.

- (9) Solidly drive a forked tree limb (or the two straight stakes in the shape of an "X") into the spot marked on the ground for the pivot point.
- (10) Adjust the height of the log or board by digging a trench or building up a berm or height of the pivot stake to achieve grazing fire.

c. Emplace sector stakes.

- (1) Locate the left and right limits of your sector of fire.
- (2) Lay the M240 on the left or right sector of fire.
- (3) Place a sector stake on the outside of the barrel (or stock) just behind the grazing fire log/board to prevent the weapon from moving past the sector limit.
- (4) Drive the sector stake solidly into the ground to establish the left (or right) sector of fire.
- (5) Repeat for the opposite sector of fire limit.

d. Emplace aiming notches.

**Note:** The use of aiming stakes hampers the use of a grazing fire board/log so the technique of notching the aiming board is used instead of separate aiming stakes.

- (1) Place the M240 into the pivot stake.
- (2) Lay the M240 on the desired predesignated target.
- (3) Solidly notch the grazing fire log or board under the barrel or stock ensuring the weapon is aligned along the desired point of aim.

(4) Repeat for each predesignated target.

3. Employ sector stakes and aiming stakes (bipod mode).

a. Construct field expedients.

(1) Select two sturdy straight stakes.

**Note:** Tree limbs 1 to 1.5 inches in diameter or pieces of an ammunition box about 18 inches long make good sector stakes.

(2) Select one sturdy forked tree limb 12 to 14 inches long (or two more straight stakes to make an 'X') to serve as the pivot stake.

(3) Select one sturdy and any additional forked tree limb 12 to 14 inches long (or two more straight stakes to make an 'X') for each desired aiming point.

(4) Ensure the bottom end of each stake is pointed.

b. Emplace pivot stake.

**Note:** Instead of using a front pivot stakes the bipod legs themselves may be used. In this case, dig two circular trenches for the bipod legs to pivot within.

(1) Lay the M240 in the center of its firing location.

(2) Determine whether the pivot stake will be under the barrel or under the stock and mark the location of the pivot point under the appropriate part of the weapon (stock/barrel).

(3) Solidly drive a forked tree limb (or the two straight stakes in the shape of an "x") into the spot marked on the ground for the pivot point.

(4) Place the M240 into the pivot stake.

c. Emplace sector stakes.

(1) Locate the left and right limits of your sector of fire.

(2) Lay the M240 on the left or right sector of fire (using the pivot stake).

(3) Place a sector stake on the outside of the barrel (or stock) to prevent the weapon from moving past the sector limit.

**Note:** Notched stakes may be used to achieve the desired elevation.

(4) Solidly drive the sector stake into the ground.

**Note:** This establishes the left (or right) sector of fire.

(5) Repeat for the opposite sector of fire limit.

(6) Dig a shallow trench or groove to permit rotation of the bipod feet as you move the stock from one notch or stake to another.

d. Emplace aiming stakes.

- (1) Place the M240 into the pivot stake.
- (2) Lay the M240 on the desired predesignated target.
- (3) Solidly drive the notched tree limb under the barrel of stock.

**Note:** This ensures the weapon is aligned along this point of aim and at the desired height.

- (4) Repeat for each predesignated target.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Determined the type of the field expedient to be used.	_____	_____
2. Constructed a grazing fire board/log.	_____	_____
3. Employed sector stakes and aiming stakes (bipod mode).	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025- 8095) AND M240B (1005-01-412-3129) M240C (1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359- 2714, M240N (1005-01-493-1666)	TC 3-22.240 Medium Machine Gun

