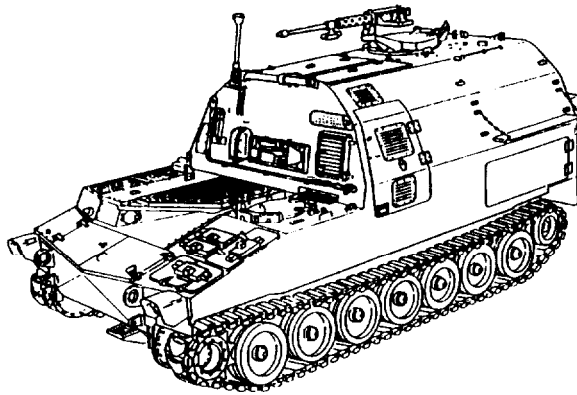


**OPERATOR'S MANUAL**



**CARRIER, AMMUNITION,  
TRACKED  
M992A21  
(NSN 2350-01-352-3021)  
EIC: AE6**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY  
OCTOBER 1993**

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No. 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D.C., 6 June 1997

**OPERATOR'S MANUAL**

**CARRIER, AMMUNITION, TRACKED**

**M992A1**

**(NSN 2350-01-352-3021)**

**EIC: AE6**

TM 9-2350-287-10, dated 22 October 1993, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New, changed, or deleted material is indicated by a vertical bar in the margin of the page or by a deletion notice.
3. Added pages or changed page numbers are indicated by a vertical bar by the page number.

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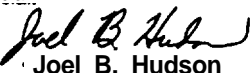
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Front Cover

By Order of the Secretary of the Army:

Official:

  
**Joel B. Hudson**  
Administrative Assistant to the  
Secretary of the Army  
03587

**DENNIS J. REIMER**  
General, United States Army  
Chief of Staff

DISTRIBUTION:

To be distributed in accordance with the initial distribution number (IDN) 372351, requirements for TM 9-2350-287-10.

**WARNING**

## CARBON MONOXIDE HAZARD



## CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

- Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and when breathed deprives body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH can result from serious exposure.
- The following precautions MUST be followed to ensure personnel are safe whenever personnel heater, main engine, or auxiliary engine is operated for any purpose.
  - DO NOT operate personnel heater or engine of vehicle in enclosed area without adequate ventilation.
  - DO NOT idle engine for long periods without ventilator blower operation. If tactical situation permits, open hatches.
  - DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
  - NEVER sleep in a vehicle when the heater is operating or the engine is idling.
  - BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Treatment for affected personnel shall be: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 21-11 and get medical attention.
  - BE AWARE: neither the gas particulate filter unit nor the field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE  
POISONING IS GOOD VENTILATION

**WARNING**

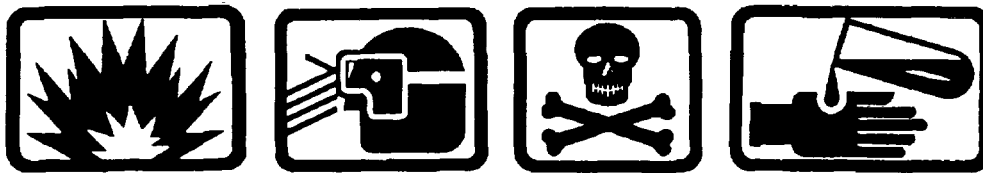
## HEAT/COLD ACTIVITY HAZARD

## Requirements for Water Intake and Work/Rest Cycles

Leaders and supervisors must be aware of the potential for heat and cold injuries. For prevention guidelines, refer to local procedures and TB MED 507, Occupational and Environmental Health Prevention, Treatment and Control of Heat Injury; and TB MED 81, Cold Injury.

**WARNING**

## BATTERY HAZARDS



- Lead-acid batteries can explode. Do not smoke, have open flames, or make sparks around a battery, especially if the caps are off. If a battery is gassing, it can explode and cause injury to personnel.
- Ventilate when charging or using battery in an enclosed space.
- Wear safety goggles and acid-proof gloves when battery cover must be removed or when adding electrolyte.
- Avoid electrolyte contact with skin, eyes, or clothing. If battery electrolyte spills, take immediate action to stop burning effects:
  - External. Immediately flush with cold running water to remove all acid.
  - Eyes. Flush with cold water for at least 15 minutes. Seek immediate medical attention.
  - Internal. Drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek immediate medical attention.
  - Clothing or Vehicle. Wash at once with cold water. Neutralize with baking soda or household ammonia solution.

## BATTERY HAZARDS (continued)

- Wear safety glasses or goggles when checking batteries. Always check electrolyte level with engine stopped. Do not smoke or use exposed flame when checking battery; explosive gases are present and severe injury to personnel can result
- Remove or disconnect batteries or turn off master battery disconnect switch prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent damage to clothing.
- Remove all jewelry, such as rings, identification tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

**WARNING****CHEMICAL AGENT RESISTANT COATING (CARC) HAZARD**

Unusable chemical agent resistant coating (CARC) mixtures are considered hazardous waste and will require disposal in accordance with Federal, state, DOD, DA, and local installation hazardous waste regulations. Consult the installation environmental office for proper disposal guidance. Mixed CARC is extremely flammable. Use only in well-ventilated areas. Keep away from open flames, sparks, and other ignition sources.

**WARNING**

## FUEL HANDLING HAZARDS

- Fuel is very flammable and can explode easily. To avoid serious Injury or death:
  - Keep fuel away from open flame or any spark (ignition source).
  - Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.
  - Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.
  - Clean fuel tank to purge any flammable liquid or vapors before welding, grinding, or using any heat-producing device near the fuel tank.
  - Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel, fuel lines, or fuel tanks.
  - When refueling, stop vehicle, shut down engine, and apply parking brake. Ensure no open flame is near area. Never smoke. Never add fuel with engine running. Do not have driver seated when adding fuel. After fuel is added, securely close reservoir cap; a loose cap can cause a fuel leak or be a fire hazard. Before starting vehicle, check that no fuel is spilled on or around vehicle.
  - Ground fuel funnel or nozzle against filler neck to prevent sparks, and be sure to replace fuel tank cap.

**WARNING****SOLVENT P-D-680 HAZARDS**

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using drycleaning solvent. Failure to follow this warning may result in injury or death to personnel.
- If personnel become dizzy while using drycleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.
- When P-D-680 drycleaning solvent is used, notify the local medical authority (preventive medicine) and environmental coordinator concerning medical surveillance, respiratory protection, and disposal requirements.

**WARNING****NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) EXPOSURE AND VEHICLE AIR FILTERS HAZARDS**

- NBC-contaminated air filters must be handled and disposed of only by authorized and trained personnel. The unit commander or senior officer in charge of maintenance personnel must ensure that prescribed protective clothing (FM 3-4) is used and that prescribed safety measures and decontamination procedures (FM 3-5) are followed. The local unit SOP is responsible for final disposal of contaminated air filters. Failure to comply may cause severe injury to personnel.



**NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) EXPOSURE AND  
VEHICLE AIR FILTERS HAZARDS (continued)**

The NBC protection filters use a type of carbon that contains Chromium VI. This is a known carcinogen if inhaled or swallowed. Damaged or unusable filters are classified as hazardous waste.

- Do not throw away damaged or unusable filters as trash.
- Turn in damaged or unusable filters to your Hazardous Waste Management Office or Defense Reutilization and Marketing Office (DRMO).
- Filters are completely safe to handle and use if they are not damaged in such a way that carbon leaks from them. If carbon does leak, use protection (such as a dust respirator to cover nose and mouth) and put carbon in a container (such as a self-sealing plastic bag); turn in to your Hazardous Waste Management Office or DRMO.
- Disposal of hazardous waste is restricted by law. Violation is subject to criminal penalties.

**WARNING**

**GENERAL OPERATION HAZARDS**

- When traveling over rough terrain, soft ground, or wet/icy surfaces, slow down and shift to a lower gear. When driving on a floor, dock, or bridge, ensure that combined weights of machine and load do not exceed safe limit. Check for sufficient overhead clearance.
- Do not back up vehicle without ground guide. Limited vision can lead to vehicle damage and injury to personnel. Use at least two ground guides when backing; if only one guide is used, stop operations if communications between driver and ground guide are interrupted.
- Do not let vehicle coast downhill with clutch pedal depressed or transmission in position "N"(neutral). Vehicle may increase speed and go out of control, resulting in injury or death to personnel.

**GENERAL OPERATION HAZARDS (continued)**

- If you lose a track (break a track shoe or vehicle throws a track), extreme caution must be exercised in maintaining control. Immediately release accelerator and let vehicle coast to a stop. Do not apply braking action-brake pedal, laterals, pivots, or any type of steering controls. Braking causes vehicle to pull to the active, or good, track and could result in a rollover. If absolutely necessary, apply braking action **ONLY** if the vehicle is approaching a ravine or cliff or if you perceive the outcome to be catastrophic, probably resulting in fatalities. When rollover is imminent, all crew members should immediately withdraw inside vehicle, tighten seatbelts, and hold onto a secure fixture until vehicle comes to a complete stop.
- Area must be clear of personnel before operating vehicle.
- When operating the vehicle, observe the following precautions:
  - Always drive carefully. Drive with extra caution until you can operate the equipment with skill.
  - Do not move vehicle until all doors and hatches are secured and all equipment is properly stowed.
  - Never move vehicle without first receiving a signal from the ammunition team chief.
- Many components on the vehicle, such as seats, doors, universal joints, and track, are very heavy and should be handled carefully. Have an assistant help when lifting heavy components.

**WARNING****HIGH NOISE LEVEL HAZARD**

Hearing protection is required for operator and also for all personnel working in and around the vehicle when engine is running.

**WARNING**

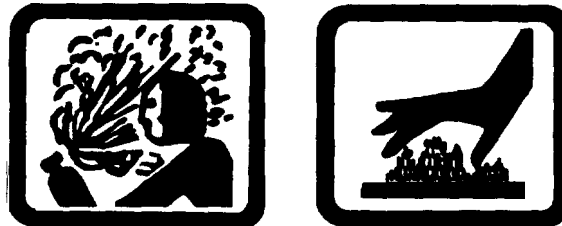
**PERSONNEL HEATER HAZARDS**



- Do not place flammable materials or explosives on or near personnel heater. To prevent injury to personnel and damage to equipment, do not block or restrict heater vent.
- Do not use vehicle MASTER switch to shut down heater, as fuel vapors may accumulate in ventilating air circuit.
- Be alert during heater operations for exhaust odors or signs of exposure to carbon monoxide.

**WARNING**

**FIRE EXTINGUISHER (CO<sub>2</sub>) HAZARDS**



- Remain CALM. Avoid breathing CO<sub>2</sub>. It may quickly cause rapid breathing, loss of consciousness, and suffocation. Quickly exit vehicle if situation permits. If unable to exit, ventilate to remove the extinguisher gas. The driver is at the greatest risk. Ventilate the vehicle before reentry. Failure to follow this emergency procedure can result in serious injury or death to personnel.
- Fire extinguisher CO<sub>2</sub> can cause severe burns. Do not touch the cone when using fire extinguisher or discharge directly on skin.
- Handle fire extinguisher carefully. Do not bang or drop cylinder.

**WARNING****AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES) HAZARDS**

Any automatic fire extinguishing system (AFES) component in need of maintenance or repair is prone to accidental discharge. Accidental discharge could lead to frostbite or other injury. Small parts or tools become dangerous projectiles when propelled by Halon at 750 psi (5171 kPa).

**WARNING****UPPER REAR DOOR HAZARDS**

- Stand clear when opening or closing upper rear door (ballistic shield). If you open or close this door from outside the vehicle (using bottom switch), keep head and shoulders out of door travel path.
- Make sure travel path of upper rear door is clear of personnel before opening or closing door. Call out "CLEAR" when opening or closing door to prevent personnel from stepping in front of door.
- During normal operations, mechanical safety lock should be used when positioning door. Lock supports door if hydraulic safety mechanism fails.

**WARNING****CONVEYOR HAZARDS**

Be careful when deploying conveyor. Observe the following precautions when deploying, operating, and stowing conveyor:

- Keep hands and body parts clear of moving parts of conveyor.
- Make sure footing is firm and deployment area is free of obstructions.
- Be prepared to move quickly; conveyor deploys rapidly. Make sure door is positioned properly to control deployment speed.
- Have an assistant hold conveyor in stowed position while safety strap is removed or installed.

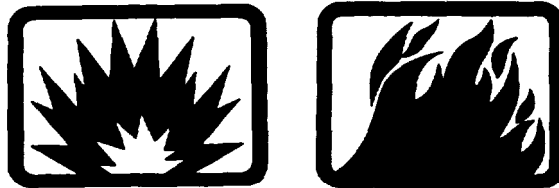
**WARNING**

**CONVEYOR HAZARDS (continued)**

- Be careful to keep conveyor from swinging left or right.
- Do not operate conveyor with chain guards removed.
- Make sure conveyor slings are properly attached.
- Do not drop or throw projectiles onto conveyor. Promptly remove projectiles and propelling charges from conveyor.
- Attach ground strap to truck or stockpile.

**WARNING**

**AMMUNITION HAZARD**



Ammunition carrying explosives must be handled with care at all times. The explosive in primers and fuses is very sensitive to shock and high temperatures. Keep ammunition away from heaters. If ammunition is dropped, heated, thrown, tumbled, or dragged, an explosion may result, causing death or injury to personnel and destruction of equipment. Disassembly of ammunition is not authorized.

**WARNING**

**PROJECTILE RACK ASSEMBLY HAZARDS**

- Before moving projectile rack assemblies, park vehicle on level ground. If vehicle is not level, projectile racks may tip, causing injury or damage.
- If both projectile rack assemblies are to be moved, move right assembly first. After left projectile rack assembly is moved, leave hoisting hook attached; this support is necessary because the assemblies tend to tip forward when both are moved back.

**WARNING****TOWING**

When hooking or unhooking towbar from a disabled vehicle, set parking brake or chock tracks of disabled vehicle before hooking or unhooking towbar. If towed vehicle is not chocked or parking brake is not set, disabled vehicle may move, causing injury or death to personnel and/or damage to equipment.



## OPERATOR'S MANUAL

### CARRIER, AMMUNITION, TRACKED M992A1 (NSN 2350-01-352-3021) EIC: AE6

#### REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-IM-OPIT, Warren, MI 48397-5000. A reply will be furnished to you.

You may also provide DA Form 2028-2 information to TACOM via datafax or e-mail:

- TACOM's fax number is DSN 786-6323 or Commercial (810) 574-6323
- TACOM's e-mail address is [tacom-tech-pubs@cc.tacom.army.mil](mailto:tacom-tech-pubs@cc.tacom.army.mil)

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## HOW TO USE THIS MANUAL

This operator's manual was designed to provide you with the information you will need to operate and maintain the M992A1.

The information contained in this manual is presented in four chapters and five appendixes. Each chapter is divided into sections covering operating procedures and/or other information for specific vehicle systems or components. When a reference is made to a table, figure, paragraph, or appendix, refer to that portion of the text.

To find information pertaining to a broad range of information (such as vehicle troubleshooting, preventive maintenance, or vehicle descriptions):

1. Identify the desired topic.
2. Find the general topic in the table of contents in the front of this manual or in the index on the front cover.
3. Refer to the page called out in the table of contents or the front-cover index.

To find information relating to a specific component or system.

1. Determine the name or function of the component/system.
2. Find the name or function in the subject-index listing at the end of this manual.
3. Refer to the page called out in the subject-index listing.

**IMPORTANT**

You must read and understand this manual BEFORE operating the M992A1.

Throughout this manual you will frequently see the phrase 'notify Unit maintenance.' When instructed to notify Unit maintenance, do exactly that; Unit maintenance personnel have the tools and training to efficiently and correctly perform the next level of maintenance. Throughout this manual you will also see WARNING, CAUTION, and NOTE headings. There are good reasons for every one of these notices.

**WARNING**

**A warning is used to alert the user to hazardous operating and maintenance procedures, practices, or conditions that could result in injury or death. Warnings must be strictly observed.**

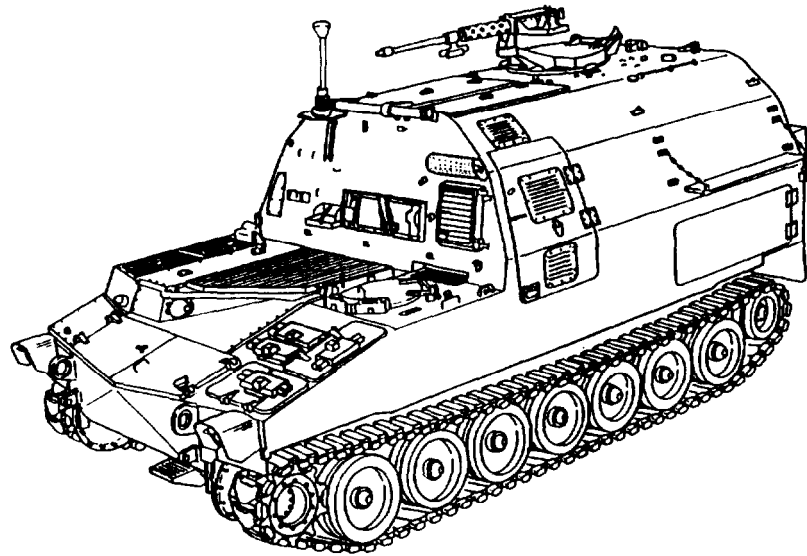
**CAUTION**

**A caution is used to alert the user to hazardous operating or maintenance procedures, practices, or conditions that could result in damage to, or destruction of, equipment or mission effectiveness. Cautions must be strictly observed.**

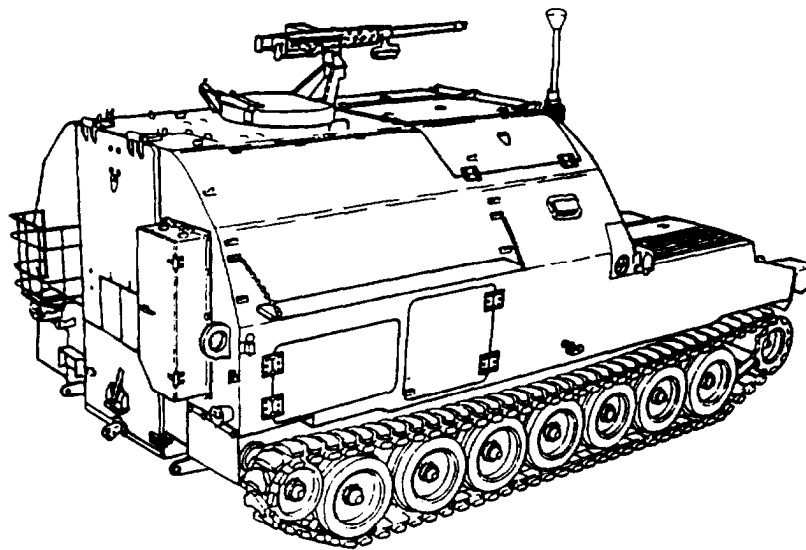
**NOTE**

**A note highlights an essential operating or maintenance procedure, condition, or statement.**

Note that Appendix A of this manual gives the full title of every manual, form, pamphlet, or other document referenced in this manual. Also, acronyms and abbreviations used in the manual are listed and spelled out on page 1-2.



M992A1 FRONT LEFT VIEW



M992A1 REAR RIGHT VIEW

Change 1

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# CHAPTER 1 INTRODUCTION

## Chapter Overview

This chapter introduces the operator to the M992A1 Tracked Ammunition Carrier. The information found in Chapter 1 includes the following:

- Brief description and purpose of the M992A1
- Statement of intended vehicle use
- Reference to pertinent documents
- List of abbreviations used throughout this manual
- Vehicle data and specifications
- Location and description of equipment essential for successful mission completion
- Technical principles of operation for various M992A1 systems

Chapter 1 is divided into the following sections:

- Section I GENERAL INFORMATION
- Section II EQUIPMENT CAPABILITIES, FEATURES, DESCRIPTION, AND PERFORMANCE DATA
- Section III TECHNICAL PRINCIPLES OF OPERATION

## Section I. GENERAL INFORMATION

### Scope

This manual contains information you need to operate the M992A1, Tracked Ammunition Carrier. The primary use of the M992A1 is to provide overland transport of 155 millimeter projectiles and charges from ammunition supply points to howitzers in the field. Included in the manual are instructions for the proper use of on-board ammunition handling and stowage equipment, as well as driving and crew maintenance procedures.

In terms of driving capabilities and limitations, the M992A1 is comparable to the M109A6 howitzer. The speed, mobility, and maneuverability of the M992A1 equals that of the M109A6, making the M992A1 well suited for efficient resupply of ammunition to M109A6 howitzers.

### Maintenance Forms and Records

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS). ■

## TM 9-2350-287-10

### Hand Receipt (HR) Manuals

This manual has a companion document with a TM (technical manual) number followed by HR (hand receipt). TM 9-2350-287-10-HR consists of preprinted hand receipts (DA Form 2062) that list the end-item-related equipment you must account for: Components of End Items (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL). As an aid to property accountability, additional HR manuals may be requisitioned from the following source, in accordance with procedures found in AR 25-30:

The U.S. Army Adjutant General Publications Center  
ATTN: AGLD-OD  
1655 Woodson Road  
St. Louis, MO 63114

### Destruction of Army Materiel To Prevent Enemy Use

Refer to TM 750-244-6 for procedures on the destruction of tank-automotive equipment to prevent use by an enemy. Destruction of munitions is covered in TM 750-244-5-1 (conventional ammunition) and TM 43-0002-33 (improved conventional munitions).

### Reporting Equipment Improvement Recommendations (EIRs)

If your M992A1 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF Form 368. Mail it to the address specified in DA Pam 738-750.

### List of Abbreviations

A	Annually
AAL	Additional Authorization List
AFES	Automatic Fire Extinguishing System
AFES/MDS	Automatic Fire Extinguishing System Manual Discharge System
AHE	Ammunition Handling Equipment
AOAP	Army Oil Analysis Program
APU	Auxiliary Power Unit
BII	Basic Issue Items
BITE	Built-In Test Equipment
CAGEC	Commercial and Government Entity Code
CARC	Chemical Agent Resistant Coating
CK	Cyanogen Chloride
COEI	Components of End Items
CVC	Combat Vehicular Crewman
DA	Department of the Army
DOD	Department of Defense
E	Empty
EIR	Equipment Improvement Recommendation
Ext.	Extinguisher
F	Full; Fahrenheit
GAA	Grease, Automotive and Artillery
GPS	Global Positioning System

1-2      **Change 1**

## List of Abbreviations (continued)

H	Hour	■
HR	Hand Receipt	
IAW	In Accordance With	
Illus	Illustration	
I R	Infrared	
L	Low	
LAW	Lubricating Oil for Aircraft Weapons	
LED	Light-Emitting Diode	
LHR/CS	Low Heat Rejection/Cold Start	
LRB	Left Rear Bottom (canister stowage area)	
LRT	Left Rear Top (canister stowage area)	
M	Monthly	
MOM	Momentary	■
MTOE	Modification Table of Organization and Equipment	
MWRH	Mounted Water Ration Heater	■
N	Neutral	
NBC	Nuclear, Biological, and Chemical	
OC	On Condition	
OFSA	Optical Fire Sensing Assembly	
p.	Page	
para	Paragraph	
PLGR	Precision Lightweight GPS Receiver	■
PMCS	Preventive Maintenance Checks and Services	
Qty. Recm.	Quantity Recommended	
Qty. Rqr.	Quantity Required	
RRB	Right Rear Bottom (canister stowage area)	
RRM	Right Rear Middle (canister stowage area)	
RRT	Right Rear Top (canister stowage area)	
RSI	Remote Status Indicator	
S	Semiannually	
SCEA	Standard Control Electronic Amplifier	
STE/ICE	Simplified Test Equipment/Internal Combustion Engine	
T/A	Test and Alarm	
TAMMS	The Army Maintenance Management System	■
3-D	3-Dimensional	
TOE	Table of Organization and Equipment	
U/M	Unit of Measure	
VFP	Ventilated Face Piece	
VFPS	Ventilated Face Piece System	
W/	With	
W/O	Without	



## Section II. EQUIPMENT CAPABILITIES, FEATURES, DESCRIPTION, AND PERFORMANCE DATA

### Purpose

The M992A1 is a field artillery ammunition support vehicle comparable to current field artillery weapons (M109A6 and M110A2 self-propelled howitzer class) in terms of speed, mobility, and survivability.

### Capabilities

This full-tracked, self-propelled, diesel-powered vehicle is highly mobile and maneuverable. It is capable of long-range, high-speed operation on improved roads. It is also well suited to rough terrain, muddy or marshy ground, sand, snow, and ice. The M992A1 can also ford waterways where maximum depth is 42 inches (106.68 cm).

### Features

- Ammunition handling equipment (AHE) that includes a hydraulically operated conveyor, two projectile rack assemblies, and related components.
- A diesel-powered auxiliary power unit (APU) used to drive the hydraulic system and recharge vehicle batteries.
- Simplified test equipment for the internal combustion engine (STE/ICE).
- Automatic fire extinguishing system (AFES).

AFES is an automatic and manual electrical system that, when activated, provides fire-extinguishing capability for the engine and crew compartments. It consists of test and alarm panels, sensors, and associated equipment explained later in this section and in the Chapter 4 operating instructions.

Automatic electrical operation will automatically sense and discharge an agent to extinguish hydrocarbon fires. The crew system provides an automatic electrical second-shot capability if the fire continues burning or if a second fire occurs.

To discharge the fire-extinguishing agent, manual electrical operation must be manually activated by the crew. The crew system second-shot manual electrical activation is available if the fire continues to burn; it must be manually activated by a crew member.

These systems will not activate unless the crew/engine test and alarm panel maintenance switches are in the horizontal POWER ON normal operational position. (See Chapter 4.)

- Nuclear, biological, and chemical (NBC) agent detection and protection system.
- Ammunition storage racks and compartments.

**LOCATION AND DESCRIPTION OF MAJOR COMPONENTS**

The locations and descriptions of major components used to operate the M992A1 effectively are shown on pages 1-5 through 1-8.

MAIN ENGINE EXHAUST OUTLET (1): Provides outlet for main engine exhaust gases.

APU ENGINE EXHAUST OUTLET (2): Provides outlet for APU engine exhaust gases.

IDLER WHEELS (3): Right and left idler wheels guide, support, and maintain tension for the track.

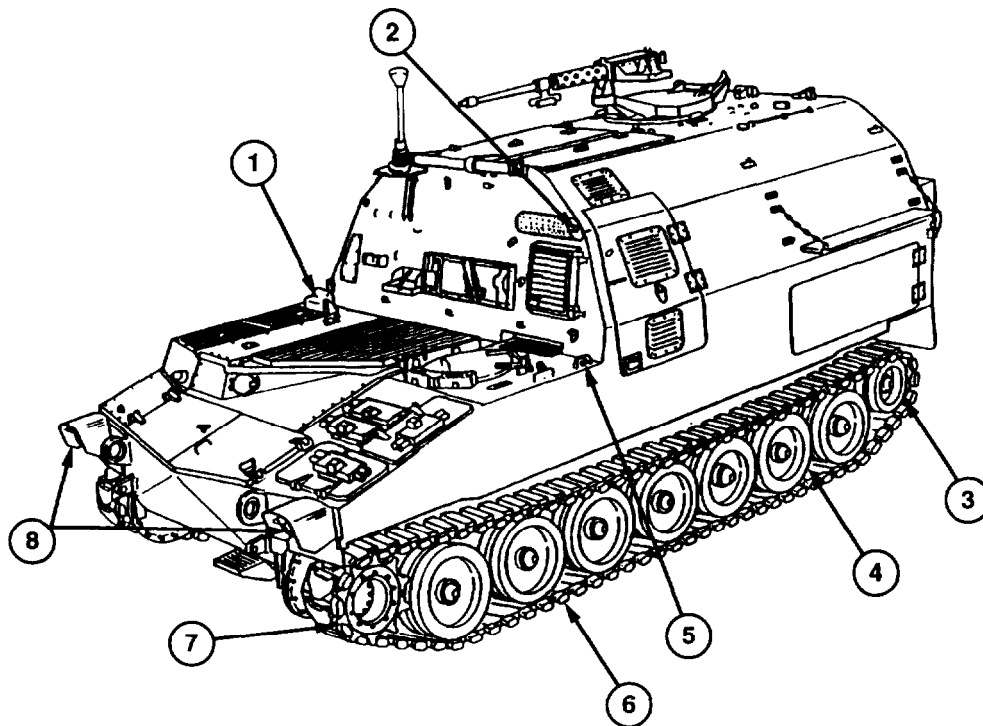
ROADWHEELS (4): Seven sets per side provide support and guide the track.

LANYARD CABLE PULL HANDLE (5): Provides for emergency manual discharge of one engine compartment and two crew compartment extinguishers to extinguish fires in the engine and crew compartments.

TRACKS (6): Eighty two-pin, rubber-padded track shoes per side provide support and traction in various terrains.

DRIVE SPROCKETS (7): Left and right sprockets are mounted on the final drives to drive each track.

HEADLAMPS (8): Provide light for night driving under normal or blackout conditions.



M992A1 Left Front View

**LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued)**

UPPER REAR DOOR (BALLISTIC SHIELD) (1): Provides ballistic protection to personnel and materiel in crew compartment during vehicle operation.

COMMANDER'S CUPOLA (2): Provides access to machine gun mount; rotates manually 360 degrees (6400 mils).

MACHINE GUN (3): M2, 0.50-caliber heavy barrel provides protection for the vehicle.

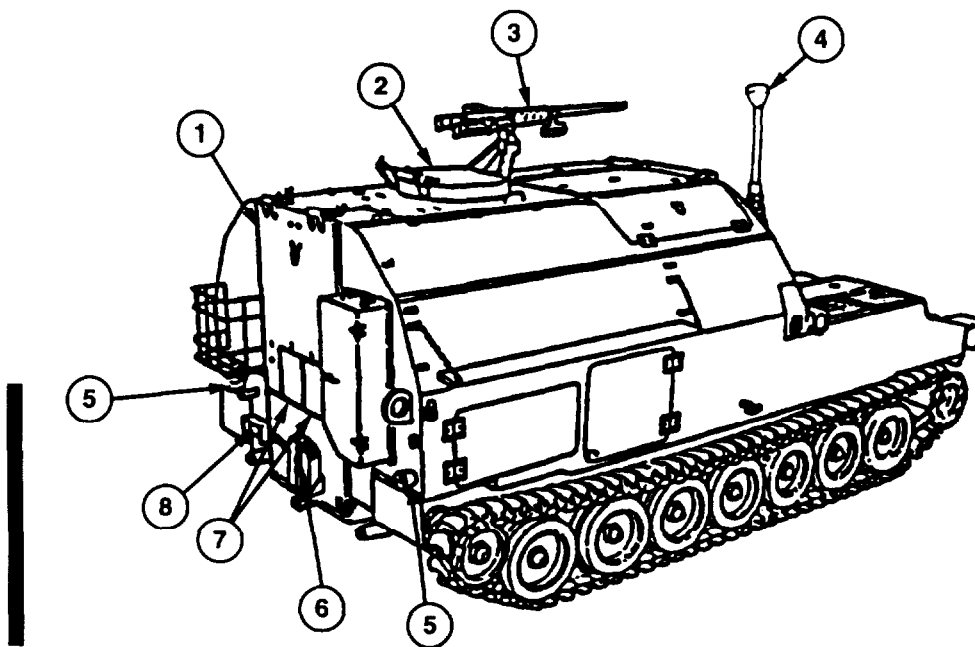
AN/PSN-11 (PLGR) (4): Satellite Signals Navigation Set Antenna in conjunction with Global Positioning System (GPS) unit; provides highly accurate, continuous, all-weather, three-dimensional (3-D) position, velocity, and time.

TAILLIGHT/STOPLIGHT (5): Two combination taillight/stoplight units provide rear light for night driving under normal and blackout conditions.

M13 DECONTAMINATING APPARATUS, PORTABLE (6): Used to spray decontaminating agent DS-2 on surfaces of the vehicle and equipment to reduce the level of chemical toxic agents.

SMALL UPPER DOORS (7): Two small doors allow operation of conveyor while upper rear door is closed.

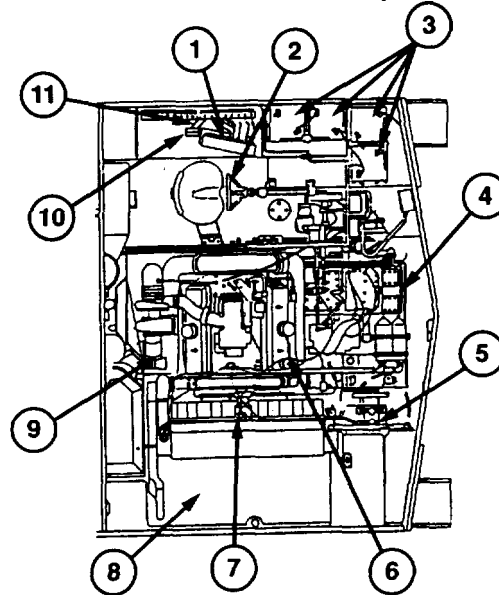
REAR NATO SLAVE RECEPTACLE (8): Used to connect the M992A1 electrical system with that of another vehicle to provide power access.



M992A1 Right Rear View

## LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued)

## M992A1 Engine, Transmission, and Driver's Compartments



DRIVER'S CONTROL SAND INDICATORS (1): Contained entirely in the driver's compartment.

STEERING CONTROLS, DRIVER'S (2): Allows driver to control vehicle direction.

BATTERIES (3): Four 12-volt lead-acid batteries connect to provide 24-volt vehicle electrical system.

TRANSMISSION (4): XTG-411-4 transmission contains cross-drive torque converter, four speeds forward and two reverse.

FINAL DRIVE ASSEMBLIES (5): Transfer direct drive from transmission to drive sprockets.

MAIN ENGINE (6): Diesel, 8V71T, Low Heat Rejection/Cold Start (LHR/CS) engine provides power to drive transmission.

COOLING FANS AND RADIATOR (7): Provide cooling to main engine.

FUEL TANKS, UPPER AND LOWER (8) (upper tank shown): Store fuel to power main engine and the APU.

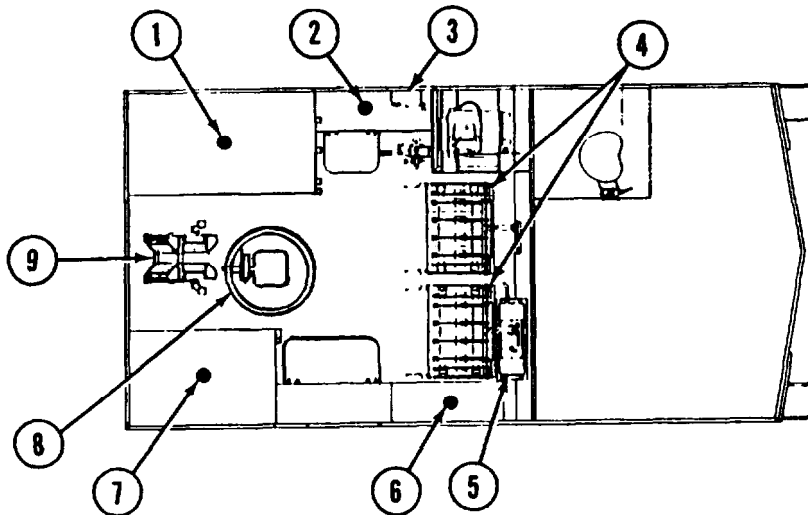
MAIN ENGINE EXHAUST SYSTEM (9): Expels exhaust gases from main engine.

LANYARD CABLE PULL HANDLE (10): Allows driver to manually discharge one engine compartment fire extinguisher cylinder without leaving the vehicle.

FORWARD NATO SLAVE RECEPTACLE (11): Used to connect the M992A1 electrical system with that of another vehicle for slave-starting operations; also used to provide power access. Use only the forward receptacle when slave-starting another vehicle.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued)

M992A1 Crew and Cargo Compartment



LEFT REAR CHARGE CANISTER STOWAGE SHELVES (1): Provide stowage for M13A2 canisters, PA37A1 canisters, fuses, 0.50-caliber ammunition, primer, and three copperhead rounds.

LEFT FRONT CHARGE CANISTER STOWAGE AREA (2): Provides stowage for M13A2 canisters.

HYDRAULIC SYSTEM CONTROL PANEL (3): Contains controls and gages for operation of hydraulic system.

PROJECTILE RACK ASSEMBLY (4): Two projectile rack assemblies, each containing five removable and interlocking rack sections, provide stowage capacity for 90 155-millimeter projectiles. Boxes above the rack assemblies provide stowage for M3A1 canisters and M119A1 canisters.

HYDRAULIC RESERVOIR (5): Contains hydraulic fluid to operate conveyor and upper rear door.

RIGHT FRONT CHARGE CANISTER STOWAGE SHELVES (6): Provide stowage for M13A2 canisters, PA37A1 canisters, and 0.50-caliber ammunition.

RIGHT REAR CHARGE CANISTER STOWAGE SHELVES (7): Provide stowage for M13A2 canisters and PA37A1 canisters.

COMMANDER'S SEAT (8): Provides seating for the commander.

CONVEYOR (9): Hydraulically or manually operated to load or unload ammunition.

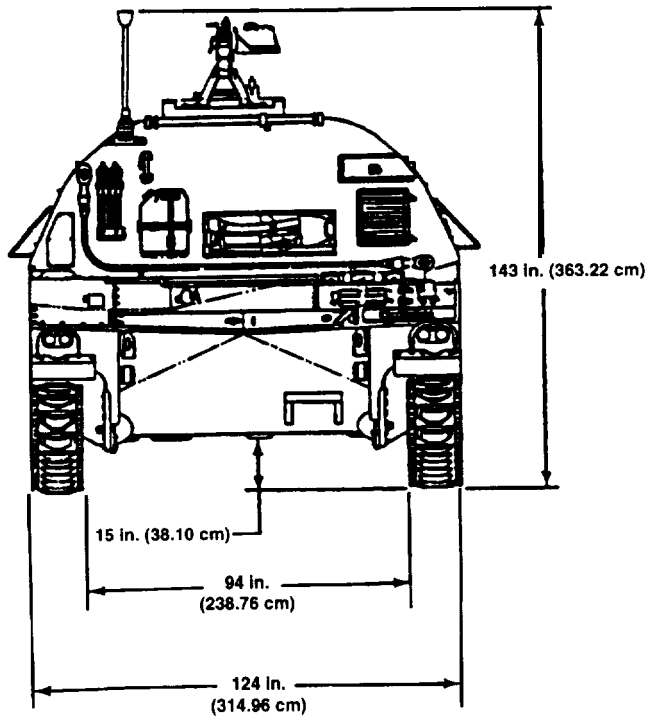
**PERFORMANCE DATA**

**General**

Armament .....0.50-cal, M2, HB flex machine gun;  
 three 5.56-mm, M16A2 rifles  
 Crew .....During transit - max. 5  
 During operation - 3  
 Engine ..... 2-cycle, 8V71T diesel (LHR/CS)  
 Brake horsepower (max.) .....405 at 2300 rpm  
 Brake horsepower (continuous) .....345 at 2300 rpm  
 Engine horsepower (full load) .....440 at 2300 rpm  
 Transmission .....XTG-411-4

**Weight and Dimensions**

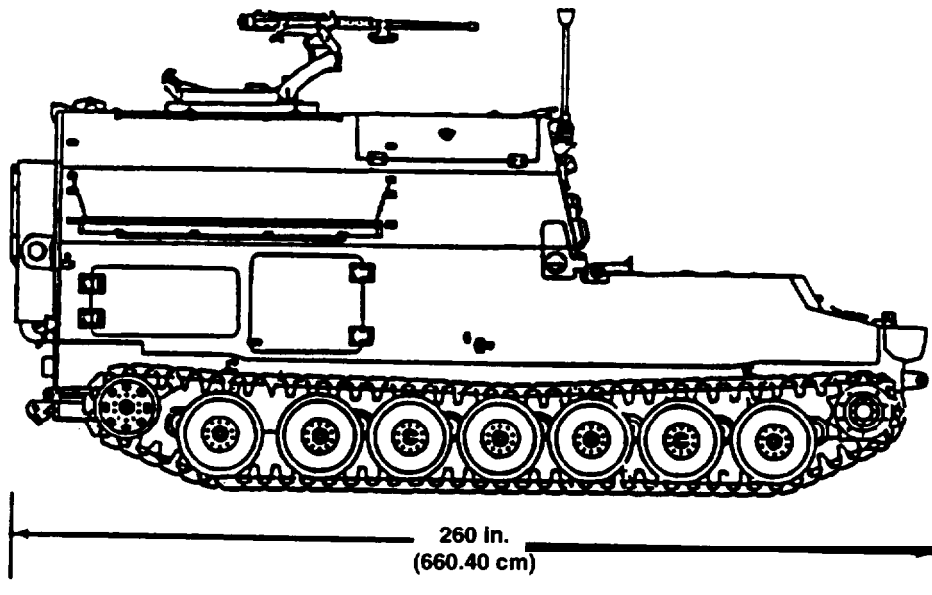
Combat loaded .....57,500 lb (26,105 kg)  
 Overall length .....260 in. (660.40 cm)  
 Overall width ..... 124 in. (314.96 cm)  
 Width between tracks .....94 in. (238.76 cm)  
 Height (overall; combat loaded to top of GPS antenna assembly) ..... 143 in. (363.22 cm)  
 Ground clearance ..... 15 in. (38.10 cm)  
 Electrical system:  
 Battery power .....24 V dc  
 Batteries .....4



**PERFORMANCE DATA (continued)**

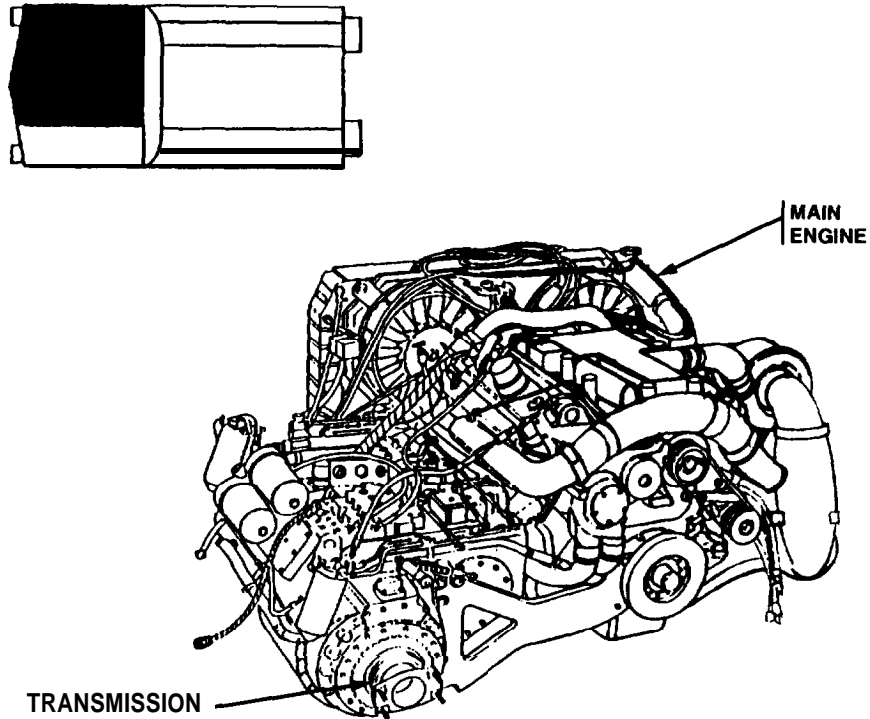
**Capacities**

Fuel tanks (upper and lower) (diesel) .....	135 gal. (511.03 L)
Engine crankcase .....	9 1/2 gal. (35.96 L) dry
	6 3/4 gal. (25.55 L) refill
Transmission .....	24 1/2 gal. (92.73 L) dry
	14 gal. (53 L) refill
Cooling system .....	20 1/4 gal. (76.65 L) dry
	14 1/2 gal. (54.89 L) refill
APU crankcase .....	3 1/2 qt (3.31 L)
APU chaincase .....	1 qt (0.95 L)
Hydraulic reservoir .....	18 1/2 gal. (70.03 L) dry
	13 gal. (49.26 L) refill
Final drive .....	2 qt (1.89 L)
Fan gear case .....	0.43 qt (0.41 L)



**Performances**

Maximum speed .....	35 mph (56.31 kph)
Maximum speed, reverse .....	7 mph (11.26 kph)
Cruising range .....	220 mi (353.98 kph)
Grade-ascending ability (max.) .....	60 percent
Grade-descending ability (max.) .....	60 percent
Maximum trench-crossing width .....	72 in. (182.88 cm)
Maximum vertical wall .....	21 in. (53.34 cm)
Minimum turning radius .....	1 vehicle length
Fording depth .....	42 in. (106.68 cm)

**Section III. TECHNICAL PRINCIPLES OF OPERATION****POWERPACK**

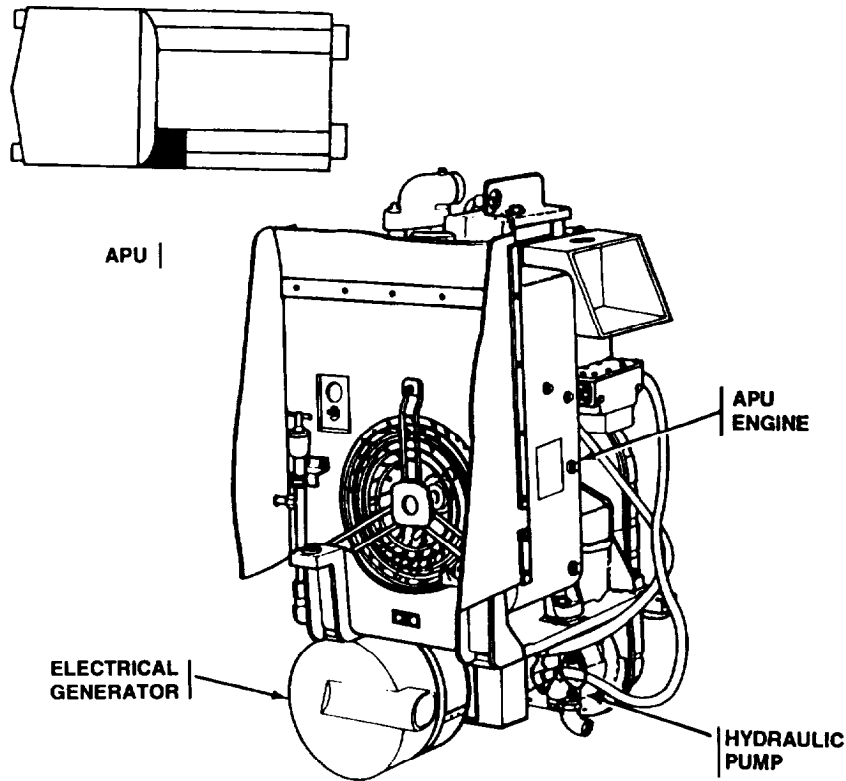
**MAIN ENGINE:** A turbocharged, two-cycle, V-8 engine. The engine provides 440 horsepower at 2300 rpm necessary to drive the vehicle transmission. The engine also drives the backup hydraulic pump when the backup pump is engaged.

**TRANSMISSION:** Transmission, differential, steering, and braking are combined into one unit. Uses cross-drive torque converter to transmit torque to final drive assemblies. Provides four-speed forward, two-speed reverse capability.

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AUXILIARY POWER UNIT (APU)

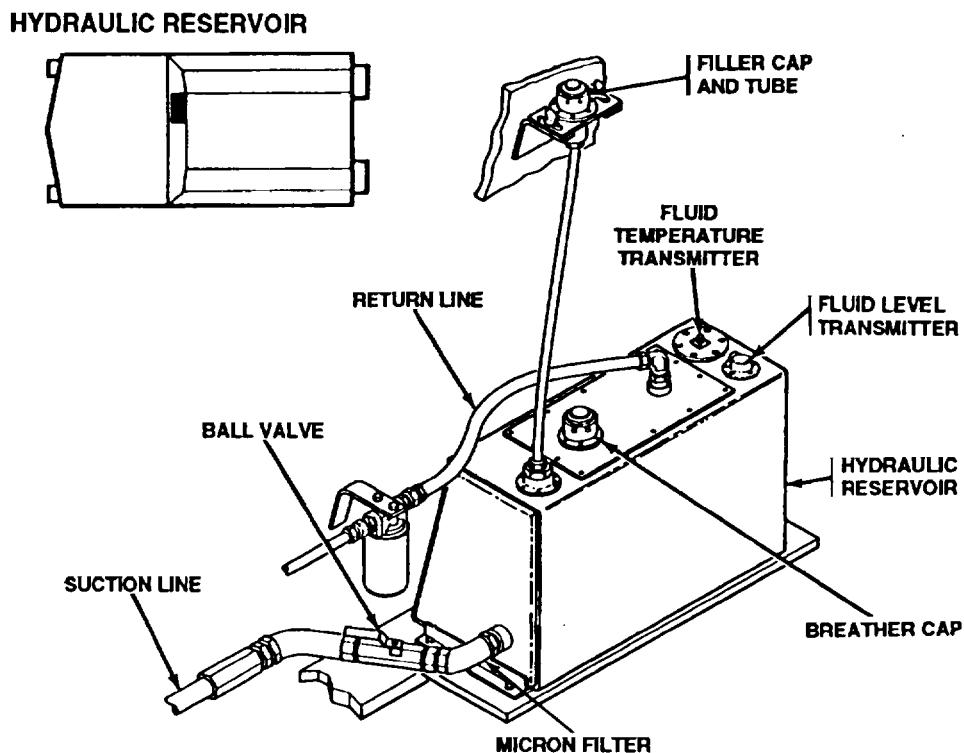


APU: The APU uses a separate and independent engine to drive (via a chain-and-sprocket arrangement) an electrical generator and primary hydraulic pump.

APU ENGINE: The engine is a two-cylinder, four-cycle, 11.5 horsepower diesel engine. Ignition, fuel supply switch, and engine indicators are located on the APU control box in the cargo compartment.

ELECTRICAL GENERATOR: When driven, the generator will supply enough power to run its own electrical system and that of a supported vehicle, via slave receptacles and cable. This slave power may be used to charge dead batteries of a disabled vehicle or to operate the supported vehicle's electrical system.

HYDRAULIC PUMP: The pump supplies hydraulic fluid to all hydraulic circuits whenever the APU is functioning. The pump is of the rotary-gear type.