**071-025-0012**  
**Dismount an M240B or M240L Machine Gun from a Vehicle**

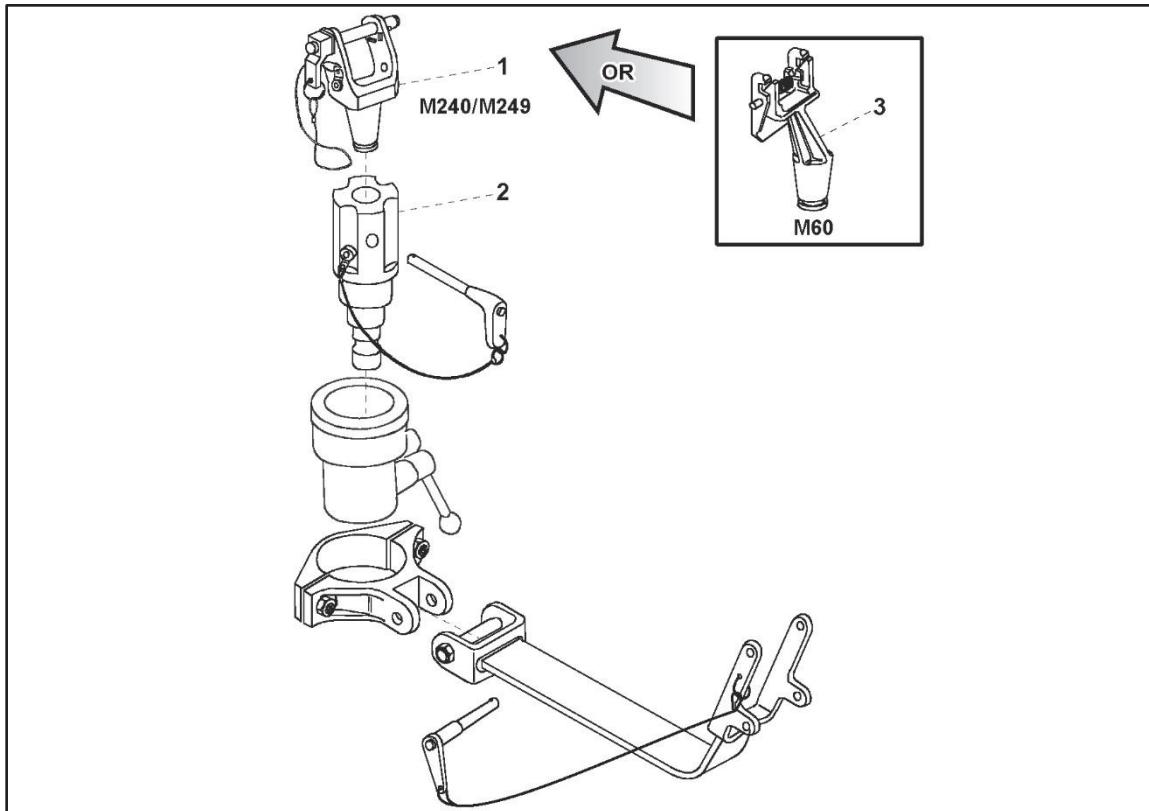
**Conditions:** You are a crewmember on a vehicle and you have been directed to dismount the M240B or M240L machine gun from the vehicle.

**Standards:** Clear the weapon, lock the ring brake assembly on the vehicle, and remove the M240 machine gun from the M197 weapon mount. Dismount the weapon mount from the pintle socket on the vehicle, if required.

**Performance Steps**

1. Clear the weapon.
2. Lock the ring brake assembly on the vehicle (if equipped).
3. Remove the machine gun from the M197 machine gun mount (see figure 3-390).

**Note:** Weapon mounts connect to a pintle socket located on a vehicle. The M197 mount consists of a travel lock assembly, travel lock bracket assembly, pintle adapter assembly, and a pintle.



**Figure 3-390. M197 weapon mount**

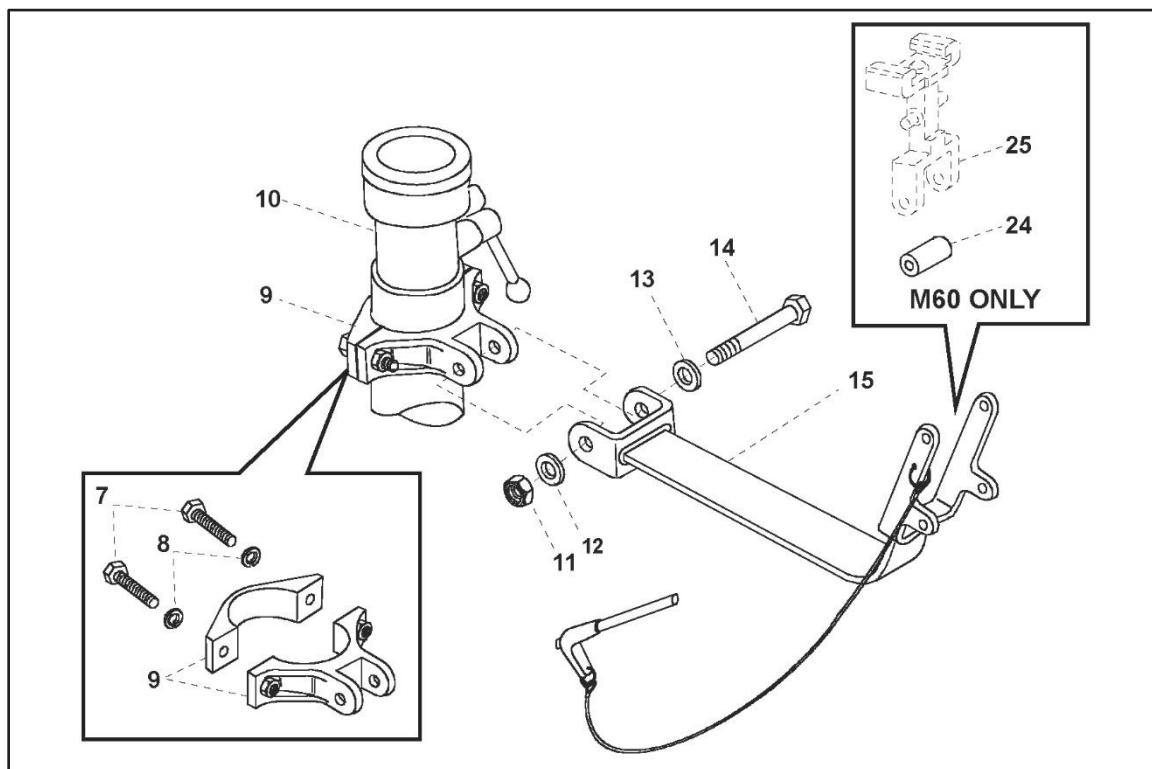
- a. Remove the quick release pin.
- b. Remove the weapon from the carriage by lifting the weapon up.
- c. Replace the quick release pin.

4. Dismount the weapon mount from the pintle socket on the vehicle, as required.

a. Disengage the pintle socket locking mechanism by doing one of the following:

**Note:** There are three locking mechanism types based on which type is mounted to the vehicle.

- (1) Loosen the four lock screws, using a 3/8-inch open-end box wrench, by turning counterclockwise until threaded ends are flush with pedestal socket's inner wall.
  - (2) Remove the pintle locking pin.
  - (3) Loosen the pintle locking lever.
- b. Dismount the M197 pintle and pintle adapter assembly from the pintle socket.
- (1) Remove the M197 pintle and pintle adapter assembly from the pintle socket on the vehicle by lifting it out of the pintle socket.
  - (2) Remove the quick release pin from the pintle adapter assembly.
  - (3) Remove the pintle from the pintle adapter assembly.
  - (4) Reinsert the quick release pin into the pintle adapter assembly.
  - (5) Uninstall the travel lock assembly (see figure 3-391).



**Figure 3-391. Uninstalling the M197 mount travel lock**

- (a) Uninstall the travel arm by removing two flat washers (see figure 3-391, items 12 and 13, page 3-957), hexagon head cap screw (see figure 3-391, item 14, page 3-957), and self-locking nut (see figure 3-391, item 11, page 3-957).
  - (b) Replace the two flat washers (see figure 3-391, items 12 and 13, page 3-957), hexagon head cap screw (see figure 3-391, item 14, page 3-957), and self-locking nut (see figure 3-391, item 11, page 3-957) into the travel arm to prevent loss of items.
  - (c) Uninstall the two halves (see figure 3-391, item 9, page 3-957) of travel lock bracket assembly from the structural tube of the pintle (see figure 3-391, item 10, page 3-957) by removing two lock washers (see figure 3-391, item 8, page 3-957) and two machine bolts (see figure 3-391, item 7, page 3-957).
  - (d) Reassemble the two halves of the travel lock bracket assembly using the two lock washers (see figure 3-391, item 8, page 3-957) and two machine bolts (see figure 3-391, item 7, page 3-957) to prevent loss of items.
- (6) Uninstall the ammunition adapter bracket and deflector, if installed.
- (a) Remove the two cap screws and two nuts.
  - (b) Remove the ammunition adapter bracket and deflector from the weapon.
  - (c) Reconnect the ammo adapter bracket and deflector using the two cap screws and two nuts to prevent loss of items.
- c. Re-engage the pintle socket locking mechanism by doing one of the following:
- (1) Tighten the four locking screws until mount will not pull out of socket.
  - (2) Insert the pintle locking pin.
  - (3) Tighten pintle locking lever.