**HYDRAULIC RESERVOIR:** Holds hydraulic system fluid. Reservoir capacity is 13 gallons (49.26 liters).

**SUCTION LINE:** Passes fluid to the main or backup hydraulic pump. A strainer at the inlet of the line prevents contaminants from entering the hydraulic circuits.

**BALL VALVE:** Controls the flow of hydraulic fluid through the suction line. This valve is manually operated and must be opened before main or backup pump is operated.

**RETURN LINE:** Passes exhausted hydraulic fluid back to the reservoir. An in-line, 1 O0-micron filter removes particles from the returning fluid.

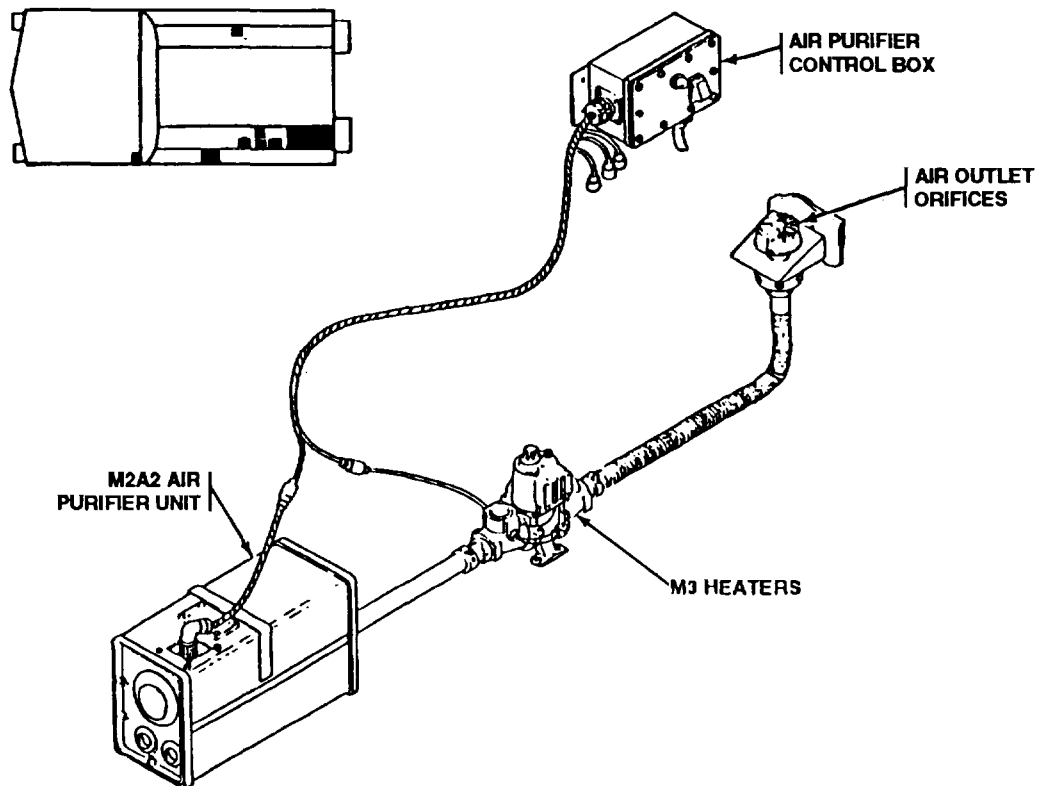
**BREATHER CAP:** Vents reservoir pressure to atmosphere.

**FILLER CAP AND TUBE:** Permit ease of hydraulic fluid refill. A strainer is housed within the tube to prevent entry of contaminants.

**FLUID LEVEL TRANSMITTER:** Monitors the level of hydraulic fluid in the reservoir. The transmitter emits an electronic signal to a level gage on the hydraulic control panel.

**FLUID TEMPERATURE TRANSMITTER:** Monitors the temperature of hydraulic fluid in the reservoir. The transmitter emits an electronic signal to a temperature gage on the hydraulic control panel.

**MICRON FILTER:** Filters hydraulic fluid returning to the reservoir.

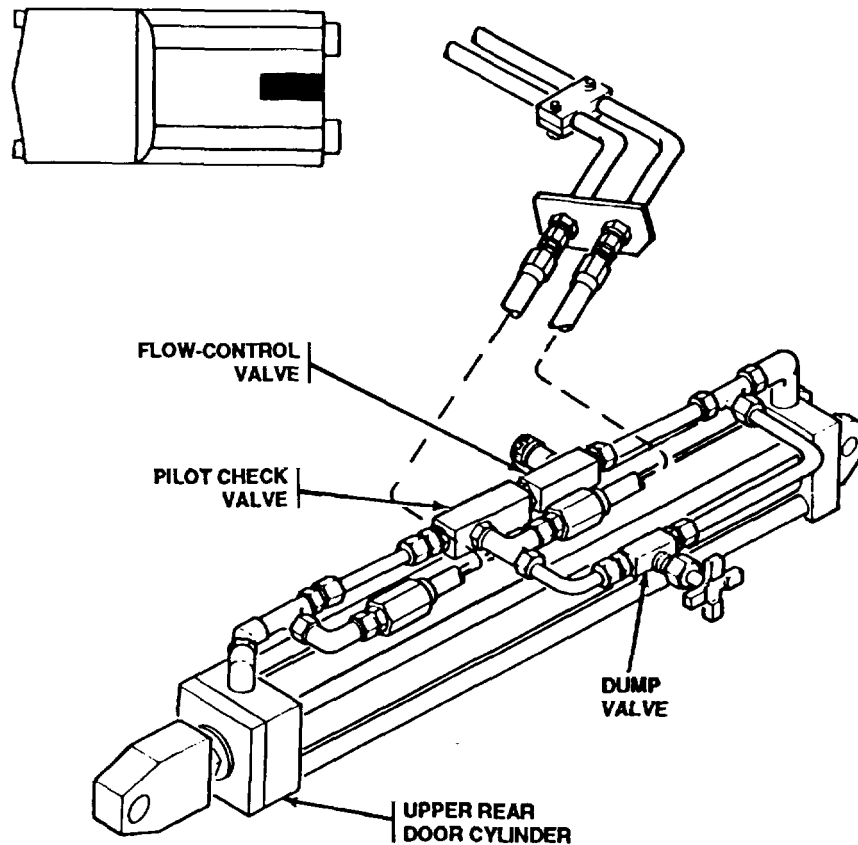


**M2A2 AIR PURIFIER UNIT:** Removes all known chemical agents from the air. The air purifier can produce a flow of 12 cubic feet (0.34 cubic meters) of breathable air per minute. The pure air is then supplied to up to four crew members through hosing to four air outlet orifices and individual M25A1 face pieces. The air purifier unit consists of an M13 particulate filter, an M1 2A1 gas filter, and an MiA1 air purifier precleaner in a steel housing.

**AIR OUTLET ORIFICES:** Provide stowage locations for hoses that connect to canisters on M25A1 face pieces. Three orifices are located in the crew compartment, and one is located in the driver's compartment.

**AIR PURIFIER CONTROL BOX:** Contains ON/OFF switch for operation of the VFPS.

**M3 HEATERS:** Warm the air before it reaches the face pieces. A heater is connected in-line to each M25A1 face piece. Each heater is individually temperature-adjusted and switched (OFF/ON). Heaters must be turned on when operating the VFPS in outside temperatures of less than 40°F (4.40C).

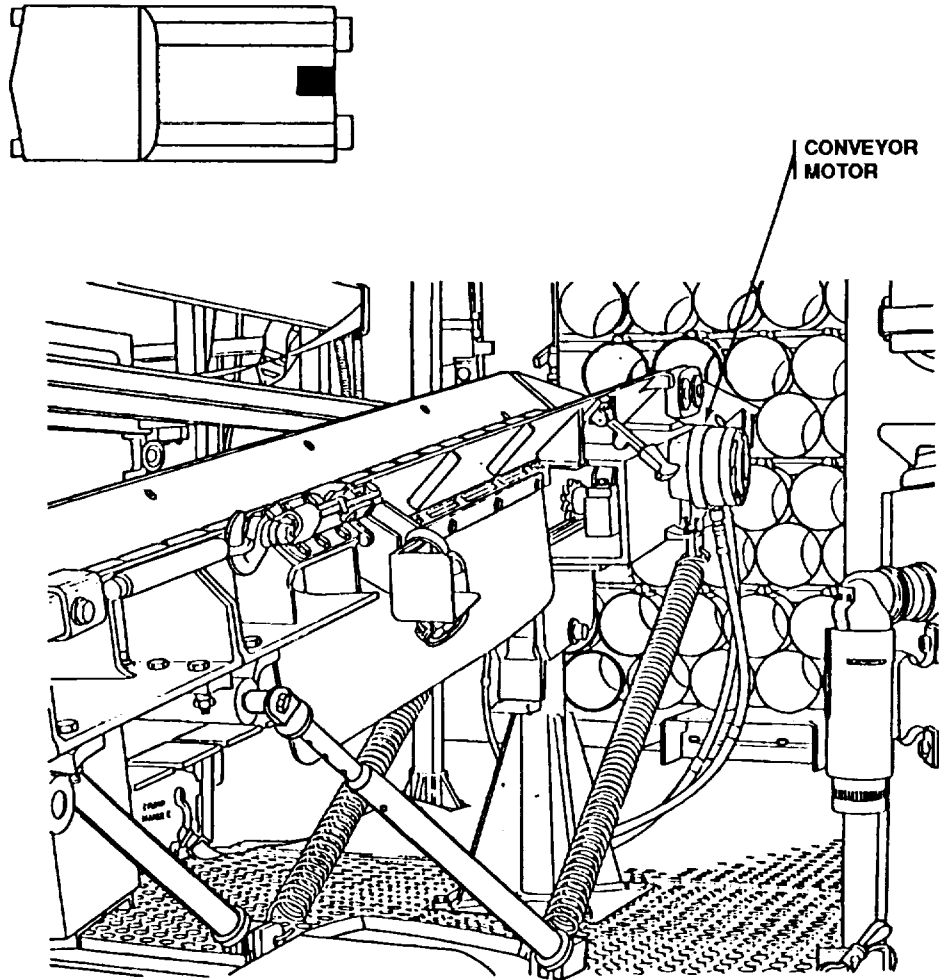


**UPPER REAR DOOR CYLINDER:** Hydraulically opens and closes the upper rear door (ballistic shield).

**FLOW-CONTROL VALVE:** An adjustable valve that enables smooth closing of the upper rear door (ballistic shield). This valve is preset at the factory and should not require adjustment.

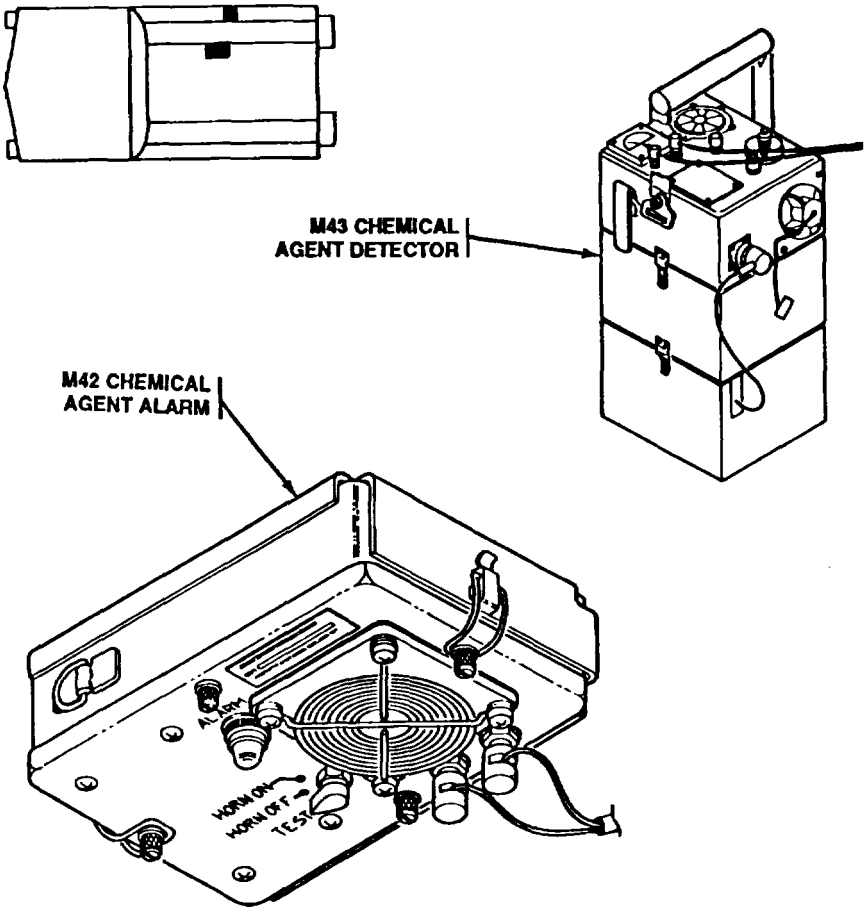
**PILOT CHECK VALVE:** Prevents dangerous door drop if hydraulic line ruptures.

**DUMP VALVE:** Enables the operator to close the *door* if hydraulic power *is lost*. This is accomplished by opening the dump valve and then shifting BALLISTIC SHIELD directional control valve, located on the hydraulic control panel, to the down position.



**CONVEYOR MOTOR:** Drives the conveyor sprocket and chain. The motor is hydraulically operated and operation is reversible. Rotational direction of the motor is determined by the CONVEYOR directional control valve. Rotational speed of the motor is controlled by the setting of a flow-control valve.

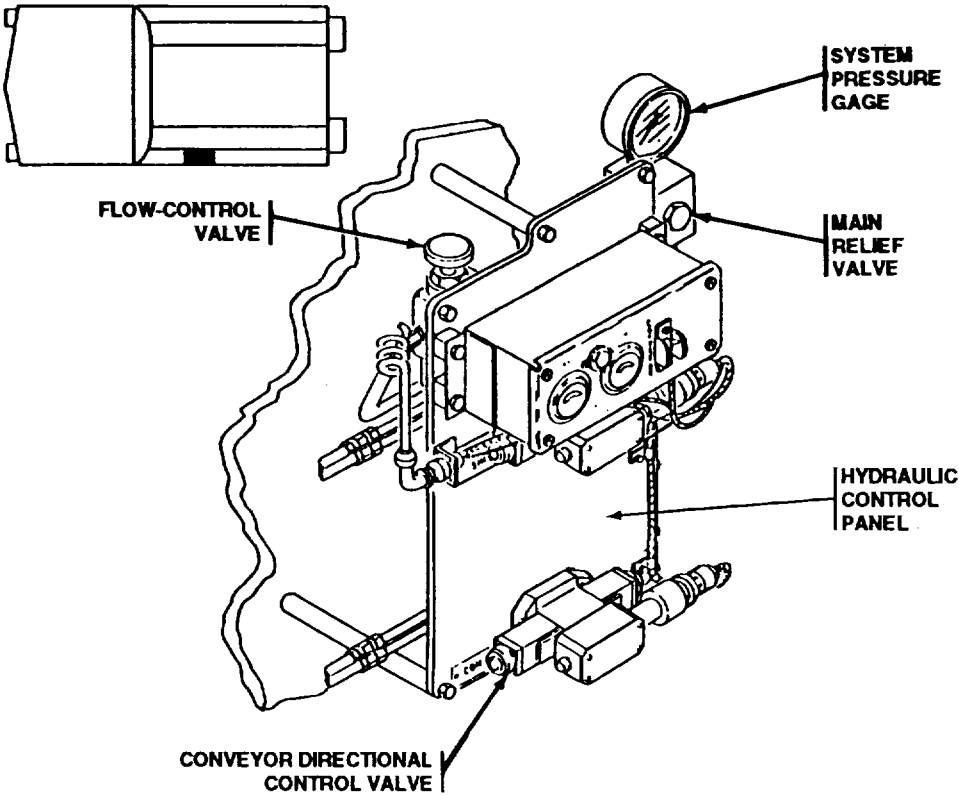
CHEMICAL AGENT DETECTION AND ALARM SYSTEM



M43 CHEMICAL AGENT DETECTOR: Senses the presence of very low concentrations of chemical agents and breathable aerosols. Contaminants are sensed by the detector, and an electrical signal is sent to the chemical agent alarm. The detector unit may be operated using power from the vehicle's electrical system; it also may be battery operated.

M42 CHEMICAL AGENT ALARM: Signals to crew members that chemical agents have been sensed by the M43 detector. The alarm may provide an audible and visual signal or a visual signal only, depending on setting.

HYDRAULIC CONTROL PANEL



**HYDRAULIC CONTROL PANEL:** Controls hydraulic system functions and allows monitoring of hydraulic system pressure.

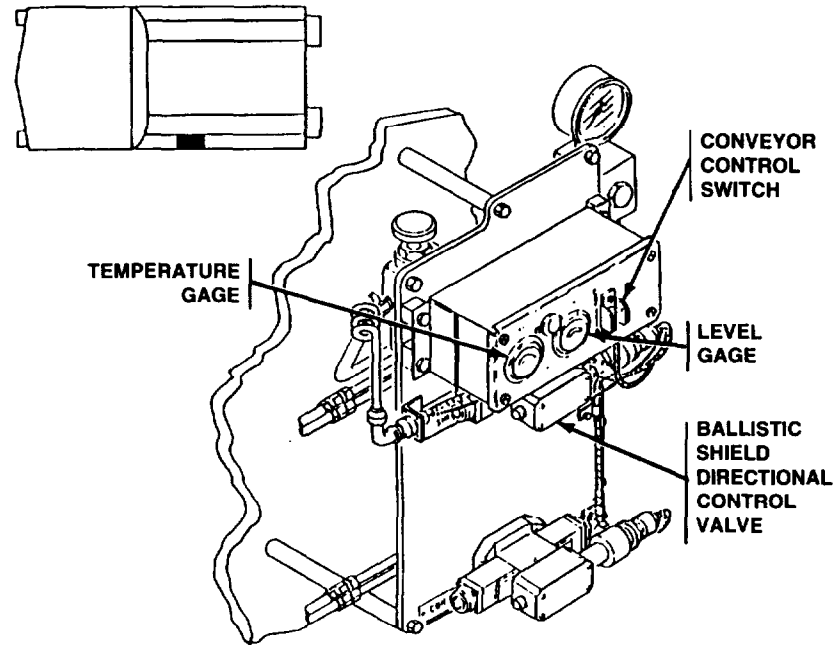
**MAIN RELIEFVALVE:** Limits hydraulic system pressure. Normal maximum pressure setting is 1550 psi (10, 686.75 kPa). System pressure over 1550 psi is relieved through the valve to the reservoir.

**SYSTEM PRESSURE GAGE:** Monitors hydraulic system pressure.

**FLOW-CONTROL VALVE:** Regulates flow of hydraulic fluid. Valve can be adjusted manually to achieve desired conveyor speed.

**CONVEYOR DIRECTIONAL CONTROL VALVE:** Controls direction of fluid flow to the conveyor motor. Positioning of an internal spool determines the direction of conveyor motor rotation. The valve may be electrically powered by the conveyor switch or manually operated by pressing the buttons at either side of the valve.

## HYDRAULIC CONTROL PANEL (continued)



**BALLISTIC SHIELD DIRECTIONAL CONTROL VALVE:** Controls direction of fluid flow to the upper rear door cylinder. Positioning of an internal spool determines direction of cylinder rod movement. The valve may be electrically powered by either of the upper rear door switches or may be manually operated by pressing the buttons at either side of the valve.

**TEMPERATURE GAGE:** Displays the temperature of hydraulic system fluid monitored by the fluid temperature transmitter.

**LEVEL GAGE:** Displays level of hydraulic system fluid in the hydraulic reservoir as monitored by the fluid level transmitter.

**CONVEYOR CONTROL SWITCH:** Controls electrical activation of the conveyor directional control valve.



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## CHAPTER 2 OPERATING INSTRUCTIONS

### Chapter Overview

This chapter outlines procedures crew members must follow to properly operate the M992A1.

Information found in Chapter 2 includes:

- Visual and functional descriptions of driver and crew controls and indicators.
- Checks and services required to maintain vehicle in working order.
- Step-by-step instructions for operating major vehicle systems under usual and unusual conditions.
- Operation of auxiliary equipment and backup systems and procedures to follow in emergency situations.

Chapter 2 is divided into the following sections:

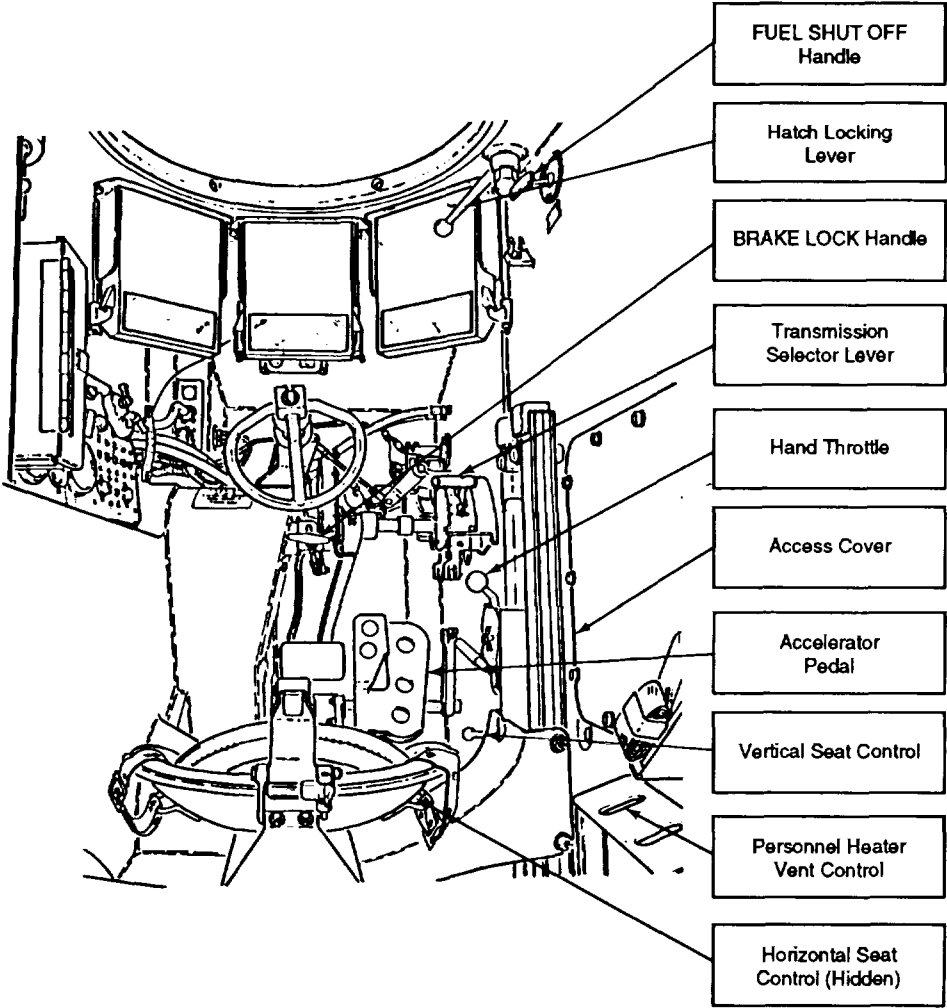
Section I	DESCRIPTION OF CONTROLS AND INDICATORS
Section II	PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
Section III	OPERATION UNDER NORMAL CONDITIONS
Section IV	OPERATION UNDER UNUSUAL CONDITIONS

Section I. DESCRIPTION OF CONTROLS AND INDICATORS

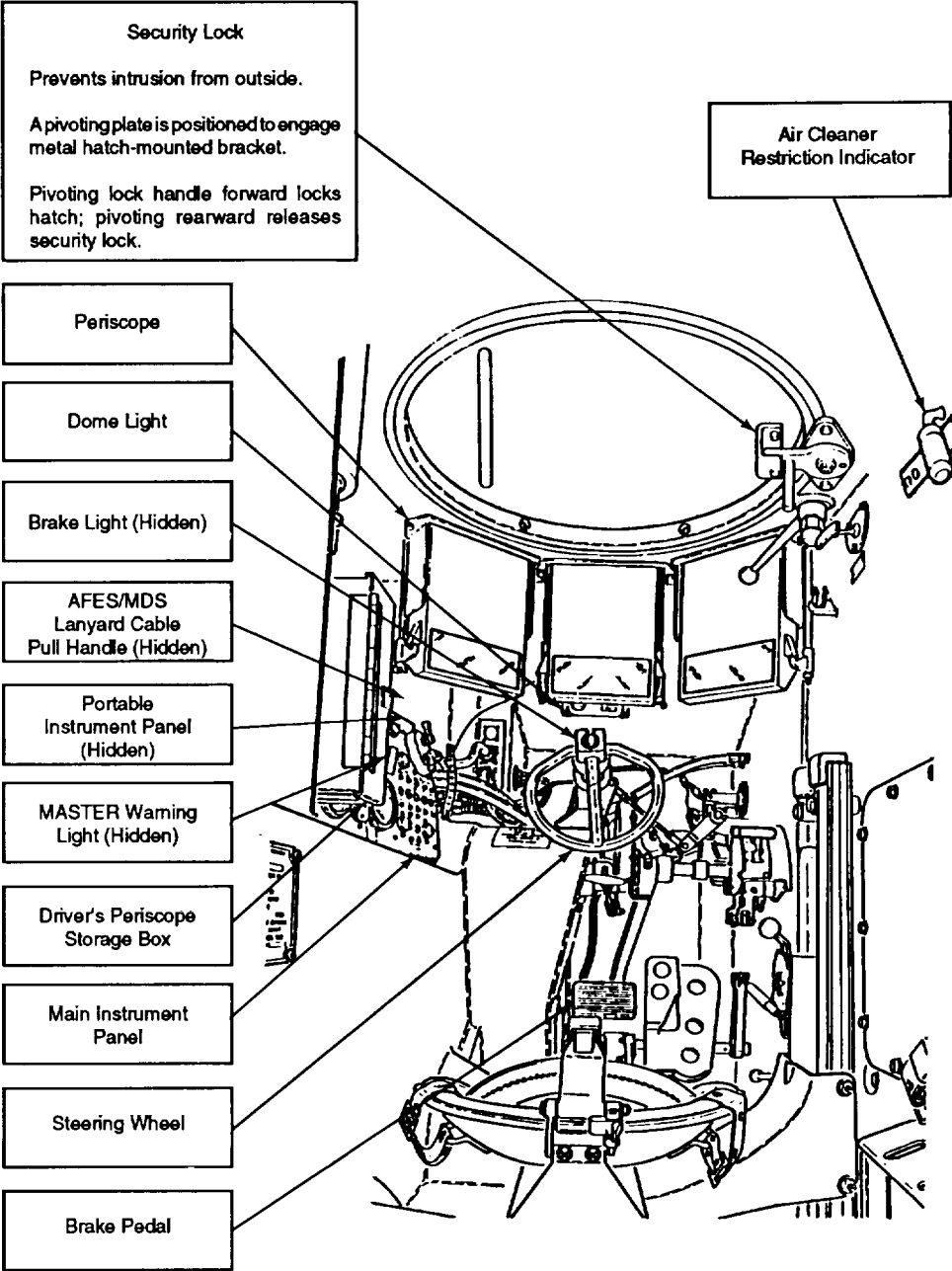
DRIVER'S CONTROLS AND INDICATORS

NOTE

Detailed information for use of the controls and indicators can be found in Sections III and IV of this chapter.



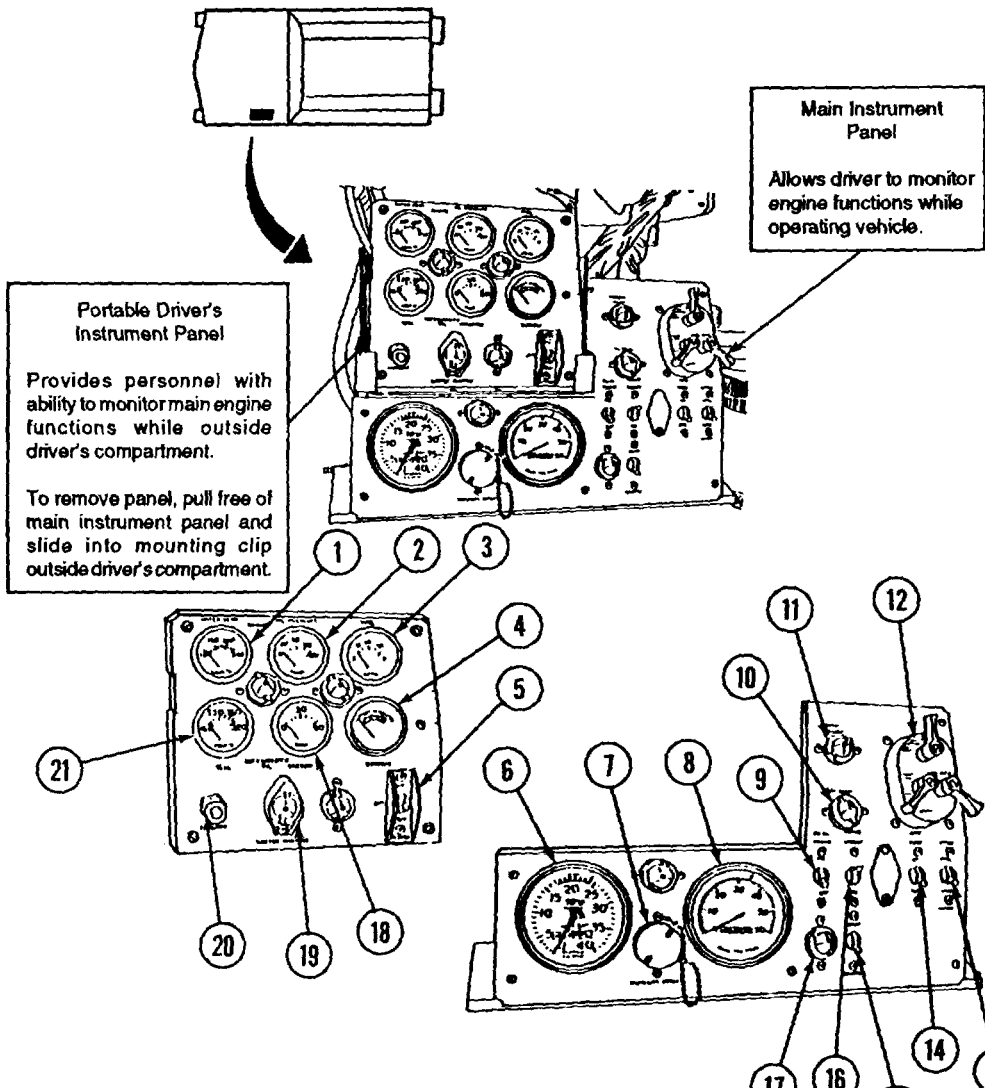
DRIVER'S CONTROLS AND INDICATORS (continued)

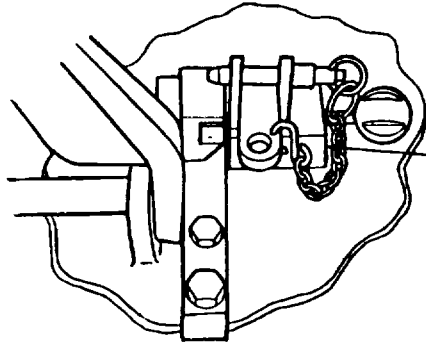


## DRIVER'S CONTROLS AND INDICATORS (continued)

REFER- ENCE NUMBER	CONTROL OR	INDICATOR FUNCTION
1	Water Temperature Gage	Indicates temperature of main engine coolant.
2	Engine Oil Pressure Gage	Indicates pressure of main engine oil.
3	Fuel Level Gage	Indicates amount of fuel in either upper or lower tank.
4	Battery Gage	Indicates charge level of batteries.
5	Master Switch	Controls all vehicle electrical power.
6	Tachometer/Hour Meter	Indicates engine speed in rpm and hours of operation.
7	Auxiliary Power Outlet	Provides power for auxiliary 24-volt tools.
8	Speedometer/Odometer	Indicates vehicle speed in mph and miles traveled.
9	Fuel Prime Switch	Controls fuel pump to prime system.
10	High-Beam Indicator	Indicates when high beams of headlights are on.
11	Parking Brake Indicator	Indicates parking brake is engaged.
12	Service Light Switch	Controls vehicle lights.
13 Switch	Upper/Lower Fuel Gage	Allows operator to check level in upper and lower fuel tanks.
14	Bilge Pump Switch	Controls operation of bilge pump.
15	Starter Switch	Controls operation of main engine starter.
16	Glow Plug Switch	Controls operation of glow plug.
17	GLOW PLUG Indicator	Indicates when glow plug system has been activated.
18	Transmission Oil Pressure Gage	Indicates pressure of transmission oil.
19	Master Warning Indicator	Indicates when master switch is on.
20	Coolant Level Indicator	Indicates low engine coolant level.
21	Transmission Oil Temperature Gage	Indicates temperature of transmission oil.

DRIVER'S CONTROLS AND INDICATORS (continued)





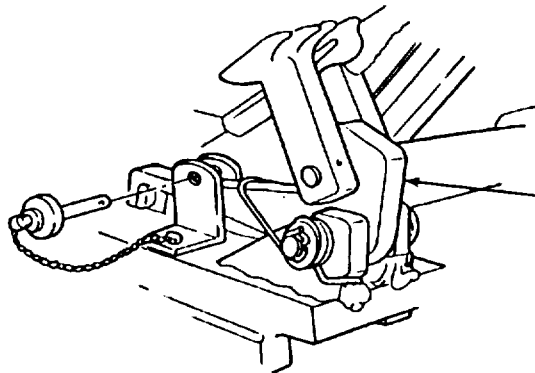
**Driver's Hold-Open Latch**

Holds hatch door open for entry, exit, or driving with the seat raised.

Spring-loaded lockpin automatically engages when door is fully raised.

Quick-release pin provides driver with protection from falling hatch door should spring-loaded lockpin fail.

To release latch, remove quick-release pin from horizontal position and stow in forward hole, then pull latch knob outward.



**Commander's Cupola Hold-Open Latch**

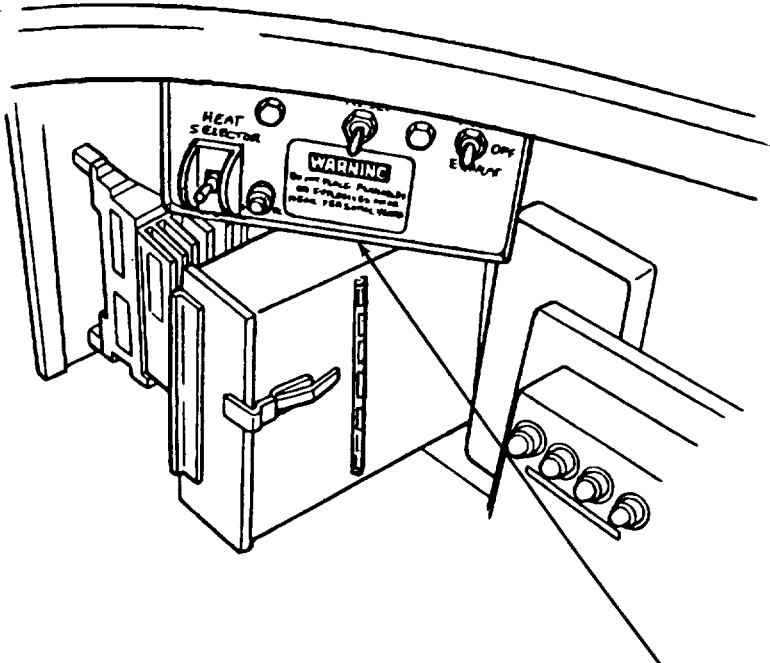
Holds commander's cupola hatch open when commander is observing ammunition loading or unloading or is operating the 0.50-caliber machine gun.

Spring-loaded latch automatically engages when hatch is open 120 degrees.

Quick-release pin provides commander with protection from falling hatch during operation.

To release latch, remove quick-release pin from horizontal position and stow in forward hole, then push latch handle to release latch.

DRIVER'S CONTROLS AND INDICATORS (continued)



**Accessory Control Box**

Controls heat and ventilation of the crew compartment.

The HEAT SELECTOR switch allows the driver to choose either low or high heat.

An indicator lights when the heater is operating.

Outside air can be drawn into the crew compartment by selecting INTAKE on the VENTILATOR SELECTOR control. Fumes can be removed from the crew compartment area by selecting the EXHAUST setting.

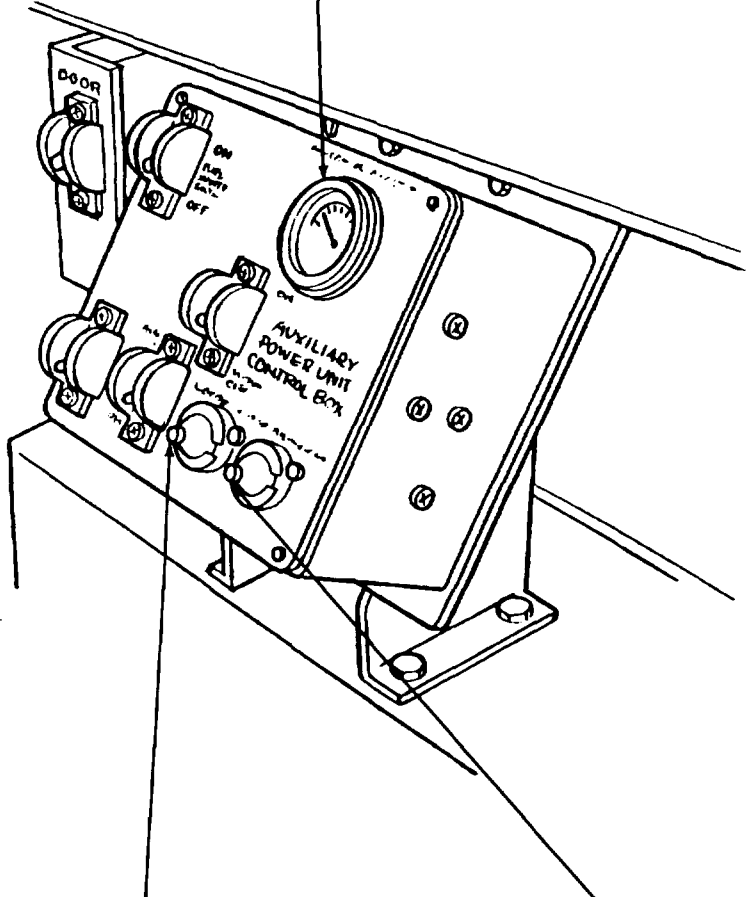
For operating instructions for the personnel heater, see page 2-187.



CREW CONTROLS AND INDICATORS

Auxiliary Power Unit (APU) Control Box

**ENGINE OIL PRESSURE Gage**  
Monitors APU engine oil pressure in pounds per square inch (psi). The gage is graduated in 10-psi increments from 0 to 60 psi. Normal operating pressure ranges from 25 to 35 psi.

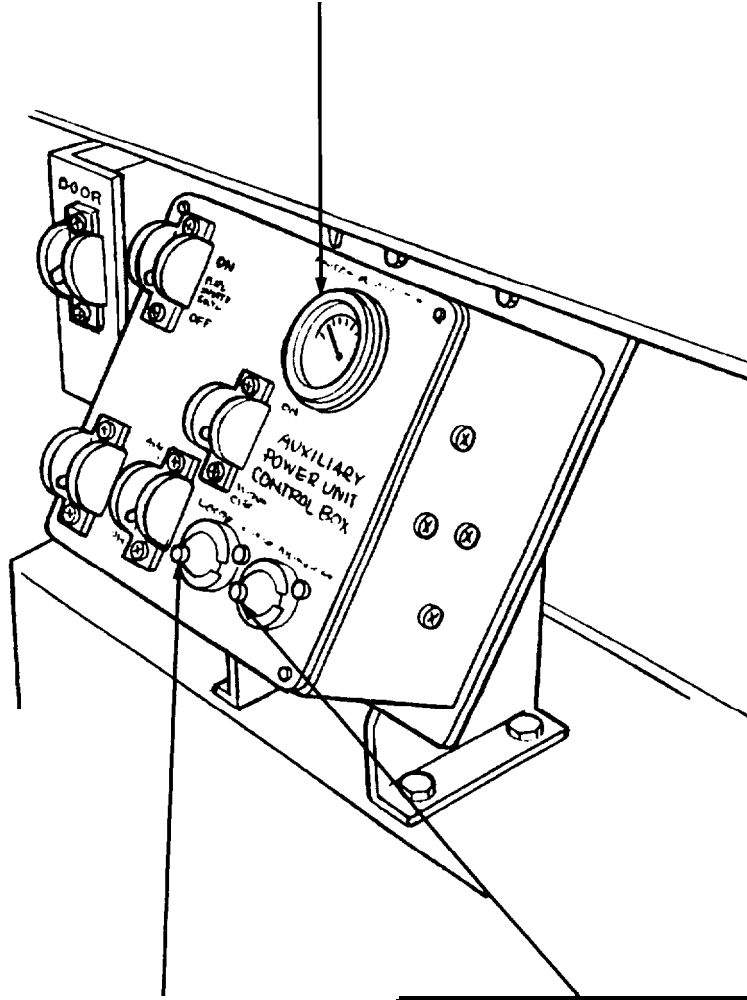


**LOW OIL PRESS Lamp**  
This red lamp lights when a low oil pressure condition exists in the APU lubricating system.

**HIGH AIR TEMP Lamp**  
This red lamp lights when the APU overheats.

**CREW CONTROLS AND INDICATORS (Auxiliary Power Unit [APU] Control Box)  
(continued)**

**ENGINE OIL PRESSURE Gage**  
Monitors APU engine oil pressure in pounds per square inch (psi). The gage is graduated in 10-psi increments from 0 to 60 psi. Normal operating pressure ranges from 25 to 35 psi.



**LOW OIL PRESS Lamp**  
This red lamp lights when a low oil pressure condition exists in the APU lubricating system.

**HIGH AIR TEMP Lamp**  
This red lamp lights when the APU overheats.

CREW CONTROLS AND INDICATORS (continued)

Hydraulic Control Panel

Hydraulic Pressure Gage

The gage measures pressure generated by the main hydraulic pump in pounds per square inch (psi), from 0 to 3000 psi.

Gage should measure 100 to 300 psi with hydraulic pump operating conveyor, upper rear door down, and hydraulic fluid at normal operating temperature.

Flow-Control Valve

Meters flow of hydraulic fluid to conveyor.

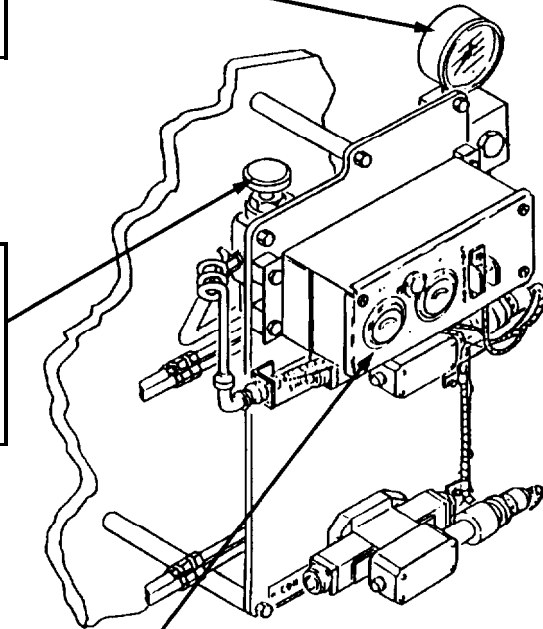
Valve can be manually adjusted to increase or decrease flow and, therefore, the operating speed of conveyor.

HYDRAULIC RESERVOIR  
TEMPERATURE Gage

Monitors temperature of hydraulic fluid in the reservoir. Temperature is measured in degrees Fahrenheit.

Gage is graduated in 20°F increments from 120° to 240°F.

Hydraulic fluid temperature should not exceed 160°F.

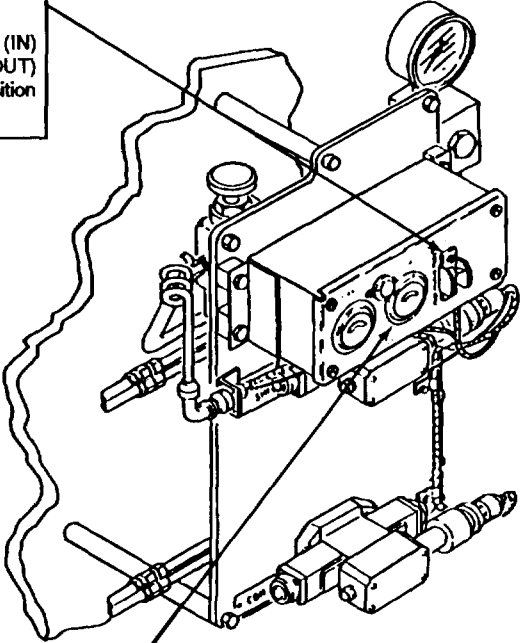


CREW CONTROLS AND INDICATORS (Hydraulic Control Panel) (continued)

**CONVEYOR Switch**

Electrically controls operation of conveyor directional control valve.

The three-position switch is positioned down (IN) to load cargo. Upward positioning of switch (OUT) is used to unload cargo. Switch in center position stops conveyor.



**HYDRAULIC RESERVOIR LEVEL Gage**

Monitors hydraulic reservoir fluid level.

Gage is graduated from empty (E) to full (F) in 1/4-tank increments.

Fluid should not measure less than 3/4.

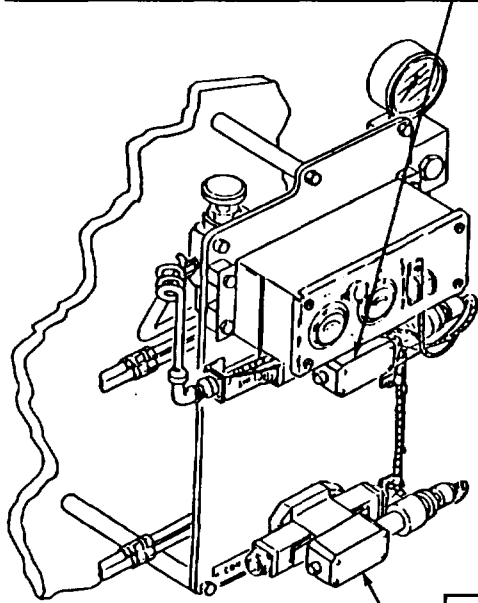
CREW CONTROLS AND INDICATORS (Hydraulic Control Panel) (continued)

**BALLISTIC SHIELD Directional Control Valve**

Directs flow of hydraulic fluid to upper rear door (ballistic shield) actuator.

The valve may be electrically controlled by top or bottom upper rear door switch or may be manually operated at valve.

For manual operation, pressing right-hand button closes upper rear door and pressing left-hand button opens door.



**CONVEYOR Directional Control Valve**

Directs flow of hydraulic fluid to the conveyor motor.

The valve may be electrically controlled by the conveyor switch or may be manually operated at the valve.

For manual operation, pressing the right-hand button moves the conveyor chain out; pressing the left-hand button moves the conveyor chain in.

**CREW CONTROLS AND INDICATORS (continued)**

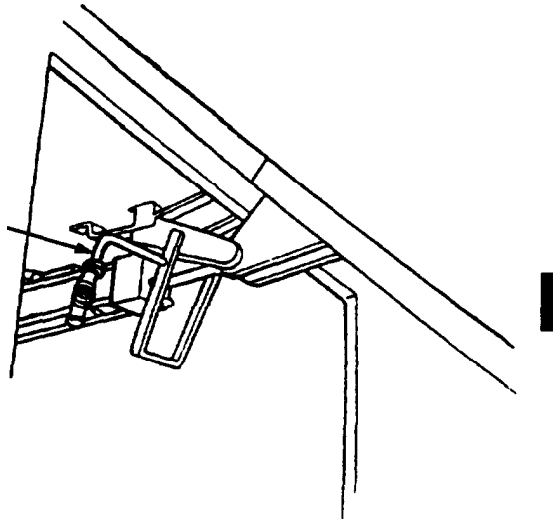
**Upper Rear Door (Ballistic Shield)**

**Upper Rear Door  
Mechanical Lock**

Mechanically secures upper rear door in open position.

The mechanical lock holds door open in 45 degree or 90-degree position by wedging between door and roof plate.

When door opens, lock latches automatically.

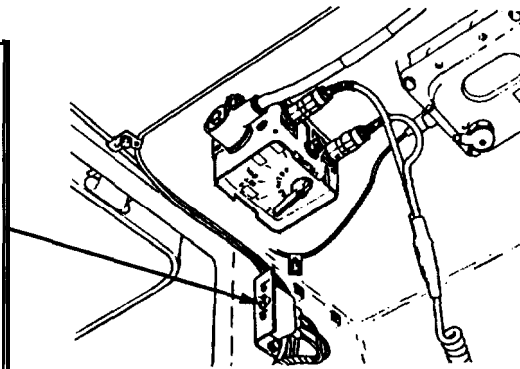


**Upper Rear Door  
Switch-Top**

This three-position, momentary-contact switch controls electrical power for movement of the upper rear door.

When switch is positioned to UP, the door opens.  
When switch is positioned to DOWN, the door closes.

When switch lever is released, it returns to center (off) position and upper rear door movement stops.

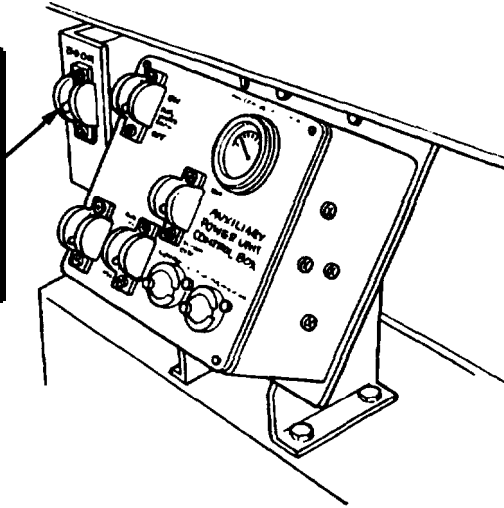


CREW CONTROLS AND INDICATORS (Upper Rear Door [Ballistic Shield]) (continued)

Upper Rear Door  
Switch-Bottom

This switch is identical to switch at top and is operated the same way.

The bottom switch is positioned just inside left side of lower rear door, well within reach of personnel outside vehicle.

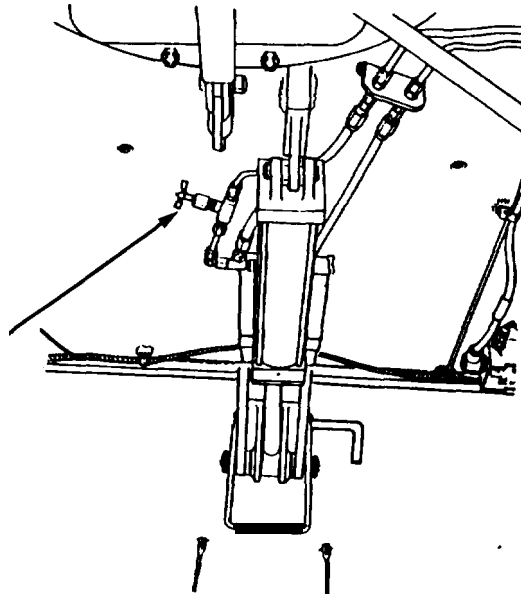


Upper Rear Door  
Dump Valve

The valve is used to permit opening and closing of the door if hydraulic system fails.

Opening the valve allows hydraulic fluid to bypass flow-restrictive devices in circuit.

The valve should be used to open or close door manually only in emergencies.



CREW CONTROLS AND INDICATORS (continued)

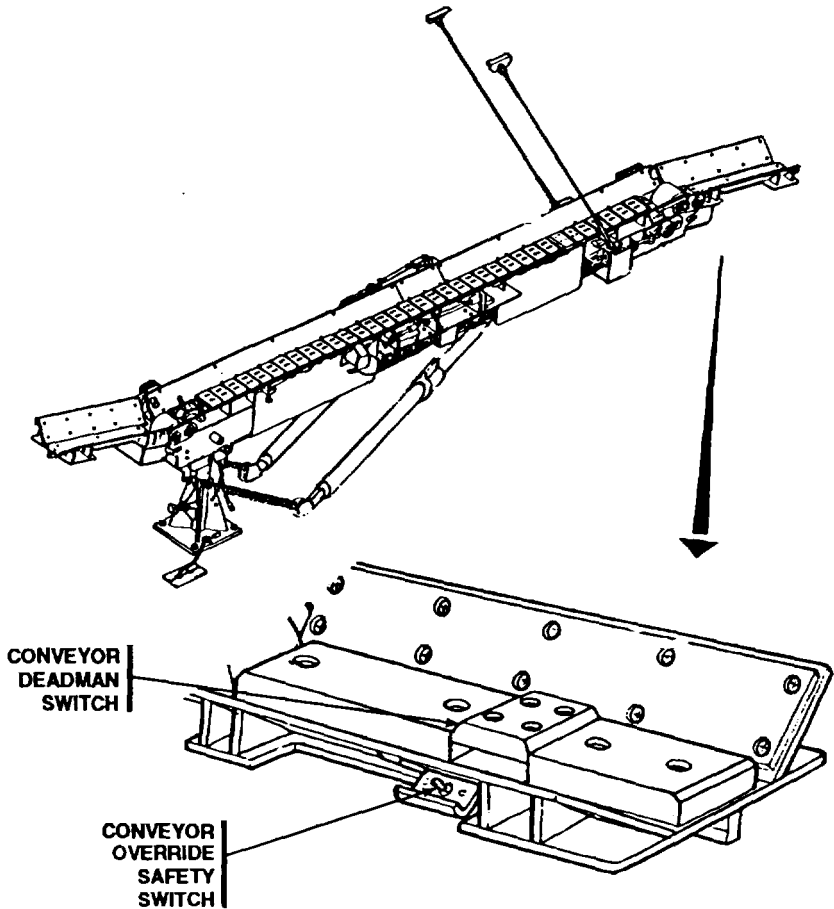
Conveyor

**Conveyor Override Safety Switch**

This two-position toggle switch is used to turn off conveyor from outside end of conveyor. It does this by breaking electrical continuity through the conveyor circuit, overriding main CONVEYOR switch on hydraulic control panel. The safety switch should be turned off each time conveyor is stowed.

Turning override safety switch to OFF shuts down conveyor. With safety switch turned to ON and main CONVEYOR switch positioned to either IN or OUT, conveyor will operate in selected direction.

This switch is only one safety device used to prevent pile-up of ammunition on conveyor. The main CONVEYOR switch and the deadman switch (p. 161) should be used for normal operation.



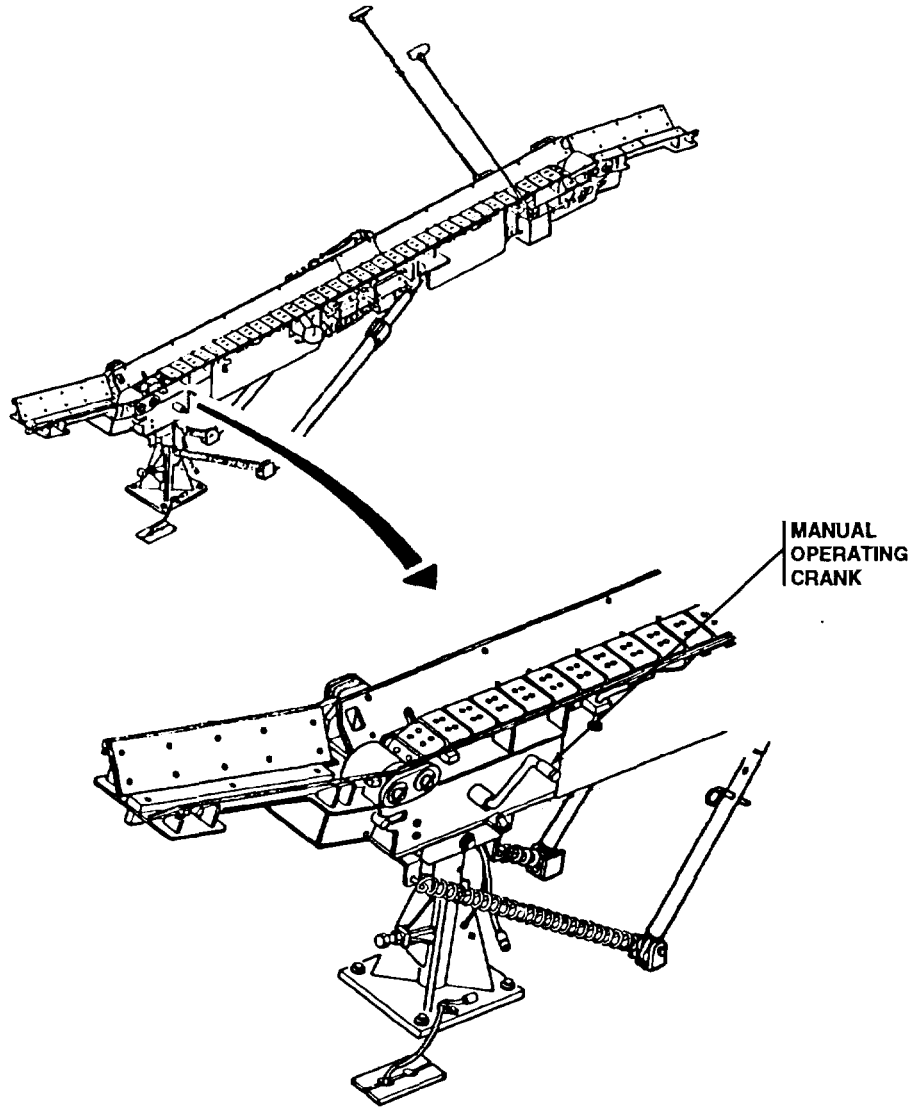


**Manual Operating Crank**

The crank is used to operate the conveyor when related hydraulic components fail.

When needed, crank handle is removed from its stowage location at base of left rear canister compartment and is inserted into hole opposite hydraulic motor.

Turning handle clockwise moves conveyor chain out. Turning handle counterclockwise moves conveyor chain in.



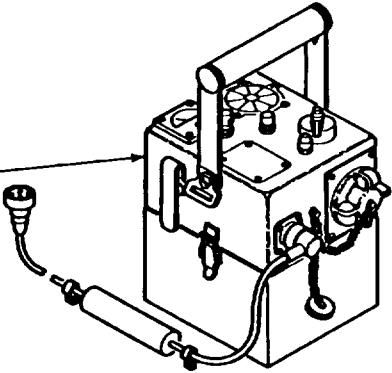
CREW CONTROLS AND INDICATORS (continued)

Chemical Agent Detection and Alarm System

**Chemical Agent Detector M43**

Detects very low concentrations of chemical agent vapors and inhalable aerosols. Detector may be operated continuously but must be serviced every 12 hours.

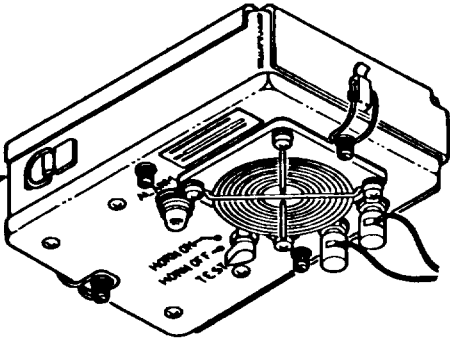
Refer to TM 3-6665-225-12 for detailed description of this unit.



**Chemical Agent Alarm M42**

When connected to M43 detector, M42 alarm provides remote audible and/or visual signal if M43 detector senses a chemical agent.

For a detailed description of this unit, refer to TM 3-6665-225-12.



CREW CONTROLS AND INDICATORS (continued)

Ventilated Face Piece System (VFPS)

**Control Box On/Off Switch**

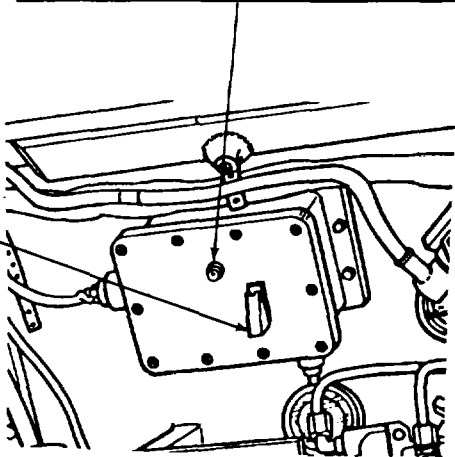
When turned to ON, this switch activates air purifier unit and supplies electrical power for operation of M3 heaters.

This switch is a two-position toggle switch covered by a red guard.

The switch lever is positioned up for ON and down for OFF.

**Control Box Power Indicator Lamp**

This blue-green lamp lights when on/off switch is turned to ON.



**M3 Heater Control Knob**

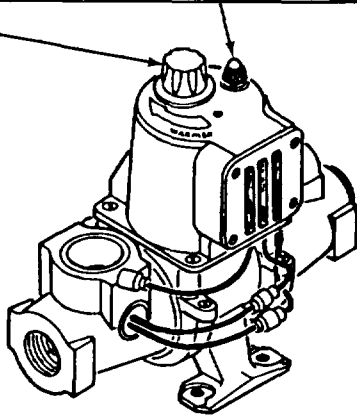
When turned, the knob controls warming of breathable filter air received at each ventilated face piece (VFP).

When NBC power control box on/off switch is set at ON, control knob at each heater can be turned on and adjusted for desired heater.

Turning control knob clockwise increases heat. Each heater is individually controlled.

**M3 Heater Indicator Lamp**

When a heater is turned on, its blue-green lamp will light.



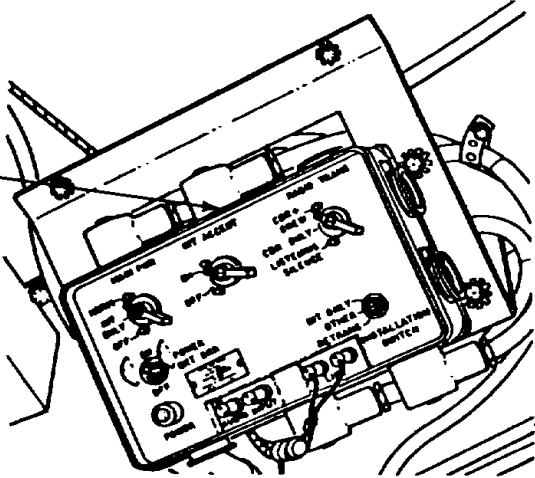
CREW CONTROLS AND INDICATORS (continued)

Intercommunications Equipment

**AN 1780/VRC**

This is the master control box for the intercommunications system. Unit must be properly set up for intercommunications system to work.

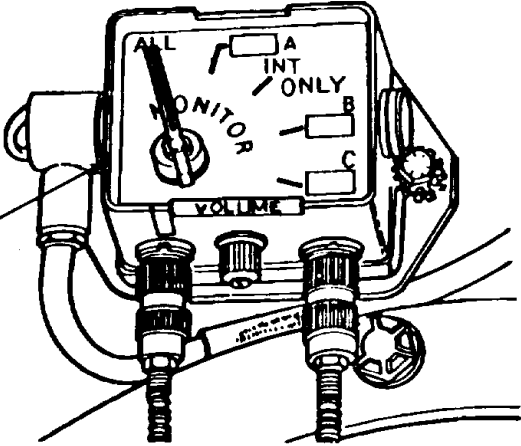
Refer to TM 11-5830-340-12 for detailed description of this unit.



**C-2298/VRC**

This is the individual control box for each crew member using an audio accessory. The audio accessory connects with intercommunications system via receptacles at base of C-2298/VRC.

Refer to TM 11-5830-340-12 for detailed description of this unit.



CREW CONTROLS AND INDICATORS (continued)

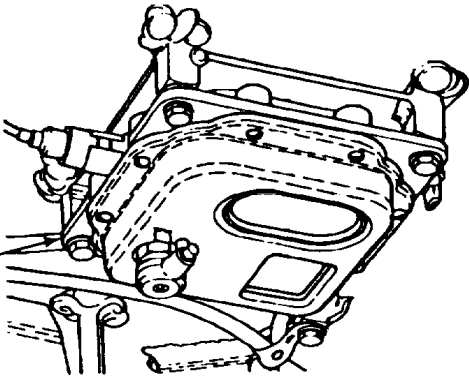
Miscellaneous Controls and Indicators

**Dome Lights**

Five lamps provide lighting for interior of cargo compartment.

Each unit is individually switched on and off.

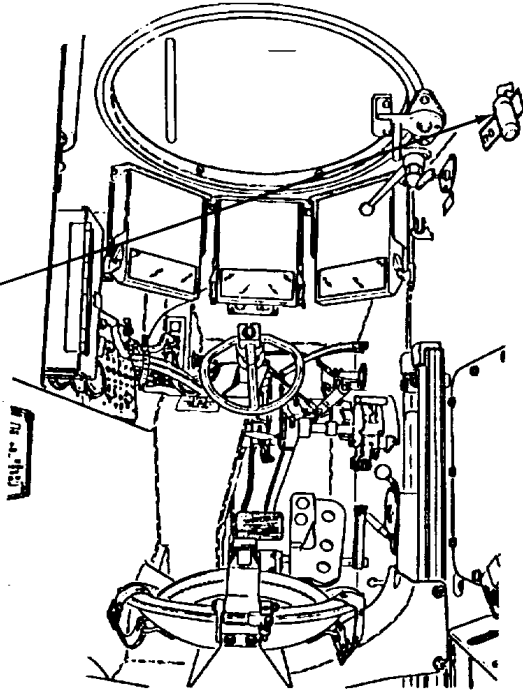
Turning switch lever fully clockwise turns on white light. To turn on blue-green light, press safety latch and turn switch lever counterclockwise past stop. To turn light off, turn lever to center position.



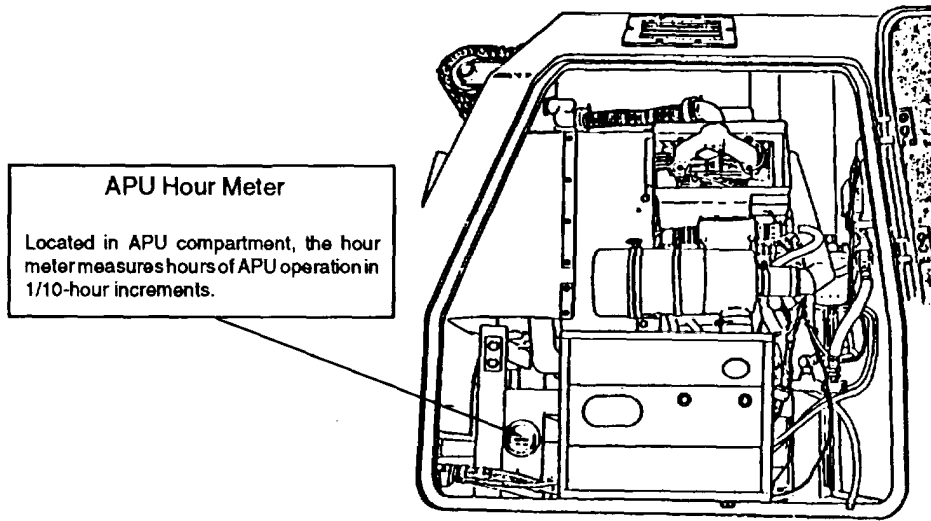
**Air Cleaner Restriction Indicator**

Indicates a restricted or blocked filter.

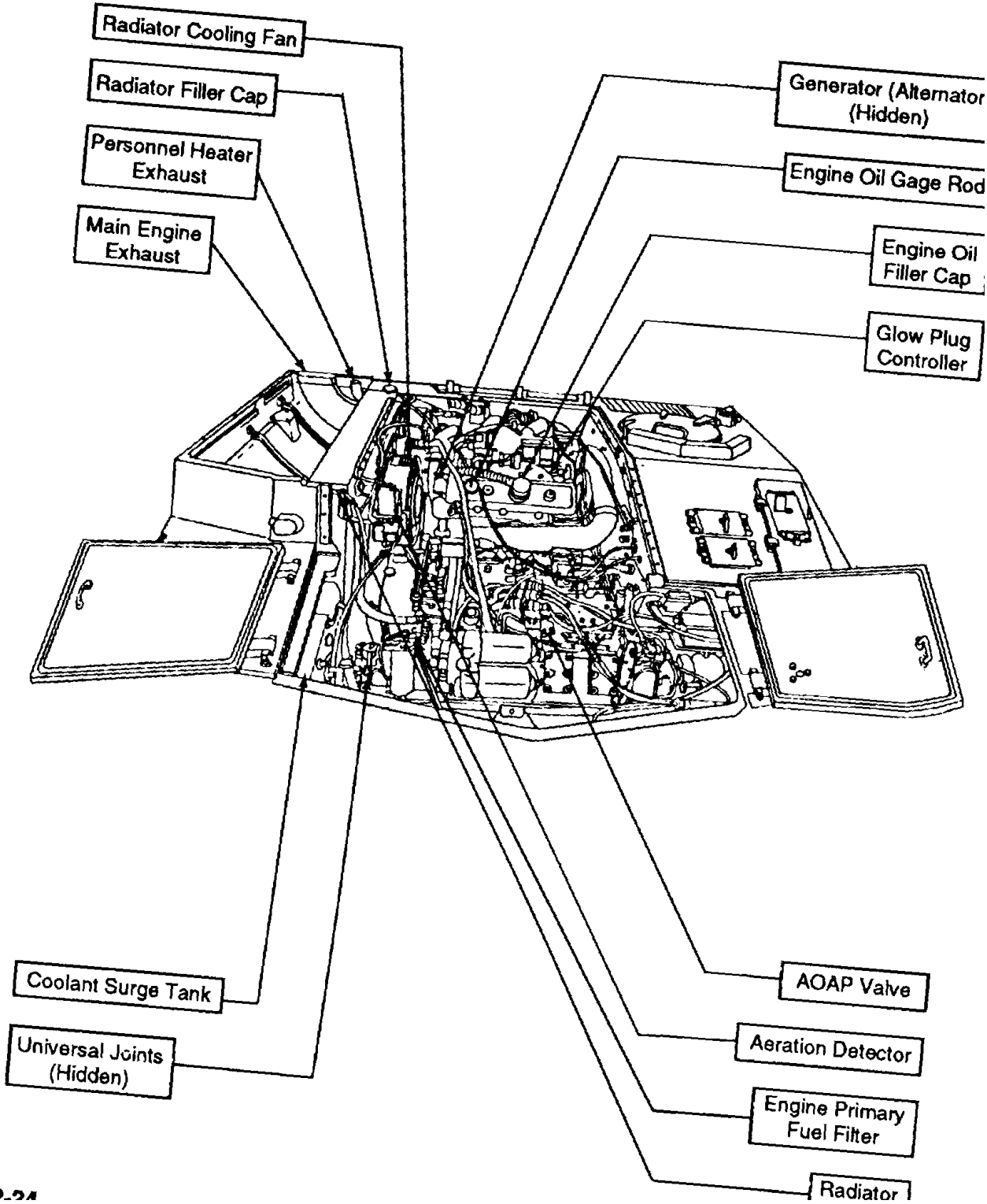
Signal window displays a yellow sleeve that indicates amount of restriction in air cleaner. When sleeve climbs into red zone, air cleaner filter is restricted and requires service.



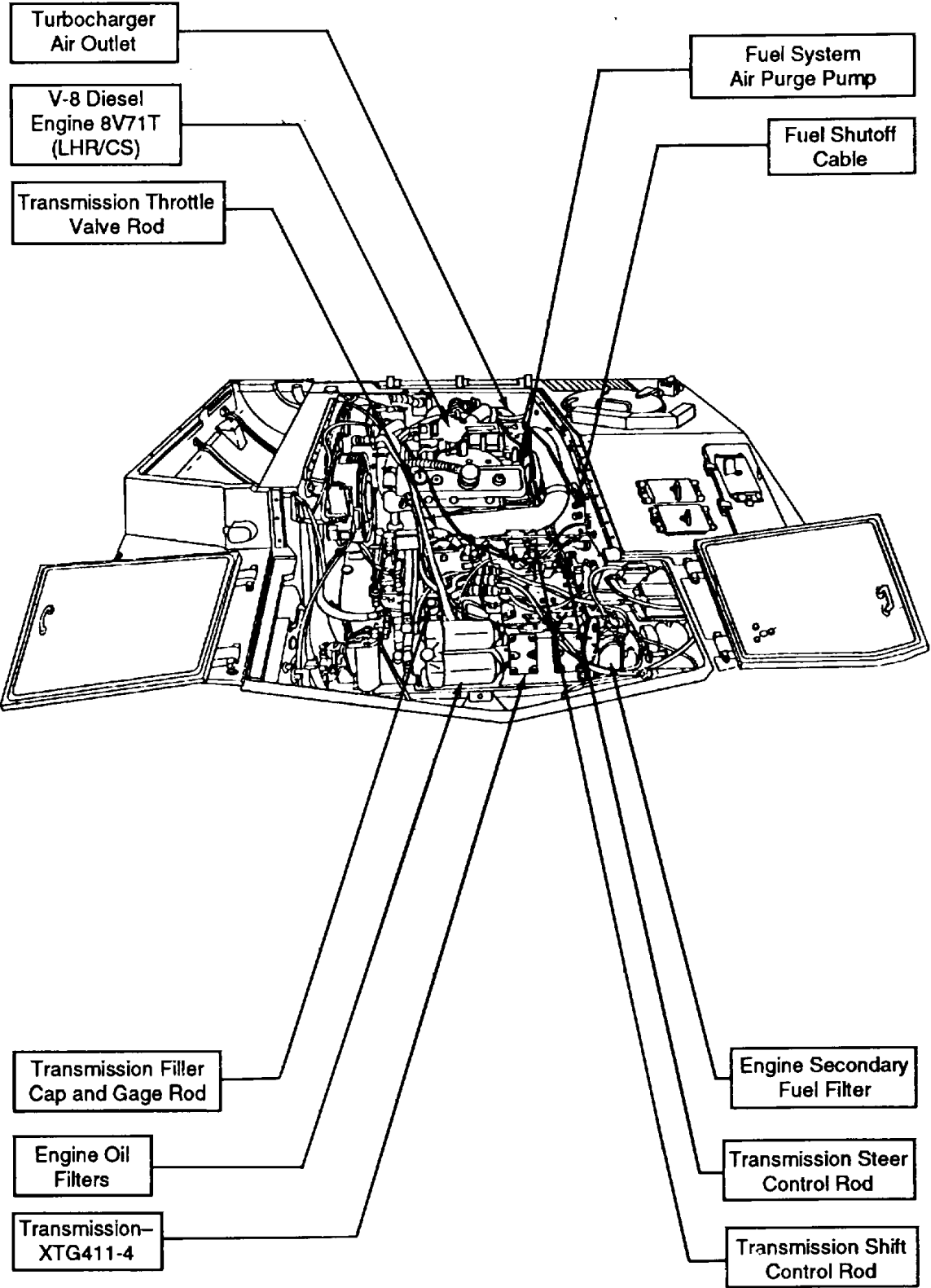
**CREW CONTROLS AND INDICATORS (Miscellaneous Controls and Indicators)**  
(continued)



POWERPACK



POWERPACK (continued)





## Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

### General

The purpose of performing preventive maintenance checks and services (PMCS) is to discover and correct any defects before serious damage or failure occurs. Performing the PMCS as outlined on this and the following pages will help you keep a well-maintained and properly functioning vehicle. Always perform the PMCS in the same sequence each time; by doing so, you will develop habits that will help you to spot trouble quickly.

### WARNING

**Unusable CARC mixtures are considered hazardous waste and will require disposal in accordance with Federal, state, DOD, DA, and local installation hazardous waste regulations. Consult the installation environmental office for proper disposal guidance. Mixed CARC is extremely flammable-use only in well-ventilated areas and keep away from open flames, heat, sparks, and other ignition sources.**

Painting at the operator level is limited to touch-up/spot painting. CARC paint that has been opened must be used within eight hours or it will deteriorate beyond use. Mix only what is needed for immediate use. Refer to TM 43-0139.

### PMCS Procedures

In Table 2-1, Preventive Maintenance Checks and Services for Model M992A1, the PMCS are grouped according to Before operation, During operation, After operation, Weekly, or Monthly checks or services.

- *Before you operate.* Always keep in mind the CAUTIONs and WARNINGs. Perform your Before PMCS before the vehicle leaves its containment area or performs its intended mission.
- *While you operate.* Always keep in mind the CAUTIONs and WARNINGs. Perform your During PMCS when the vehicle is being used in its intended mission.
- *After you operate.* Be sure to perform your After PMCS after the vehicle has been taken out of its mission mode or returned to its containment area.

*Perform Weekly as well as Before operations PMCS if.*

- You are the assigned operator and have not operated the vehicle since the last weekly PMCS.
- You are operating the vehicle for the first time.

**PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (continued)**

*If your equipment fails to operate.* Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

*While you perform PMCS, have tools with you and keep an eye out for the following:*

- Loose bolts.* A loose bolt can be difficult to spot without using a wrench. However, you can often identify a loose bolt by observing loose or chipped paint around the bolt head and bare metal or rust at its base. Tighten loose bolts and spot paint as required.
- Damaged welds.* Damaged welds may be detected by observing rust or chipped paint where cracks occur.
- Frayed electrical wires and loose connectors.* Check electrical wiring for cracks due to aging and exposed wires that could cause an electrical short. Tighten loose clamps and connectors.
- Frayed brake cables and loose linkages.* Check brake cables for signs of excessive wear near their middles. Make sure throttle and steering linkages are properly secured.
- Corrosion.* Check for signs of deterioration, rust, unusual cracking, softening, swelling, or breaking.
- Leakage definitions.* Leakage definitions for operator/crew PMCS shall be classified as follows:
  - Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
  - Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
  - Class III Leakage of fluid great enough to form drops that fall from the item being checked/ inspected.

**CAUTION**

**Equipment operation is allowable with minor leakages (Class I or II). Of course, you must consider the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor. When operating with Class I or Class II leaks, continue to check fluid levels as required in your PMCS.**

**Class III leaks should be reported to your supervisor or Unit maintenance.**

*Damage definitions.* Damage definitions are as follows:

- Blowby.* Powder marking beyond a sealing surface.
- Burr.* A raised portion, restricting the entrance of a part, component, or assembly.

**PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (continued)**

- *Crack.* A narrow break or separation in material.
- *Gouge.* A groove or cavity in a sealing surface that cannot be repaired.
- *Nick.* An indentation caused by an object(s) striking the material.

*Troubleshooting.* If your equipment does not perform as required, refer to Chapter 3 under Troubleshooting for possible problems. Report any malfunctions or failures on DA Form 2404, or refer to DA Pam 738-750.

*Maintenance.* If an assembly must be removed and/or disassembled in order to perform PMCS, refer to the maintenance procedures in Chapter 3.

**CAUTION**

**Improper use of high-pressure water hose or steam cleaner can damage seals and electrical components, resulting in equipment failure. Use high-pressure water only on suspension system.**

*Cleaning.* Suspension components may be cleaned with high-pressure water or steam cleaners. Do not use high-pressure water hose or steam cleaner in the driver's or crew compartment.

*Reporting new faults.* Any faults found but not covered in PMCS should be reported on DA Form 2404.

**PMCS Table**

Your PMCS table (next page) lists the inspections and care of your equipment required to keep it good operating condition. Explanations of the column headings are as follows:

- *Item No.* The item number column of your PMCS table is to be used for reference. When completing DA Form 2404, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.
- *Interval.* This column of your PMCS table tells you when to do a certain check or service.
- *Location, Item to Check/Service.* This column of your PMCS table provides the location and the item to be checked or serviced.
- *Crewmember, Procedure.* This column of your PMCS table tells you how to do the required checks and services and which crewmember(s) is responsible for each check or service. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have Unit maintenance do the work.
- *Not Fully Mission Capable If.* This column tells you when and why your equipment cannot be used.

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

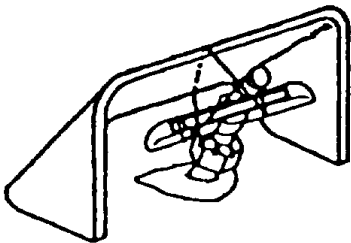
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
1	Before	Vehicle Exterior	<p><b><u>DRIVER</u></b></p> <p>Walk around vehicle. Check for any obvious leaks, missing items, or damage to equipment.</p>	Any Class III leak found. Vehicle has damage or is missing items that would prevent operation.
2	Before	Subfloor Drain and Hull Plugs	<p><b><u>DRIVER</u></b></p> <p><b><u>CAUTION</u></b></p> <p>Do not ford if any drain plugs are missing.</p> <p>Check all drain plugs and hull plugs for installation.</p> <p><b><u>DRIVER</u></b></p> <p><b><u>WARNING</u></b></p> <p>Any automatic fire extinguishing system (AFES) component in need of maintenance or repair is more prone to accidental discharge. Accidental discharge could lead to frostbite or other injury. Small parts or tools become dangerous projectiles when propelled by Halon discharging at 750 psi (5171 kPa).</p>	
3	Before	External Fire Extinguisher Handle	<p>Check to make sure handle is properly seated and laced with double-strand wire.</p> 	Wire seal is broken or missing or extinguisher handle is pulled.

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

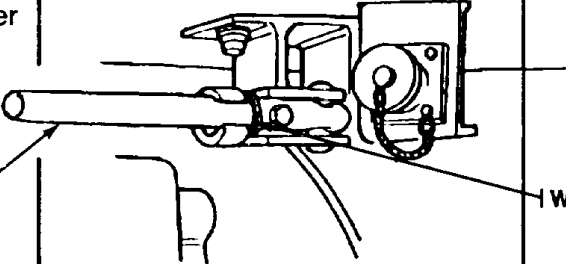
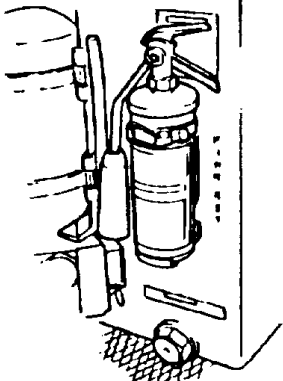
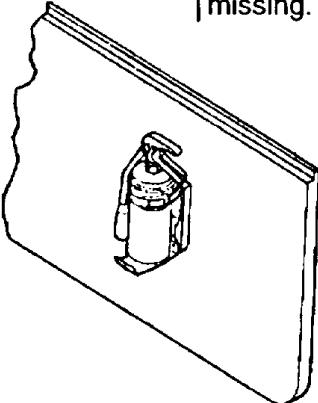
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
4	Before	Driver's Compartment Manual Fire Extinguisher Handle	<p><u>DRIVER</u></p> <p>Check to make sure handle is properly seated and laced with double-strand wire.</p> 	Wire seal is broken or extinguisher handle is pulled.
5	Before	Cooling System and Cooling Fans	<p><u>DRIVER</u></p> <ol style="list-style-type: none"> <li>Check radiator coolant level. Fluid should be at top of filler neck.</li> <li>Check for leaks and serviceability of hoses, filler cap, and gasket.</li> <li>Check cooling fans.</li> </ol>	<ol style="list-style-type: none"> <li>Class III leak exists.</li> <li>Either cooling fan is missing, fin(s) is broken or cracked.</li> </ol>
6	Before	Portable Extinguisher Bottle	<p><u>COMMANDER</u></p> <p>Check the two portable fire extinguisher bottles in crew compartment to determine if they are properly sealed and mounted securely.</p>  	One or more fire extinguishers is missing or damaged or seal is broken or missing.

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location		Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service			
7	Before	Engine Automatic Fire Extinguishing System (AFES)		<p><b>DRIVER/COMMANDER</b></p> <p>Perform the following checks at engine test and alarm (T/A) panel. If indications below do not occur, troubleshoot engine AFES.</p> <p>a. Maintenance switch must be in horizontal AFES POWER ON position.</p> <p>b. Turn MASTER switch to ON. AFES POWER ON lamp on engine T/A panel should light.</p> <p><b>NOTE</b></p> <p>Positions of lamps and SYSTEM TEST/LAMP TEST switch are the same for engine and crew T/A panels.</p> <div style="text-align: center;"> <p>The diagram shows the ENGINE FIRE DETECTION panel with four indicator lamps at the top: POWER ON, PASS TEST, FAULT, and FIRE ALARM. Below the lamps is a selector switch with positions T/W, T/A, AUTO, and MANUAL. At the bottom, there is an EXTINGUISHERS section with a SYSTEM TEST LAMP TEST switch and a CAUTION label. Callouts point to the POWER-ON LAMP, the AFES MAINT/AFES POWER-ON SWITCH, and the SYSTEM TEST/LAMP TEST SWITCH.</p> </div>	<p>a. Maintenance switch in vertical AFES MAINT position.</p> <p>b. POWER ON lamp not lit.</p>

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
7	Before	Engine Automatic Fire Extinguishing System (AFES) (continued)	<p><b>NOTE</b></p> <p>The engine AFES automatically goes through the built-in test equipment (BITE) test cycle.</p> <p>c. Observe PASS TEST lamp. It lights 4-6 seconds upon successful completion of BITE test.</p> <p>d. Observe that FAULT lamp does not light.</p> <p>e. Check AUTO and MANUAL extinguisher light-emitting diodes (LEDs). LEDs should not be lit.</p>	<p>c. PASS TEST lamp does not light.</p> <p>d. FAULT lamp is lit and one or more LEDs are lit.</p> <p>e. FAULT lamp is lit and one or more LEDs are lit.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

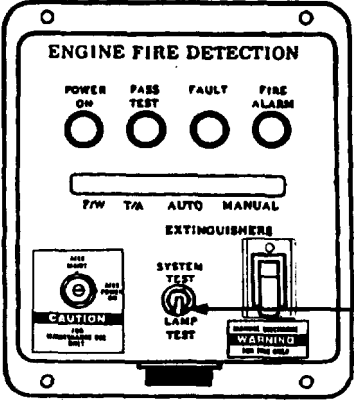
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
7	Before	Engine Automatic Fire Extinguishing System (AFES) (continued)	<p>f. Position SYSTEM TEST/LAMP TEST switch to LAMP TEST. All engine T/A panel lamps, remote status indicator (RSI) lamps, and LEDs light.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Positions of lamps and SYSTEM TEST/LAMP TEST switch are the same for engine and crew T/A panels.</p> <div style="text-align: center;">  </div>	f. Any AFES lamp/LED does not light.
7.1	Before	Driver's Seat Assembly	<p><b>DRIVER</b></p> <p>Move drivers seat to several positions by operating drivers seat adjusting lever. When lever is released, plunger should seat into support and hold seat securely in position. Inspect adjusting lever, specifically the area that controls movement of the plunger.</p>	Any indication that seat does not stay securely locked into position. Adjusting lever is broken or unserviceable.



Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

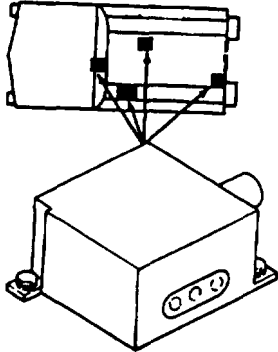
Item No.	Interval	Location	Crewmember Procedure	Not-Fully Mission Capable If:
		Item to Check/Service		
8	Before	Crew Automatic Fire Extinguishing System (AFES)	<p><u>CREWMEMBER</u></p> <p>Clean eyes of four optical fire-sensing assemblies with lens paper (Item 37, Appendix D).</p>  <p>OPTICAL FIRE-SENSING ASSEMBLY</p>	
9	Before	Crew Automatic Fire Extinguishing System (AFES)	<p><u>COMMANDER</u></p> <p>Perform the following checks at crew T/A panel. If indications below do not occur, troubleshoot crew AFES (p. 3-1 8).</p> <p>a. Maintenance switch must be in horizontal AFES POWER ON position.</p> <p>b. Make sure driver has turned MASTER switch to ON. POWER ON lamp on crew T/A panel should light.</p> <p><b>NOTE</b> The crew AFES automatically goes through the BITE test cycle.</p>	<p>a. Maintenance switch in vertical AFES MAINT position.</p> <p>b. POWER ON lamp not lit.</p>

Table 2-1 Preventative Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
9	Before	Crew Automatic Fire Extinguishing System (AFES) (continued)	<p>c. Observe the PASS TEST lamp. It will light 4-6 seconds upon successful completion of BITE test.</p> <p>d. Observe that FAULT lamp does not light.</p>	<p>c. PASS TEST lamp does not light.</p> <p>d. FAULT lamp is lit and one or more LEDs are lit.</p>
			<p>e. Check LEDs of extinguishers No. 1 through No. 6. When any LED is lit, crew extinguisher cylinder in crew compartment is faulty.</p> <p>f. Position SYSTEM TEST/LAMP TEST switch to LAMP TEST. All crew T/A panel lamps and LEDs should light.</p> <p><b>NOTE</b> Positions of lamps and SYSTEM TEST/LAMP TEST switch are the same for engine and crew T/A panels.</p>	<p>e. FAULT lamp is lit and one or more LEDs are lit.</p> <p>f. Any AFES lamp/LED does not light.</p>

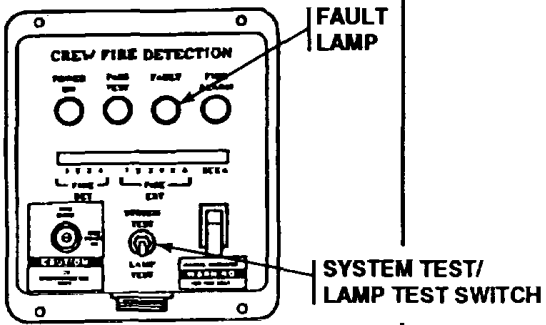
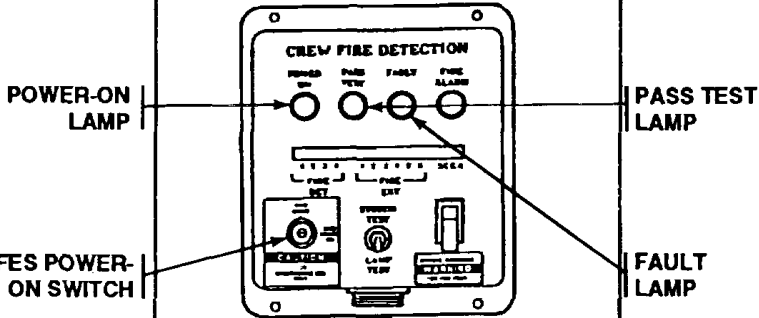


Table 2-1 Preventative Maintenance Checks and Services for Model M992A1

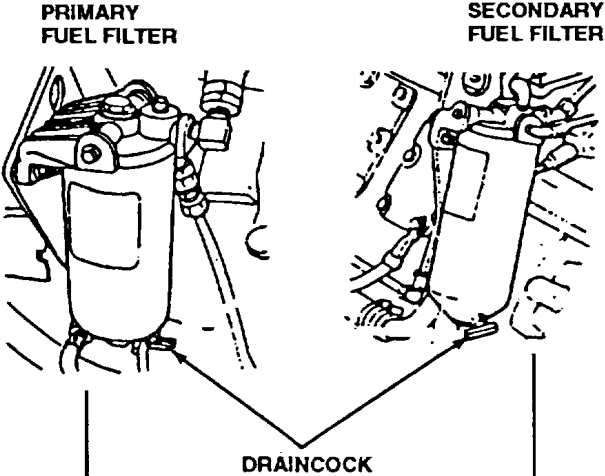
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
10	Before	Primary and Secondary Fuel Filters	<p><b>DRIVER</b></p> <p>Open bottom draincocks and drain water until clear fuel flows from filters. Close draincocks.</p>	Any Class III leak found.
				
11	Before	Transmission Oil Level	<p><b>DRIVER</b></p> <p>Check oil level; level should be within the OPERATING RANGE stamped on dipstick. Add oil as required.</p> <p style="text-align: center;"><b>CAUTION</b></p> <p>Power train assemblies must use OE/HDO-15W-40 (MIL-L-2104) while under warranty.</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

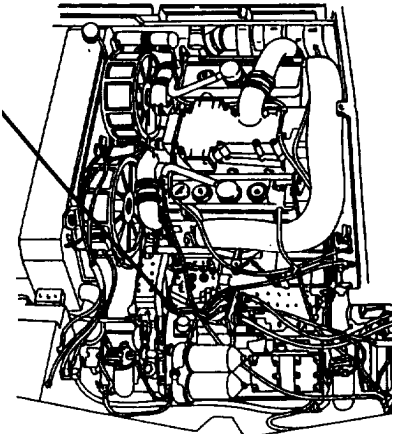
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If
		Item to Check/ Service		
11	Before	Transmission Oil Level (continued)	<p><b>NOTE</b></p> <p>New transmissions are delivered with preservative PE-10-1. Until first scheduled oil change, maintain proper oil level by adding OE/HDO or OEA</p> 	
12	Before	Engine Oil Level	<p><u>DRIVER</u></p> <p><b>NOTE</b></p> <p>Make engine oil level check with vehicle on level ground if possible.</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

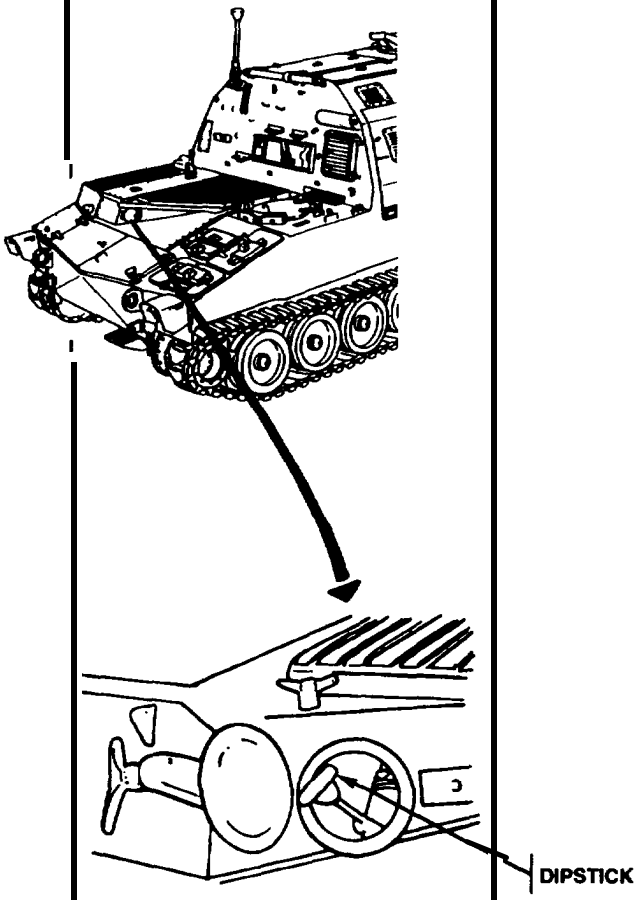
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check Service		
12	Before	Engine Oil Level (continued)	<p>Oil level will take approximately 20 minutes to stabilize in engine crankcase. After 20 minutes, check oil level; it should be within the L - F range stamped on dipstick.</p> 	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
13	Before	Glow Plug System	<p><u>DRIVER</u></p> <p><b>NOTE</b></p> <p>A functional check of the glow plug system must be performed whenever operation in ambient temperatures below 50°F (5.5°C) is anticipated and after any maintenance is performed on the glow plug system.</p> <p>a. Turn MASTER switch to ON.</p> <p>b. Position GLOW PLUG switch to ON, then release.</p> <p>c. If temperature is 50°F (5.5°C) or above, the GLOW PLUG lamp will light for one second, then go off.</p> <p>d. If temperature is below 50°F (5.5°C) the GLOW PLUG lamp will light for 35 seconds, flash on and off for a minute, and then go off.</p>	<p>c. GLOW PLUG lamp does not light or go off.</p> <p>d. GLOW PLUG lamp does not light, flash, or turn off.</p>

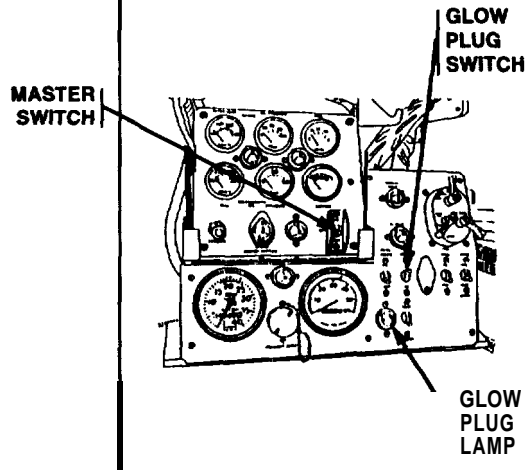


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
		Item to Check/Service		
14	Before	Accelerator Pedal	<p><u>DRIVER</u></p> <p>Check for smooth operation of accelerator pedal and missing or unservicable accelerator pedal return spring.</p>	Return spring is missing or unserviceable or accelerator pedal does not return to idle position after being depressed.
15	Before	0.50-Cal. M2 Machine Gun	<p><u>COMMANDER</u></p> <p>Mount weapon and perform PMCS IAW TM 9-1005-213-10.</p>	Machine Gun cannot be securely mounted.
16	Before	Intercom System	<p><u>COMMANDER</u></p> <p>Check all controls and indicators for proper operation and PMCS IAW TM 11-5830-340-12.</p>	Communication is not possible between commander and driver.
16.1	Before	PLGR	<p><u>COMMANDER</u></p> <p><b>Check all controls, indicators, and assemblies for proper operation and PMCS IAW TM 11-5825-291-13.</b></p>	
17	Before	Parking Brake	<p><u>DRIVER</u></p> <p>Check parking brake operation (p. 2-84).</p>	Parking brake does not hold.
17.1	Before	Instruments and Gages	<p><u>DRIVER</u></p> <p><b>NOTE</b></p> <p>Vehicle may take longer than usual to warm up, depending on local climate.</p> <p>a. Turn on fuel prime switch for one minute. Start engine; follow "starting main engine" procedures (p. 2-82). Run engine at fast idle (1000 rpm).</p>	a. Engine will not start.