<b>Performance Measures</b>	<b>GO</b>	<b>NO-GO</b>
1. Cleared the weapon.	_____	_____
2. Locked the ring brake assembly on the vehicle.	_____	_____
3. Removed the machine gun from the M197 machine gun mount.	_____	_____
4. Dismounted the weapon mount from the pintle socket on the vehicle, if required.	_____	_____

<b>References Required</b>	<b>Primary</b>
TM 9-1005-245-13&P/T.O. 11W2-8-1-322/TM 1005-13A&P/1 Operator's, Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List (RPSTL) for Ground Mounts;	TM 9-1005-313-10/T.O. 11W2-6-5-1/TM 08670A/09712A-10/B/SW360-AH-OPI-010 Machine Gun, 7.62MM, M240 (NSN 1005-01-025-8095) AND M240B (1005-01-412-3129) M240C

<b>References Required</b>	<b>Primary</b>
Machine Gun Mounts; and Combinations for Tactical/Armored Vehicles M122 Machine Gun Tripod (1005-00-710-5599) (EIC: 4EF) M122A1 Machine Gun Tripod (1005-00-433-1617) M192 Machine Gun Tripod (1005-01-503-0141) M3 Machine Gun Tripod (1005-00-322-9716) (EIC: 4EA) M142 Machine Gun Mount (1005-00-854-4463) 6650, .50 Caliber, Machine Gun Mount (1005-00-704-6650) M197 Machine Gun Mount (1005-01-413-4098) MK64 Machine Gun Mount MOD 5 (1010-01-180-9319); MOD 9 (1010-01-412-3159) MK93 MOD 0 Machine Gun Mount (USMC ONLY) (1005-01-383-2949) MK93 MOD 1 Machine Gun Mount 1005-01-383-2757) MK93 MOD 2 Machine Gun Mount (1005-01-502-7547)	(1005-01-085-4758), M240D (1005-01-481-6695), M240E1 (1005-01-252-4288) M240G (1005-01-359-2714), M240N (1005-01-493-1666)

TC 3-22.240 Medium Machine Gun

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# Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms for STP 17-19D1-SM-TG is the proponent are marked with an asterisk (\*). The proponent for other terms is listed in parenthesis after the definition.

## SECTION I – ACRONYMS AND ABBREVIATIONS

◦	degree
<b>AA</b>	avenue of approach
<b>ABS</b>	antilock braking system
<b>ACH</b>	advanced combat helmet
<b>ADP</b>	Army doctrine publication
<b>AFES</b>	Automatic Fire Extinguishing System
<b>AFMAN</b>	Air Force manual
<b>AGL</b>	above ground level
<b>ANR</b>	active noise reduction
<b>AP</b>	armor piercing
<b>AR</b>	Army regulation
<b>ARD</b>	antireflection device
<b>ATP</b>	Army techniques publication
<b>ATPIAL</b>	Advanced Target Pointer Illuminator Aiming Light
<b>ATT</b>	aided target tracker
<b>ATTP</b>	Army tactics, techniques, and procedures
<b>AZ</b>	azimuth
<b>BASS</b>	Bradley Advanced Survivability Seat
<b>BCF</b>	brightness/contrast/focus
<b>BCU</b>	battery coolant unit
<b>BFT</b>	blue force tracking
<b>BFV</b>	Bradley fighting vehicle
<b>BII</b>	basic issue items
<b>BIT</b>	built-in test
<b>BLEPS</b>	Ballistic Laser Eyewear Protection
<b>BUIS</b>	back-up iron sight
<b>C</b>	Celsius
<b>C4</b>	composition 4
<b>C4ISR</b>	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
<b>cal</b>	calibration
<b>CBRN</b>	chemical, biological, radiological, and nuclear
<b>CBRNE</b>	chemical, biological, radiological, nuclear, and explosives
<b>CCO</b>	close combat optic
<b>CCP</b>	central control panel
<b>CDET</b>	commander's data entry tool
<b>CG</b>	control grip
<b>CIK</b>	crypto ignition key
<b>CIV</b>	commander's independent viewer
<b>CFF</b>	call for fire
<b>CHS</b>	commander's hand station
<b>CLP</b>	cleaner, lubricant, and preservative
<b>CLU</b>	command launch unit
<b>cm</b>	centimeter
<b>COMSEC</b>	communications security
<b>CREW</b>	counter radio-controlled improvised explosive device electronic warfare
<b>CSCP</b>	commander's sight control panel
<b>CTD</b>	commander's tactical display