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
7.1	Before	Instruments and Gages (continued)	<p>b. ENGINE WATER TEMP gage reads 160° F to 185° F minimum, 230° F maximum.</p> <p>c. ENGINE OIL PRESSURE gage reads 30-70 psi at fast idle.</p> <p>d. TRANSMISSION OIL TEMP gage reads 220° F to 240° F normal, 300° maximum.</p> <p>e. TRANSMISSION OIL PRESSURE gage reads 10-45 psi at fast idle.</p>	<p>b. ENGINE WATER TEMP gage inoperative or does not read within limits.</p> <p>c. ENGINE OIL PRESSURE gage inoperative or does not read within limits</p> <p>d. TRANSMISSION OIL TEMP gage inoperative or does not read within limit:</p> <p>e. TRANSMISSION OIL PRESSURE gage inoperative or does not read within limits.</p>

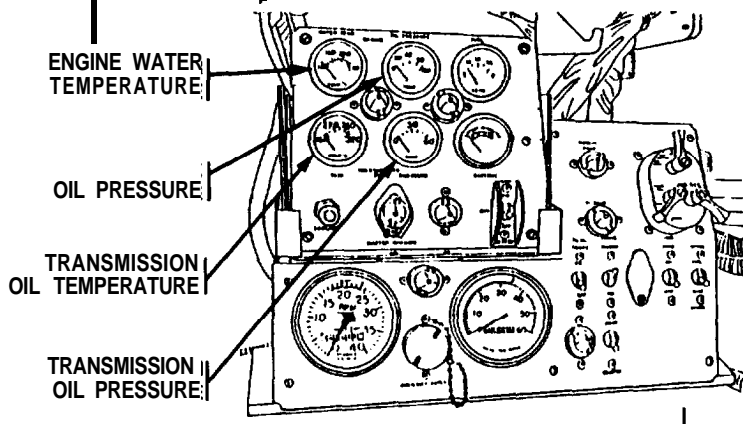




Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
17.1	Before	Instruments and Gages (continued)	<p>f. BATTERY - GENERATOR Indicator gage - green zone (charging).</p> <p>g. TACHOMETER - Run engine at low (normal) idle. Should operate without excessive fluctuation or unusual noises, at idle speed of 550 to 650 rpm.</p> <p>h. Low COOLANT level warning lamp - Press to test for proper operation.</p> <p>i. FUEL gage indicates full (F).</p>	<p>f. Gage inoperative or does not read in green zone.</p> <p>h. Lamp missing or inoperative.</p>
18	During	Brakes	<p><u>DRIVER</u></p> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Area must be clear of personnel before operating vehicle.</p> <p>Check brake operation.</p> <p><u>DRIVER</u></p>	<p>Locks up or binds; inoperative or intermittent, defective, or out of adjustment.</p>
19	During	Steering	<p>Check response to determine proper function.</p>	<p>Locks up or binds.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

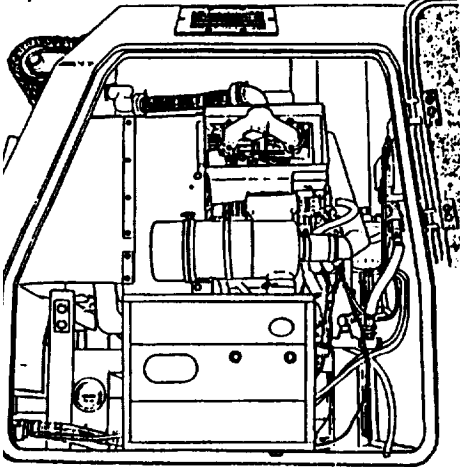
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
20	During	Power-pack	<p><u>DRIVER</u></p> <p>Check for unusual noises or vibrations.</p>	Performance or function inadequate; unusual noises or vibrations inoperative.
21	During	Auxiliary Power Unit (APU)	<p><u>CREWMEMBER</u></p> <p>Open APU front door and check APU engine oil level. Add oil to bring level up to full (F) mark on dip stick. Add or drain as needed. Stall APU (p. 2-118). Check for operation of unit.</p>	
				
22	During	Hydraulic Gages/Lines	<p><u>CREWMEMBER</u></p> <p>a. Apply system pressure by activating APU unit.</p> <p>b. Check gages for normal indications when operating hydraulic system:</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

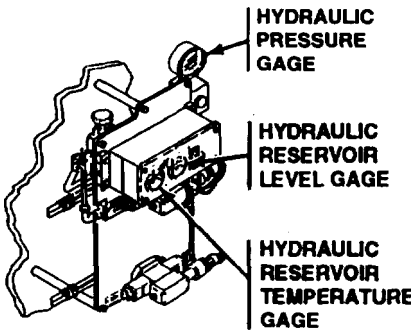
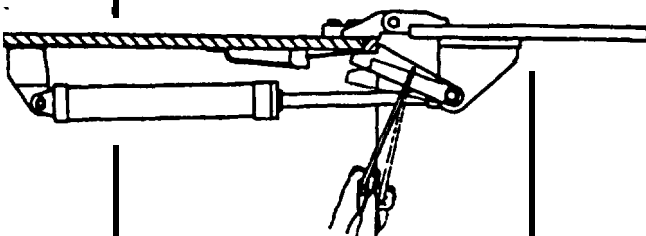
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
23	During		<ul style="list-style-type: none"> <li>Hydraulic pressure gage should read 100 to 300 psi with pump operating but no hydraulic actuators operating.</li> <li>Hydraulic reservoir temperature gage should not exceed 160°F during hydraulic system operation.</li> <li>Hydraulic reservoir level gage should read in the green range.</li> </ul> <p>c. Check all hydraulic lines, hoses, and connectors for any leaks.</p> 	<p>Hydraulic system gage reads below 100 or over 300 psi.</p> <p>Temperature gage inoperative or exceeds 160°F.</p> <p>Reservoir level gage does not read in green range.</p> <p>c. Any Class III leaks found.</p>
		Upper Rear Door (Ballistic shield) Mechanical Lock	<p><u>CREWMEMBER</u></p> <p>Check operation of upper rear door. Make sure mechanical locking device properly engages at 45-degree and 90-degree positions.</p> 	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
		Item to Check/Service		
24	During	Conveyor	<p><u>CREWMEMBER</u></p> <p><b><u>WARNING</u></b></p> <ul style="list-style-type: none"> <li>• <b>Make sure footing is firm and deployment area is free of obstructions. When deploying conveyor, be prepared to stand to one side and move quickly after conveyor begins to move; it moves rapidly.</b></li> <li>• <b>Keep fingers clear of section hinges when deploying conveyor.</b></li> <li>• <b>Make sure door is positioned at 120 degrees from closed. This will help control speed of deployment. Failure to heed this warning may result in severe injury to personnel.</b></li> </ul> <p><b>NOTE</b></p> <p>Check conveyor chain tension prior to starting motor.</p> <p>a. Deploy conveyor (p. 2-150).</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
24	During	Conveyor (continued)	<p>b. Check conveyor chain tension (p. 3-43). Tension is correct when tops of plastic and steel conveyor pads are vertically aligned with chain tension indicator. If conveyor pads hang no lower than bottom of indicator, no adjustment is necessary.</p> <p>c. Listen for unusual noises made by conveyor motor. If motor grinds, shut down conveyor hydraulic circuit and operate manually.</p> <p>d. Check alignment of conveyor chain. Chain should be over sprocket at either end of conveyor and should be centered with rollers.</p>	

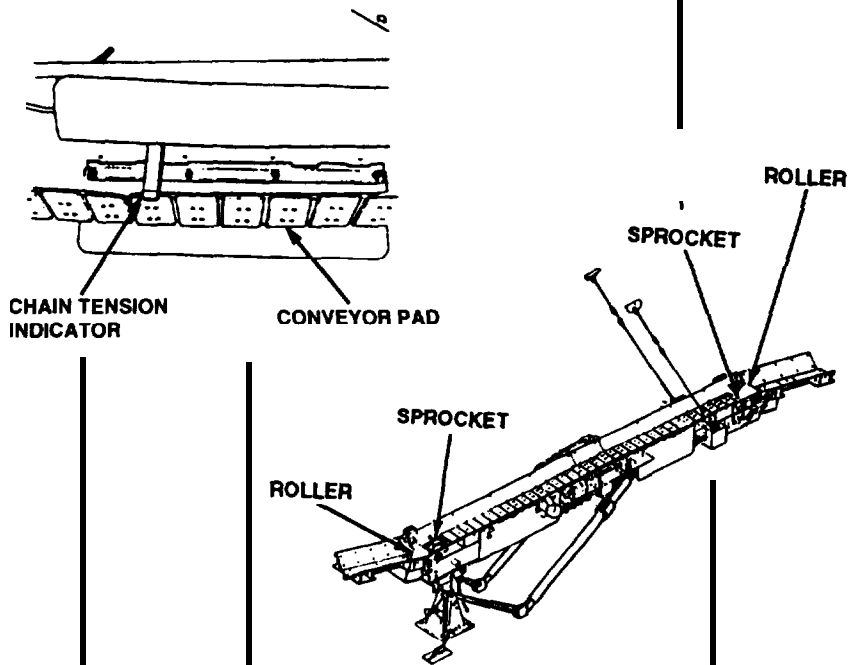
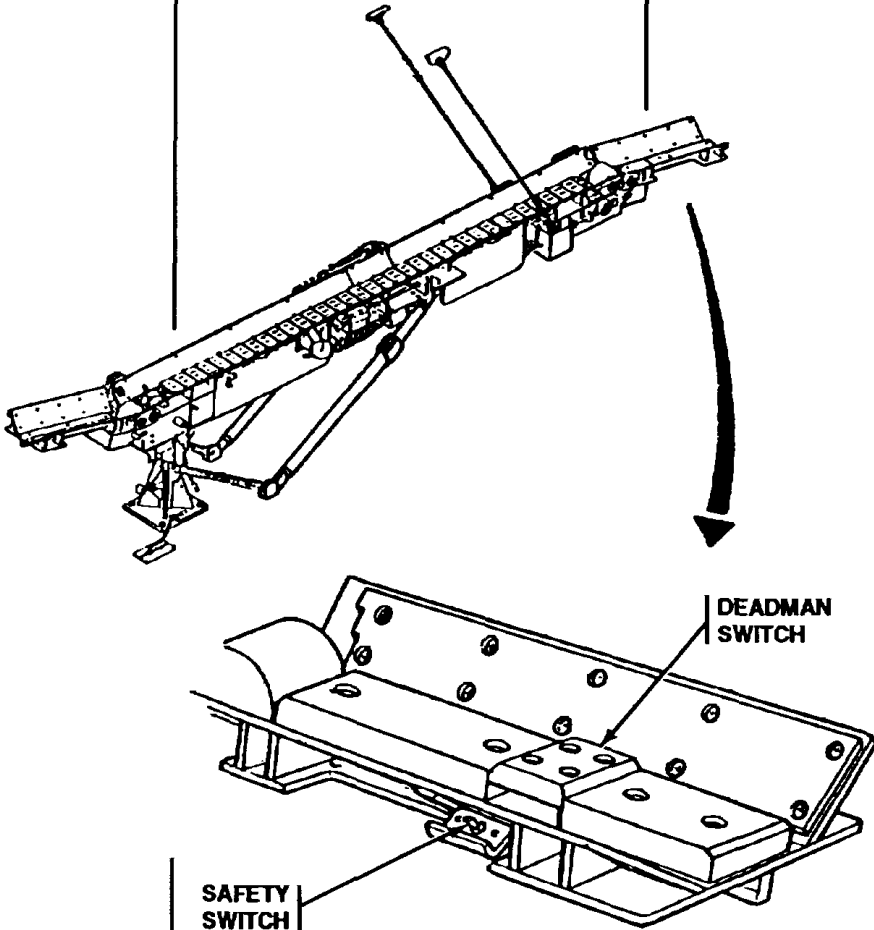


Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
24	During	Conveyor (continued)	<p>e. Check operation of deadman and safety switches:</p> <ul style="list-style-type: none"><li>• With conveyor operating, press down on bracket covering deadman switch. Conveyor should stop. Release pressure on bracket covering deadman switch. Conveyor should restart.</li><li>• Turn safety switch to OFF. Conveyor should stop. Turn safety switch to ON. Conveyor should restart.</li></ul>	



The diagram illustrates the mechanical components of the conveyor system. The upper portion shows a perspective view of the conveyor structure with a bracket positioned over a deadman switch. A curved arrow points from this perspective view to a more detailed, exploded view of the switch mechanism below. In this detailed view, the 'DEADMAN SWITCH' is labeled as a rectangular component with a central protrusion, and the 'SAFETY SWITCH' is labeled as a smaller component with a lever arm. Both are mounted on a metal plate with several screws.

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

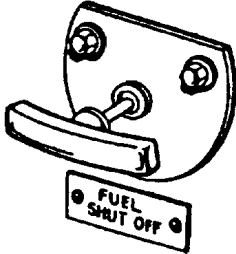
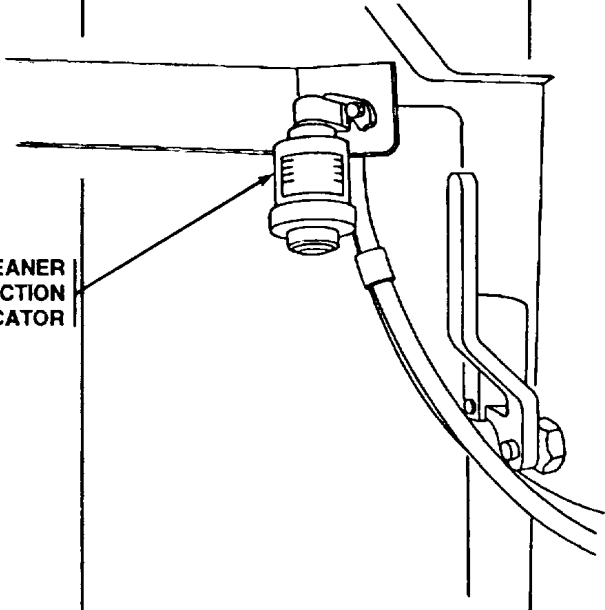
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
25	After	FUEL SHUT OFF Cable	<p><u>DRIVER</u></p> <p>Check for proper operation.</p> 	Fuel shutoff cable is broken or unserviceable.
26	After	Restriction	<p><u>DRIVER</u></p> <p>Check air cleaner restriction indicator. If indicator is in red range, clean and service air cleaner filter packs as needed (p. 3-28).</p> 	Air cleaner restriction indicator cracked or unserviceable.

Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

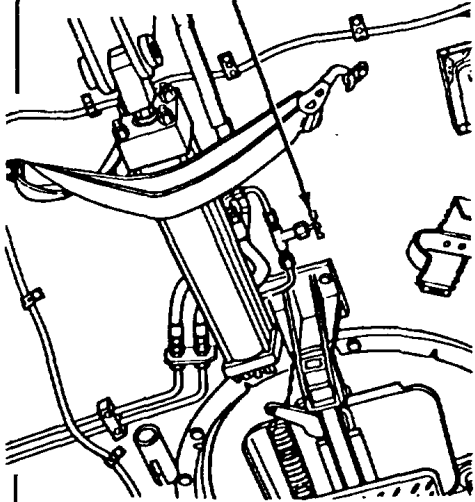
Item No.	Interval	Location		Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service			
27	After	Upper Rear Door Dump Valve		<p><u>CREWMEMBER</u></p> <p>Check upper rear door dump valve to make sure that it is closed (fully clockwise).</p> <p><b>UPPER REAR DOOR DUMP VALVE</b></p> 	



Table 2-1. Preventative Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
28	After	0.50-Cal M2 Machine Gun	<p><u>COMMANDER</u></p> <p><u>WARNING</u></p> <p><b>Check that machine gun is clear of ammunition and barrel is free of obstructions.</b></p> <p>a. Disassemble, clean, and lightly lubricate machine gun. Perform PMCS IAW TM 9-1005-213-10.</p> <p><u>CAUTION</u></p> <p><b>Never pull back bolt assembly with the safety on "S." The safety assembly will be damaged.</b></p> <p>b. Reassemble machine gun and check for ease of operation.</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
29	After	APU Oil Level	<p><u>DRIVER</u></p> <p>Open APU front door and check APU engine oil level. Add oil to bring level up to full (F) mark on dipstick. Add or drain as needed.</p>	
30	After Filters	APU Fuel	<p><u>DRIVER</u></p> <p>Turn MASTER switch and APU FUEL SHUT OFF switch to ON. Drain the primary APU fuel filter (back against wall) first and then the secondary filter until contaminants are removed. Turn APU FUEL SHUT OFF switch and MASTER switch to OFF. Inspect fuel lines and hoses for damage, leaks, and loose connections.</p>	Class III leak found.

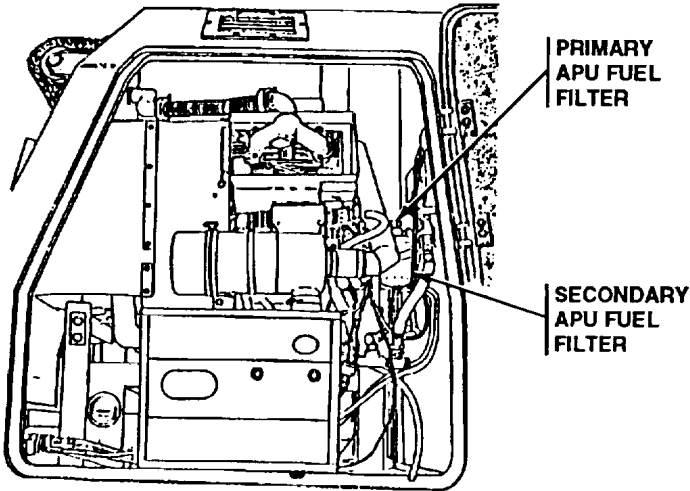


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
31	After	APU Engine Air Passages	<p><u>DRIVER</u></p> <p>Check that air passages are free of dirt and debris. Inspect for clogging in louvers in front and side doors. Open front of APU and inspect fan for dirt, debris, or damage.</p>	
32	After	Primary and Secondary Fuel Filters	<p><u>DRIVER</u></p> <p>Open bottom draincocks and drain water until clear fuel flows from filters. Close draincocks.</p> <div style="text-align: center;"> </div>	Any Class III leak found.
33	After or not laced.	Final Drive U-Joints	<p><u>DRIVER</u></p> <p>a. Inspect left and right final drive U-joints for presence and security of lacing wire on U-joint bolts.</p> <p>b. Check final drives for oil leaks.</p>	<p>a. Any U-joint bolt is loose, missing,</p> <p>b. Class III leak found.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
34	After	Transmission Oil Level	<p><u>DRIVER</u></p> <p>Check oil level; level should be within the OPERATING RANGE stamped on dipstick. Add oil as required (Appendix E).</p> <p><b>NOTE</b></p> <p>New transmissions are delivered with preservative PE-10-1. Until first scheduled oil change, maintain proper oil level by adding OE/HDO or OEA.</p>	

TRANSMISSION  
OIL LEVEL  
DIPSTICK

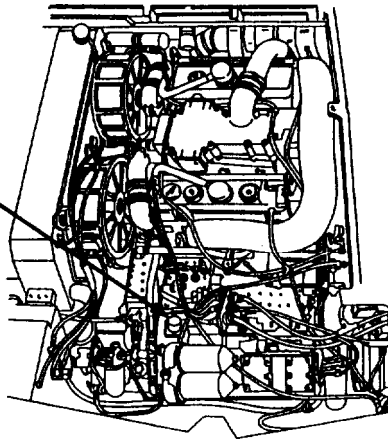


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

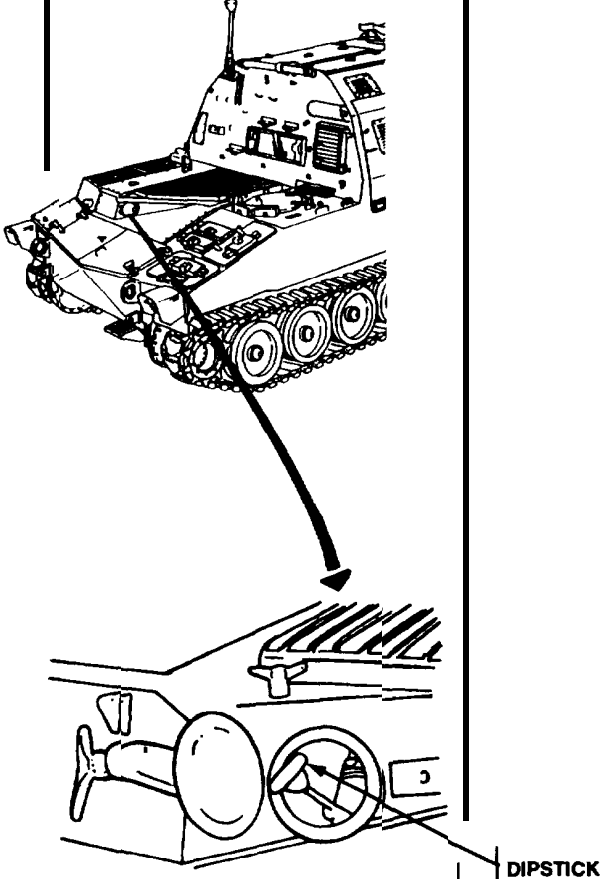
Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
35	After	Engine Oil Level	<p><u>DRIVER</u></p> <p><b>NOTE</b></p> <p>Make engine oil level check with vehicle on level ground if possible.</p> <p>Oil level will take approximately 20 minutes to stabilize in engine crankcase. After 20 minutes, check oil level; it should be within the L - F range stamped on dipstick.</p> 	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

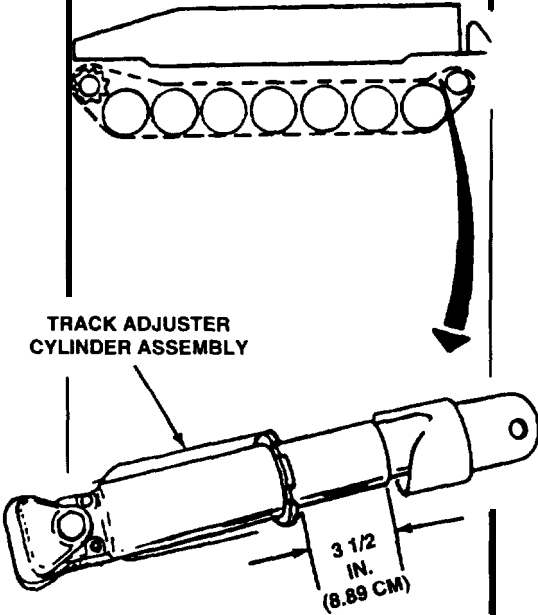
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
36	After	Track Adjuster Cylinder Assemblies	<p><u>CREWMEMBER</u></p> <p>Check for bent or broken track adjuster cylinder assemblies.</p> <p>Track adjusters have reached their maximum extended limit at 3 1/2 inches (8.89 cm).</p> 	Either track adjuster cylinder assembly is bent, broken, or beyond maximum limits.
16.1	After	Lower Rear Door	<p><u>CREWMEMBER</u></p> <p>Open lower rear door (p. 2-137). Operate handle several times to make sure there is no free play and lock does not close without actuating it. If lock closes or there is excessive free play in handle, notify Unit maintenance.</p>	Lock closes or there is excessive free play in handle.

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
37	After	Track Tension	<p><b>CREWMEMBER</b></p> <p>a. Move vehicle back and forth several times on level ground. Coast to a stop without braking. Place transmission in neutral. Turn off engine. Measure distance between top of third roadwheel from sprocket and track. The distance should be between 1/4 inch (0.84 cm) and 3/8 inch (0.95 cm). If not, adjust track tension.</p> <p><b>CAUTION</b></p> <p><b>When increasing track tension, do not let track adjuster extend beyond 3 1/2 inches (8.89 cm).</b></p> <p>To increase track tension, pump grease (GAA) into clean fitting on track adjuster until correct tension is obtained.</p>	a. Track tension will not adjust.

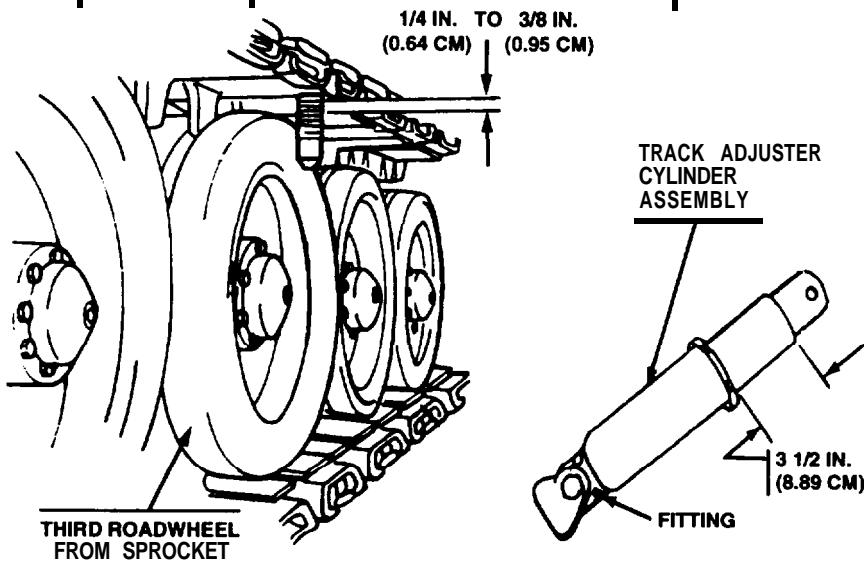


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
37	After	Track Tension (continued)	<p style="text-align: center;"><b><u>WARNING</u></b></p> <p><b>Lubricant is under high pressure. Loosen bleed plug slowly to avoid injury to personnel.</b></p> <p style="text-align: center;"><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• When measurement has reached 3 1/2 inches (8.89 cm), track adjuster cylinder assembly has reached its maximum limit. Remove one track shoe and readjust track tension.</li> <li>• If track sag cannot be taken up, decrease track tension; remove track shoe and adjust.</li> </ul> <p>To decrease track tension, open bleed plug on track adjuster cylinder assembly and reduce pressure until tension is released.</p> <p>b. Tighten bleed plug and wipe away excess grease.</p>	

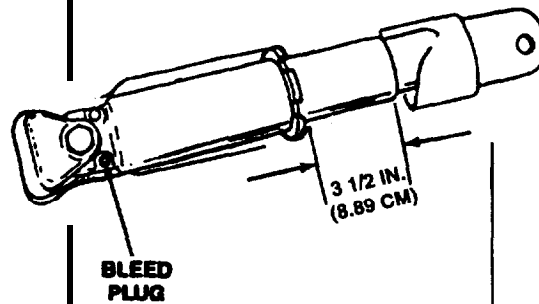




Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

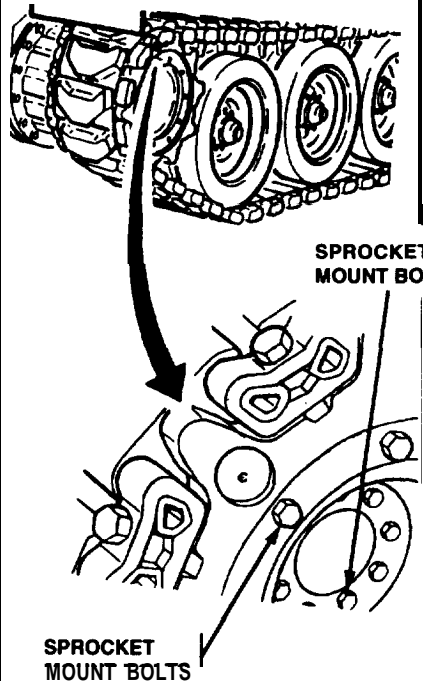
Item No.	Interval	Location	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
		Item to Check/Service		
38	After	Sprockets	<p><u>DRIVER/CREWMEMBER</u></p> <p>a. Check sprockets for cracked, broken, or missing teeth, loose or missing sprocket mount bolts, and loose or missing sprocket to hub mount bolts.</p>  <p style="text-align: center;"><b>SPROCKET TO HUB MOUNT BOLTS</b></p> <p><b>SPROCKET MOUNT BOLTS</b></p>	<p>a. Any sprocket tooth is cracked, broken, or missing. Any sprocket mount bolt is missing or broken. Any sprocket to hub mount bolt is missing or broken.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
38	After	Sprockets (continued)	<p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>- Only two sprocket teeth have wear indicators.</li> <li>- Sprocket teeth wear faster on the inside. A tooth may be excessively worn, but still not show wear into wear mark.</li> </ul> <p>b. Check sprocket teeth for excessive wear. Using a ruler, measure from inside edge of tooth into wear area. Then measure distance from edge of tooth to wear indicator. If the first measurement is equal to or greater than the second, sprocket wear is excessive. Notify Unit maintenance.</p>	<p>b. One or more sprocket teeth worn into edge of wear indicator; one or more sprocket teeth showing excessive wear.</p>

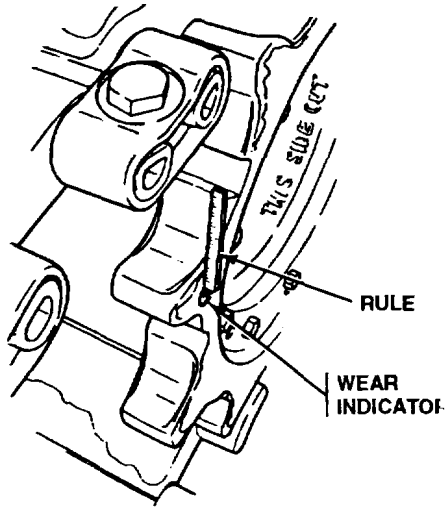
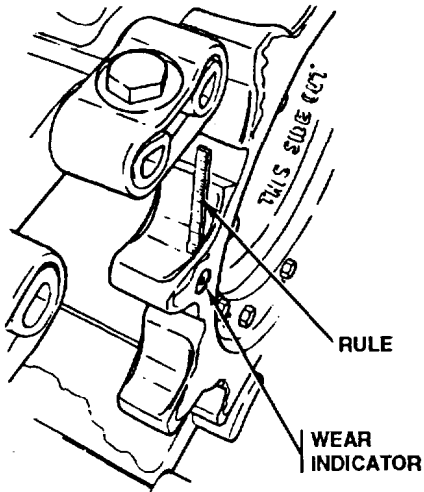
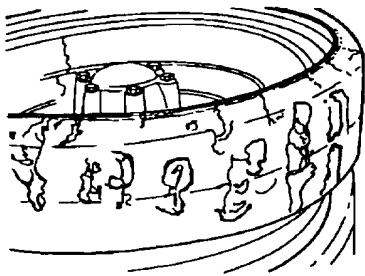


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

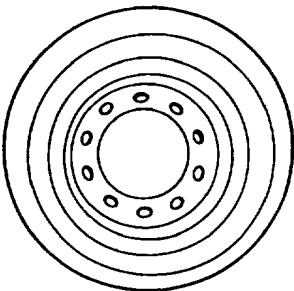
Item No.	Interval	Location Item to Check/ Service	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
39	After	Roadwheels and Idler Wheels	<p><u>DRIVER/CREWMEMBER</u></p> <p>a. Check to make sure mounting nuts are secure.</p> <p>b. Check for loss of rubber, pitting, shrinking, and separation of rubber from metal. Separation of 1 inch (2.54 cm) of rubber from surface around 3/4 of roadwheel and/or chunking that causes metal-to-metal contact between roadwheel and track.</p> <p>c. Check for elongation of mounting holes.</p> <p><b>NOTE</b> Relief valves are located on back of roadwheel and idler hubs and should be checked for slippage.</p> <p>d. Check roadwheel hub for grease seepage.</p> <p style="text-align: center;"><b>2-60</b></p>	<p>a. Two or more idler wheel mounting nuts missing. Three or more roadwheel mounting nuts on same hub missing.</p> <p>b. Missing, bent, warped, or cracked roadwheel or idler</p> <p>c. Mounting holes are elongated on any wheel.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

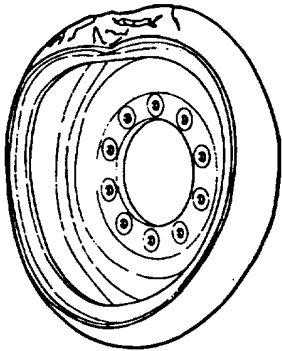
Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
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CHUNKING OF RUBBER



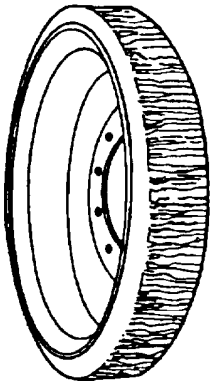
ELONGATED MOUNTING HOLES



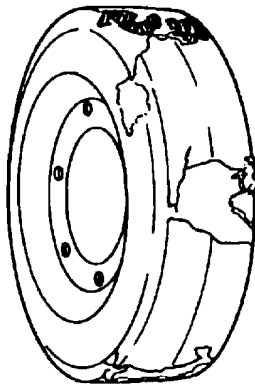
BENT, CRACKED ROADWHEEL



SEPARATION OF RUBBER



CRACKED RUBBER ON SURFACE



SEVERE CHUNKING OF RUBBER

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
40	After	Wheel Hubs and Shock Absorbers	<p><u>DRIVER/CREWMEMBER</u></p> <p><b>WARNING</b></p> <p><b>Check all hubs carefully. Hubs may be hot. Failure to heed this warning may result in injury to personnel.</b></p> <p>a. Check for overheated wheel hubs. After operation, touch all hubs cautiously for noticeable temperature difference between components. An overheated hub indicates a malfunction, inadequate lubrication, or damaged bearing.</p> <p><b>NOTE</b></p> <p>If shock absorber is operating properly, it should be warmer than hull area around it.</p> <p>b. Check lower end of shock absorber cautiously, and check for temperature difference between hull cold area and shock absorber. If overheating occurs, notify Unit maintenance.</p> <p>c. Turn shock absorber from side to side. If shock absorber moves, upper end is damaged. Notify Unit maintenance.</p>	<p>a. Wheel hub is overheating.</p> <p>b. Shock absorber broken, missing, or</p> <p>c. Shock absorber moves from side to side.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
41	After	Track Shoes and Bushings	<p><u>DRIVER/COMMANDER</u></p> <p><b><u>WARNING</u></b></p> <p><b>If you lose a track (break a track shoe or vehicle throws a track), extreme caution must be exercised in maintaining control. Immediately release accelerator and let vehicle coast to a stop. Do not apply braking action-brake pedal, laterals, pivot, or any type of steering controls. Braking causes vehicle to pull to the active, or good, track and could result in a rollover. If absolutely necessary, apply braking action ONLY if vehicle is approaching a ravine, a cliff, or if you perceive the outcome to be catastrophic, probably resulting in fatalities. When rollover is imminent, all crew members should immediately withdraw inside vehicle, tighten seatbelts, and hold onto a secure fixture until vehicle comes to a complete stop.</b></p> <p style="text-align: center;">2-63</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
41	After	Track Shoes and Bushings (continued)	<p style="text-align: center;"><b>NOTE</b></p> <p>Worn bushings are very difficult to locate. They will cause track pin to appear off-center. A track shoe with a worn bushing may have protruding track pin and unusual gaps between two adjacent shoes.</p> <p>a. Check track shoes for damaged track pins and any unusual or uneven gaps between adjacent track shoes, indicating worn bushings.</p> <p>b. Check track shoe for damage, including cracked or broken shoe body; bent, broken, or missing center guides; and chunked or missing roadwheel pad rubber. Report damaged track to Unit maintenance. Replace worn or missing track pads and track pad nut (p. 3-38).</p> <p style="text-align: center;"><b>2-64</b></p>	<p>a. Any track shoe with worn bushing. Any bushing deemed unserviceable. Any track shoe bent, broken, or cracked. Any track pin bent, broken, or missing.</p> <p>b. Any track shoe body bent, cracked, or broken. Any track pin bent, broken, or missing.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
42	After	Track End Connectors and Center Guides	<p><u>DRIVER/COMMANDER</u></p> <p>Check for loose, missing, or worn end connectors and bolts, track center guides, track pads, and track shoes.</p>	Any missing or cracked end connectors, missing center guides, or missing bolts.

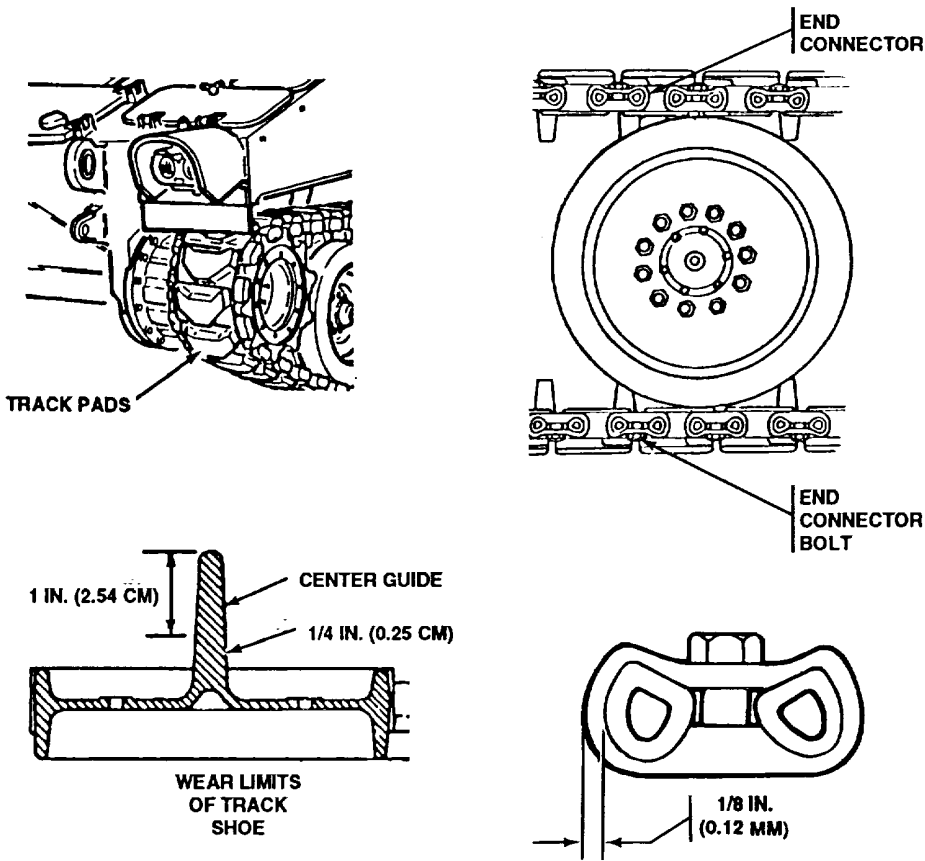




Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

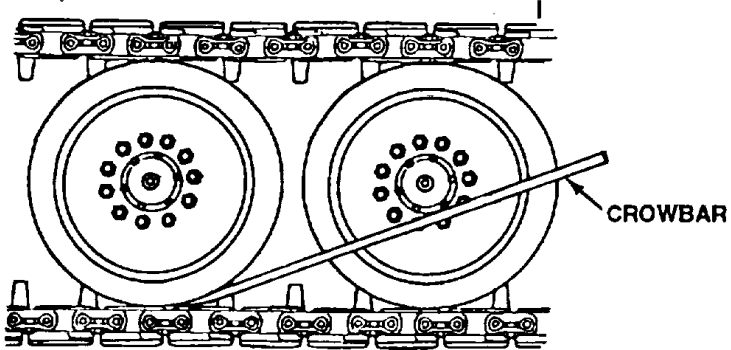
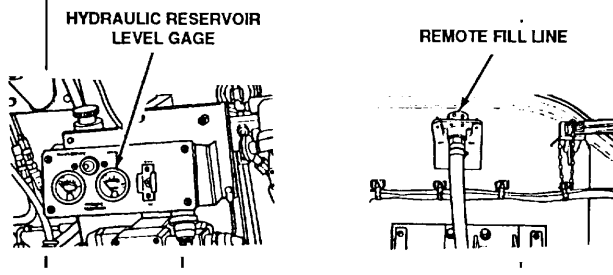
Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
43	After	Torsion Bars and Road-wheel Arms	<p><u>DRIVER</u></p> <p>Check for bent, broken, or missing roadwheel arms and torsion bars. With crowbar, try to lift each roadwheel. If any roadwheel comes up easily, you have a broken or missing torsion bar. Report any broken or missing torsion bars to Unit maintenance.</p> 	Torsion bar or roadwheel arm is bent, broken, or missing.
44	Weekly	Hydraulic Fluid Level	<p><u>DRIVER/COMMANDER</u></p> <p>With MASTER switch turned to ON, check HYDRAULIC RESERVOIR LEVEL gage to make sure needle is on F. If necessary, add hydraulic oil through remote fill line to bring level up to F mark.</p> 	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
		Item to Check/Service		
46	Weekly	Chemical Agent Detector Unit	<p>[Text and Art Deleted]</p> <p><u>DRIVER/CREWMEMBER</u></p> <p><b><u>WARNING</u></b></p> <p><b>NBC-contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.</b></p> <p>Service detector unit IAW TM 3-6665-225-12. Replace reservoir fluid and change air filter only as needed. Perform PMCS IAW TM 3-6665-225-12.</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

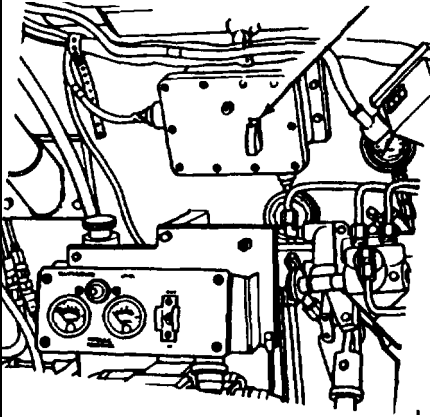
Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
47	Weekly	Nuclear, Biological, and Chemical (NBC) System Air Purifier	<p>a. Remove air inlet cover. With MASTER switch turned to ON, turn VFPS (NBC) power switch to ON. Check motor for smooth operation. Check air outlets for airflow. Inspect filter assembly for dents, cracks, secure mounting, and missing parts.</p> <p style="text-align: center;"><b>VFPS (NBC) POWER SWITCH</b></p>  <p>b. Check operation of NBC heaters. Turn VFPS (NBC) power switch to ON. Turn air heater ON and check that green light illuminates (p. 2-202).</p> <p><b><u>DRIVE/CREWMEMBER</u></b></p>	
48	Weekly	Lights	<p>a. Check driving lights by turning on driving lights switch (p. 2-195). Depress high-beam switch to make sure lights operate properly on high and low beams</p> <p>b. Check HI BEAM indicator light and MASTER WARNING indicator light.</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
48	Weekly	Lights (continued)	<p><b>NOTE</b></p> <p>Driver will turn on lights and crew member will check for operation.</p> <p>c. Check stoplights and taillights to see that they operate properly. Make sure lights brighten during braking.</p> <p>d. Check blackout drive lights:</p> <ul style="list-style-type: none"> <li>• Set main light switch lever to BO DRIVE.</li> </ul> <p>e. Check dome lights.</p> <p><u>DRIVER</u></p>	
49	Weekly	Bilge Pump	<p><b><u>CAUTION</u></b></p> <p><b>Do not run bilge pump for more than one minute dry, or more than 15 minutes wet, without starting engine.</b></p> <p>Check operation of bilge pump. If pump is dry, feel air outlet when pump is running.</p>	Bilge pump is in-operative or missing.

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	<u>Crewmember Procedure</u>	Not Fully Mission Capable If:
50	Weekly	Batteries	<p><u>DRIVER</u></p> <p><b><u>WARNING</u></b></p> <p>Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around battery, especially if caps are off. If gassing exists, notify Unit maintenance for removal and servicing.</p> <p>* Remove all jewelry, such as rings, dogtags, and bracelets. If jewelry contacts battery terminal, a direct short can result in injury to personnel, instant heating of tools, and damage to equipment.</p> <p>* To avoid eye injury, eye protection is required when working around batteries. Lead-acid battery gas can explode. Do not smoke, have open flames, or make sparks, especially if caps are off.</p> <p><b>2-70</b></p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
50	Weekly	Batteries (continued)	<p>b. Make sure the vent holes on caps are open to permit escape of gases; also, make sure caps are screwed on tightly.</p> <p>c. Inspect terminals, posts, clamps, cables, battery hold-downs, and battery boxes for corrosion. If corrosion is present, have Unit maintenance clean and coat all clamps, hold-downs, and battery boxes, except posts and terminals.</p> <p style="text-align: center;"><b><u>CAUTION</u></b></p> <p><b>To reduce battery damage, do not remove batteries from equipment battery boxes, except during scheduled maintenance or battery replacement. Battery replacement will be performed only by Unit maintenance personnel.</b></p> <p>d. Make sure a light coat of GAA grease is applied and covers all terminals and posts after clamping down battery. Keep grease from between posts and terminals.</p>	

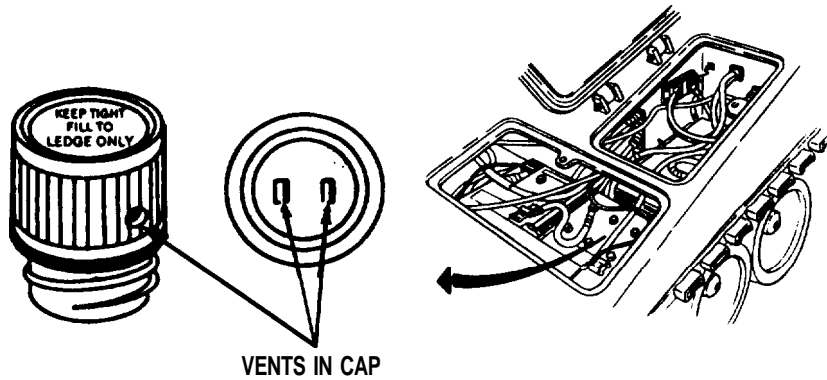


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

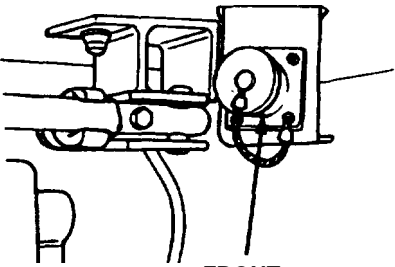
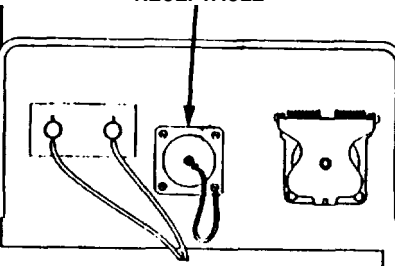
Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
50	Weekly	Batteries (continued)	<p>e. Make sure rubber grommets are in place to keep cables from being cut on the edge of holes.</p> <p>f. Further battery information can be found in TM 9-6140-200-14.</p> <p><u>DRIVER</u></p>	
51	Weekly	Front and Rear Slave Cable Receptacles	<p>Check front and rear slave cable receptacles and caps (two locations) for damage, burned-out condition, and corrosion.</p>  <p style="text-align: center;">FRONT SLAVE CABLE RECEPTACLE</p> <p style="text-align: center;">DRIVER'S COMPARTMENT</p>  <p style="text-align: center;">REAR SLAVE CABLE RECEPTACLE</p> <p style="text-align: center;">REAR OF VEHICLE</p>	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location		Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service			
52	Weekly	Doors, Hatches, and Latches		<p><u>COMMANDER</u></p> <p>Check hatch/door seals for looseness, tears, or deterioration. Make sure latches and doors lock securely in both open and closed positions.</p>	<p>Driver's or commander's hatch will not lock, open, and/or close. Rear door will not open or close or is misaligned. Any hatch or door is missing.</p>
53	Weekly	Tow Pintle		<p><u>DRIVER</u></p> <p>Check tow pintle for proper operation. Pull back spring arm. Make sure pintle opens. Close pintle. Make sure pintle locks close. Inspect pintle for loose mounting bolts.</p>	

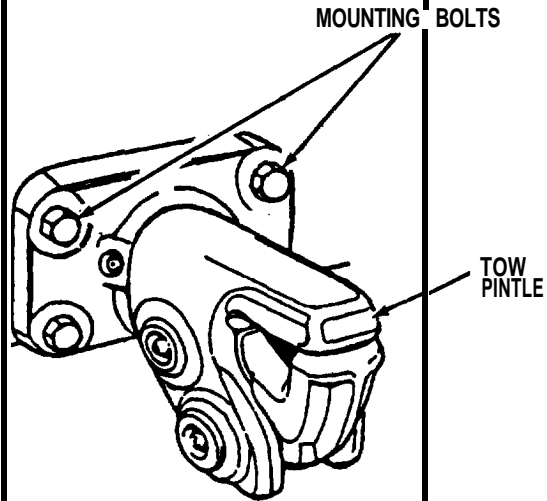




Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

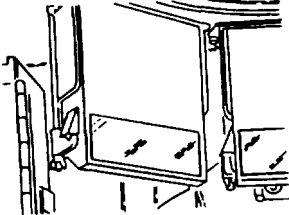
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
54	Weekly	M45 Periscopes	<p><u>DRIVER</u></p> <p><b>CAUTION</b> Handle periscopes carefully during removal, to avoid damaging frame and glass.</p>  <p>a. Remove periscope by loosening two thumbscrews.</p> <p>b. Check between carrier wall and periscope for dirt or moisture.</p> <p><u>COMMANDER</u></p> <p>Check for damage and cleanliness.</p> <p>[Text and Art Deleted]</p>	<p>b. Any periscope is missing or unserviceable, or over 50% of vision is obstructed.</p>
55	Weekly	M27 Periscope	<p>Check for damage and cleanliness.</p>	<p>Periscope is missing or over 50% of vision is obstructed</p>
56				

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

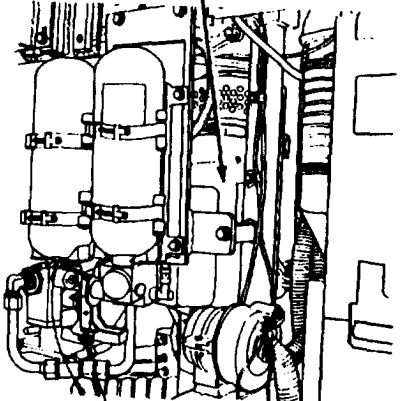
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
57	Weekly	Personnel Heater	<p style="text-align: center;"><b><u>WARNING</u></b></p> <ul style="list-style-type: none"> <li>• If heater operates improperly fuel may overflow, causing danger of fire or explosion.</li> <li>• Be alert during heater operation for exhaust odors or signs of exposure to carbon monoxide. Carbon monoxide can kill you. If present, shut off heater and ventilate vehicle.</li> <li>• Explosive/flammable materials are a fire hazard. Do not store aerosol cans, solvents, fuel, etc., anywhere inside vehicle. Stow ammunition and powder in authorized stowage racks.</li> </ul> <p>a. Start and operate heater (p. 2-187). If heater does not start, notify Unit maintenance.</p> <p>b. Check crew/driver duct outlets for steady warm-air output. If there is no warm-air output, shut off heater (p. 2-188) and notify Unit maintenance.</p> <p style="text-align: center;"><b>PERSONNEL HEATER</b></p> 	

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location	<u>Crewmember</u> Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
58	Weekly	APU Soundproof Panels	<p><b>NOTE</b></p> <p>No soundproof panel is required for forward wall.</p> <p>Open APU side door. Make sure soundproof panels are mounted securely.</p> <p><b>DRIVER</b></p>	
59	Weekly	APU Engine Air Filter Element	<p><b>WARNING</b></p> <p>If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal instructions.</p> <p><b>CAUTION</b></p> <p>When assembling filter element unit, make sure edge of cover marked TOP is positioned at top edge of canister.</p> <p>Loosen filter-cap clamp eyebolt. Remove filter cover. Remove filter wingnut and slide filter element from canister. Hold gasket end of filter element to light source. If light is not visible through element, service the element. Remove rubber baffle from inside of cover. Empty dust from cover and wipe inside of cover with a clean damp cloth. Install baffle in filter cover. Reassemble filter unit.</p>	

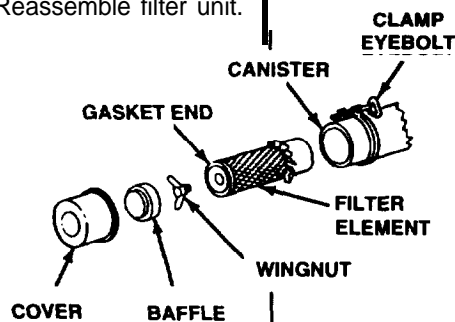
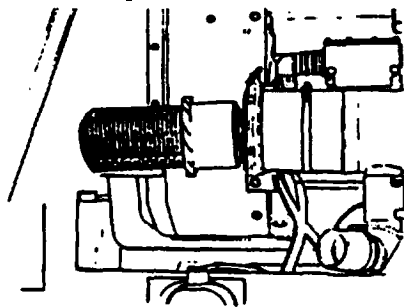


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
60	Weekly	Fatigue (Floor) Mats	<p><u>COMMANDER</u></p> <p>Inspect fatigue (floor) mats in crew compartment for tears.</p>	
61	Monthly	Stowage Areas	<p><u>COMMANDER/ CRFWMEMBERS</u></p> <p>Inspect all internal and external stowage boxes, stops, brackets, decals, shelves, nets, and restraints for damage. This is the duty of every crewmember. Notify Unit maintenance if any damage exists.</p>	
62 and	Monthly	Projectile Rack Sections	<p><u>COMMANDER/CREWMEMBERS</u></p> <p>Remove projectile rack sections from against front wall of crew/cargo compartment (p. 2-182). Inspect rack restraints for broken safety wires loose or missing bolts. Check that rack-interlocking rods are not bent and are securely installed. Check that setscrew at each locking handle pivot is present and secure. Inspect locking bars for security.</p>	<p>Rack section missing. Safety wire broken, loose, or missing bolts. Rack interlocking rods bent, cracked, or missing. Setscrew for locking handle missing. Locking bar will not lock.</p>

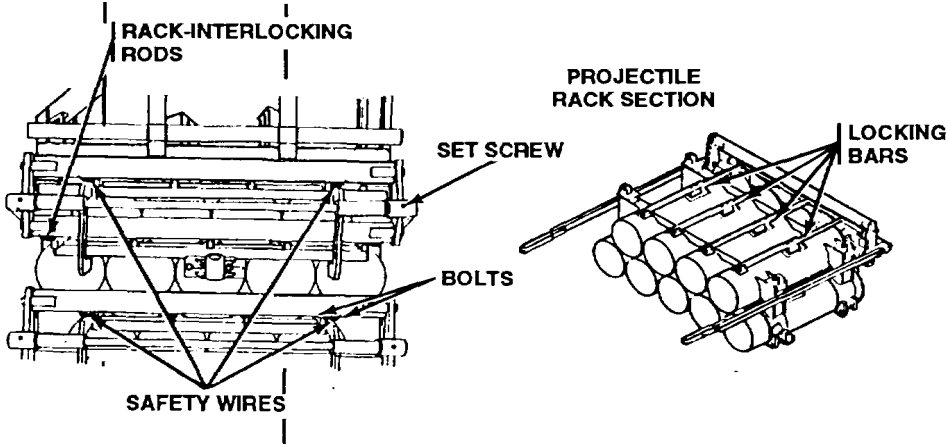


Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

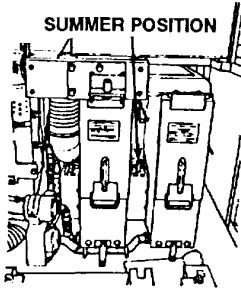
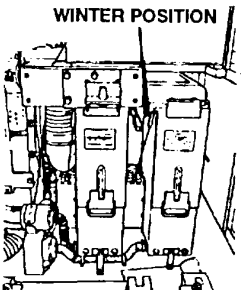
Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
63  unfiltered	Monthly	Engine Air Cleaner	<p><u>DRIVER/COMMANDER</u></p> <p>a. Check air filters (p. 327).</p> <p>b. Check to see that access door closes and latches securely. Locking handles must be properly set for summer or winter.</p> <p>c. Blow filters out with low-pressure air. Wash filters with warm water if needed. If washed, allow filters to completely dry before reinstallation.</p> <p>d. Check air filter doors, seals, and hoses.</p> <div style="text-align: center;">  <p>SUMMER POSITION</p>  <p>WINTER POSITION</p> </div> <p>e. Set summer or winter position (p. 2-148).</p>	<p>b. Air cleaner doors, filter elements, or hoses are missing. Air cleaner doors won't open or close properly. Any hose or filter is torn or has a hole.</p> <p>c. Any evidence of leakage of air into intake system.</p> <p>d. Any air filter hose door, or seal is missing or damaged.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

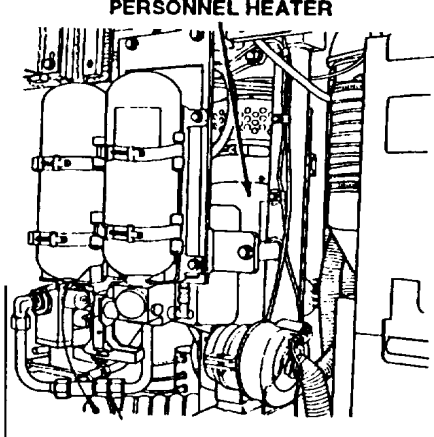
Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
64	Monthly	Personnel Heater	<p><u>DRIVER/COMMANDER</u></p> <p>a. Check personnel heater for signs of damage and fuel leaks.</p> <p>b. Check all heater air outlets for obstructions.</p> <p>c. Check all tubes, fuel filter, fuel pump, and hoses for air and fuel leaks by smelling and looking at hull floor under heater area.</p> <p>d. Check for evidence of fuel leak- age by smelling and looking at hull floor under heater area.</p> <p style="text-align: center;"><b>PERSONNEL HEATER</b></p> 	<p>a. Any fuel leak found.</p> <p>c. Any fuel leak found.</p>

Table 2-1. Preventive Maintenance Checks and Services for Model M992A1

Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable If:
65	Monthly	Fuel Strainer and Fill Cap	<p><u>DRIVER/COMMANDER</u></p> <p>Service fuel strainer and fill cap (p. 3-24).</p>	
66	Monthly	Final Drive	<p>Remove level-check plug. Oil should be level with bottom of opening. If not, add OE/HDO until oil flows from level-check plug opening. Clean and reinstall plug.</p> <div style="text-align: center;"> <p>LEVEL-CHECK PLUG</p> </div> <p style="text-align: center;">2-80</p>	Any Class I11 leak found.

### Section III. OPERATION UNDER NORMAL CONDITIONS

#### Assembly and Preparation for Use

Before operating a new or reconditioned vehicle, make sure Unit maintenance services the vehicle.

#### Initial Adjustment and Daily Checks

Perform the preventive maintenance checks and services (PMCS) in Section II of this chapter to make sure all adjustments and checks are completed.

#### Operating Procedures

Be familiar with all controls, instruments, and procedures before attempting to operate the vehicle.

#### WARNING

- Fasten the seatbelt. Drive carefully. Take it easy until you can operate with skill.
- Protect your hearing. Due to high-intensity noise, hearing protection is required while operating vehicle.
- If a track is thrown while vehicle is moving, do not apply the brake; rather, allow vehicle to coast to a halt.
- Do not move vehicle until all latches and doors are secured in closed position and all equipment is properly stowed.

#### CAUTION

- Never leave vehicle unattended while engine is running.
- This vehicle does not have an automatic transmission. It must be shifted manually.
- To prevent overheating and damage to transmission and engine, observe the following precautions:
  - When starting from a halt, begin with transmission selector lever in first gear.
  - Do not hold vehicle on an incline with transmission in gear.
  - Prior to shutting down engine, set hand throttle at 1000-1200 rpm for three to five minutes or until coolant temperature measures 185°F or lower. Then run at idle for one to three minutes.



OPERATING PROCEDURES (continued)

- Do not block engine air intake grille with camouflage or other materials.
- Do not operate engine at idle for more than 10 minutes. Using hand throttle at fast idle setting (1000 rpm) will help reduce engine overheating.

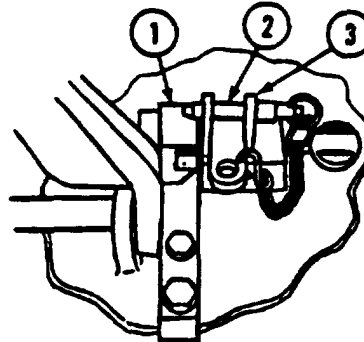
STARTING MAIN ENGINE

**WARNING**

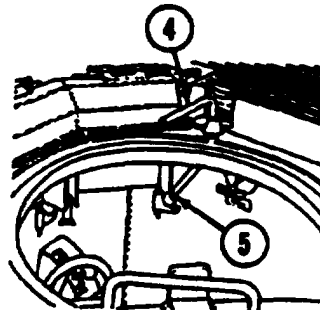
Whenever vehicle is operated with hatch cover opened, hatch cover must be locked.

1. Make sure that driver's hatch cover will lock in opened and closed positions. Lock driver's hatch cover in desired position.

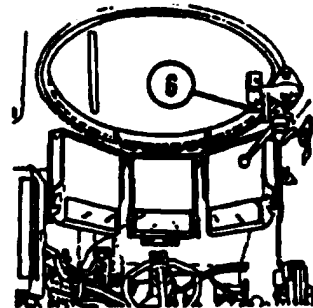
- Lock opened. Engage hold-open lock (1) with latching pin positioned over flat portion of hatch cover locking tab. Remove quick-release pin (2) from stowage position and insert pin (2) through horizontal bracket (3) and over flat portion of hatch cover locking tab.



- Lock closed. With hatch cover closed, turn locking handle (5) to the rear to lock external hatch cover latch (4).



- Security lock. To prevent entry from outside, push security latch handle (6) forward.



**STARTING MAIN ENGINE (continued)**

2. Adjust driver's seat as necessary.

- Adjusting up and down. Hold seat down and pull up on adjusting lever (7). With lever raised, lift or press seat to obtain correct height. Release adjusting lever to lock in position.

- Adjusting forward and backward.

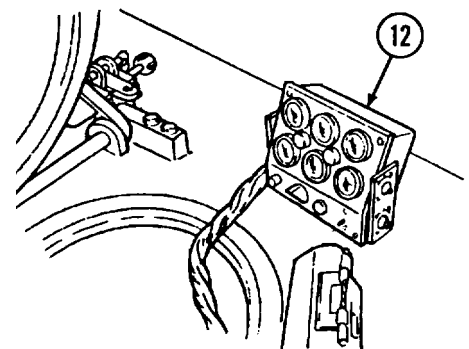
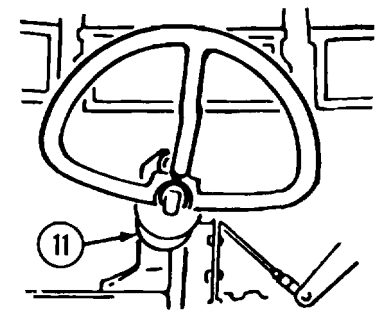
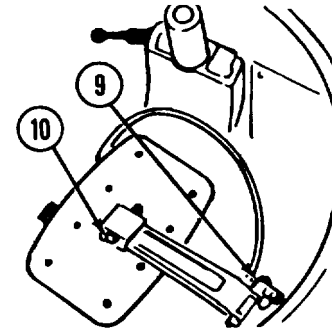
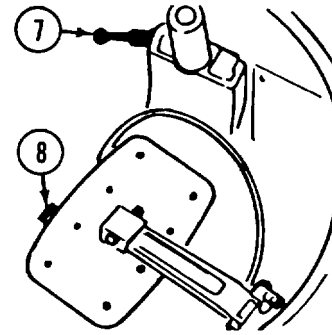
Pull up on adjusting tab (8) and move seat forward or backward. Release adjusting tab to lock in position.

- Backrest positioning. Press pawl (9) and rotate backrest up and back. When backrest is positioned vertically, reposition pawl to lock backrest.

- Adjusting backrest height. Remove adjusting pin (10) and lower or raise backrest. When desired height is obtained, install pin in adjusting holes.

3. Adjust steering wheel by pressing sleeve bearing (11) forward and rotating steering wheel up or down. Raise wheel if driving with hatch open; lower wheel when driving with hatch closed. When correct adjustment is obtained, release sleeve bearing to lock position.

4. If driving in raised position, clip portable instrument panel (12) into bracket (on top of hull just left of driver's hatch).



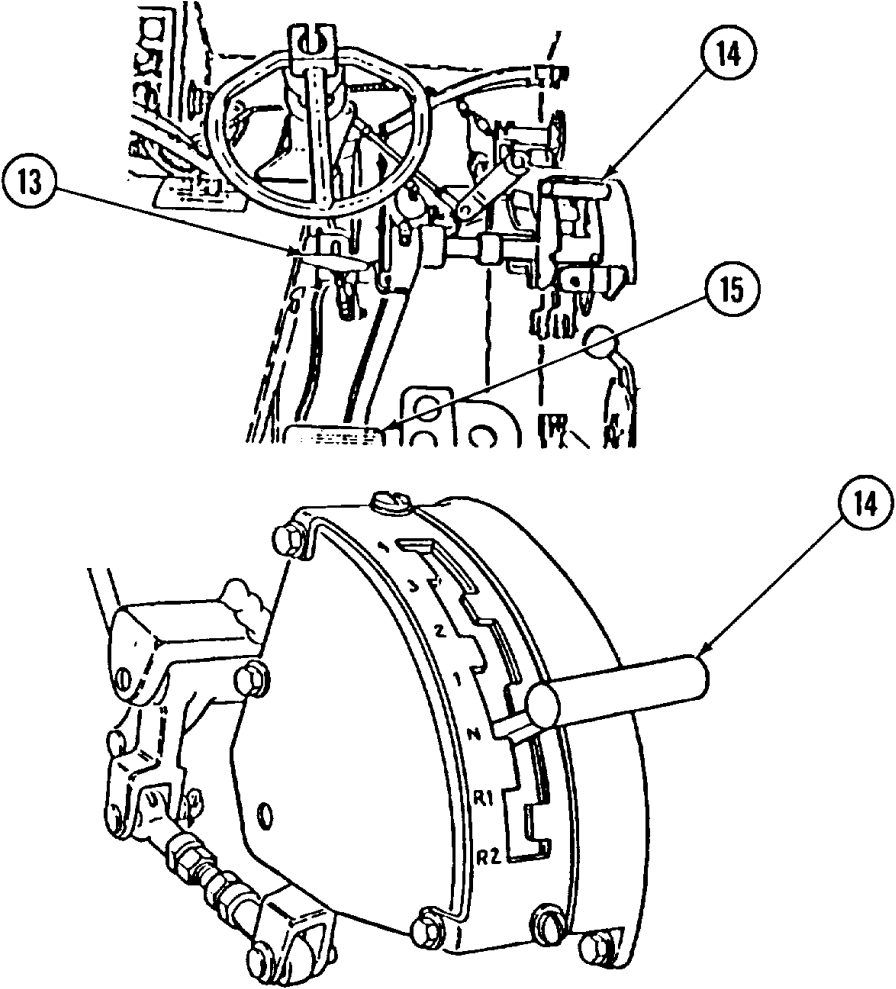
**STARTING MAIN ENGINE (continued)**

**NOTE**

\* Use the following procedure for starting engine in normal temperature climates (+40F, or 4.4°C). Refer to cold-weather starting procedures (p. 2-212) when temperature is below +40F (4.40C), or if engine will not start in moderately cold climates.

\* Before applying the service brake while on steep slopes (greater than 20 percent), adjust the driver's seat so you can apply maximum leverage to the brake.

- 5. Set vehicle brake by pressing on service brake pedal (15) and pulling out and down on parking BRAKE LOCK handle (13). Brake will be set when handle is released in this position. If stopping on a steep slope, press on service brake pedal (15), pull out and down on parking BRAKE LOCK handle (13), release, and press on service brake pedal (15) again.
- 6. Shift transmission selector lever (14) to N (neutral), and make sure it locks into position.



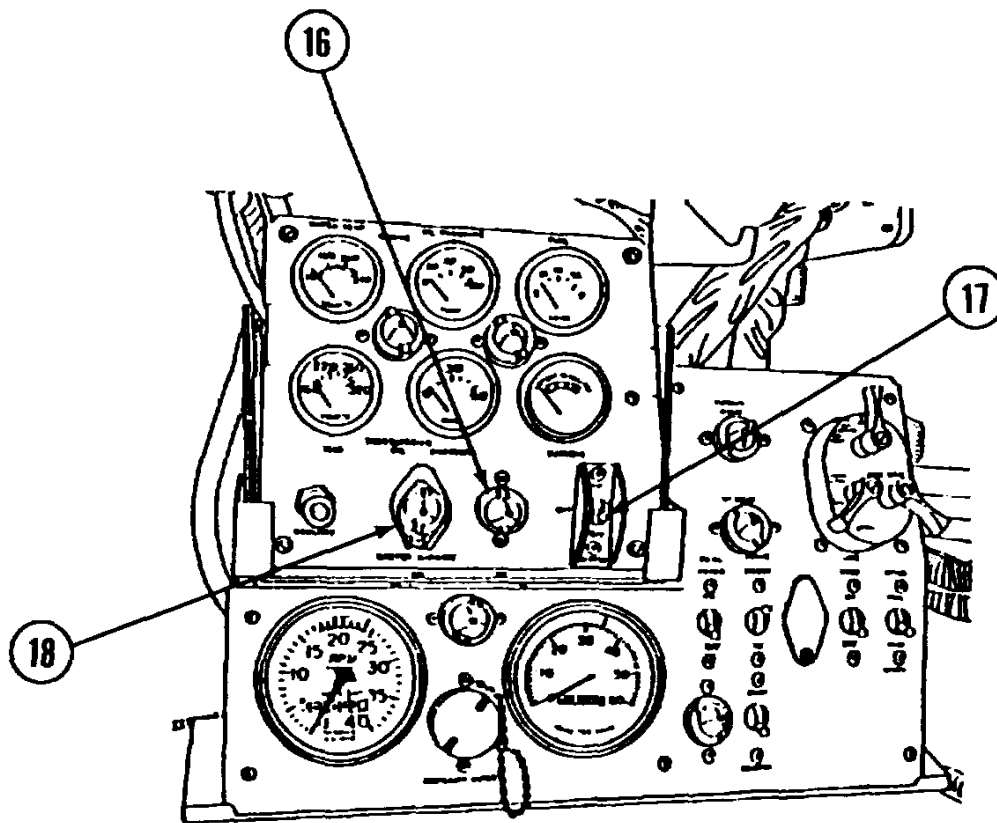
## STARTING MAIN ENGINE (continued)

**CAUTION**

Before starting engine, you should check for hydrostatic lock. Intermittently actuate STARTER switch (with MASTER switch set to ON and FUEL SHUT OFF handle pulled out). The following symptoms indicate hydrostatic lock:

- Engine starts to turn over with starter, then stops.
- Starter sounds as if straining when engine is cranking.
- Engine seems to bind.

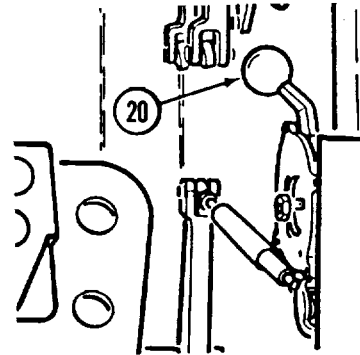
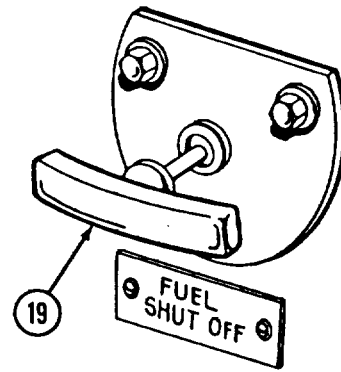
If you suspect hydrostatic lock, stop cranking immediately and notify Unit maintenance.



7. Turn MASTER switch (17) to ON. Indicator lamp (16) and MASTER WARNING light (18) should light with MASTER switch set to ON.

**STARTING MAIN ENGINE (continued)**

8. Pull FUEL SHUT OFF handle (19) to OFF before checking for hydrostatic lock.
9. Check for hydrostatic lock by intermittently activating STARTER switch (22) (with MASTER switch (17) set to ON and FUEL SHUT OFF handle (19) pulled out).
10. Release FUEL SHUT OFF handle (19).
11. Place throttle control lever (20) in idle position.
12. If fuel filters have been drained since last start, hold FUEL PRIME switch (21) at ON for 1 minute. Release switch after allotted time.



**WARNING**

Protect our hearing. Due to high-intensity noise, hearing protection is required when operating this vehicle.

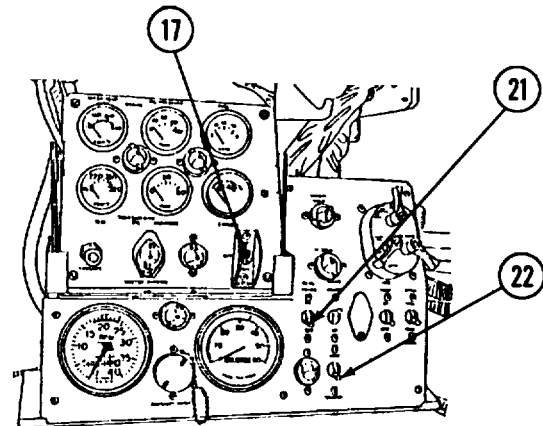
**CAUTION**

Do not operate starter continuously for over 30 seconds. If engine does not start, allow one-minute cool-off period before again engaging starter. Notify Unit maintenance if engine fails to start after fourth try.

**NOTE**

An electrical relay prevents driver from operating starter continuously for more than 30 seconds. If tactical situation dictates, commander can use combat override switch (p. 2-241) to allow continuous cranking of starter for more than 30 seconds.

13. Push and hold engine STARTER switch (22) to START until engine starts.

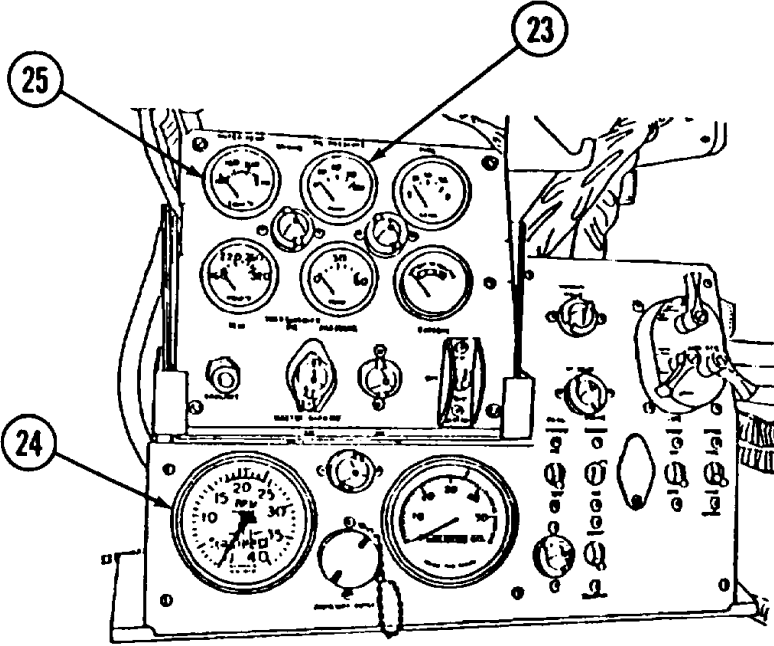


STARTING MAIN ENGINE (continued)

**CAUTION**

**If you notice a shrill whine (above normal turbine whine), rubbing, unusual vibrations, and/or sudden increase in exhaust smoke, shut off engine and notify Unit maintenance.**

14. Set throttle control lever (20) so that tachometer (24) reads 550 to 600 rpm. While engine is idling at this speed, watch ENGINE OIL PRESSURE gage (23). If engine oil pressure does not register 5 to 30 psi within 15 seconds of start, immediately pull FUEL SHUT OFF handle (19) to stop engine and notify Unit maintenance.

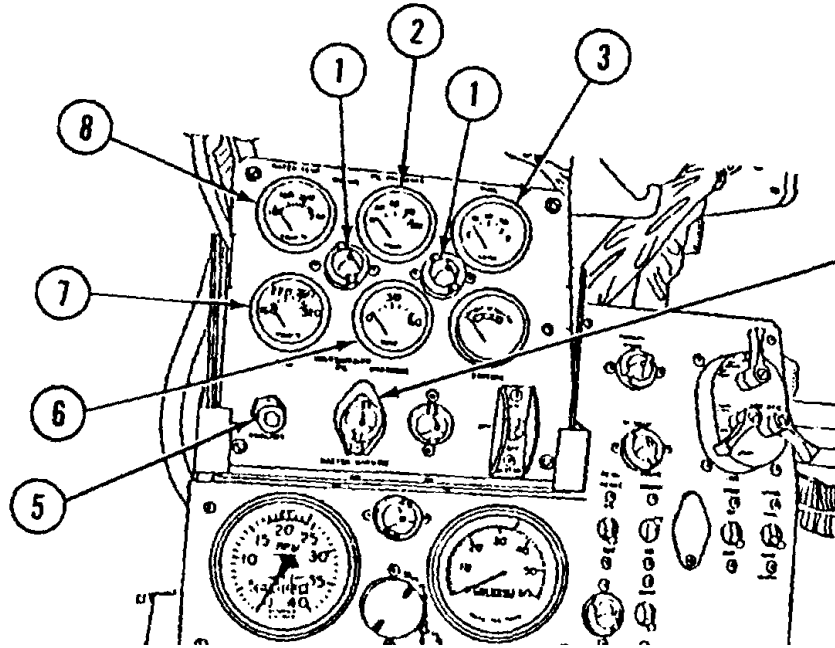


15. Idle engine for about two minutes; then move throttle control lever (20) to set engine speed at 1000 rpm (fast idle) on tachometer(24). Continue to warm engine until ENGINE WATER TEMPerature gage (25) registers at least 170°F.

16. Perform portable instrument panel checkout procedure (p. 2-88) during engine warmup.

## PORTABLE INSTRUMENT PANEL CHECKOUT PROCEDURE

Frequently check the following gages and indicators (callouts 1-8) to make sure vehicle powerpack continues to operate correctly. If the normal indications are not observed during this check, refer to the troubleshooting section in Chapter 3; troubleshooting procedures begin on page 3-2.



1. Instrument panel lights (1) should be set to OFF at this time. Turn on lights, if desired, to illuminate portable instrument panel using light switch assembly on main instrument

### **CAUTION**

**If engine oil pressure is below 30 psi at 1000 rpm, check oil level.**

2. ENGINE OIL PRESSURE gage (2) should indicate between 30 and 50 psi at 1000 rpm and between 50 and 70 psi at 2100 rpm. Maximum allowable pressure is 70 psi.

**1. PORTABLE INSTRUMENT PANEL CHECKOUT PROCEDURE (continued)****WARNING**

**Never allow flame or any smoking within 50 feet of fueling operations.**

3. FUEL gage (3) should be near FULL mark at start of operations. If necessary, shut down engine and fill tanks.
4. MASTER WARNING lamp (4) should go out after engine has run for 15 seconds.

**CAUTION**

**If the MASTER WARNING light goes on during operation, immediately check TRANSMISSION OIL PRESSURE gage, TRANSMISSION OIL TEMPerature gage, ENGINE WATER TEMPerature gage, and ENGINE OIL PRESSURE gage (steps 4, 5, 6, and 7, respectively) for readings in the normal ranges. If gage readings are correct but lamp stays lit, notify Unit maintenance.**

5. COOLANT level indicator lamp (5) should be set to OFF.
6. Press COOLANT level indicator lamp (5) to check that lamp works.
7. TRANSMISSION OIL PRESSURE gage (6) should indicate 18-45 psi at 1835-1900 rpm. Minimum allowable pressure is 10 psi at 1000 rpm.
8. TRANSMISSION OIL TEMPerature gage (7) should indicate 220°F to 240°F. Maximum allowable temperature is 300°F.
9. ENGINE WATER TEMPerature gage (8) should indicate between 170°F and 185°F. Maximum allowable temperature is 230°F.

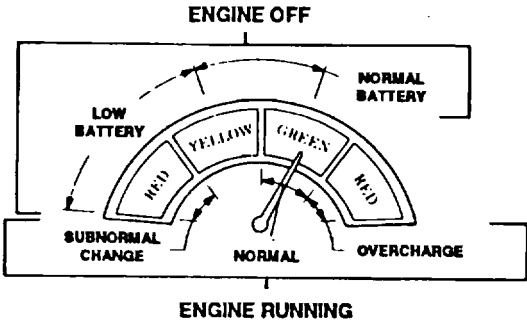
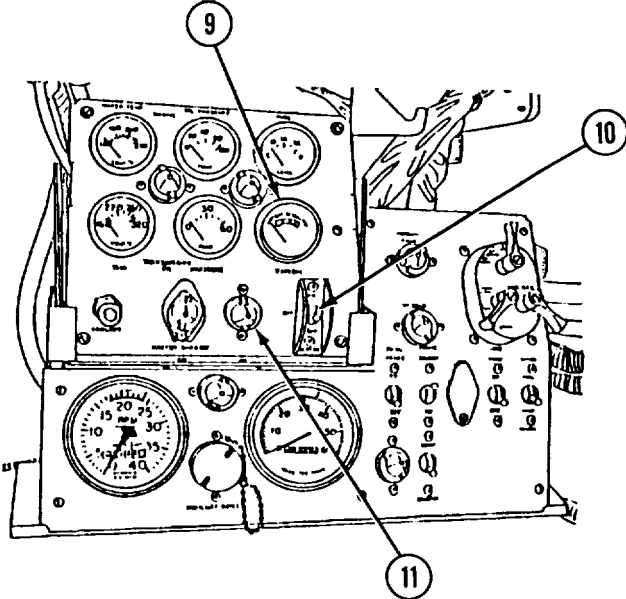


PORTABLE INSTRUMENT PANEL CHECKOUT PROCEDURE (continued)

10. BATTERY-GENERATOR indicator (9) needle should be in GREEN (normal) range.

**CAUTION**

If generator charging rate indicates subnormal charge or overcharge, notify Unit maintenance.

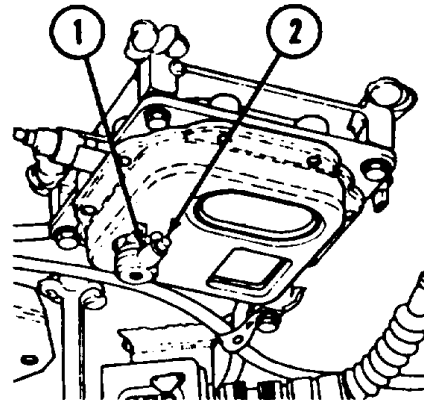


- 11. MASTER switch (10) will be set to ON during vehicle operation.
- 12. Master indicator light (11) should be on whenever MASTER switch is set to ON. If light does not go on when switch is set to ON, or if light remains lit when switch is set to OFF, notify Unit maintenance.

**OPERATION OF DRIVING LIGHTS AND DOME LIGHTS**

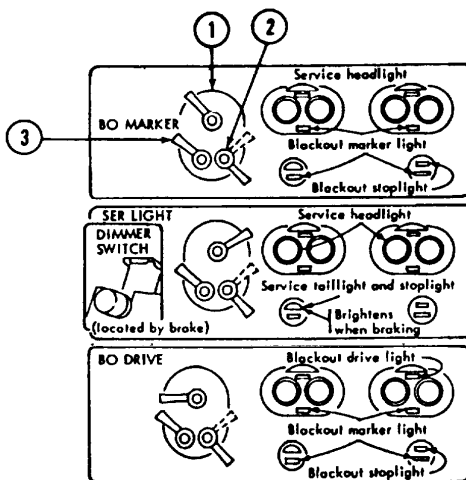
**Operation of Dome Light**

1. To set blue-green light to ON, turn switch lever (1) fully clockwise.
2. To set white light to ON, press safety latch (2) and turn switch lever (1) counterclockwise past stop.
3. To set both lights to OFF, position switch lever (1) in center position.



**Operation of Light Switch Assembly**

The following panels show which lamps are turned on by different positions of main light switch.



1. Push up safety switch (2) to release main light switch (1). Release safety switch after main light switch is properly positioned.
2. Push up on instrument panel light switch (3) to turn on instrument panel lights.

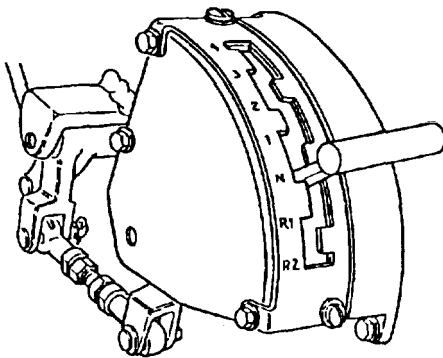
## SHIFTING THE TRANSMISSION

The transmission is equipped with a shift inhibitor that restricts movement of the transmission selector lever. This prevents downshifting of transmission until vehicle speed drops within correct operating limits for desired gear range.

While downshifting, always brake vehicle to prevent vehicle speed from overrunning engine speed.

### CAUTION

- Never descend an incline with transmission in neutral.
- Do not hold vehicle on incline with transmission in gear; Instead, lock brake and shift transmission to neutral.
- Always shift to a lower transmission gear range when engine rpm is less than 1725.

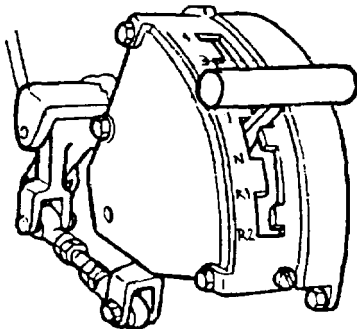


NEUTRAL (N) should be used when:

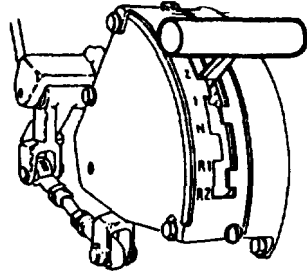
- Vehicle is stopped or parked.
- Engine is being started or shut down.
- Idling.

FIRST GEAR (1) should be used when:

- Setting vehicle in forward motion during field operation. Upshift to higher gear when vehicle speed permits.
- Ascending or descending steep grades and driving on soft, muddy, or rough terrain.
- Making short, forward radius turns. Short forward radius turns on hard surfaces should be initiated from a standstill. Top speed is 6 mph.

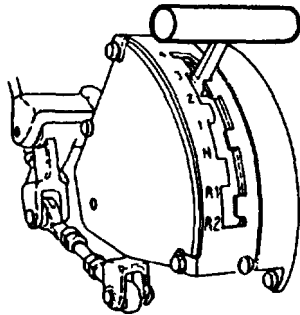


SHIFTING THE TRANSMISSION (continued)



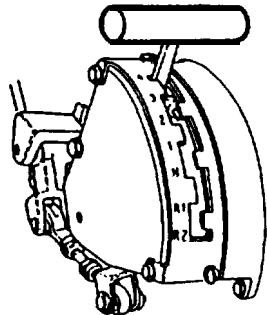
SECOND GEAR (2) should be used when:

- Towing heavy loads,
- Ascending or descending steep grades and driving on extremely soft, muddy, or rough terrain.
- Making short, forward radius turns. Top speed is 9 mph.



THIRD GEAR (3) should be used when:

- Vehicle is operating on hard-surfaced roads, until sufficient speed (12 to 15 mph) permits shifting to FOURTH GEAR range.
- Pulling heavy loads for sustained periods and ascending or descending long grades. Top speed is 24 mph.

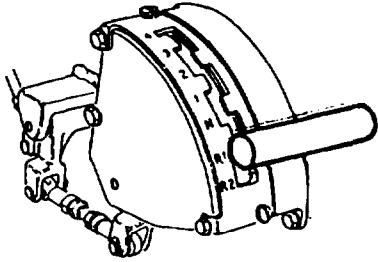


FOURTH GEAR (4) should be used when driving under normal conditions on firm, smooth, level ground. Top speed is 35 mph.

SHIFTING THE TRANSMISSION (continued)

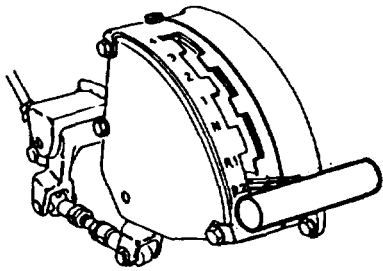
**CAUTION**

Never attempt to shift into reverse gear range unless vehicle is at standstill and engine is operating at idle rpm.



REVERSE-FIRST GEAR RANGE (R1) should be used when:

- Backing up.
- Making turns with heavy loads or when on soft ground.
- Ascending steep grades backward for maximum engine power.
- Making short, rearward radius turns.



REVERSE-SECOND GEAR RANGE (R2) should be used when driving on level, hard-surfaced ground when backward movement for long distances becomes necessary.

## DRIVING THE VEHICLE

**WARNING**

- Brake vehicle to prevent vehicle speed from overrunning engine speed. If vehicle speed overruns engine speed, you will not be able to downshift and may lose control of vehicle.
- Drive carefully, especially if unfamiliar with vehicle. Avoid oversteering and speeding on hard pavement; you could lose control of vehicle.
- Be sure driver's and commander's hatches are locked in either the opened or closed position. To avoid injury to personnel, secure upper and lower rear doors, personnel side doors, and all other covers in closed position before moving.
- Make sure charge canisters, projectiles, fuses, and all other stowed items are securely restrained before moving vehicle.
- Never move vehicle without first receiving a signal from the ammunition team chief that all crew members are seated and that stowed items are secured. Always use seatbelts while traveling.
- For the safety of personnel in the area when backing up, position two ground guides who can clearly see each other; one should be able to see the driver and the other should be able to see the area behind the vehicle. If necessary, one on-board guide, using a CVC helmet, can direct the vehicle using VIC 1 intercommunication with driver.

**CAUTION**

- Do not leave vehicle unattended while engine is running.
- When starting on a hill, depress brake and place transmission in first gear. Increase engine speed and release brake.
- Do not hold vehicle on an incline by using accelerator. Transmission overheating will result.
- Do not coast when descending grades; instead, downshift transmission.
- Observe overhead and side clearances. When turning vehicle, allow ample clearance for corners of vehicle. When making sharp turns, shift to first or second gear.
- If vehicle throws a track, do not use the brake to stop; instead, stop accelerating and coast to a stop.

**DRIVING THE VEHICLE (continued)**

**Preparation for Movement**

Before moving the M992A1, check to see that all systems and cargo compartments are secured for travel. The steps that follow present specific items to be checked before moving.

1. Make sure conveyor is properly stowed and secured (p. 2-163).
2. Make sure the following doors are closed and secured:
  - Personnel side door (p. 2-133)
  - Canister side doors (p. 2-134)
  - Top (middle, left, and right) doors (pp. 2-135 and 2-136)
  - Upper rear door (p. 2-140) and upper rear door small doors (p. 2-142)
  - Lower rear door (p. 2-137)
  - APU side and front doors (pp. 2-142 and 2-143)
  - Transmission access doors (p. 2-134.1)
  - Battery access doors (p. 2-134.2)
  - Fuel cap access door
3. Make sure driver's hatch door and commander's cupola hatch door are secured in open position (with hold-open latches) or in closed position (pp. 2-143 and 2-145).
4. Check to make sure the following items are secured with restraint straps (and bars, if applicable):
  - Propelling-charge canisters (p. 2-174)
  - Fuse boxes
  - Primer boxes
  - 0.50-caliber ammunition boxes
5. Check to make sure all projectiles are locked in place (p. 2-180).
6. Check to make sure all other loose items are stowed/secured.

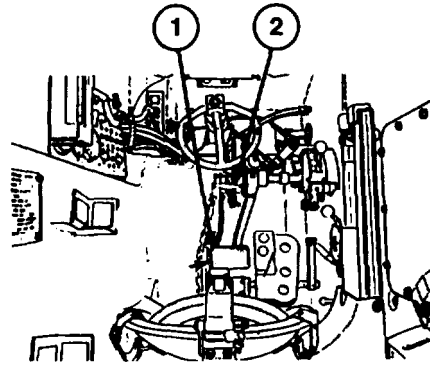




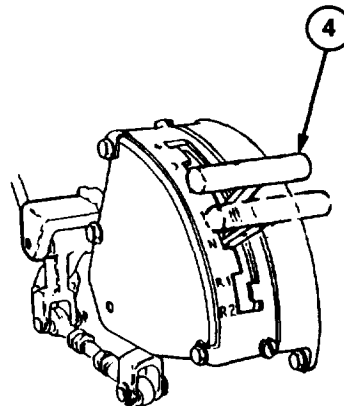
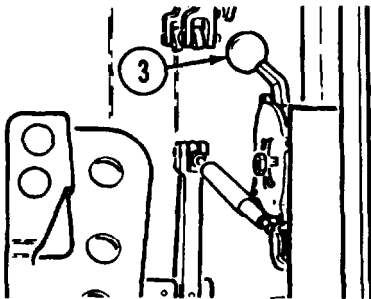
DRIVING THE VEHICLE (continued)

■ Moving the Vehicle

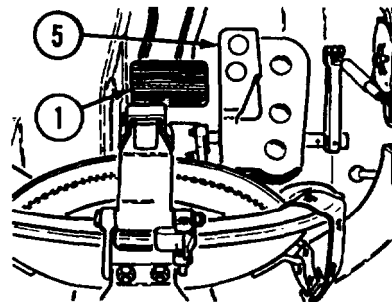
1. Press down on brake pedal (1), and pull out on BRAKE LOCK handle (2).



2. With brake pedal (1) depressed and throttle control lever (3) adjusted to idle position, shift from N (neutral) to 1 (first gear) (4).

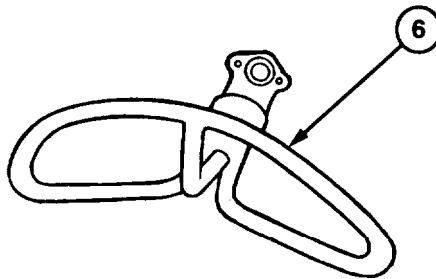


3. Release brake pedal (1) and push accelerator pedal (5) to obtain desired speed. Shift through intermediate ranges into desired speed range (pp. 2-92 through 2-94).



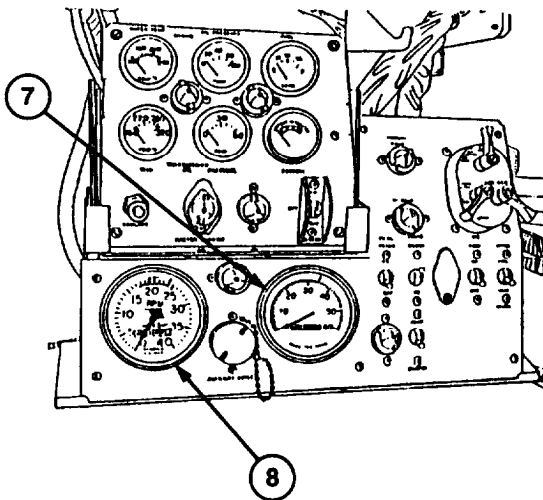
**DRIVING THE VEHICLE (continued)**

4. To turn vehicle, turn steering wheel (6) in desired direction.

**CAUTION**

When engine speed is less than 1725 rpm, shift to lower range.

5. Frequently check tachometer (8), speedometer (7), and other instrument panel gages. While driving the vehicle, check for unusual engine noises and vibration, and proper operation of steering and brakes.



**DRIVING OVER ROUGH, SOFT, OR HILLY TERRAIN**

**WARNING**

- **To avoid possible Injury and vehicle damage, approach obstacle head-on.**
  - **Warn crew members to brace themselves.**
  - **Hatches, doors, and stowed items must be secured before proceeding over obstacle.**
1. Crossing a Ditch, Hole, or Trench. Apply brake and shift to first gear. When vehicle reaches bottom and starts to climb, depress accelerator to attain power needed to climb free of obstacle.
  2. Driving over Barrier (21 inches maximum vertical height). As vehicle approaches barrier, release accelerator, apply brake, and shift to first gear. Apply full power when starting over barrier. Release accelerator pedal upon reaching crest and permit vehicle to settle over it. Balance vehicle forward of the crest to begin descent. When front of tracks touch ground, add power and move on.
  3. Starting Vehicle on an Upgrade. To avoid rolling backward when vehicle is headed uphill, apply power before releasing brake.

**CAUTION**

- **Do not use engine as braking source for a long period of time. Transmission overheating will result.**
  - **Using service brakes too long will burn them out. Release and apply brakes occasionally.**
4. Descending Steep Grades. Shift transmission into first gear and apply brake as necessary to slow vehicle.

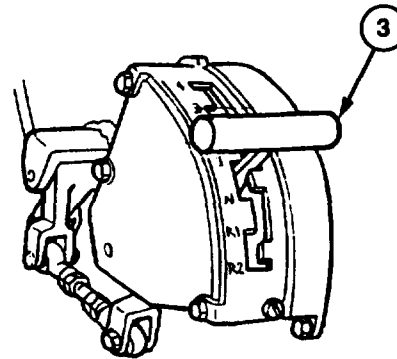
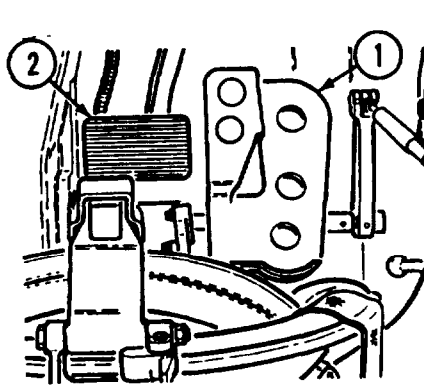
**CAUTION**

**Making sharp turns in first gear may cause a track to be thrown.**

5. Driving in Loose Sand, Dirt, or Rocks. Shift into first gear and make series of short, gradual turns. This action will allow debris to be expelled from track.

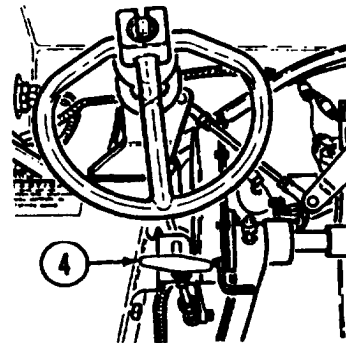
**STOPPING THE VEHICLE**

1. Release accelerator pedal (1) and slowly depress brake pedal (2) until vehicle stops.

**NOTE**

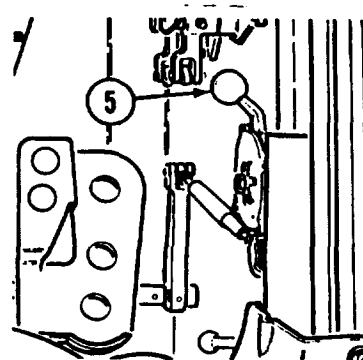
Before applying the service brake while on steep slopes (greater than 20 percent), adjust the driver's seat so you can apply maximum leverage to the brake.

2. With brake pedal (1) depressed, shift transmission selector lever (3) into neutral and pull parking BRAKE LOCK handle (4) out and down. Release brake pedal (1). If stopping on a steep slope, press on brake pedal (1) after pulling BRAKELOCK handle (4) out and down.

**CAUTION**

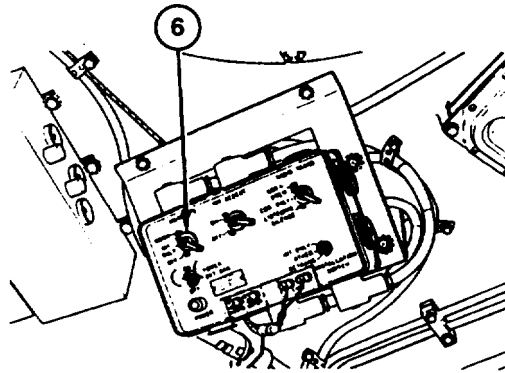
**Failure to perform steps 3 and 4 before shutting down engine may result in engine damage.**

3. Set throttle control lever (5) to run engine at 1000-1200 rpm on tachometer. Run engine at this speed for 3-5 minutes or until coolant temperature measures 185°F or less.
4. Set throttle control lever (5) forward to return engine to normal idle (550-600 rpm). Idle 1-3 minutes before stopping engine.



STOPPING THE VEHICLE (continued)

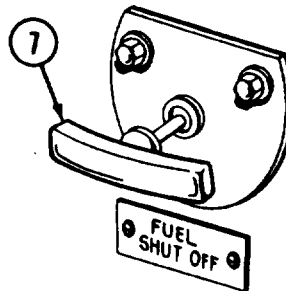
5. Turn communications switch (6) to OFF.



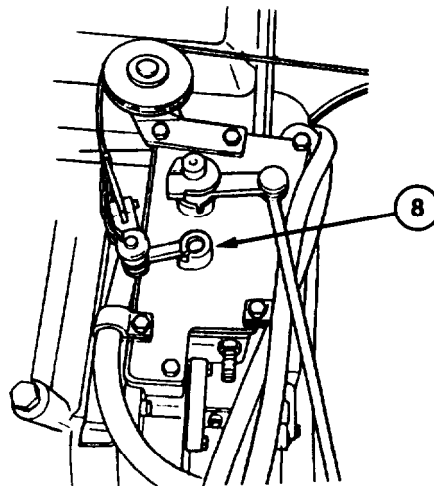
6. Turn off all light switches and accessory switches in driver's compartment and crew/cargo compartment.
7. Pull out FUEL SHUT OFF handle (7) to stop engine.

**WARNING**

If engine does not stop when FUEL SHUT OFF handle (7) is pulled, open engine intake grille and turn lever (8) on engine. Hold lever (8) until engine stops. Failure to comply may result in injury to personnel.



8. Turn MASTER switch to OFF.
9. Do after-operation PMCS.

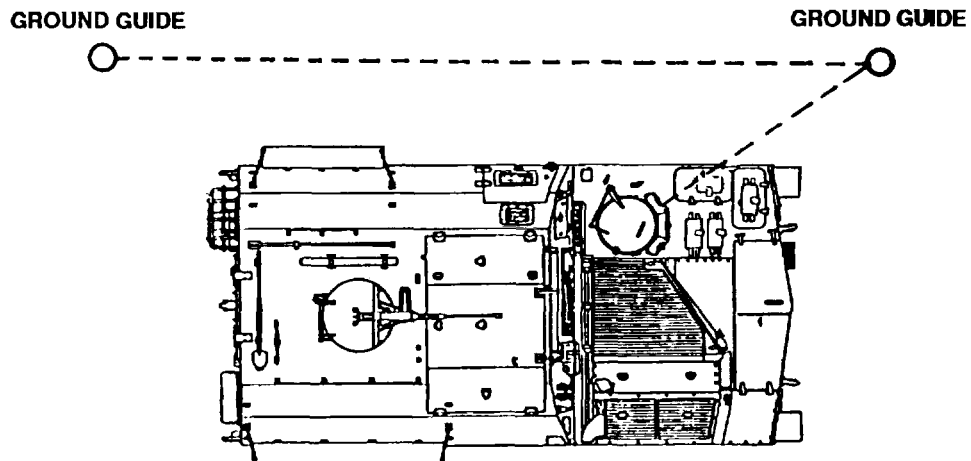


**BACKING THE VEHICLE****WARNING**

For the safety of personnel in the area when backing, position two ground guides who can clearly see each other, with one being able to see the driver and the other being able to see area behind vehicle. If necessary, one onboard guide, using a CVC helmet, can direct the vehicle back using VIC 1 intercommunication with driver.

**Backing with Two or More Ground Guides**

1. Ground guides must be positioned so they can see obstructions behind vehicle and can relay backing instructions visually to driver.
2. Ground guide at rear of vehicle will check vehicle path and manually signal backing instructions to front guide.
3. Front guide will relay backing instructions to driver.
4. Driver will back vehicle slowly and according to instructions.