## Glossary

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<b>CTIS</b>	Central Tire Inflation System
<b>CV</b>	crypto variable
<b>C/VAM</b>	compass/vertical angle measurement
<b>CVC</b>	combat vehicle crewman
<b>DA</b>	Department of the Army
<b>DAGR</b>	Defense Advanced Global Positioning System Receiver
<b>dB</b>	decibel
<b>DC</b>	direct current
<b>DCD</b>	driver's compass display
<b>DCM</b>	display control module
<b>DD</b>	Department of Defense form
<b>DDC</b>	detector dewar cooler
<b>DDL</b>	digital data link
<b>DIDEA</b>	decide, identify, decide, engage, and assess
<b>DMC</b>	digital magnetic compass
<b>DNS</b>	day/night sight
<b>DPM</b>	dipropylene glycol methyl ether
<b>DU</b>	display unit
<b>DVE</b>	driver's vision enhancer
<b>DVO</b>	direct view optic
<b>EL</b>	elevation
<b>ESD</b>	electro-static discharge
<b>F</b>	Fahrenheit
<b>FBCB2</b>	Force XXI Battle Command, brigade and below
<b>FCU</b>	fire control unit
<b>FDC</b>	fire direction center
<b>FFCS</b>	full function crew station
<b>FH</b>	frequency hopping
<b>FHM</b>	frequency hopping-master
<b>FLIR</b>	forward-looking infrared
<b>FM</b>	field manual
<b>FMFM</b>	Fleet Marine Force manual
<b>FOV</b>	field of view
<b>FPL</b>	final protective line
<b>FRK</b>	field repair kit
<b>FSV</b>	fire support vehicle
<b>ft-lb</b>	foot-pound
<b>G-SIZE</b>	gate size
<b>GCH</b>	gunner's control handles
<b>GCS</b>	ground control station
<b>GHS</b>	gunner's hand station
<b>GLU</b>	grenade launcher unit
<b>GMD</b>	grease, molybdenum disulfide
<b>GMG</b>	grenade machine gun
<b>GPS</b>	Global Positioning System
<b>GSCP</b>	gunner's sight control panel
<b>GTA</b>	graphic training aid
<b>HATS</b>	hull, armament, turret, and suspension
<b>HB MG</b>	heavy barrel machine gun
<b>HE</b>	high explosive
<b>HIU</b>	hatch interrupt unit
<b>HMMWV</b>	high mobility multipurpose wheeled vehicle
<b>HMU</b>	height management unit
<b>HWTS</b>	heavy weapon thermal sight
<b>IAW</b>	in accordance with
<b>IBAS</b>	improved Bradley acquisition subsystem
<b>IBIT</b>	initiated built-in test
<b>ICS</b>	intercommunications control set

<b>ICV</b>	Infantry Carrier Vehicle
<b>IED</b>	improvised explosive device
<b>IR</b>	infrared
<b>ISU</b>	integrated sight unit
<b>ITAS</b>	improved target acquisition system
<b>JBC-P</b>	Joint Battle Command-Platform
<b>JCAD</b>	joint chemical agent detector
<b>JCIMS</b>	Joint Combat Identification Marking System
<b>JCR</b>	Joint Capabilities Release
<b>KDU</b>	keyboard display unit
<b>KEK</b>	key encryption key
<b>kHz</b>	kilohertz
<b>kph</b>	kilometers per hour
<b>kPa</b>	kilopascal
<b>LAW</b>	lubricant, arctic, weapons
<b>LED</b>	light-emitting diode
<b>LFU</b>	laser filter unit
<b>LIF</b>	light interference filter
<b>LNE</b>	late net entry
<b>LO</b>	lubrication order
<b>LOI</b>	letter of instruction
<b>LOS</b>	line of sight
<b>LP</b>	listening post
<b>LRAS3</b>	long-range advanced scout surveillance system
<b>LRF</b>	laser range finder
<b>LSA</b>	lubricant, semi-fluid, automatic weapons
<b>LTA</b>	launch tube assembly
<b>LTLM</b>	laser target locator module
<b>LTLMU</b>	laser target locator module unit
<b>LWTS</b>	light weapon thermal sight
<b>MCRP</b>	Marine Corps reference publication
<b>MCS</b>	master control station
<b>MCWP</b>	Marine Corps warfighting publication
<b>MDI</b>	modernized demolition initiator
<b>MGS</b>	mobile gun system
<b>MEL</b>	maximum engagement line
<b>MELIOS</b>	mini eyesafe laser infrared observation set
<b>MIL-STD</b>	military standard
<b>mm</b>	millimeter
<b>MOA</b>	minute of angle
<b>MOS</b>	military occupational specialty
<b>mph</b>	miles per hour
<b>MS</b>	methyl salicylate
<b>MWTS</b>	medium weapon thermal sight
<b>NATO</b>	North Atlantic Treaty Organization
<b>NBC</b>	nuclear, biological, and chemical
<b>NCS</b>	net control station
<b>NFOV</b>	narrow field of view
<b>Nm</b>	Newton-meter
<b>NSN</b>	national stock number
<b>NTD</b>	nametag defilade
<b>NVD</b>	night vision device
<b>NVG</b>	night vision goggle
<b>NVS</b>	night vision sight
<b>O/R</b>	override
<b>ODS</b>	Operation Desert Storm
<b>OP</b>	observation post
<b>OT</b>	observer-target