**BACKING THE VEHICLE (continued)****Backing with One On-board Guide 1.**

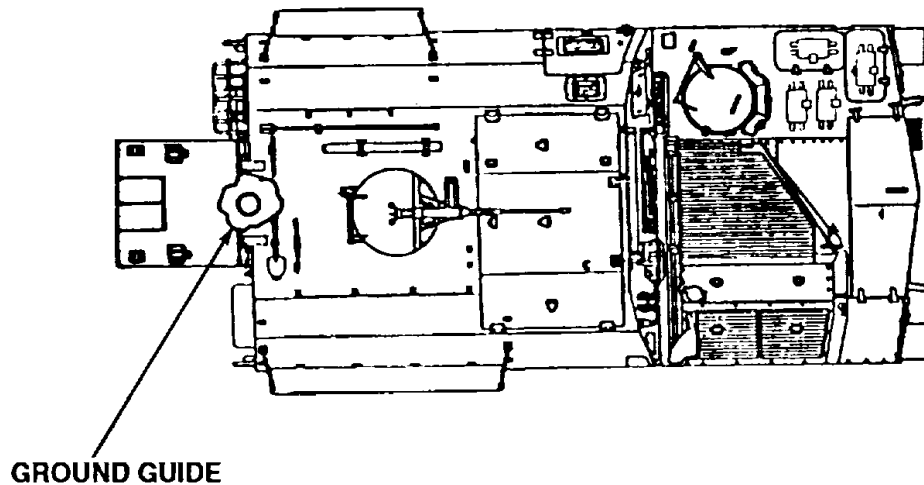
1. Open rear doors (pp. 2-137 and 2-138).
2. Driver and guide will connect CVC helmet cables to control box receptacles and switch on intercommunications equipment. Guide must use control box just inside vehicle rear doorway.
3. Driver and guide will establish intercommunications via communications equipment.

**WARNING**

\* For the safety of personnel in the area, driver must stop vehicle if communications are interrupted during backing operations.

\* To avoid damage to upper rear door and injury to personnel in the area, ground guide must always consider rear clearance of opened door when instructing driver.

4. From rear doorway, guide will check vehicle path. Guide will verbally instruct driver in backing vehicle.
5. Driver will back vehicle slowly and according to instructions.
6. Guide and driver will continue in this manner until backing operations are complete.
7. After vehicle is properly positioned, turn off intercommunications equipment and remove and stow CVC helmets.



**TOWING OPERATIONS****NOTE**

- The M992A1 is authorized to tow only one vehicle at a time and only when the other vehicle is disabled, or when towing to start engine.
- In an emergency you can tow a vehicle for a short distance (not more than 1/4 mile) without disconnecting universal joints. Put transmission selector lever in neutral position before starting towing operation. Do not tow disabled vehicle over 10 mph. Be careful not to accidentally shift into gear.

**Towing Precautions**

The following precautions should be followed to ensure safety to personnel and to prevent damage to equipment:

- Vehicle engines will be shut off and brakes applied while tow cables are being connected or disconnected.
- There must be an observer to assist driver when rigging vehicle and during towing operations.

**Towing****WARNING**

\* When tow bars or cables are used, a second vehicle is required when descending a grade of 20 degrees or more, or if road conditions require additional power. Do not exceed 10 mph.

**CAUTION**

- When universal Joints are disconnected, you cannot steer or brake. Use tow bar only.
- Stow universal joints and flanges where they will remain clean and free of dirt. Failure to do so may result in damage to equipment.



**TOWING OPERATIONS (continued)**

1. Disconnect universal joints as follows:

**NOTE**

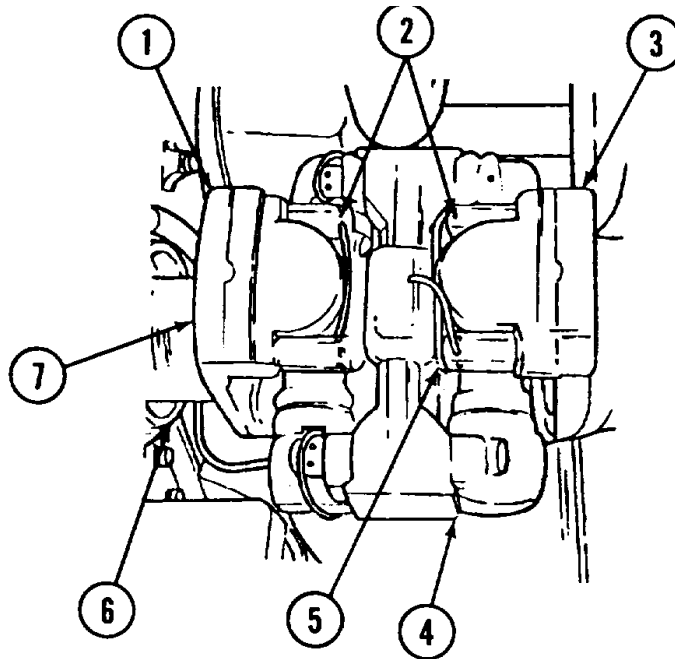
Left and right universal joints are removed the same way. Right side is shown in illustration.

- a. Open right and left transmission doors.
- b. Maneuver vehicle until all eight screws (2) are accessible.
- c. Cut lockwire (5) and remove eight screws (2).
- d. Pry final drive flange (1) away from universal joint (4). Move flange (1) toward final drive housing (6).

**WARNING**

**Universal joints are heavy. Keep hands out from underneath universal joints when they are disconnected. Failure to do so may result in injury to personnel.**

- e. Pry universal joint (4) loose from transmission flange (3), and remove universal joint (4) from vehicle.
- f. Remove final drive flange (1) from final drive shaft (7).

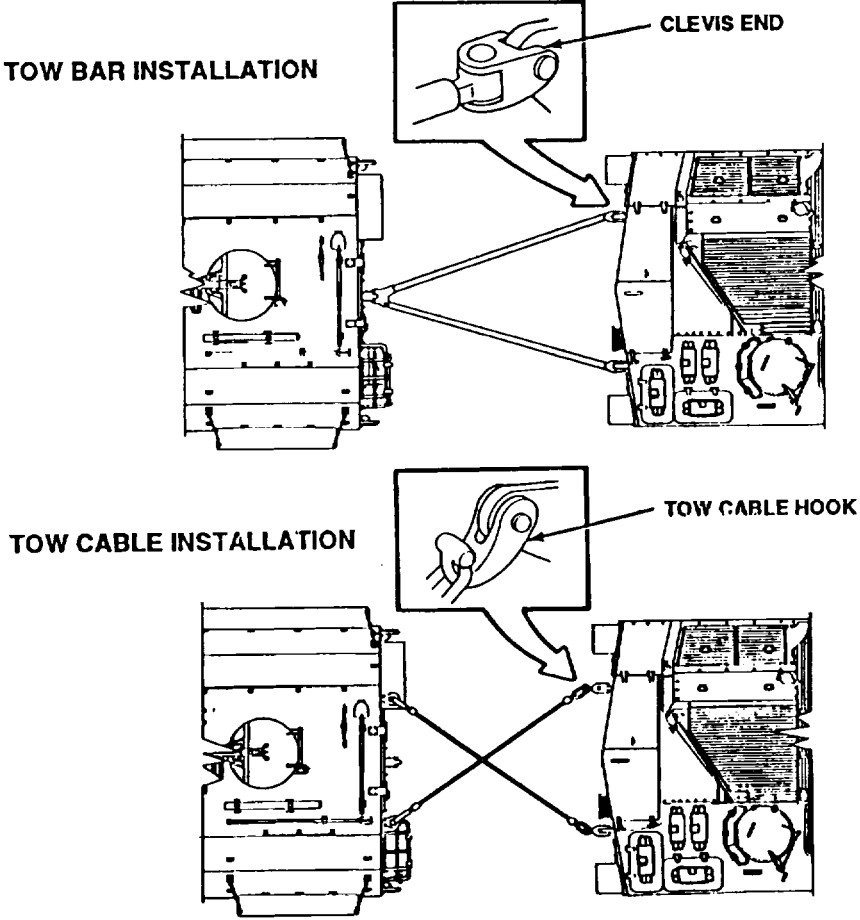


**TOWING OPERATIONS (continued)**

**NOTE**

Check fluid level in final drive after installing universal joints. You can lose fluid with final drive flange off.

- 2. Install tow bar or tow cable (refer to TM 9-4910-496-10).



- 3. Shift transmission in disabled vehicle into neutral.

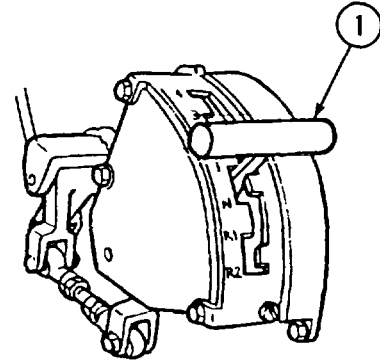
**CAUTION**

**To avoid collision when towing, be sure to steer in a wide arc when turning.**

- 4. Release brake on disabled vehicle, and signal observer to proceed.

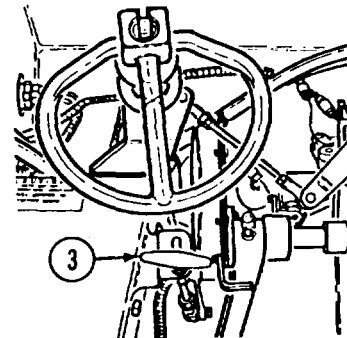
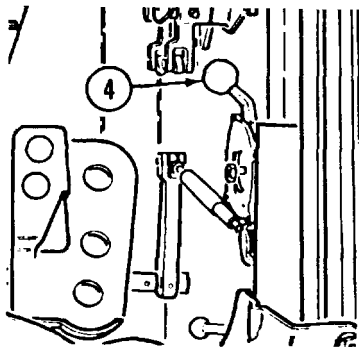
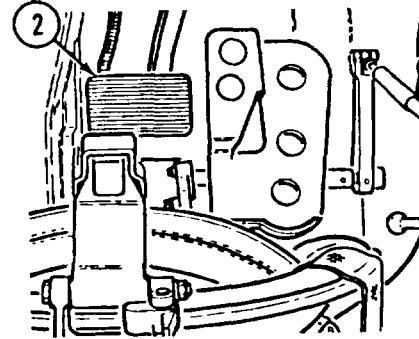
**TOWING OPERATIONS (continued)****Towing Vehicle to Start Engine**

1. When an M992A1 is towing to start an M109-family vehicle, M109 cab should be turned 180° to keep tube from striking M992A1.
2. Connect tow bar or tow cables (refer to TM 9-491 0-496-10).
3. Shift transmission selector lever (1) into second gear.
4. Depress brake pedal (2) and release parking BRAKE LOCK handle (3).

**CAUTION**

**Never depress accelerator pedal on towed vehicle.**

5. Tow vehicle in straight line forward. Do not exceed 10 mph.
6. After engine in M109-family vehicle starts, shift to neutral and adjust throttle control lever (4) to run engine at a fast idle (approximately 1000 rpm).
7. Once vehicles come to a stop, disconnect tow bar or tow cables (refer to TM 9-4910496-10).

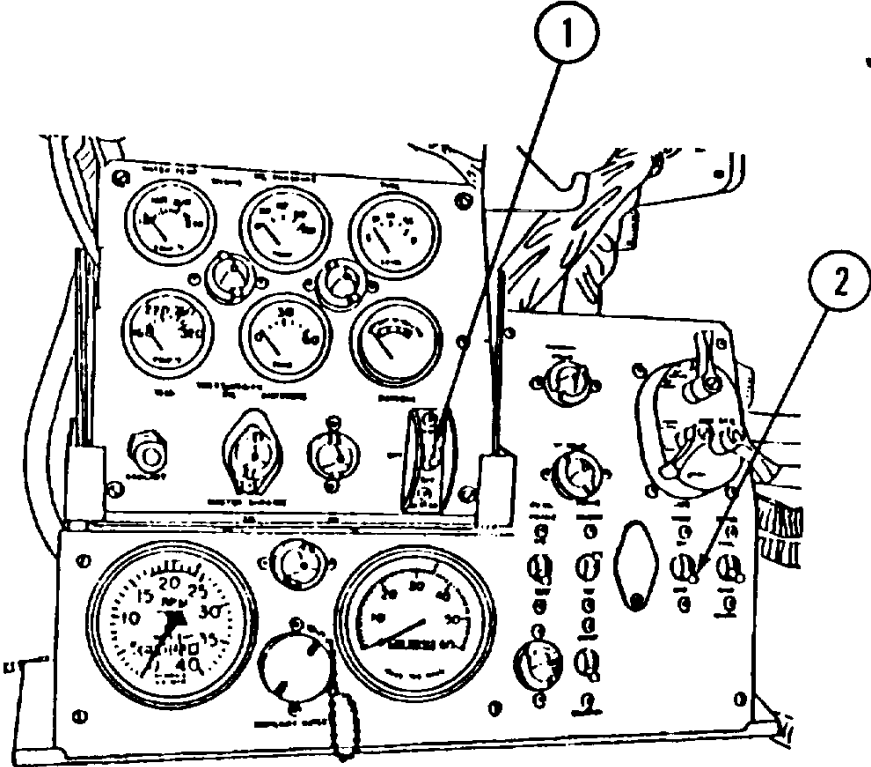


RATING BILGE PUMP

**CAUTION**

**Do not operate bilge pump for more than 1 minute if dry, or more than 15 minutes if wet, without engine running.**

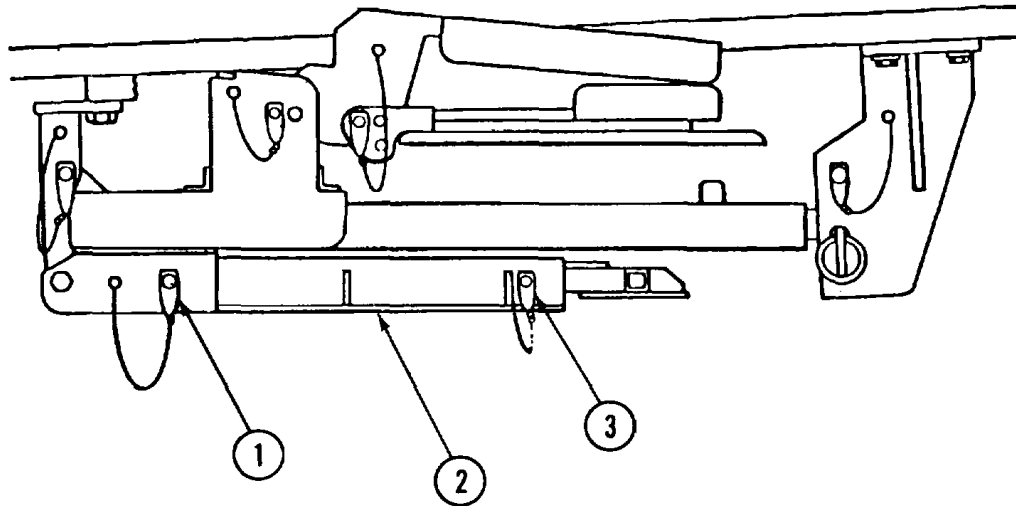
To drain water out of engine compartment, turn MASTER switch (1) and BILGE PUMP switch (2) to ON.



Deployment

**WARNING**

- Always support footrest before you remove quick-release pin. Failure to do this will allow footrest to swing freely, which could cause serious Injury.
- Before deploying footrest, make sure quick-release pin is securely positioned through holes in footrest tubes. If pin is not properly inserted, footrest will telescope when lowered and may cause Injury.



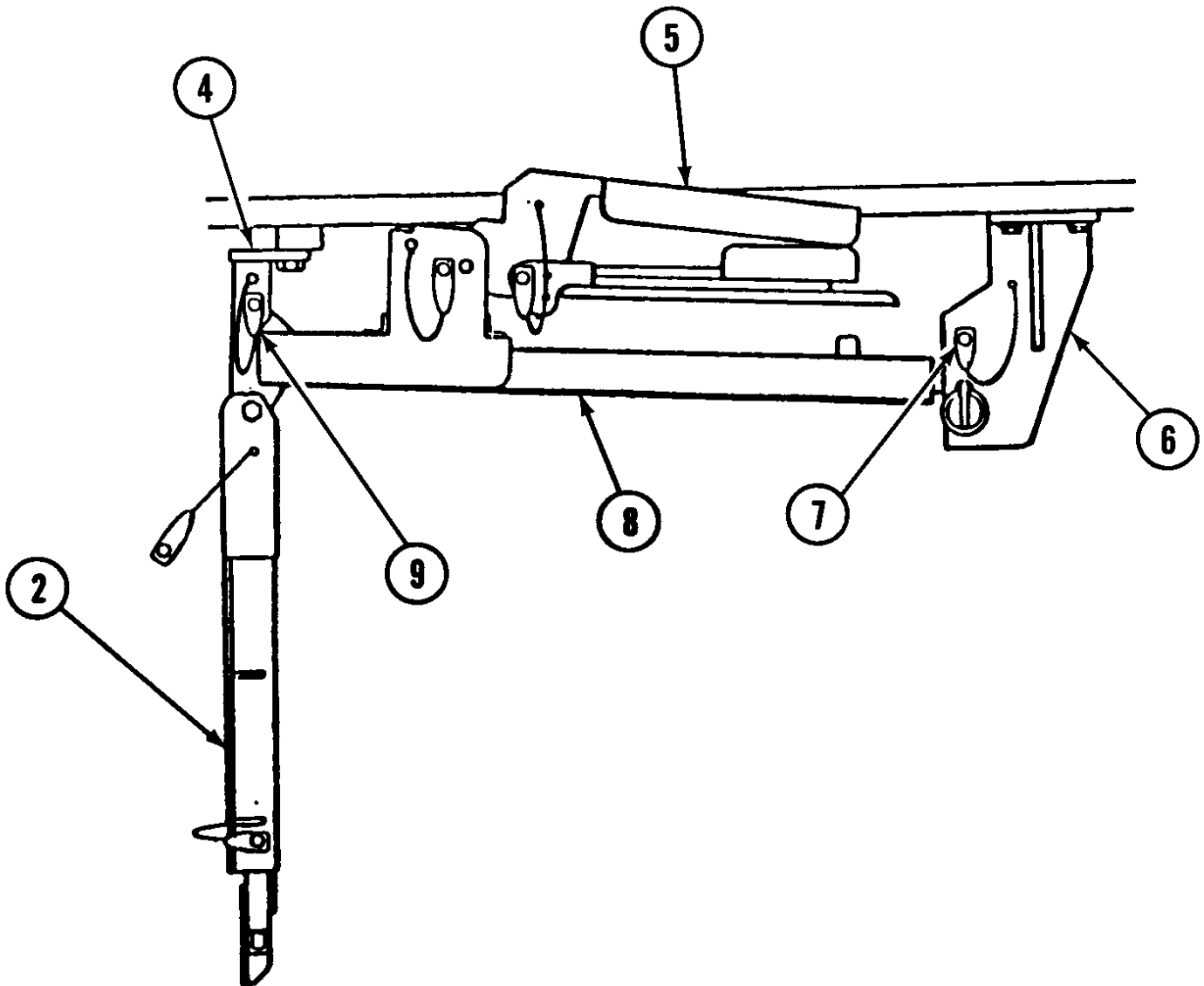
1. Make sure quick-release pin (3) is installed in footrest (2).
2. Support footrest (2) and remove quick-release pin (1) from footrest (2). Slowly lower footrest and allow it to hang freely.

## COMMANDER'S SEAT (continued)

**WARNING**

Commander's seat assembly is very heavy. It must be adequately supported before quick-release pin is removed. Failure to do so may result in serious injury. Deployment of commander's seat shall always be a two-person operation.

3. An assistant is needed to help support seat assembly and prevent footrest (2) from swinging freely.
4. While supporting seat post (8) and footrest (2), remove quick-release pin (9) from support bracket (4) and then remove pin (7) from bracket (6). Slowly lower seat assembly (5). Reinsert pin (7) into seat-stowage hole and reinsert quick-release pin (9) into support bracket (4).



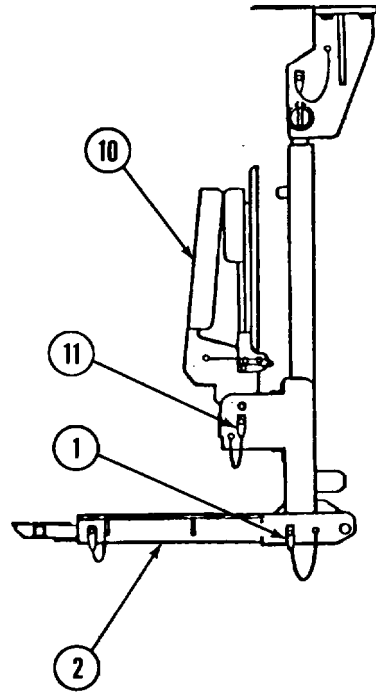
**COMMANDER'S SEAT (continued)**

5. Pivot footrest (2) forward and up. Aline forward holes and insert quick-release pin (1) in footrest (2).

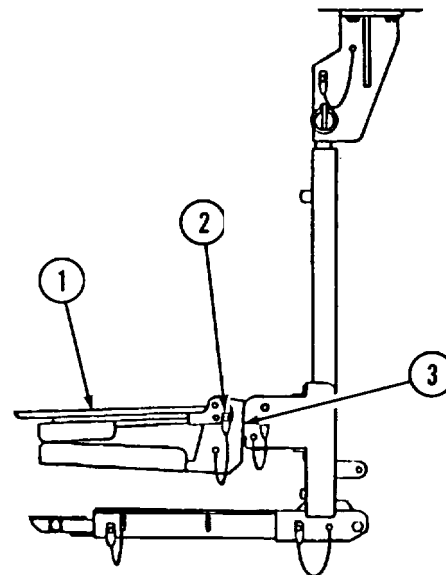
**WARNING**

**To avoid Injury, seat must be supported before removing quick release pin.**

6. Support seat (10) and remove quick release pin (11) from seat (10). Pivot seat (10) downward. Aline holes and insert pin (11) in seat (10).



**Adjustment** 1. Backrest Adjustment. Remove quick release pin (2) from seat (3). Rotate backrest (1) up for sitting, down for standing. Aline pinholes and insert quick release pin (2) in backrest (1).



**COMMANDER'S SEAT (continued)**

2. Footrest Adjustment. Remove quick-release pin (4) from footrest (5). Slide footrest (5) in or out to desired position. Align holes in footrest (5) and install quick-release pin (4) in footrest (5).

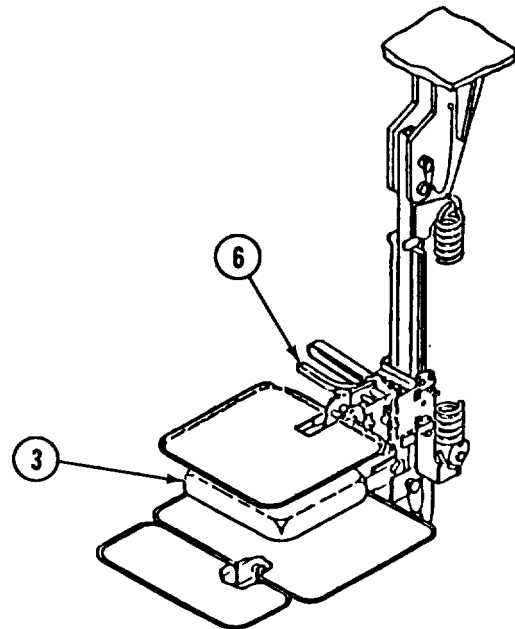
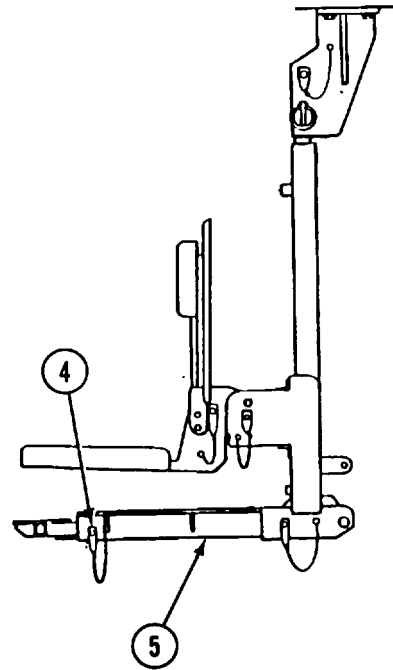
**WARNING**

**To avoid injury, sit on seat to apply downward pressure before adjusting height-adjusting handle.**

**CAUTION**

**Do not use handle guard for lifting; it is meant to prevent accidental actuation of the handle.**

3. Seat Height Adjustment. Apply downward pressure to seat (3) and pull adjusting handle (6) forward. Increase or decrease pressure on handle (6) to lower or raise seat (3). When desired height is achieved, release handle (6) and slowly release pressure until seat (3) locks into position.





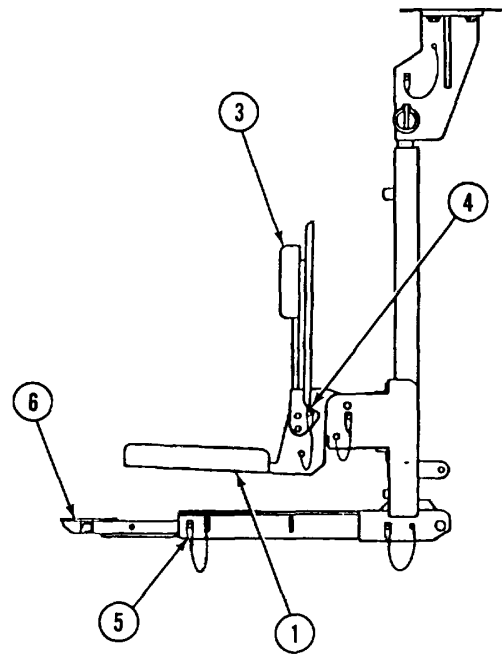
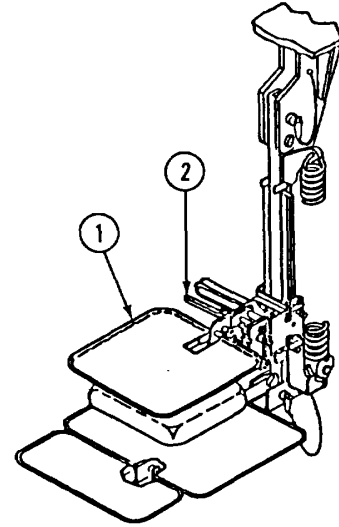
## COMMANDER'S SEAT (continued)

## Stowing

**WARNING**

**To avoid injury, sit on seat to apply downward pressure before adjusting height-adjusting handle.**

1. Apply downward pressure to seat (1) and pull adjusting handle (2) forward. Press seat (1) to its lowest point. Release handle (2) and slowly release pressure until seat (1) locks into position.
2. Remove quick-release pin (5) from footrest (6). Push footrest (6) in as far as it will go. Align pinholes in footrest (6) and insert quick-release pin (5).
3. Remove quick-release pin (4) from seat (1) and pivot backrest (3) down. Align pinholes in seat (1) and insert quick-release pin (4).



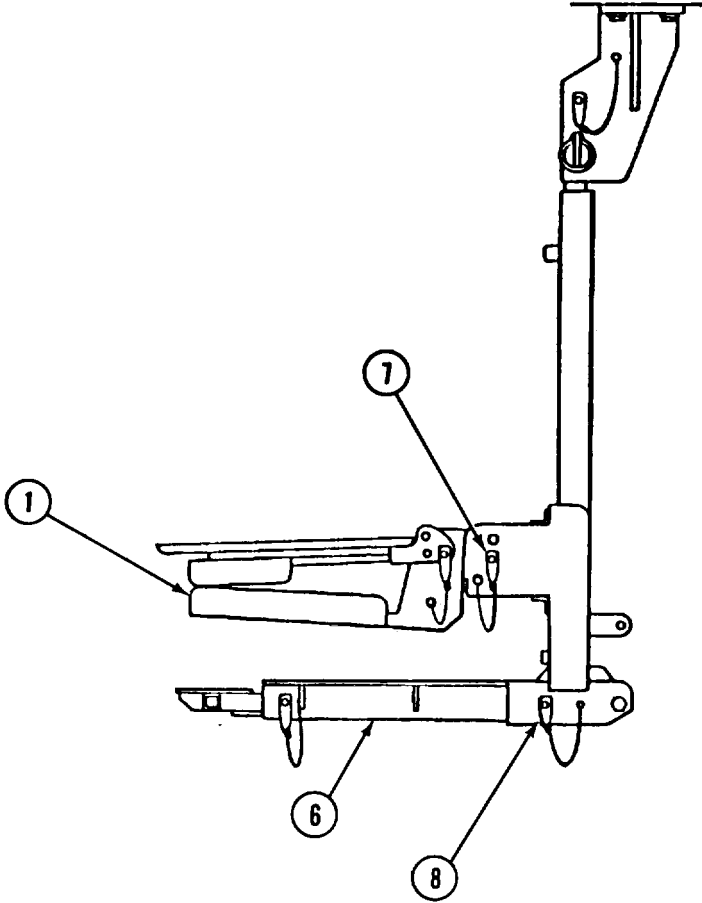
COMMANDER'S SEAT (continued)

- 4. Remove quick-release pin (7) from seat (1) and pivot seat (1) up. Align pinholes in seat (1) and install quick-release pin (7).

**WARNING**

- Before lowering footrest, make sure quick-release pin is securely inserted through holes in footrest tubes. If pin is not properly inserted, footrest will telescope when lowered and may cause injury.
- Always support footrest before you remove quick-release pin. Failure to do this will allow footrest to swing freely, which could cause serious injury.

- 5. Support footrest (6) and remove quick-release pin (8) from footrest (6). Slowly lower footrest (6) and allow it to hang freely.
- 6.



**WARNING**

To avoid injury, use two people to lift seat assembly for stowage.

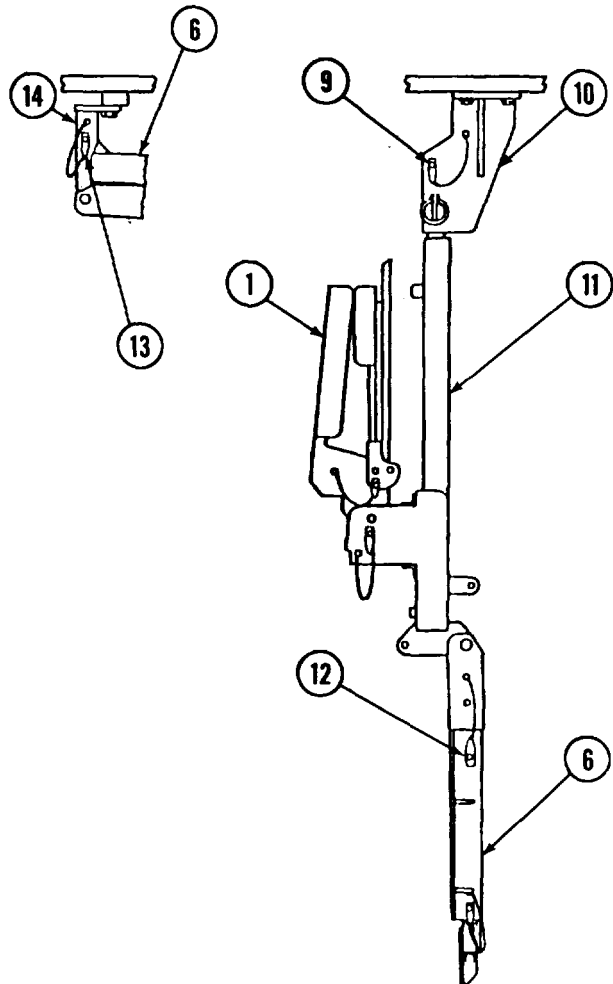
**CAUTION**

If commander's cupola periscope is to remain installed, you must rotate cupola so that periscope is 90° left of forward before you raise seat assembly. Failure to do this may result in destruction of periscope. If periscope is removed, cupola may remain forward when seat is stowed.

**NOTE**

Have an assistant help lift and support seat and prevent footrest from swinging.

6. Remove two quick-release pins (9 and 13) from bracket (10) and support bracket (14). Pivot seat (1) forward and upward until holes in seat post (11) align, and insert quick-release pin (13) in support bracket (14). Install quick-release pin (9) in bracket (10).
7. Pivot footrest (6) toward rear and up. Align pinholes in footrest (6) and install quick-release pin (12) in footrest (6).

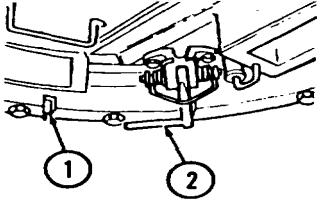


**ROTATING COMMANDER’S CUPOLA**

**CAUTION**

**Never attempt to rotate commander’s cupola while commander’s seat is stowed. Such an attempt will damage seat-height adjusting handle.**

- 1. Deploy commanders seat (p. 2-108).
- 2. Pull out on latch handle (2). Rotate cupola to desired position.
- 3. Release latch handle (2) into one of 12 notches (1) around cupola circumference.



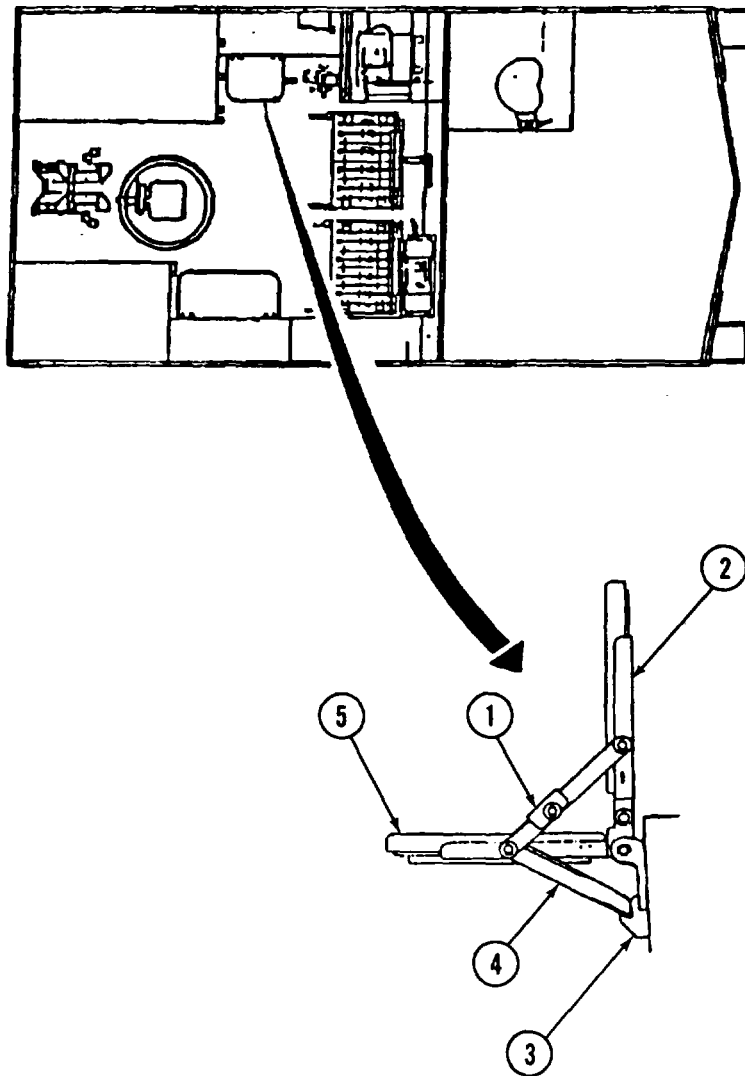
**CREW SEATS**

**WARNING**

**Seats are heavy. Support seats before pulling quick-release pins. Hinged seats, backrests, and support brackets may swing down, causing personal injury.**

**NOTE**

**To allow for maximum work space, stow all seats prior to working in vehicle. Stow seats in reverse order of deployment.**



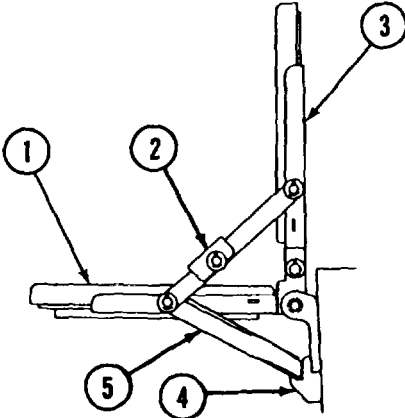
**Left Front Seat**

1. Grasp seat backrest (2) and seat (5) and rotate them up and back. Pivot bracket (4) into slot (3).
2. Raise seat backrest (2) until support joint (1) is locked.

**CREW SEATS (continued)**

**Right Front Double Seat**

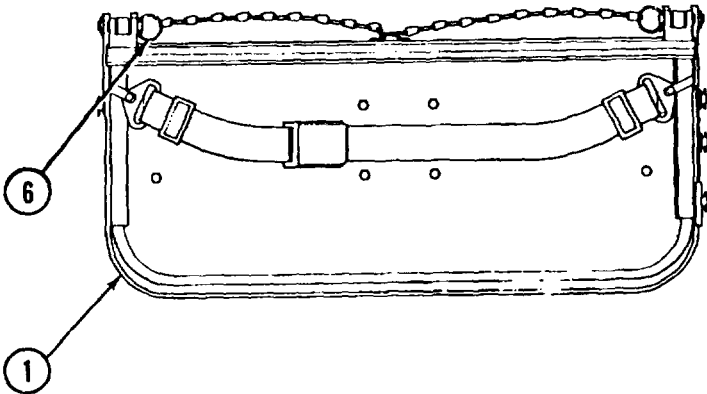
- 1. Pull up on seat backrest (3). As backrest (3) passes horizontal, seat (1) will pivot upward.
- 2. As backrest (3) and seat (1) reach full deployment, pivot bracket (5) into slots (4).
- 3. Before releasing backrest (3), make sure support joint (2) is locked.
- 4.



**WARNING**

**Seat is heavy and difficult to maneuver alone. To avoid injury, get an assistant to help you before proceeding.**

- 4. To remove seat, remove two quick-release pins (6) securing seat (1) to right-hand sponson.
- 5.



OPERATING THE APU

Starting

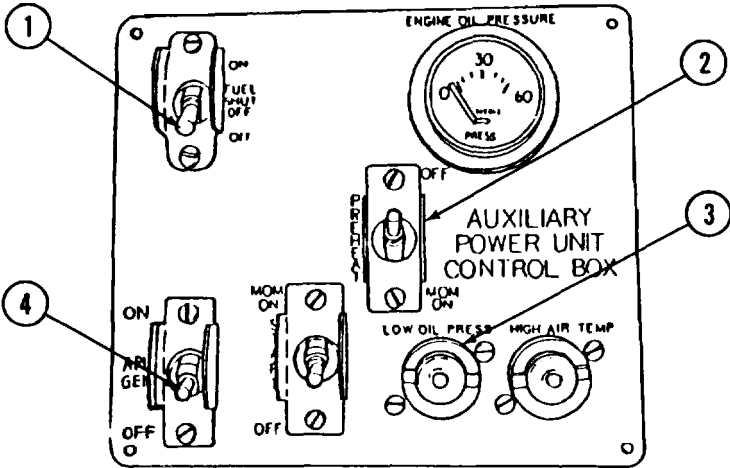
CAUTION

To avoid damaging radio components, turn off all radio switches before starting the APU.

NOTE

For operation in extremely cold weather (-25°F to -65°F; 31.7°C to 53.9°C), see page 2-219.

1. Open APU front door and check APU engine oil level. Add oil to bring level to full (F) mark on dipstick. Add or drain as necessary.
2. Turn off all electrical and radio switches.
3. Turn vehicle MASTER switch to ON.



NOTE

The APU will not start if APU GENERator switch is set to ON.

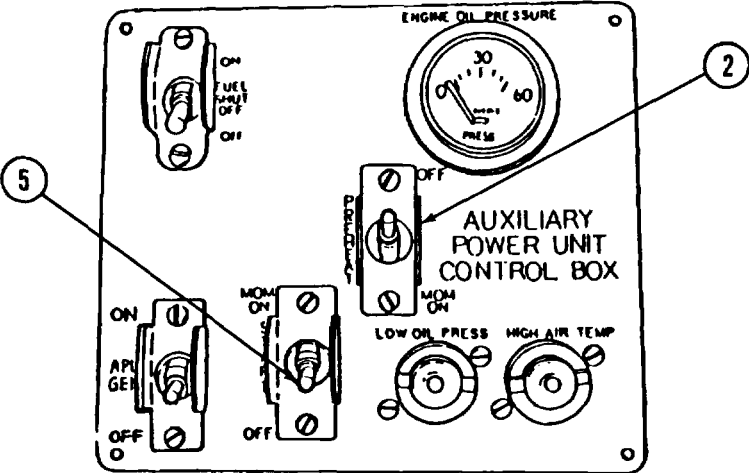
4. Make sure APU GENERator switch (4) is set to OFF.
5. Turn FUEL SHUTOFF switch (1) to ON. The LOW OIL PRESSure lamp (3) will light until APU engine starts.
6. Turn PREHEATswitch (2) to MOMentary ON. Hold switch to ON for 20 seconds if outside air temperature is above 55°F (12.8°C). Hold switch to ON for one minute if outside air temperature is between 0°F and 55°F (-17.8°C and 12.8°C). If air temperature is below 0°F, refer to page 2-215.

OPERATING THE APU (continued)

NOTE

If APU engine does not start within one minute, release START switch, but continue to hold PREHEAT switch to ON for another 20 seconds (in temperatures above 55°F [12.8°C]) or one minute (in temperatures below 55°F [12.8°C]). After allotted time, hold START switch to MOMentary ON again. If engine still does not start, troubleshoot APU (p. 3-11).

- 7. While holding PREHEAT switch (2) to MOMentary ON, move START switch (5) to MOMentary ON. Hold both switches (2 and 5) ON for about 2 to 5 seconds, then release. APU engine should start.



CAUTION

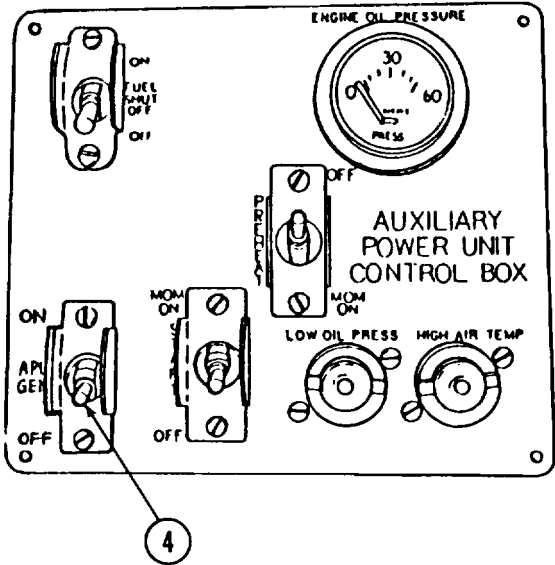
- To avoid damaging the APU engine, if LOW OIL PRESSure lamp remains lit after engine starts, or if it lights during APU operation, turn FUEL SHUT OFF switch to OFF to stop APU. Notify Unit maintenance if this problem occurs.



OPERATING THE APU (continued)

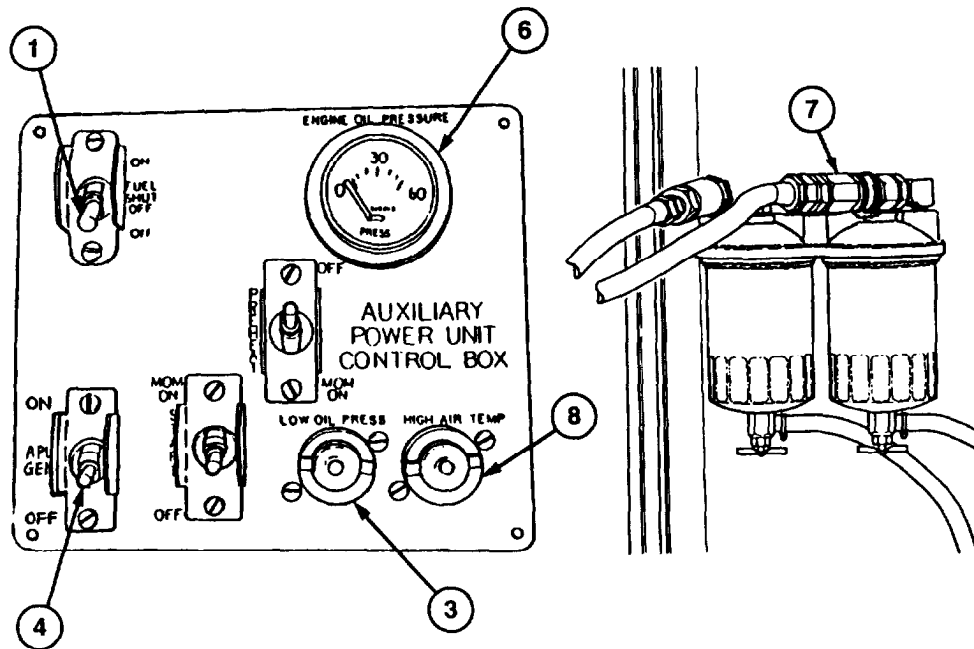
- When operating the APU at high altitudes and/or high temperatures, continuous heavy-load demands by the electrical and hydraulic systems may cause APU engine to overheat. In these extreme conditions, the APU GENERator switch should be turned to OFF and hydraulic components should be shut down periodically. Continue to run APU without load for several minutes before again operating generator and hydraulic components.
- If HIGH AIR TEMPerature lamp lights during operation, turn FUEL SHUTOFF switch to OFF. Allow APU to cool before restarting. Notify Unit maintenance if lamp lights often.

8. Allow APU to warm up for three minutes, then turn APU GENERator switch (4) to ON.



**OPERATING THE APU (continued)**

9. While the APU is operating, check LOW OIL PRESSure lamp (3), HIGH AIR TEMPerature lamp (8), and ENGINE OIL PRESSure gage (6) for APU malfunctions. ENGINE OIL PRESSURE gage (6) should indicate 25-35 psi.

**Shutting Down**

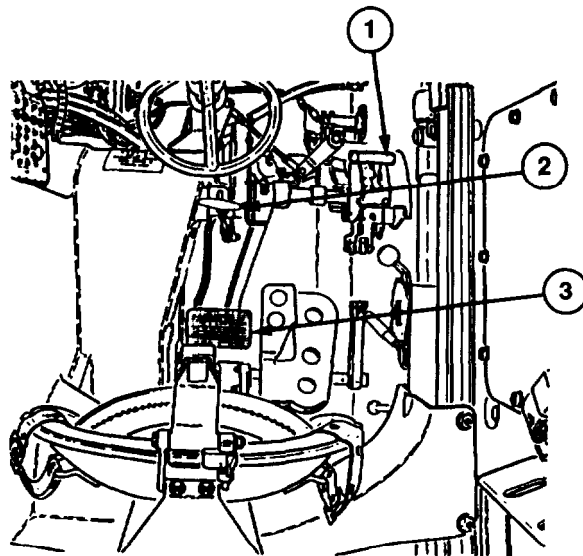
1. Turn APU GENerator switch (4) to OFF.
2. Turn FUEL SHUT OFF switch (1) to OFF.
3. Turn vehicle MASTER switch to OFF.
4. If the APU continues to run with MASTER switch set to OFF, open APU side door and disconnect fuel line (7) to APU fuel filters. Notify Unit maintenance.

**OPERATING THE APU (continued)**

**Electrical Support of Another Vehicle**

Under normal conditions, the APU generator can supply enough electrical power to operate its own electrical system and that of another vehicle that possesses a compatible electrical system. There are limitations to the generators output, however. When your vehicle's hydraulic system operates under load, the generator may occasionally switch off. This is only a temporary situation, and the generator will automatically switch on when hydraulic pressure decreases.

1. Park your vehicle close enough to the supported vehicle so that the slave cable can be interconnected at the slave receptacles of both vehicles. If your M992A1 is to support a self-propelled howitzer (M109A2, M109A3, or M109A6) during conveyor operation, position your vehicle back-to-back with the howitzer and deploy the conveyor (p. 2-150).
2. With brake pedal (3) depressed, place transmission shift selector lever (1) in N (neutral) and set parking BRAKE LOCK handle (2).



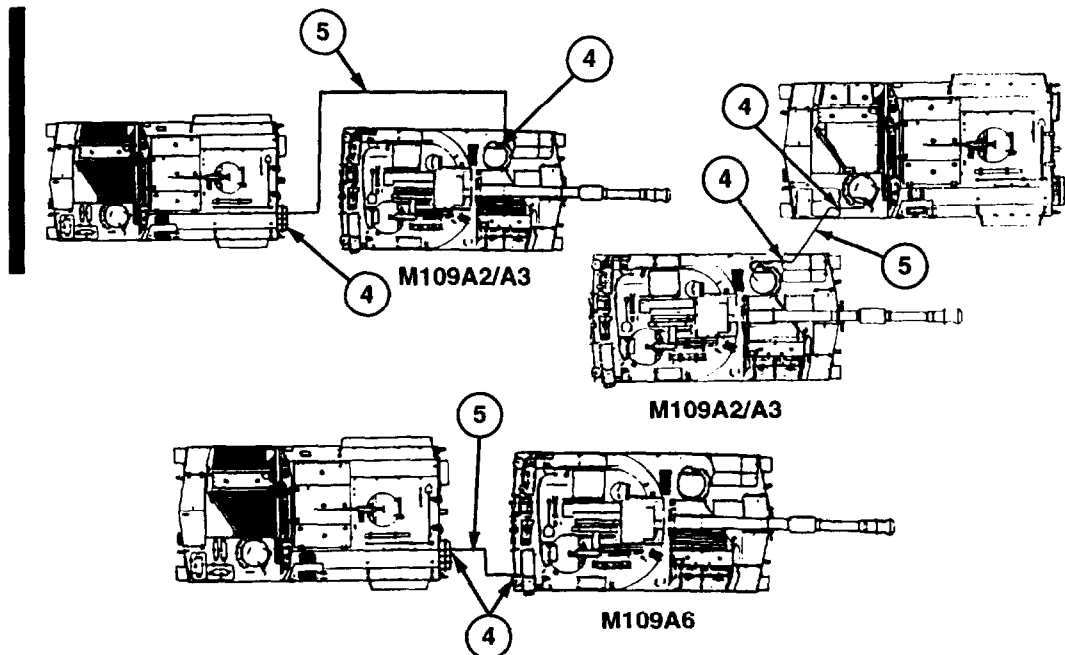
**WARNING**

**Turn MASTER switch and all other electrical switches in both vehicles OFF, to avoid personal injury or vehicle damage.**

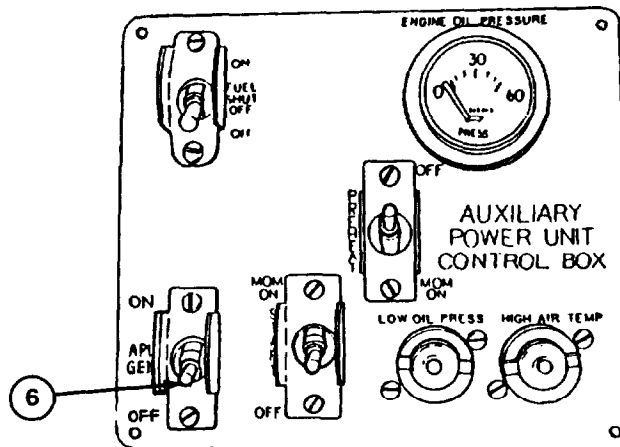
3. Shut down main engine in both vehicles (p. 2-99). Turn MASTER switches to OFF in both vehicles.

**OPERATING THE APU (continued)**

4. Attach slave cable (5) to slave receptacle (4) on both vehicles. Use adapter (Item 1, Appendix B), if necessary.



5. Turn your vehicle's MASTER switch to ON and start the APU (p. 2-118).
6. Allow the APU to warm up for three minutes, then turn APU GENERATOR switch (6) to ON.
7. Turn on MASTER switch in supported vehicle to make power available to it.

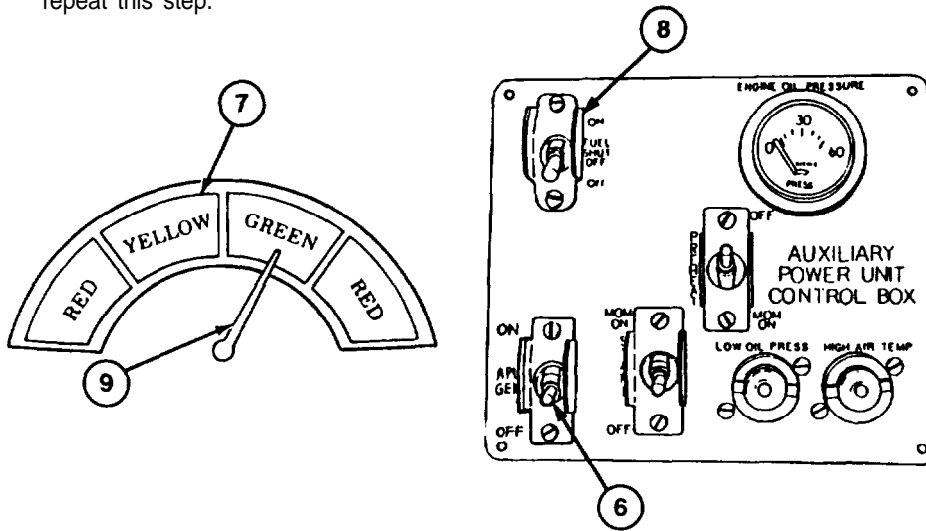


OPERATING THE APU (continued)

NOTE

Check BATTERY-GENERATOR indicator in each vehicle at least once per hour.

8. If charge indicator needle (9) drops below halfway in yellow range (7) in either vehicle, turn APU GENERator switch (6) to OFF and start both main engines. While trying to start disabled vehicle's main engine, do not rev functional vehicle's main engine. Allow engines to run until both charge indicator needles are in normal range. If needles indicate low charge, continue to run the APU until needles are halfway in yellow range, then repeat this step.



9. To stop this operation, turn APU GENERator switch (6) to OFF and turn APU FUEL SHUT OFF switch (8) to OFF.

**WARNING**

To avoid injury, turn MASTER switches to OFF in both vehicles before disconnecting slave cable.

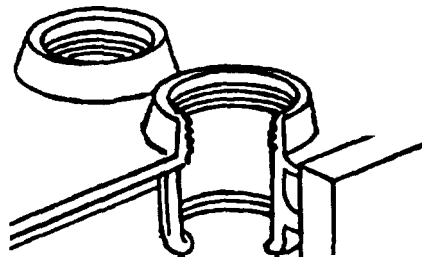
10. Turn MASTER switch to OFF in both vehicles.
11. Disconnect and stow slave cable.

**OPERATING THE APU (continued)****Charging Low Batteries with the APU****NOTE**

This procedure applies only to vehicles with low-charge batteries. If no gages or lights function on a vehicle when its MASTER switch is ON, batteries are dead. To charge dead batteries, refer to Charging Dead Batteries with the APU (p. 2-127).

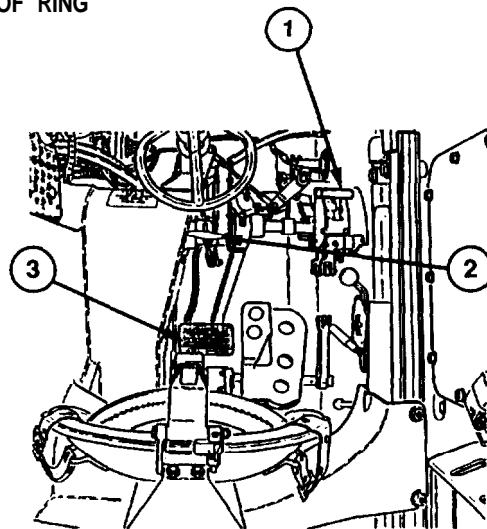
Before trying to charge batteries, do the following:

- a. Check batteries for broken cases or cables, severe corrosion, and other damage. Notify Unit maintenance if batteries are damaged.
- b. Check electrolyte level (refer to TM 9-6140-200-14). Add distilled water as necessary.



FILL TO  
BOTTOM OF RING

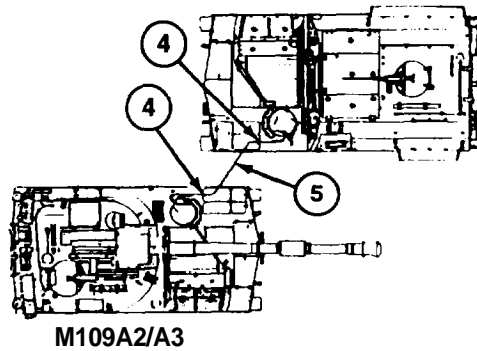
2. Park your vehicle close enough to supported vehicle so that slave cable can be interconnected at slave receptacles of both vehicles.
3. With brake pedal (3) depressed, place shift lever (1) in N (neutral) and set BRAKE LOCK handle (2).

**WARNING**

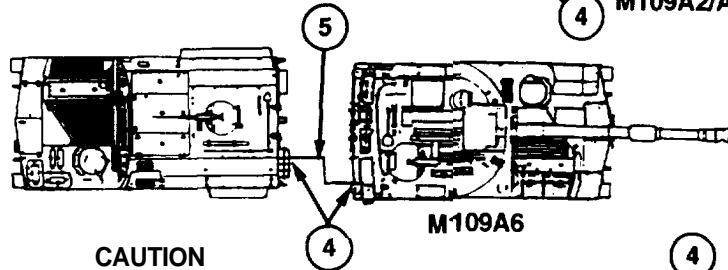
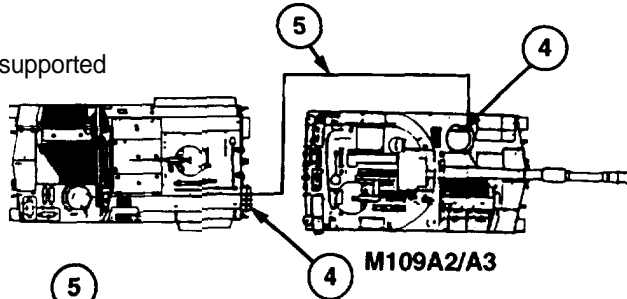
**To avoid personal injury and vehicle damage, turn off MASTER switch and all other electrical switches in both vehicles.**

**OPERATING THE APU (continued)**

4. Shut down vehicle main engine (p. 2-99). Turn MASTER switch to OFF in both vehicles.
5. Attach slave cable (5) to slave receptacle (4) on both vehicles.
6. Turn your vehicle's MASTER switch to ON and start the APU (p. 2-118).
7. Allow the APU to warm up for three minutes, then turn APU GENERator switch (6) to ON.

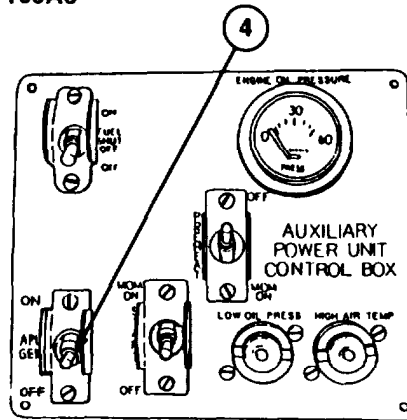


8. Turn on MASTER switch in supported vehicle, to charge batteries.



**CAUTION**

Starting your own vehicle or slave-starting another vehicle with APU GENERator switch set to ON while the APU is running can cause damage to APU STARTER/GENERATOR. When starting your vehicle or slave-starting another vehicle, make sure APU GENERator switch is set to OFF. Slave-starting another vehicle with the functioning vehicle's main engine on and being revved can cause damage to its charging system. To prevent this, have the main engine at idle (600 rpm) or turned off.



**NOTE**

You may start your vehicle's main engine to increase power generation. Make sure that APU GENERator switch is set to OFF before you start main engine. Once the main engine is started, reset GENERator switch to ON.

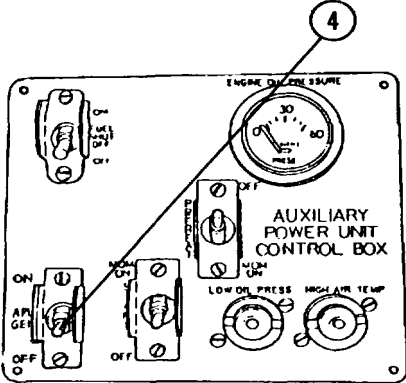
**OPERATING THE APU (continued)**

- 9. Continue charging batteries until charge indicator in supported vehicle reads well into normal range.
- 10. Turn APU GENERATOR switch (6) to OFF, and turn APU FUEL SHUT OFF switch (7) to OFF to shut down APU.

**WARNING**

**To avoid Injury, turn OFF MASTER switches in both vehicles before disconnecting slave cable.**

- 11. Turn MASTER switch to OFF in each vehicle.
- 12. Disconnect and stow slave cable.

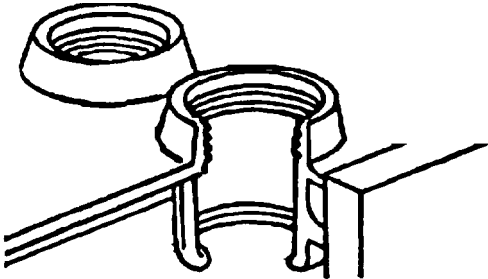


**Charging Dead Batteries with the APU**

**NOTE**

This procedure applies only to vehicles with dead batteries. If any lights or gages function when a vehicle's MASTER switch is ON, batteries are low, not dead. To charge low batteries, see page 2-125.

- 1. Before trying to charge batteries, do the following:
  - a. Check batteries for broken cases or cables, severe corrosion, and other damage. If batteries are damaged, notify Unit maintenance.
  - b. Check electrolyte level (refer to TM 9-6140-200-14). Add distilled water as necessary.



**FILL TO BOTTOM OF RING**



OPERATING THE APU (continued)

WARNING

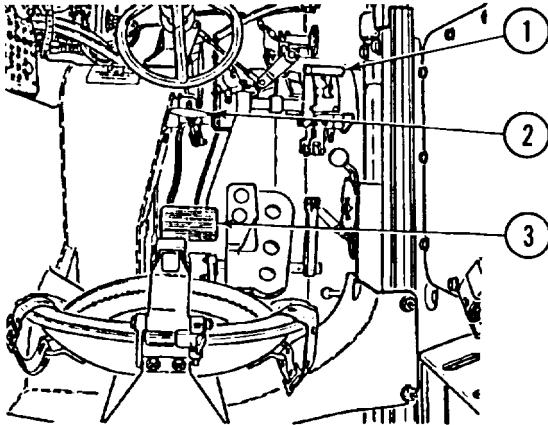
Make sure that vehicles do not touch during this operation. Shorting through vehicles could cause serious injury and/or equipment damage.

- 2. Park your vehicle close enough to supported vehicle so that slave cable can be interconnected at slave receptacle of each vehicle.

NOTE

Before applying the service brake while on steep slopes (greater than 20 percent), adjust the driver's seat so you can apply maximum leverage to the brake.

- 3. With brake pedal (3) depressed, place transmission selector lever in N (neutral) (1) and set parking BRAKE LOCK handle (2). If stopping on a steep slope, apply service brake pedal (3) again after releasing BRAKE LOCK handle (2).

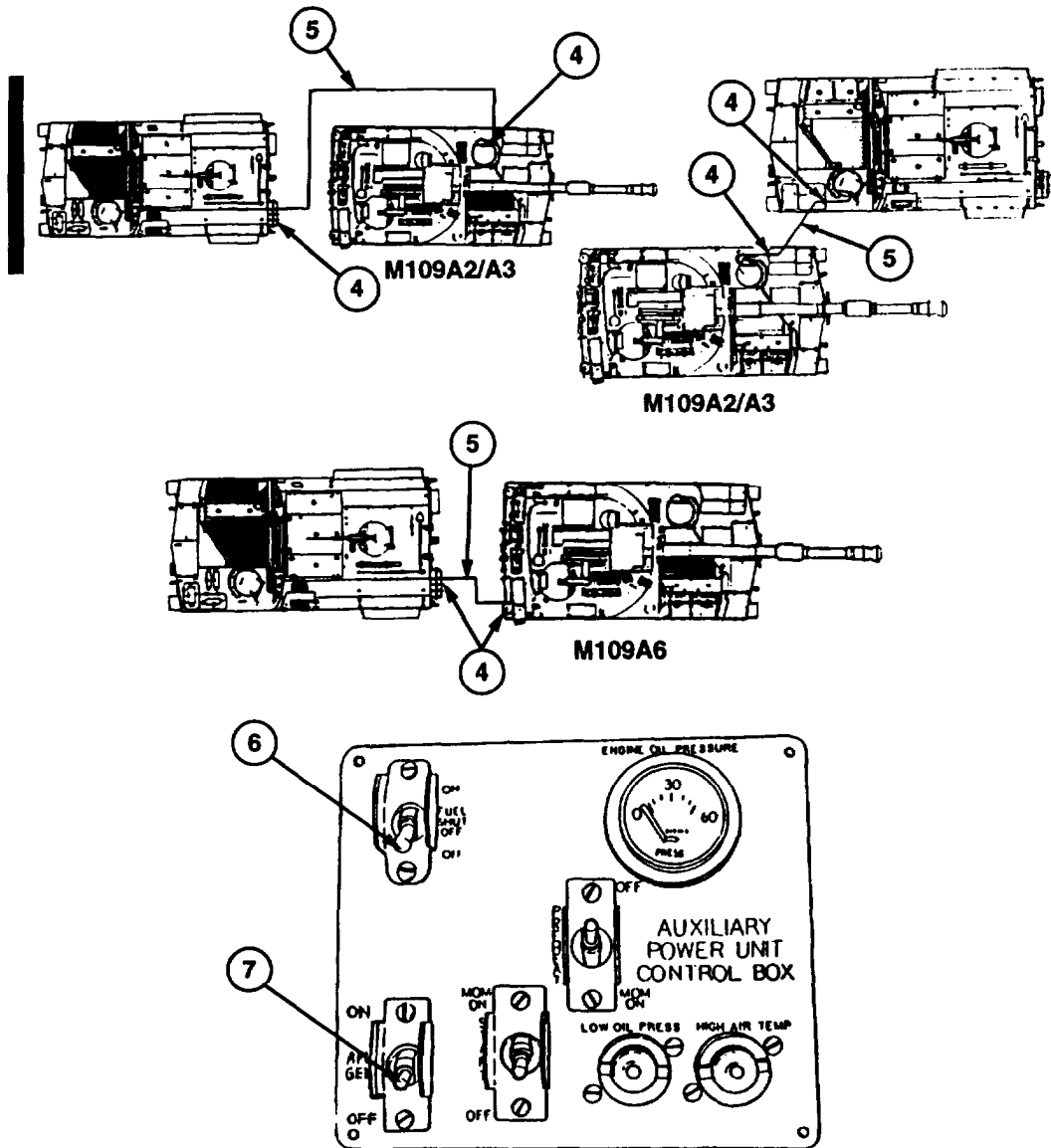


WARNING

To avoid personal injury and vehicle damage, turn OFF MASTER switch and all other electrical switches in both vehicles.

- 4. Shut down vehicle main engine (p. 2-99). Turn MASTER switch to OFF in both vehicles.
- 5. Attach slave cable (5) to slave receptacle (4) on both vehicles.
- 6. Turn your vehicle's MASTER switch to ON and start the APU (p. 2-118).
- 7. Allow the APU to warm up for three minutes, then turn APU GENERator switch (7) to ON.
- 8. Turn MASTER switch in supported vehicle to ON.

OPERATING THE APU (continued)



9. After five minutes of charging, turn APU FUEL SHUT OFF switch (6) to OFF to shut down the APU.
10. Turn your vehicle MASTER switch to OFF.
11. If gages or lights do not function in supported vehicle, return to step 6. If an additional five minutes of charging does not charge battery sufficiently for gage and light functioning, notify Unit maintenance.

**OPERATING THE APU (continued)**

12. If batteries in supported vehicle activate gages or lights unaided by the APU, charge battery as follows:
  - a. Turn MASTER switch to ON in your vehicle.
  - b. Start the APU (p. 2-118).
  - c. Turn on APU GENERATOR switch (7).
  - d. Turn MASTER switch to ON in supported vehicle. Batteries will charge.
  - e. Continue to charge batteries until charge indicator in supported vehicle reads well into normal range.

**CAUTION**

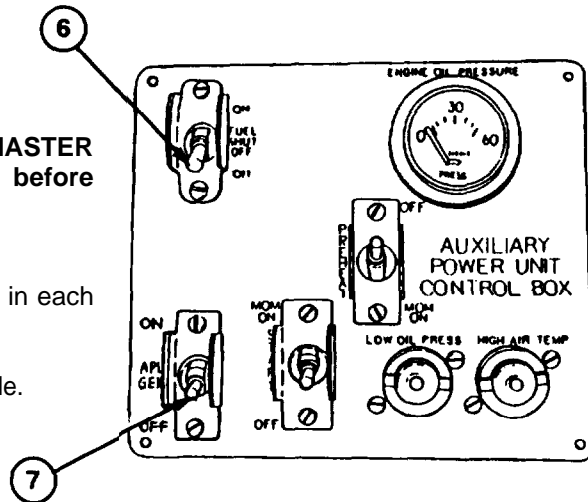
- Do not attempt to start disabled vehicle with power from APU STARTER/GENERATOR. Doing this can cause damage to APU STARTER/GENERATOR. The APU is for recharging purposes during slaving procedures only.
- Be sure APU GENERATOR switch is off before turning APU FUEL SHUT OFF switch to OFF.

13. Turn APU FUEL SHUT OFF switch (6) to OFF.

**WARNING**

To avoid injury, turn off MASTER switches in both vehicles before disconnecting slave cable.

14. Turn MASTER switch to OFF in each vehicle.
15. Disconnect and stow slave cable.



## HYDRAULIC PUMP OPERATION

[Caution Deleted]

## NOTE

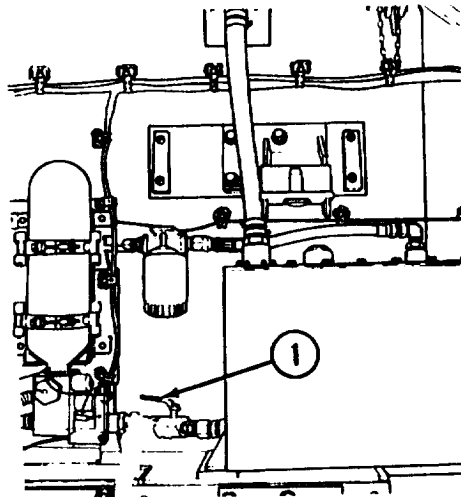
The M992A1 uses a hydraulic pump to provide power for the operation of conveyor and upper rear door (ballistic shield). The hydraulic pump is driven by the APU and should be used during normal operation.

## Operating the Hydraulic Pump

CAUTION

Be sure hydraulic reservoir ball valve is set to OPEN before turning on hydraulic pump. Hydraulic system damage will result from operating pump with ball valve closed.

1. Check to see that hydraulic reservoir ball valve (1) is set to OPEN.

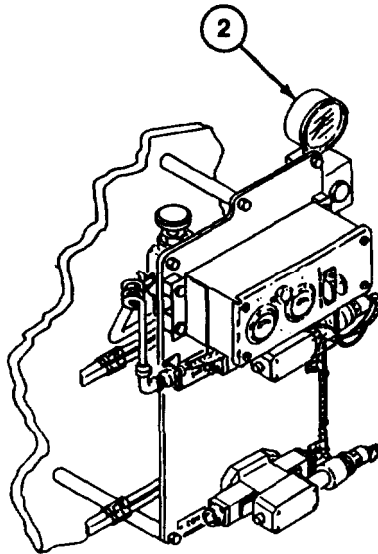


■ **HYDRAULIC PUMP OPERATION (continued)**

- 2. Start the APU (p. 2-118).

[Art Deleted]

- 3. Check pressure gage (2) on hydraulic control panel. With pump operating but no hydraulic actuators operating, pressure gage should indicate between 100 and 300 psi.



- 4. Operate hydraulic system as necessary.
- 5. To turn off primary pump, shut down the APU (p. 2-121).

## OPERATING DOORS

**WARNING**

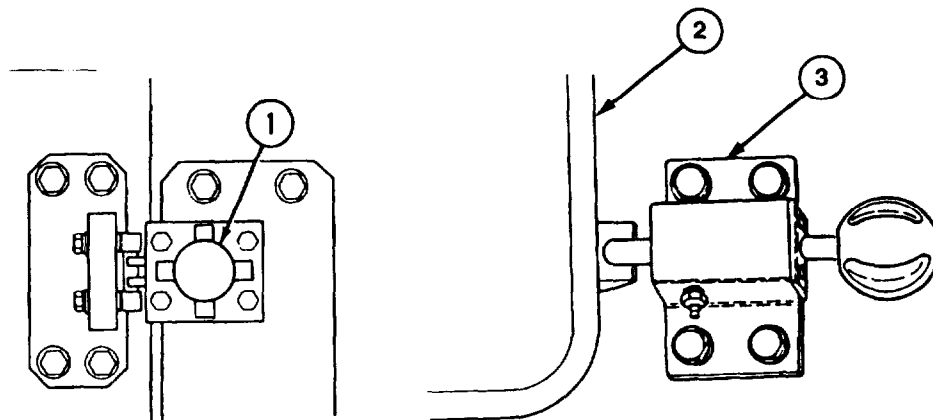
- To avoid injury, doors that must be open when loading or unloading ammunition should be secured when opened.
- To avoid damage or injury, close and secure all doors before moving vehicle.
- Keep hands, feet, and head clear when opening or closing doors. Use lifting rings for hand grasps when possible.
- Stand clear when opening or closing upper rear door (ballistic shield). If you open or close this door from outside the vehicle (using bottom switch), keep head and shoulders out of door's travel path.

## Personnel Side Door

**NOTE**

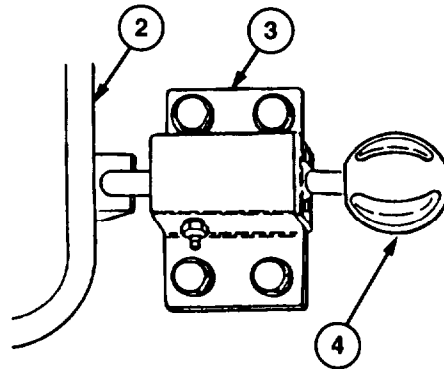
Latch handle is on outside of door only.

1. To open door, turn latch handle (1) counterclockwise to unlock, then clockwise to unlatch. Swing door open.
2. Secure door (2) open with hold-open latch (3).



**OPERATING DOORS (continued)**

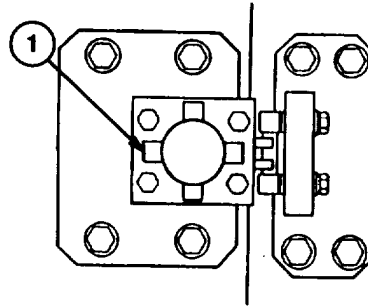
3. To close door (2), release hold-open latch (3) by pulling knob (4). Push door (2) closed. Make sure door (2) latches securely.



**Canister Side Doors**

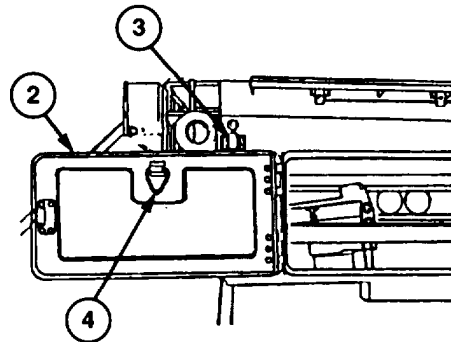
**NOTE**

Latch handles are on inside of doors only.

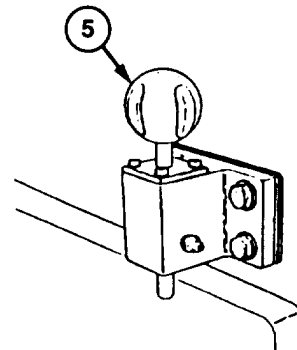


1. Turn latch handle (1) counterclockwise to unlock, then clockwise to unlatch door (2). Swing door (2) open.

2. Secure door (2) open with hold-open latch (3).



3. To close either door (2), release hold-open latch (3) by pulling knob (5) up. Push door (2) closed or use ring (4) to pull door (2) closed. Make sure door (2) latches securely.



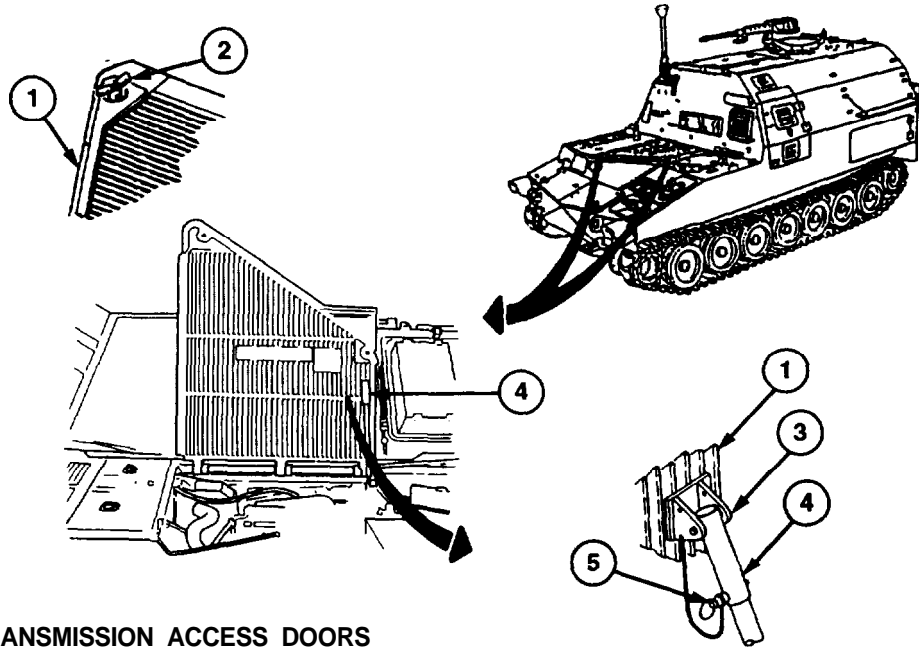
**AIR INTAKE GRILLE*****Opening Air Intake Grille*****WARNING**

**Make sure quick-release pin is properly installed to secure latch in locked position. Failure to do so will cause severe injury to personnel.**

Unscrew two handles (2) to release air intake grille (1). With the aid of an assistant, raise intake grille (1) and secure by removing quick-release pin (5) from bracket (3) and installing in intake grille support (4).

***Closing Air Intake Grille***

Remove quick-release pin (5) from intake grille support (4) and install in bracket (3). With the aid of an assistant, close intake grille (1). Screw in two handles (2) to secure intake grille (1).

**TRANSMISSION ACCESS DOORS*****Opening Transmission Access Doors*****WARNING**

**Transmission access doors are very heavy. Keep hands clear when opening or closing doors.**

**NOTE**

Right transmission access door must be opened before left transmission access door.



**TRANSMISSION ACCESS DOORS (continued)**

***Opening Transmission Access Doors (continued)***

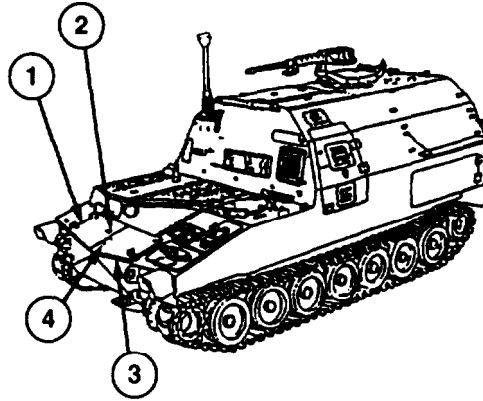
1. Unscrew handle (2) and, with the aid of an assistant, open right transmission access door (1).
2. Grasp handle (4) and, with the aid of an assistant, open left transmission access door (3).

**Closing Transmission Access Doors**

**NOTE**

Left transmission access door must be closed before right transmission access door.

1. Grasp handle (4) and, with the aid of an assistant, close left transmission access door (3).
2. With the aid of an assistant, close right transmission access door (1). Screw in handle (2) to secure right transmission access door (1).



**BATTERY ACCESS DOORS**

***Opening Battery Access Doors***

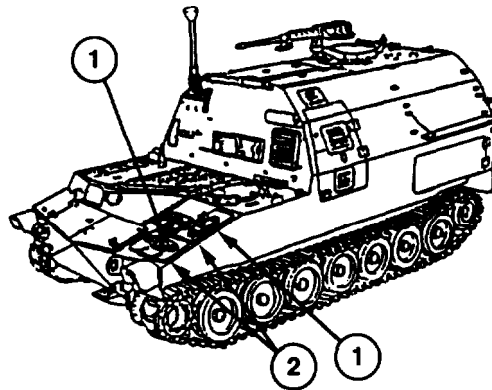
**WARNING**

**Battery access doors are very heavy. Keep hands clear when opening or closing doors.**

Unscrew handle (1) on each of two battery access doors (2) and, with the aid of an assistant, open doors (2).

**Closing Battery Access Doors**

With the aid of an assistant, close each of two doors (2) and screw in each of two handles (1).



**OPERATING DOORS (continued)****Top Middle Door****WARNING**

Top middle door is very heavy. To prevent injury you need two assistants on top of vehicle.

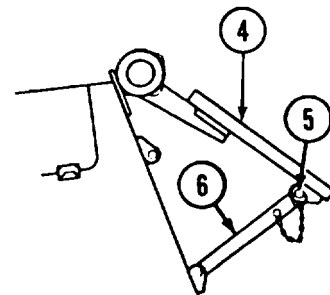
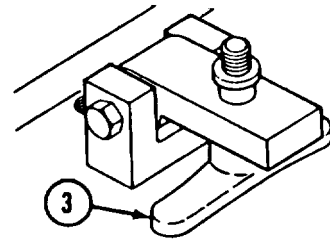
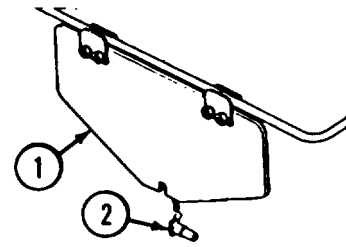
**CAUTION**

Before closing top middle door, latch must be completely flipped over to rear to prevent damage to handle and latch.

**NOTE**

- You may have to reposition machine gun before opening or closing door.
- Latch is on inside of door only.

1. Remove projectile rack stowage box guard quick-disconnect pin (2) on left projectile rack assembly. Fold down two guard plates (1) on left and right projectile rack assemblies.



2. To open top middle door (4), turn latch handle (3) counterclockwise to disengage latches. With help of two assistants, raise door (4).
3. Release bar (6) from stowage location by pulling quick-release pin (5). Secure door (4) with bar (6) and quick-release pin (5).

**NOTE**

If top right or top left door has been opened, close it before closing top middle door.

4. To close door (4), remove quick-release pin (5) and bar (6). With help of two assistants, close door (4). Make sure door (4) latches securely.
5. Stow bar (6) and secure with quick-release pin (5).

**OPERATING DOORS (continued)**

**Top Side Doors (Left and Right)**

**NOTE**

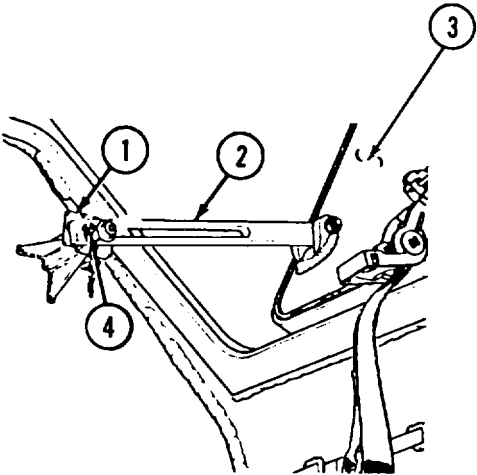
- The following procedures apply to left and right top side doors.
- Top middle door must be opened before side doors can be opened.
- You may need assistance to operate top side doors.

1. Open top middle door (p. 2-135).
2. Open top side door (3).
3. Align holes in block (1) and sliding bar (2), and insert quick-release pin (4) through sliding bar (2) into block (1).

**WARNING**

**To prevent injury, support door when removing quick-release pin.**

4. To close door:
  - a. Support door (3) and remove quick-release pin (4) from sliding bar (2) and block (1).
  - b. Lower door (3).
  - c. Close top middle door, if necessary (p. 2-135).



**OPERATING DOORS (continued)****Lower Rear Door****Opening Door from Inside or Outside Vehicle****WARNING**

Lower rear door locks upper rear door small doors in place. When lower rear door is open, upper rear door small doors may swing and injure personnel.

**NOTE**

The door-latch mechanism has a plunger that serves as a security lock. When engaged, the plunger prevents movement of inner or outer latch handles. Before the door may be opened from inside or outside, the plunger knob, located on inside of door, must be pulled.

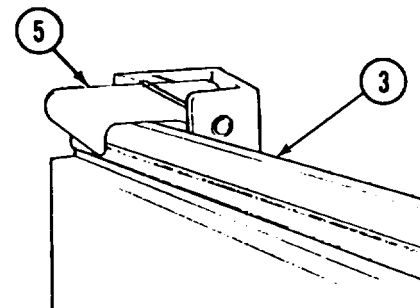
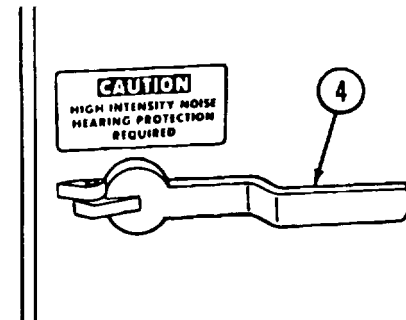
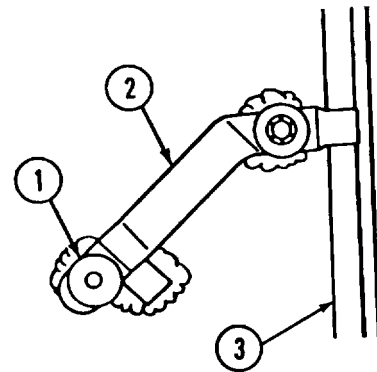
1. From inside vehicle, pull plunger knob (1).
2. Lift inner latch handle (2) or outer latch handle (4).
3. Open and secure lower rear door (3) with hold-open latch (5).
4. Open and secure upper rear door small doors (p. 2-141).

**Closing Door**

1. Close upper rear door small doors (p. 2-142).
2. Release door (3) from hold-open latch (5).
3. Close door (3) and secure with inner latch handle (2) or outer latch handle (4).

**Locking Door**

With door (3) latched, push plunger knob (1) to lock inner and outer latch handles (2 and 4).



OPERATING DOORS (continued)

Upper Rear Door

**WARNING**

- Make sure travel path of upper rear door is clear of personnel before opening or closing door. Call out “CLEAR” when opening or closing, to prevent personnel from stepping in front of door.
- When opening door from outside using lower switch, be aware of head and shoulder clearance. Serious injury may result if door strikes you.
- Upper rear door is very heavy. Keep feet and hands clear of opening when opening or closing.
- During normal operation, mechanical safety lock should be used when positioning door. Lock supports door if hydraulic safety mechanisms fail.
- If conveyor is not to be deployed, make sure conveyor stowage strap is secure (p. 2-151) and cables are removed from conveyor before opening upper rear door. As door rises above 90 degrees with cable connected, outboard section of conveyor “jumps” from deployed position. Serious injury could result.

**NOTE**

Before opening or closing upper rear door, lower rear door must be open and secured.

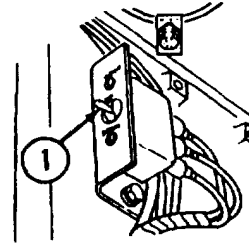
**Opening Door**

1. Open lower rear door (p. 2-137).
- 2. Activate hydraulic pump (p. 2-131).

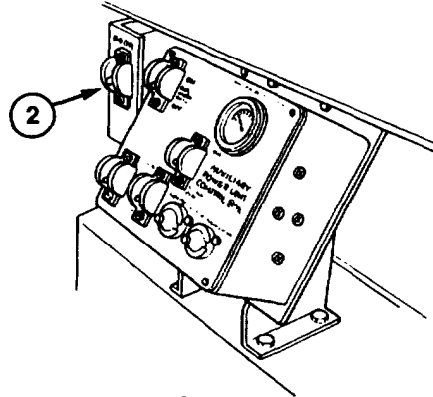
OPERATING DOORS (continued)

CAUTION

Make sure conveyor cables are released from clips on upper rear door before fully opening upper rear door. Failure to do this can result in damage to conveyor cables.



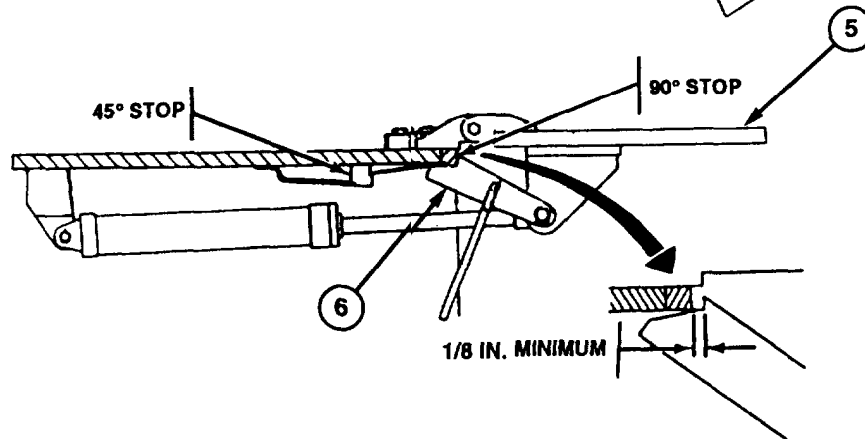
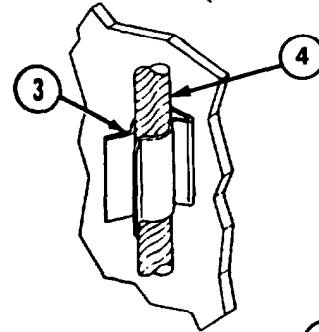
3. Shift either upper or lower DOOR switch lever (1 or 2) to UP.
4. When upper rear door (5) has opened approximately 3-4 feet, release two conveyor cables (4) from clip (3).
5. Release DOOR switch lever (1 or 2) when door (5) reaches correct height.



NOTE

Mechanical safety lock will automatically engage at door elevations of 45 and 90 degrees.

6. Be sure that mechanical safety lock has engaged, and raise door (5) so that approximately 1/8 inch exists between safety lock (6) and either lock stop.



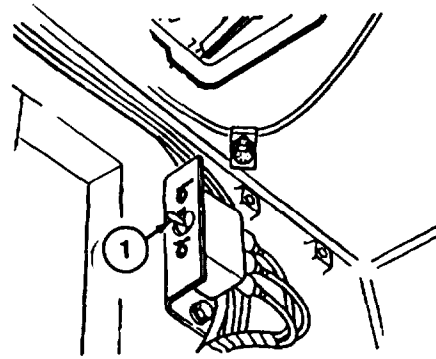
OPERATING DOORS (continued)

*Closing Door*

**CAUTION**

To avoid damage to doors, lower rear door must be open before closing upper rear door.

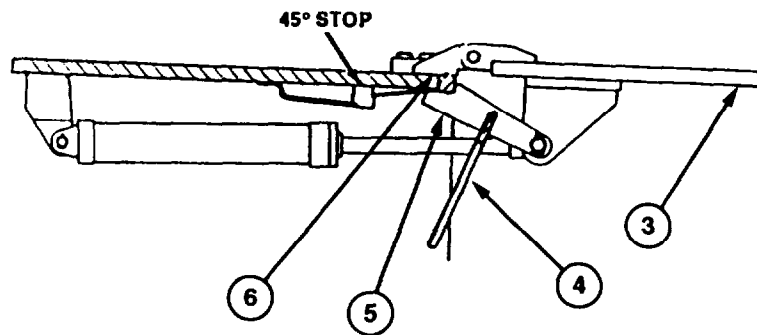
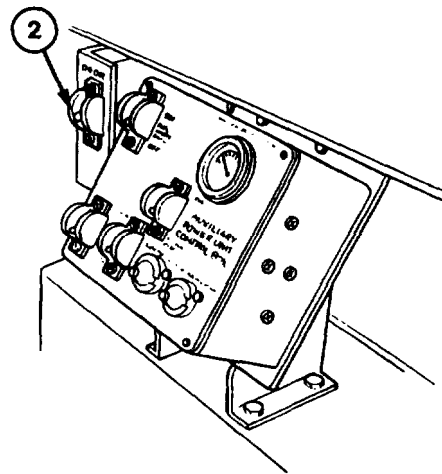
1. Activate hydraulic pump (p. 2-131).
2. Place either upper or lower DOOR switch lever (1 or 2) to UP, if necessary, to obtain a clearance of at least 1/2 inch between mechanical safety lock (5) and lock stop (6).



**WARNING**

Keep head, hands, and feet clear when closing upper rear door. Door is very heavy and can cause severe injury to personnel.

3. Pull downward on mechanical safety lock handle (4) and move either DOOR switch lever (1 or 2) to DOWN. If closing upper rear door (3) completely, continue to hold mechanical safety lock handle (4) down until mechanical safety lock (5) clears 45-degree lock stop (6).



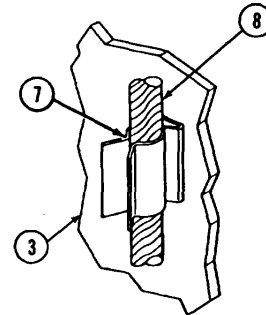
**OPERATING DOORS (continued)**

4. Secure conveyor cables (8) in door clips (7) when door (3) is 3-4 feet above fully closed position.

**CAUTION**

**To avoid damage to doors, lower rear door must be open before closing upper rear door.**

5. Close lower rear door (p. 2-137).



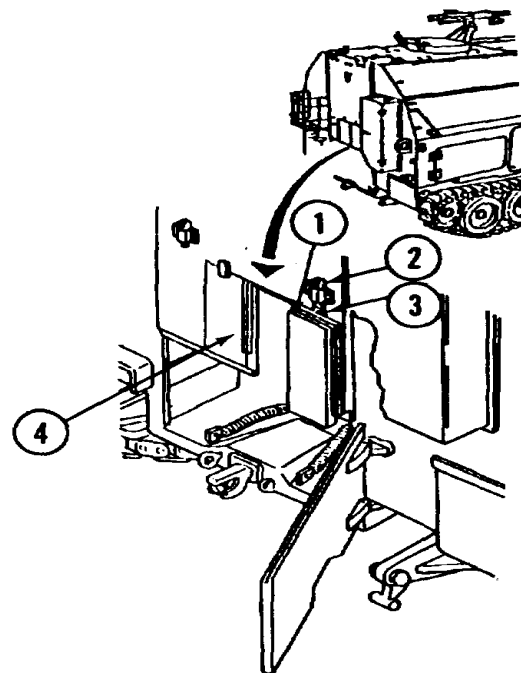
**NOTE**

- If hydraulic power fails, refer to page 2-236 for upper rear door emergency operating procedures.
- If electrical power fails, refer to page 2-240 for upper rear door emergency operating procedures.

**Upper Rear Door Small Doors**

***Opening Doors***

1. Open lower rear door (p. 2-137).
2. Open upper rear right small door (1).
3. Pull up latch (2) and secure small door striker (3).
4. Repeat steps 2 and 3 for upper rear left small door (4).

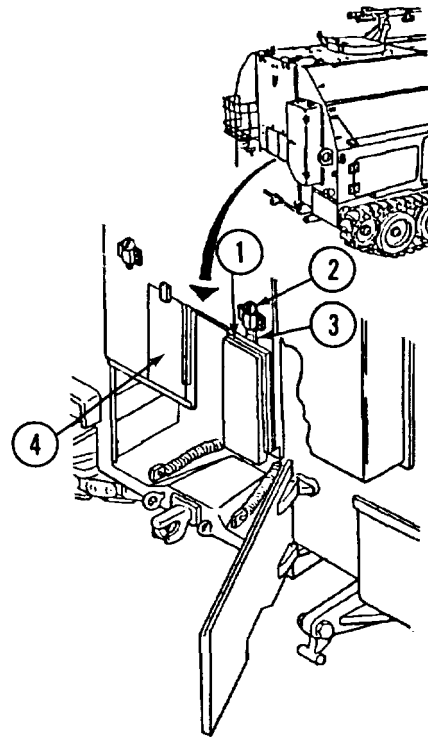




**OPERATING DOORS (continued)**

***Closing Doors***

1. Pull up latch (2) to clear small door striker (3) and close upper rear left small door (4).
2. Pull up latch (2) and close upper rear right small door (1).



**CAUTION**

Small doors do not have latches to secure them closed. They are secured by lower door flange. Do not operate vehicle without making sure small doors are secured. Small doors could be damaged by swinging open while vehicle is moving.

3. Close lower rear door (p. 2-137).

**APU Side Door**

**WARNING**

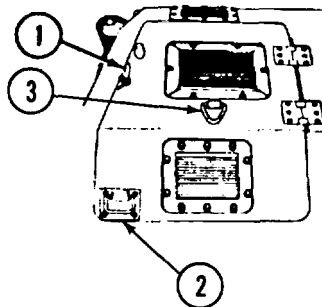
**APU side door is very heavy. Keep hands clear when opening or closing door.**

1. To open APU side door (2), turn latch handle (1) counterclockwise. Grasp "D" ring (3) and pull door (2) open.

**CAUTION**

**To avoid damage to latching mechanism, make sure that latch handle is in unlatched position before closing door.**

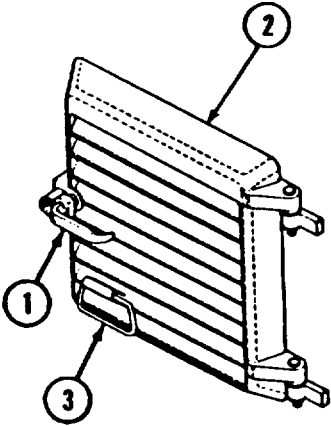
2. Close door (2). Secure door (2) by turning latch handle (1) clockwise to stop.



**OPERATING DOORS (continued)**

**APU Front Door**

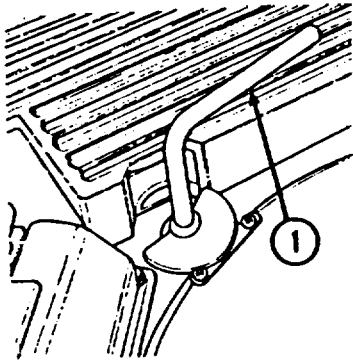
- 1. To open APU front door (2), turn latch handle (1) counterclockwise. Grasp 'D' ring (3) and pull door open.
- 2. Close door (2). Turn latch handle (1) clockwise to stop.



**Driver's Hatch Door**

**NOTE**

Driver's hatch can be opened or dosed from outside of vehicle unless security latch is fastened from inside.



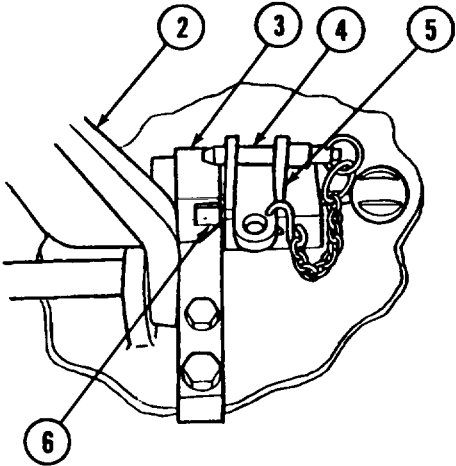
**Opening Driver's Hatch Door**

- 1. Turn handle (1) clockwise.
- 2. Open hatch door (2) until hatch tab (3) catches in hold-open hatch pin (6).

**WARNING**

**Make sure quick-release pin is properly installed to secure latch in locked position. Failure to do so will cause severe injury to personnel.**

- 3. Remove quick-release pin (4) from storage position, and insert pin (4) through horizontal bracket (5) until pin (4) is over hatch tab (3).



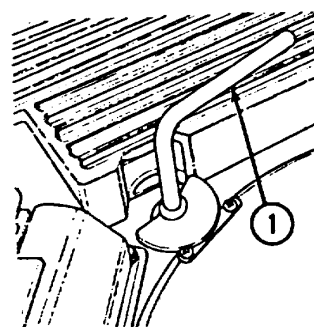
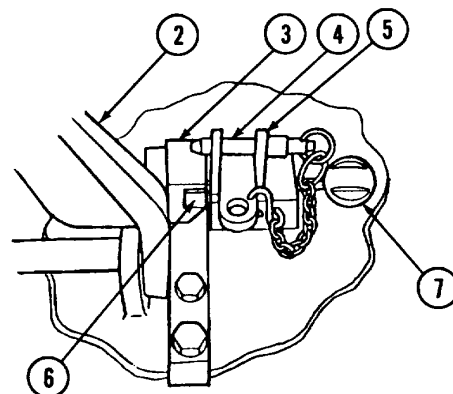
**OPERATING DOORS (continued)**

***Closing Driver's Hatch Door***

**CAUTION**

**To avoid damaging security latch, check to make sure it is positioned out of doorway before closing hatch door.**

1. Remove pin (4) from horizontal bracket (5), and install in stowage position.
2. Pull hold-open latch knob (7) to release hatch tab (3) from hold-open hatch pin (6).
3. Close hatch door (2) and secure by turning handle (1) counterclockwise.