## Glossary

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<b>PA</b>	power amplifier
<b>PAA</b>	power assist assembly
<b>PBIT</b>	power-up built-in test
<b>PBIT</b>	power-up built-in test
<b>PDF</b>	principal direction of fire
<b>PDP</b>	power distribution panel
<b>PECCH</b>	personnel and engine coolant circulation heater
<b>PED</b>	programmable encryption device
<b>PEP</b>	power entry panel
<b>PFCD</b>	picatinny fire control device
<b>PMA</b>	power module assembly
<b>PMCS</b>	preventive maintenance checks and services
<b>POA</b>	point of aim
<b>POI</b>	point of impact
<b>psi</b>	pounds per square inch
<b>PT</b>	plain text
<b>PTT</b>	push to talk
<b>PU</b>	processor unit
<b>RBC</b>	rifle bore cleaner
<b>RCO</b>	rifle combat optic
<b>RF</b>	radio frequency
<b>RMDA</b>	Ruggedized Maintenance Digital Assistant
<b>ROC-V</b>	recognition of combat vehicles
<b>ROE</b>	rules of engagement
<b>RT</b>	receiver-transmitter
<b>RV</b>	reconnaissance vehicle
<b>RVSS</b>	rear-view sensor system
<b>RVT</b>	remote video transceiver
<b>RWS</b>	remote weapon station
<b>SA</b>	situational awareness
<b>SATCOM</b>	satellite communications
<b>S-6</b>	battalion or brigade signal staff officer
<b>SC</b>	single channel
<b>SCB</b>	system control box
<b>SF</b>	standard form
<b>SINCGARS</b>	single-channel ground and airborne radio system
<b>SKL</b>	simple key loader
<b>SLF</b>	self-location
<b>SOC</b>	state of charge
<b>SOI</b>	signal operating instruction
<b>SOP</b>	standard operating procedure
<b>SRAT</b>	Stryker reactive armor tiles
<b>STORM</b>	Small Tactical Optical Rifle Mounted
<b>STP</b>	Soldier training publication
<b>SUAS</b>	small unmanned aircraft system
<b>SVBIED</b>	suicide vehicle-borne improvised explosive device
<b>TACSAT</b>	tactical satellite
<b>T&amp;E</b>	traverse and elevation
<b>TAS</b>	target acquisition system
<b>TB</b>	technical bulletin
<b>TC</b>	training circular
<b>TDS</b>	turret drive system
<b>TEK</b>	traffic encryption key
<b>TIM</b>	thermal imaging module
<b>TIP</b>	thermal identification panels
<b>TM</b>	technical manual
<b>TO</b>	technical order
<b>TOW</b>	tube launched, optically tracked, wire guided

<b>TV</b>	television
<b>TWS</b>	thermal weapon sight
<b>UAS</b>	unmanned aircraft system
<b>UBC</b>	universal battery charger
<b>UPA</b>	universal pintle adapter
<b>VC</b>	vehicle commander
<b>vdc</b>	volts direct current
<b>VDT</b>	video display terminal
<b>VDET</b>	video display electronic terminal
<b>VFM</b>	ventilated face mask
<b>VIM</b>	visual imaging module
<b>VOX</b>	voice-operated switch
<b>VPC-DC</b>	vehicle power conditioner-direct current
<b>WFOV</b>	wide field of view

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**14 January 2021**

By Order of the Secretary of the Army:

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