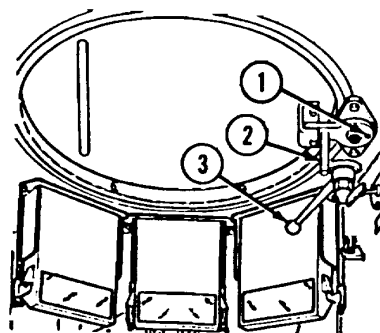


***Securing Driver's Hatch Door Against Outside Entry***

1. Secure door latching handle (3).
2. Push security latch handle (2) forward to stop.

**CAUTION**

**When releasing security latch, make sure you move handle far enough for spring-loaded detent ball (1) to engage. Failure to do this can result in damage to security latch.**



3. To release security latch, pull handle (2) to rear until spring-loaded detent ball (1) engages.

**OPERATING DOORS (continued)****Commander's Cupola Hatch Door****NOTE**

Door may be operated only from inside vehicle.

***Opening Commander's Cupola Hatch Door***

1. Deploy commander's seat (p. 2-108).

**CAUTION**

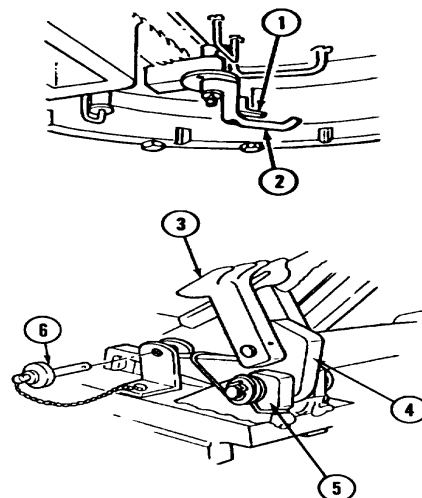
**When opening commander's cupola hatch door, make sure you move handle until spring-loaded pin engages. Failure to do this may result in damage to security latch.**

2. Press handle-release button (1) and turn latch handle (2) clockwise.
3. Push commander's cupola hatch door (3) open until hold-open latch (4) engages.

**WARNING**

**Make sure quick-release pin is properly installed to secure latch in locked position. Failure to do this will result in severe injury to personnel.**

4. Remove quick-release pin (6) from stowage and insert pin (6) through bracket (5) to secure latch (4) in locked position.



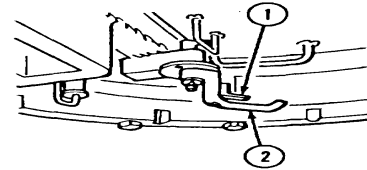
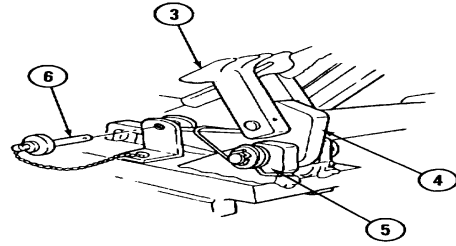
**OPERATING DOORS (continued)*****Closing Commander's Cupola Hatch Door***

1. Remove quick-release pin (6) from bracket (5) and stow.

**CAUTION**

**Check to make sure latch handle is latched in open position. Failure to do this may result in damage to latch.**

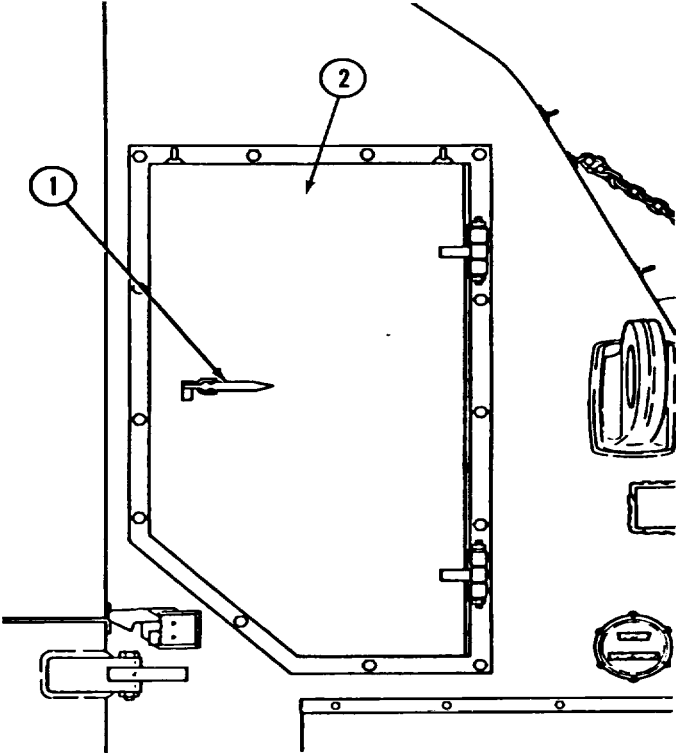
2. Release hold-open latch (4) and pull door (3) closed.
3. Press handle-release button (1) and turn latch handle (2) counterclockwise.



**OPERATING DOORS (continued)**

**AFES Extinguisher Box Door**

- 1. To open door (2), turn handle (1) counterclockwise and pull door (2) open.
- 2. To close door (2), shut door (2) and secure by turning handle (1) clockwise.



## OPERATING MAIN ENGINE AIR CLEANER SYSTEM

### Summer Position

#### NOTE

Right projectile rack assembly must be moved before locking handles may be positioned.

In temperatures over 40 F (4.4 C), leave locking handles (1) in holders.

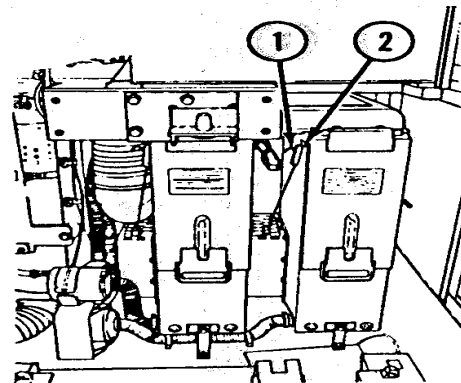
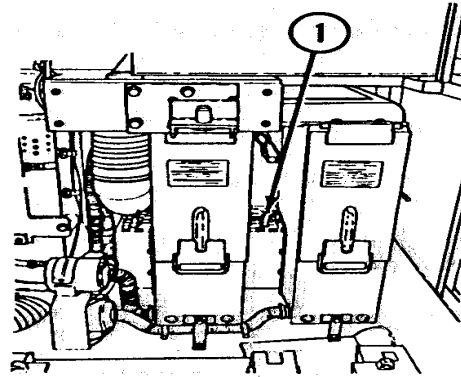
### Winter Position

In temperatures below 25 F (-3.9 C), raise locking handles (1) and fasten them on hooks (2).

### Intermediate Temperatures

When operating in temperatures from 25 F to 40 F (4.4 C to -3.9 C), position as follows:

1. Start engine with locking handles (1) in winter position.
2. When engine reaches operating temperature, place locking handles (1) in summer position.



### AIR CLEANER RESTRICTION INDICATOR

An air cleaner restriction indicator is located in driver's compartment just above engine access cover. During normal operation, a yellow sleeve in the indicator will indicate the amount of restriction. When yellow sleeve reaches the red bank on indicator, air cleaner elements should be serviced (9p. 3-28). A reset button on bottom of indicator will retract the yellow sleeve. If the restriction has not been removed, the yellow sleeve will reach into red band on indicator the next time engine is operated.

**AMMUNITION HANDLING EQUIPMENT****Loading Ammunition**

1. Open lower rear door (p. 2-137).
2. Open and secure upper rear door (ballistic shield) small doors (p. 2-141).
3. Deploy conveyor (p. 2-150).
4. Close upper rear door (p. 2-140).
5. Install conveyor shroud (p. 2-156), if necessary.
6. Operate conveyor to load projectiles onto M992A1 (p. 2-157).
7. Transfer and stow projectiles from conveyor to projectile rack assemblies (p. 2-179).
8. Load propelling-charge canisters into appropriate stowage areas (p. 2-169). Restrain canisters (p. 2-174).
9. Place fuse boxes, 0.50-caliber ammunition boxes, and primer boxes in appropriate locations (p. 2-169). Secure boxes with straps.
10. After ammunition-loading operation is completed:
  - a. Stow conveyor (p. 2-163).
  - b. Close upper rear door (p. 2-140) and upper rear door small doors (p. 2-142).
  - c. Close lower rear door (p. 2-137).

**Unloading Ammunition**

1. Deploy conveyor (p. 2-150).

**CAUTION**

**Upper rear door small doors must be opened and upper rear door must be closed before backing up to an M109A6. Failure to do so may result in damage to upper rear door.**

2. Lower upper rear door (p. 2-140).
3. Operate conveyor to unload projectiles from M992A1 (p. 2-160).
4. Unload projectile rack assemblies (p. 2-181).
5. Unload propelling-charge canisters from stowage areas (p. 2-177).



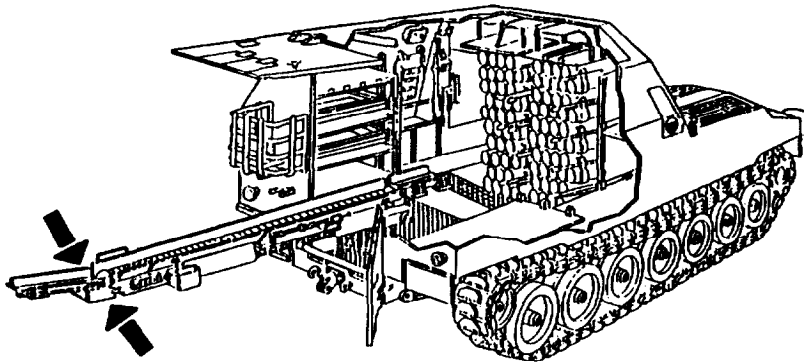
**AMMUNITION HANDLING EQUIPMENT (continued)**

6. Remove restraint straps (p. 2-177), fuse boxes, 0.50-caliber ammunition boxes, and primer boxes from vehicle.
7. After ammunition unloading operation is completed:
  - a. Stow conveyor (p. 2-163).
  - b. Close upper rear door (p. 2-140).
  - c. Close upper rear door small doors (p. 2-142).
  - d. Close lower rear door (p. 2-137).

**OPERATING THE CONVEYOR**

**WARNING**

Personnel should be aware of areas of the conveyor that can move suddenly during depoloyment. Keeping hands and body parts clear of the areas indicated on the illustration can help avoid serious injury.



**Deploying the Conveyor**

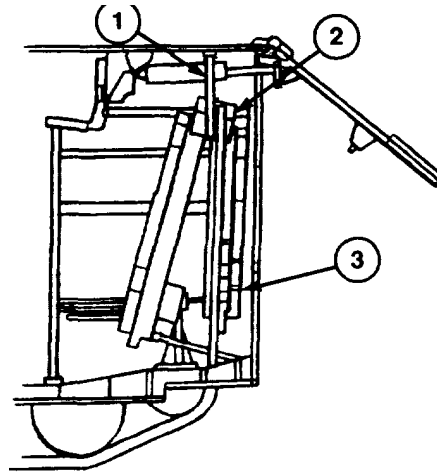
1. Open lower rear door (p. 2-137).
- 2. Activate hydraulic pump (p. 2-131).
3. Open and secure upper rear door small doors (p. 2-141).

**WARNING**

Make sure travel path of upper rear door is clear of personnel before opening door. Call out "CLEAR" when opening or closing door to prevent personnel from stepping in front of door.

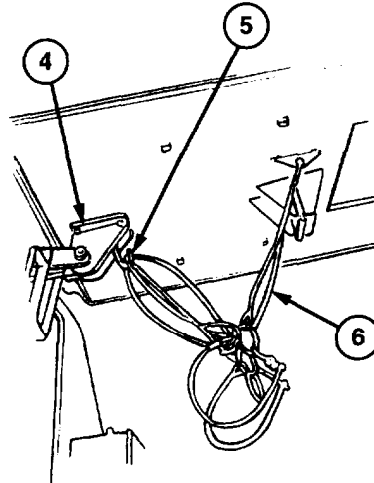
**OPERATING THE CONVEYOR (continued)**

4. Open upper rear door (ballistic shield) to 45-degree position (p. 2-138). Make sure locking device is engaged.
5. Remove two slings (6) from hook (5) on hydraulic actuator base (4).



**WARNING**

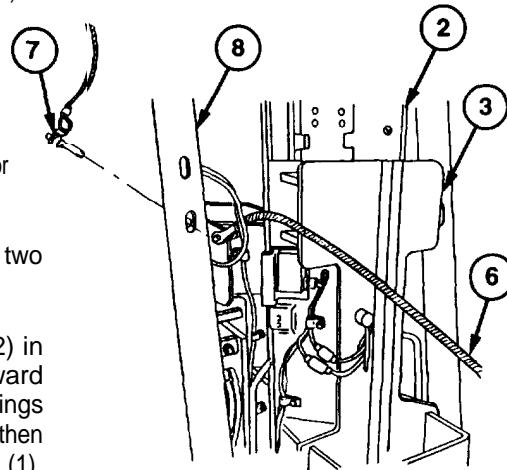
- Make sure you attach slings to conveyor properly, or conveyor may drop.
- Have an assistant hold conveyor in stowed position as you release stowage strap. This will prevent conveyor from slipping from stowed position, causing serious injury to you or others.
- Keep all parts of your body clear of conveyor hinges.



**NOTE**

If conveyor needs to be deployed parallel to the ground, use short legs of two slings. If conveyor needs to be lower, use long legs of two slings.

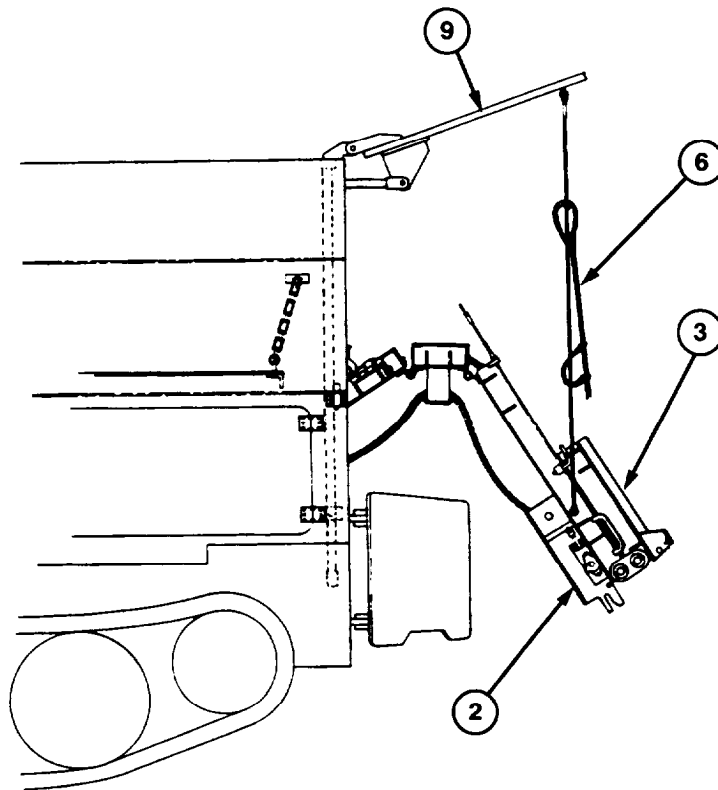
6. Connect two slings (6) to both sides of conveyor (2).
7. Remove two quick-release pins (7) from two conveyor support struts (8).
8. Have an assistant restrain conveyor (2) in stowed position by supporting it at forward dead-end section (3). Make sure two slings (6) are properly attached to conveyor (2) then release conveyor (2) from stowage strap (1).



OPERATING THE CONVEYOR (continued)

WARNING

- Make sure footing is firm and deployment area is free of obstructions. When deploying conveyor, be prepared to stand to one side and move quickly after conveyor begins to move; it moves rapidly.
  - Keep fingers clear of section hinges when deploying conveyor.
  - Keep hands away from drive section handles until handles are clear of support struts.
  - Conveyor may swing left or right when being deployed. Be careful to avoid swinging.
  - Make sure door is positioned at 120 degrees from closed position. This will help control speed of deployment.
9. Open upper rear door (9) to take slack out of two slings (6) (p. 2-138). Raise upper rear door (9) slightly higher until conveyor (2) comes free from vehicle.
10. Have assistant pull on forward dead-end section (3) until conveyor (2) extends fully.

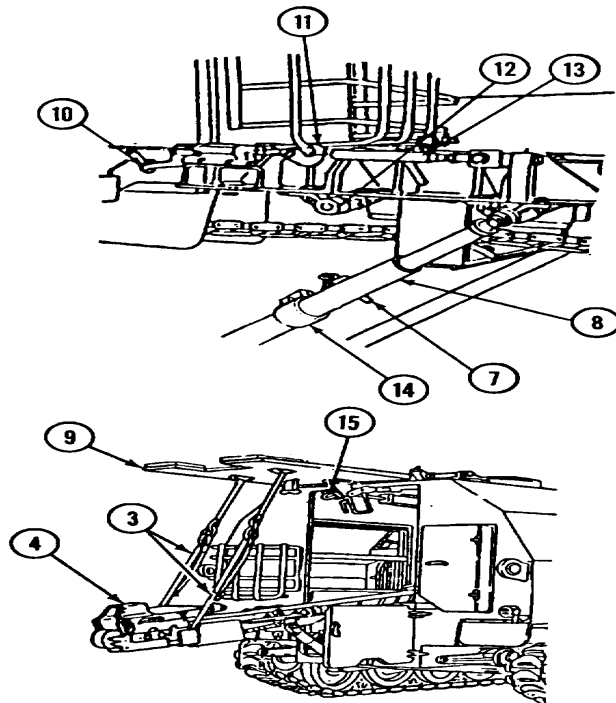


**OPERATING THE CONVEYOR (continued)**

11. To stabilize two conveyor center hinges (12), pull forward on red handle (10) and place loop (13) over hook (11). Push back on red handle (10) to lock handle (10) in place.
12. Position upper rear door (9) so conveyor (2) reaches desired height.
13. Install two quick-release pins (7) in two conveyor support struts (8). Tighten two friction clamps (14).
14. Lower upper rear door (9), and remove two slings (6) from both sides of conveyor (2) and stow in hook (5) on hydraulic actuator base (4).

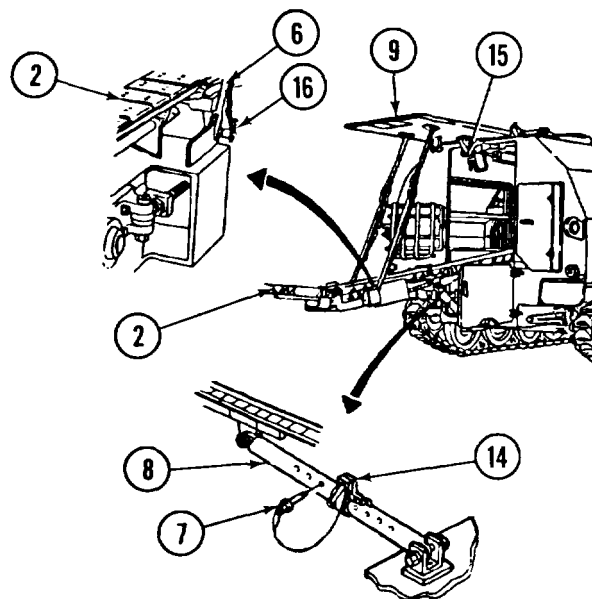
**WARNING**

Slings are not intended to support conveyor under normal operating conditions. **ONLY** if conveyor support strut is missing or fails may slings be used to support conveyor during operation. When operating in this mode, avoid sudden movement of conveyor. Periodically inspect slings and attaching hardware for damage. Notify Unit maintenance Immediately upon mission completion if sling damage exists.



**OPERATING THE CONVEYOR (continued)**

15. If conveyor (2) must be raised higher than long legs of two slings (6) allow:
  - a. Make sure the two conveyor support struts (8) are locked in position.
  - b. Position upper rear door (9) at 45 degrees from closed position (p. 2-138).
  - c. Lower upper rear door (9) until tension on two slings (6) is relieved.
  - d. Remove quick-release pin (16) from left sling (6) and disconnect long leg of sling (6) from left side of conveyor (2).
  - e. Connect short leg of left sling (6) to left side of conveyor (2) with quick-release pin (16).
  - f. Repeat steps d and e for right side of conveyor (2).
  - g. Raise upper rear door (9) to take slack out of two slings (6).
  - h. Remove two quick-release pins (7) from two conveyor support struts (8).
  - i. Loosen two friction clamps (14) on two conveyor support struts (8).
  - j. Raise upper rear door (9) until conveyor (2) is in required position.
  - k. Install two quick-release pins (7) from two conveyor support struts (8).
  - l. Tighten two friction clamps (14) on two conveyor support struts (8).
  - m. Lower upper rear door (9) and remove two slings (6) from both sides of conveyor (2) and stow in hook (15).



## OPERATING THE CONVEYOR (continued)

**WARNING**

If operating with upper rear door open, always engage mechanical safety lock before beginning conveyor operations. This will prevent upper rear door from dropping if hydraulic system fails.

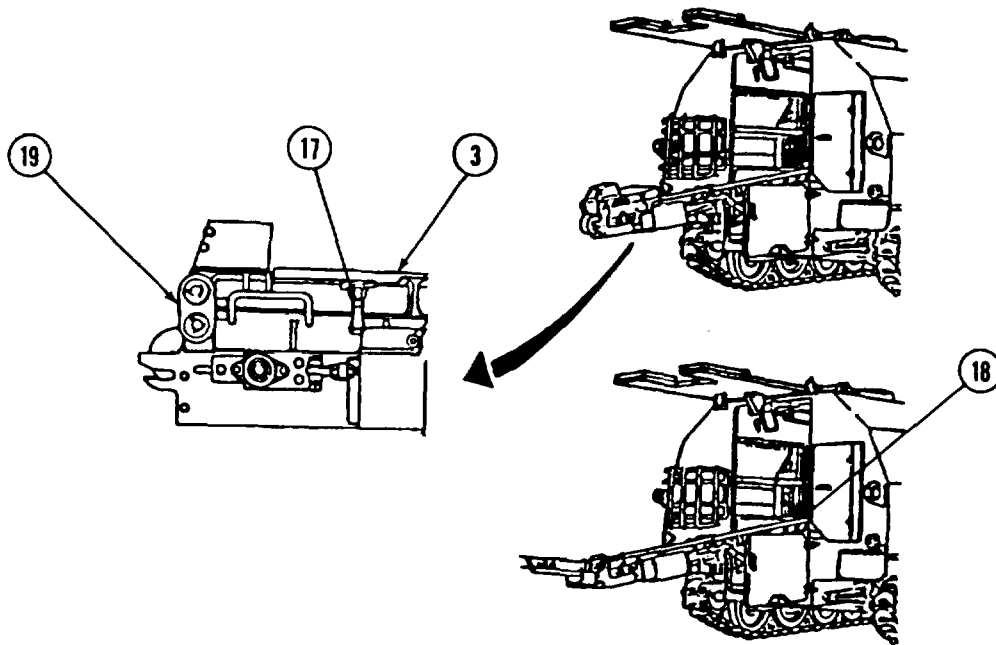
16. If operating with upper rear door (9) open, lower or raise upper rear door (9) to either 45 degrees or 90 degrees from closed position. This will engage mechanical safety lock. Raise door slightly until lock and lock stop are about 1/8 inch apart.

17. Release rubber end-section latch (17) at each end of conveyor. Flip out forward and rear dead-end sections (3 and 18).

**NOTE**

Each conveyor end section can be positioned at one of two angles respective to angle of conveyor, using flipper plates under each end section.

18. Adjust forward or rear dead-end section (3 or 17) as necessary, using flipper plates (19).



**OPERATING THE CONVEYOR (continued)**

**Installing Rear Door Shroud**

**NOTE**

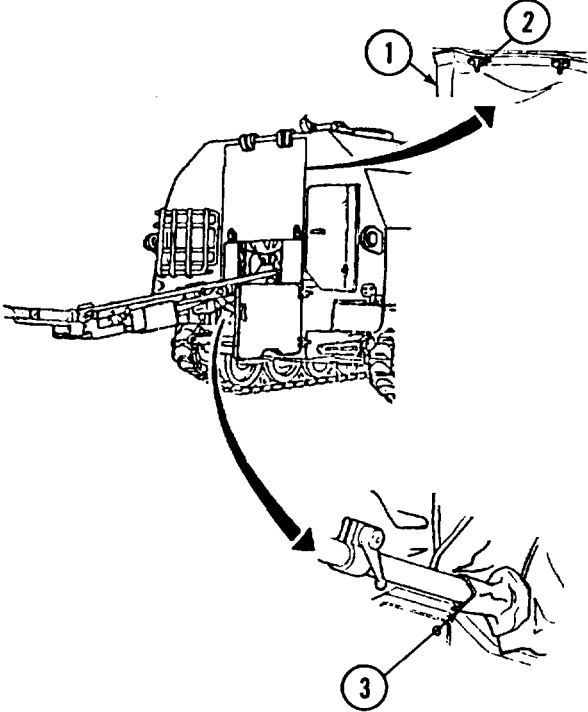
- When operating in bad weather or blackout conditions, have upper rear door (ballistic shield) closed with small door secured open and doorway shroud in place.
- When positioning door shroud, observe stencil markings on shroud. Make sure side marked IN faces inside of vehicle.

1. Deploy conveyor (p. 2-150).
2. Close upper rear door (p. 2-140).
3. Position and secure door shroud (1) over doorway using fasteners (2).
4. Fasten shroud flaps around conveyor, conveyor supports, and upper rear door cylinder with pressure-sensitive hook-and-pile tape (3).

**CAUTION**

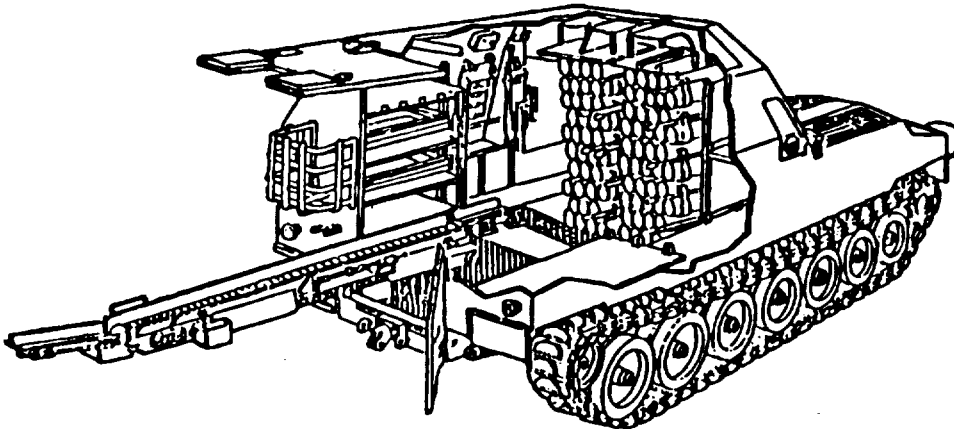
**Always remove and stow door shroud before stowing conveyor.  
If you do not, damage to shroud may result.**

5. Before stowing conveyor, remove and stow door shroud.



**OPERATING THE CONVEYOR (continued)****Loading Cargo onto M992A1****WARNING**

- Keep hands clear of moving conveyor chain at all times.
- Do not operate conveyor with chain guards removed.
- When transporting powder charges on conveyor, always attach grounding cable to supported howitzer. This prevents buildup of static electricity, reducing chance of igniting a propelling charge.
- Do not drop or throw projectiles or propelling charges onto conveyor.
- Promptly remove projectiles and propelling charges from howitzer end of conveyor. Keep end section under observation. Turn off conveyor if projectiles or propelling charges begin to pile up.
- Slings are not intended to support conveyor under normal operating conditions. ONLY if conveyor support strut is missing or fails may slings be used to support conveyor during operation. When operating in this mode, avoid sudden movement of conveyor. Periodically inspect slings and attaching hardware for damage. Notify Unit Maintenance Immediately upon mission completion if sling damage exists.



2-157



## OPERATING THE CONVEYOR (continued)

**CAUTION**

- Never activate conveyor switches or directional control valve with conveyor stowed. Serious damage to conveyor may result
- When positioning vehicle for conveyor operation, never allow weight of conveyor to be supported by slings only. Damage to slings and/or conveyor could result. Conveyor should be supported by left and right conveyor support struts when positioning vehicle.
- To avoid damage to conveyor, always stow conveyor before driving vehicle.

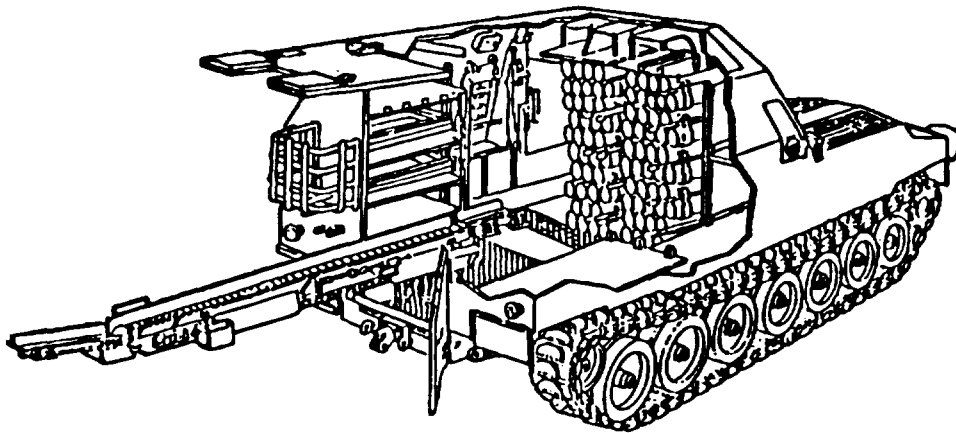
1. Deploy conveyor (p. 2-150).
2. Position conveyor as necessary to provide access to loading from ammunition supply vehicles.

**WARNING**

For safety of personnel in the area, always use ground guide(s) when backing M992A1 into position.

**CAUTION**

When conveyor is supported by slings, do not raise upper rear door and overtension cables. Slings may break, allowing conveyor to fall.



OPERATING THE CONVEYOR (continued)

NOTE

Backing instructions appear on page 2-101.

3. Back vehicle to ammunition stockpile. If ammunition is to be transferred from truck bed, back truck to M992A1 if possible.

WARNING

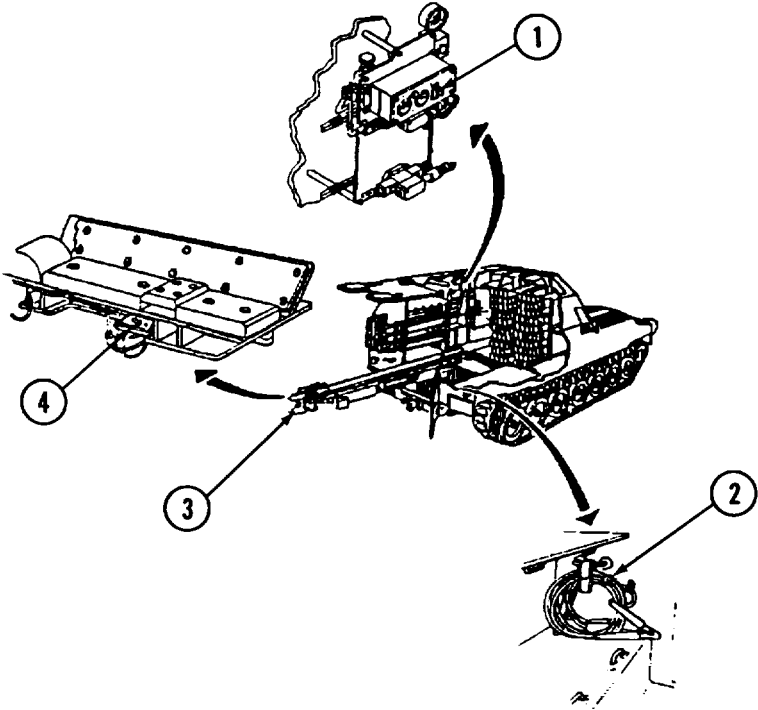
Attach ground cable to truck or stockpile. Failure to ground the M992A1 properly may result in explosion.

- 4. Attach ground cable (2) to truck or stockpile.
- 5. Turn override safety switch (4) to ON.
- 6. Position conveyor switch (1) to IN.

CAUTION

Loader must not place ammunition onto conveyor at faster rate than it can be removed at inboard end.

7. Place ammunition onto rear end section (3). Projectiles should be placed onto conveyor base-first.



**OPERATING THE CONVEYOR (continued)**

8. Push ammunition onto conveyor chain. Conveyor will move ammunition to forward end section.
9. When ammunition reaches forward end section, it must be removed promptly and stowed in designated areas.

**Unloading Cargo from M992A1**

1. Deploy conveyor (p. 2-150).

**WARNING**

- **For safety of personnel in the area, always use ground guide(s) when backing M992A1 into position.**
- **To avoid damage to upper rear door and injury to personnel in the area, ground guide must always consider rear clearance of opened door when instructing driver.**

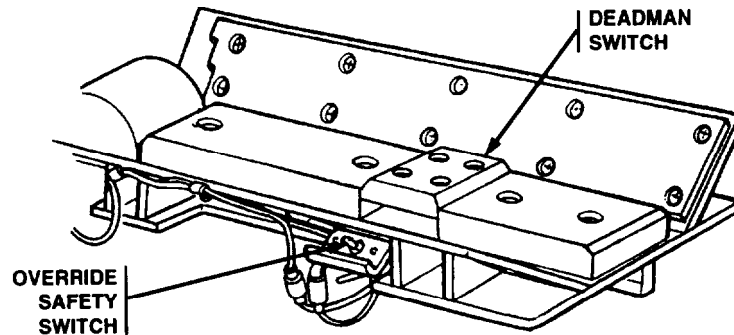
2. Back vehicle to receiving area. If cargo is to be unloaded to a supported howitzer, open howitzer rear personnel door and back vehicle until conveyor reaches doorway. Close upper rear door with upper rear door small doors open (p. 2-140).

**NOTE**

- Yellow nylon strips on conveyor are for use with the M109A6 howitzer. Back the M992A1 toward the M109A6 until yellow nylon strips are even with bulkhead of the M109A6.
- A deadman switch on rear end section of conveyor will automatically shut off conveyor, preventing a possibly dangerous pile-up of ammunition.
- Make sure conveyor override safety switch is within easy reach of howitzer crew. This is necessary to provide the howitzer crew with the capability to prevent ammunition "pile-up."
- An override safety switch on rear end section of conveyor allows the crew to shut off conveyor in an emergency situation.
- It is the responsibility of the Ammunition Team Chief to inform the howitzer crew of these features.

**OPERATING THE CONVEYOR (continued)**

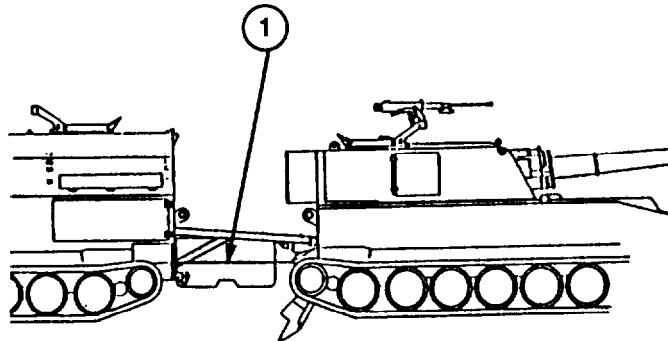
3. Maneuver vehicle and conveyor, as necessary, to position rear end section to comfortable unloading location for howitzer crew.



**WARNING**

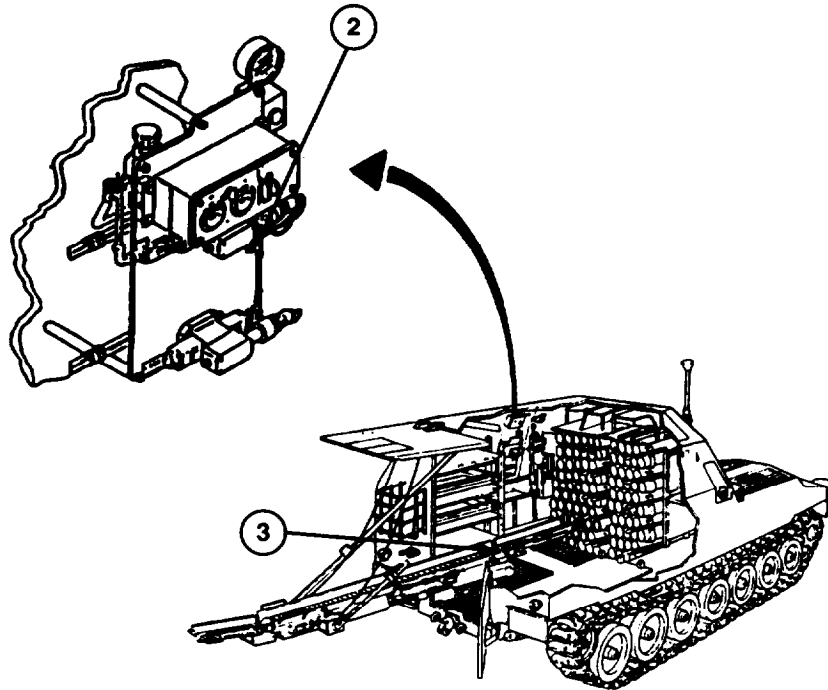
Always attach grounding cable to howitzer before unloading ammunition. Failure to do this may result in explosion of ammunition.

4. Attach grounding cable (1) to howitzer.



OPERATING THE CONVEYOR (continued)

5. Activate hydraulic pump (p. 2-131). Move CONVEYOR switch (2) to OUT.



6. Remove a projectile from rack section (p. 2-179) and slide projectile over forward end section (3) onto conveyor chain.
7. Place proper propelling charge (called for by howitzer crew) onto conveyor chain behind projectile.
8. Howitzer personnel will remove projectiles and charges from rear end section.
9. Repeat steps 6, 7, and 8 to unload additional ammunition, as required.

**OPERATING THE CONVEYOR (continued)**

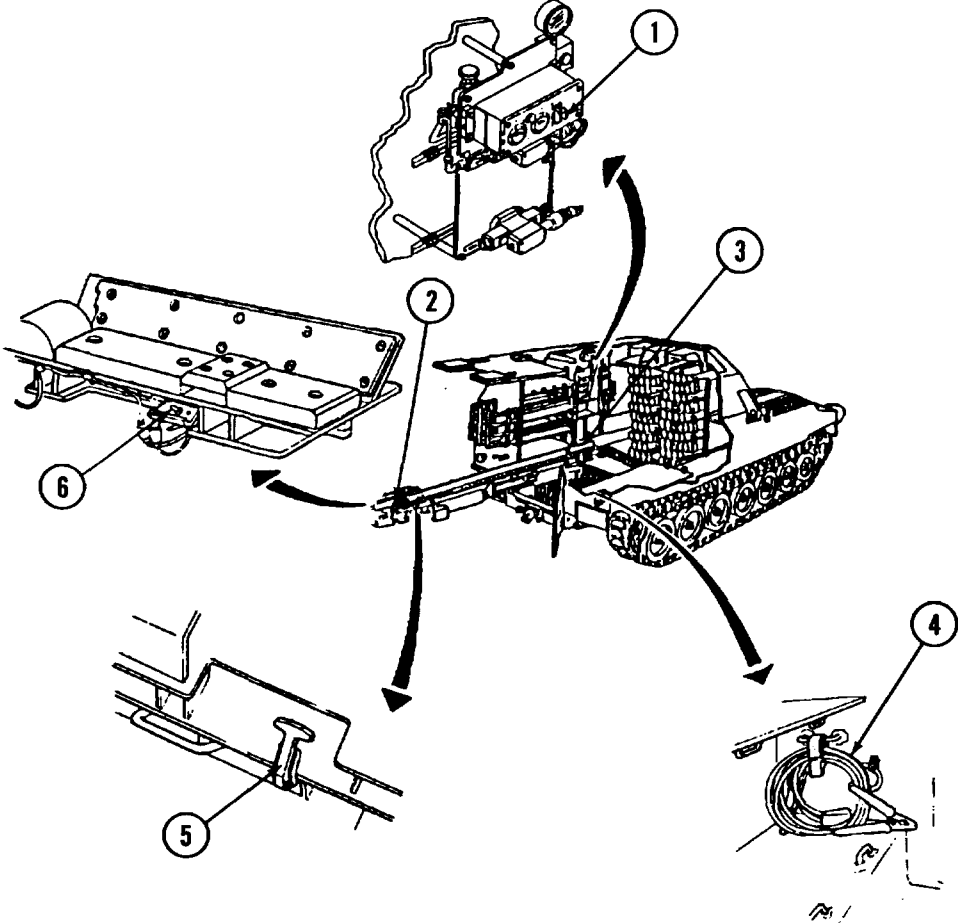
**Conveyor Shutdown and Stowage**

- 1. Push CONVEYOR switch (1) to middle OFF position.
- 2. Push conveyor override safety switch (6) to OFF.

**CAUTION**

**If rear door shroud and conveyor shroud have been installed, they must be removed and stowed before conveyor is stowed.**

- 3. Stow forward and rear end sections (2 and 3), and secure sections (2 and 3) with rubber latches (5).



- 4. Remove ground cable (4) from howitzer, truck, or stockpile. Stow ground cable in space provided in your vehicle.

**OPERATING THE CONVEYOR (continued)**

5. If upper rear door (9) was closed with small doors open, open upper rear door (9) to 45° from closed position (p. 2-138). If upper rear door (9) was open, lower door to 45° from closed position.

**NOTE**

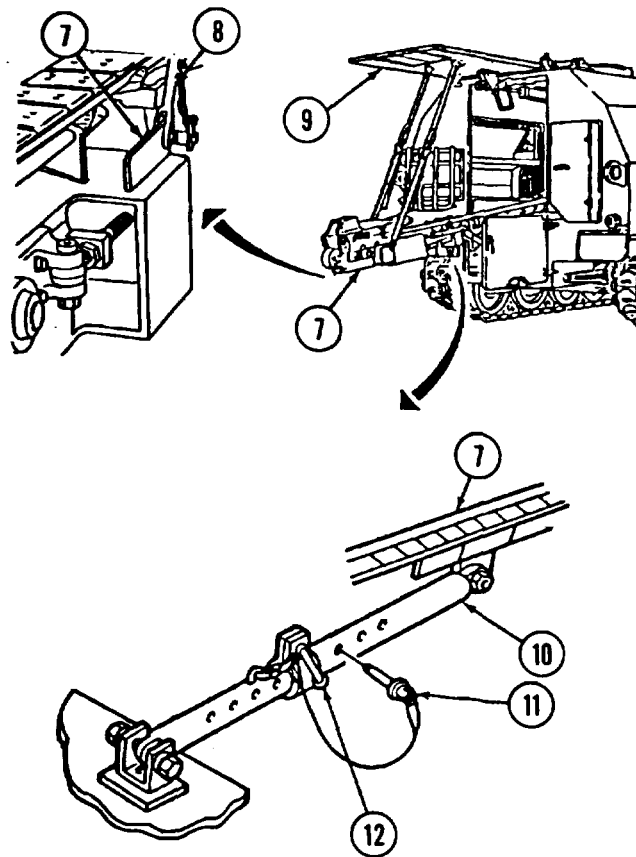
**Steps 6 through 11 apply only if conveyor was positioned above horizontal.**

6. Connect short legs of two slings (8) to conveyor (7).

**WARNING**

**To avoid damage to conveyor components and serious injury to personnel, be sure slings are free of obstructions when raising upper rear door.**

7. Raise upper rear door (9) until two slings (8) are under tension and two conveyor support struts (10) move, freeing two quick-release pins (11). Remove two quick-release pins (11) from two conveyor support struts (10), and loosen two friction handles (12).



**OPERATING THE CONVEYOR (continued)**

8. Position upper rear door (9) 45 degrees from closed position.
9. Install two quick-release pins (11) in two conveyor support struts (10), and tighten two friction handles (12).
10. Disconnect short legs of two slings (8) from right side of conveyor (7).
11. Connect long legs of two slings (8) from right side of conveyor (7).
12. Raise upper rear door (9) just enough to take slack out of two slings (8).
13. Remove two quick-release pins (11) from two conveyor support struts (10). Loosen two friction handles (12).

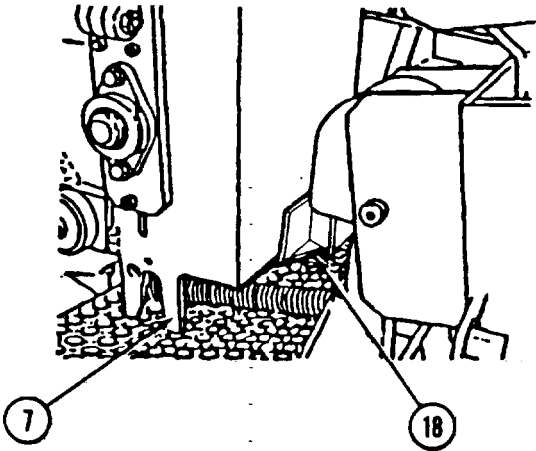
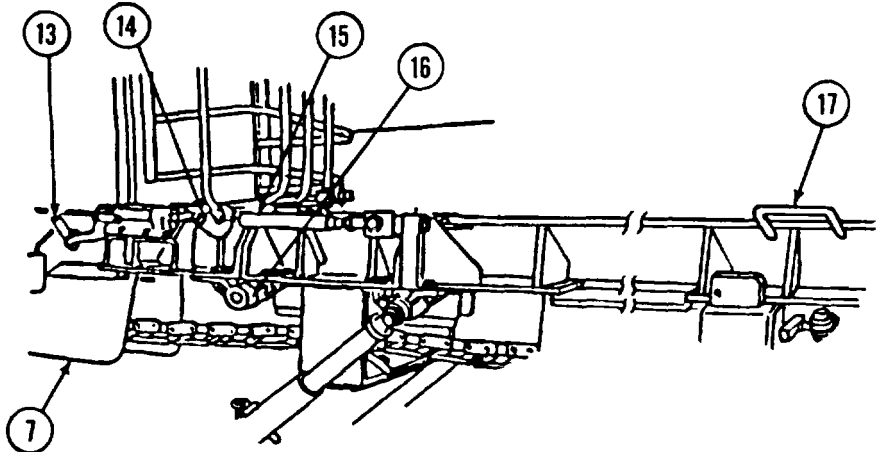
**WARNING**

- **Before unlocking center hinges, operate upper rear door to raise conveyor above horizontal. This will ensure that conveyor clears the ground and operator's feet during conveyor stowing.**
- **NEVER unlock center hinges unless slings are attached. This will allow conveyor to collapse, causing damage or serious injury.**
- **Make sure travel path of upper rear door is clear of personnel before opening door. Call out "CLEAR" when opening or closing door to prevent personnel from stepping in front of door.**

14. Operate upper rear door (9) to raise conveyor (7) to horizontal (p. 2-138).



OPERATING THE CONVEYOR (continued)



15. To unlock hinges (16) at conveyor's center section, pull out on red handles (13) on each side of conveyor (7). Remove loops (15) from hooks (14) and push down on red handles (13).

16. To fold conveyor into vehicle:

- a. Position door at maximum height (120 degrees from closed position) (p. 2-138).
- b. Push down firmly on conveyor handles (17).
- c. Push forward and up quickly and firmly.

d. After conveyor (7) is folded inside vehicle, position conveyor end over bracket (18), and lower upper rear door (p. 2-140) to secure conveyor (7) on bracket 18).

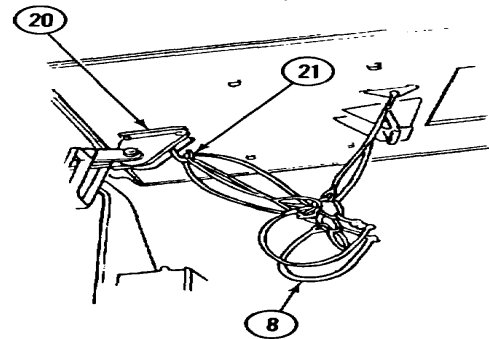
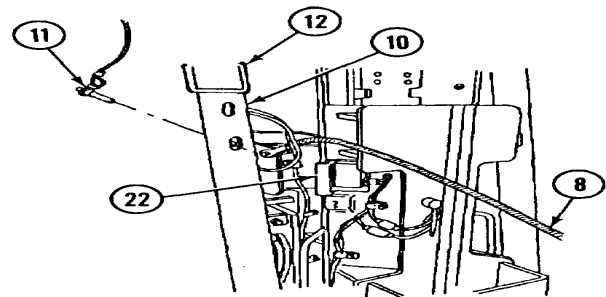
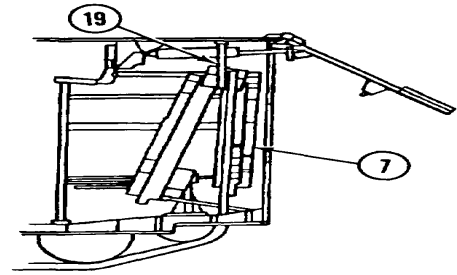
**OPERATING THE CONVEYOR (continued)**

17. With assistant supporting conveyor (7), secure conveyor (7) with stowage strap (21). Tighten strap (19).

18. Install two quick-release pins (11) in two conveyor support struts (10), and tighten two friction handles (12).

19. Disconnect two slings (8) from conveyor (7) and install in hook (21) on hydraulic actuator base (20).

20. Double-check to make sure conveyor safety switch (22) is turned to OFF.

**WARNING**

**To avoid damage to conveyor components and serious injury to personnel during upper rear door operation, secure conveyor with strap after placing it on bracket.**

21. Close upper rear door (p. 2-140).
22. Close upper rear door small doors (p. 2-142).
23. Shut down primary hydraulic pump (p. 2-132).
24. Close lower rear door (p. 2-137).

**PROPELLING-CHARGE STOWAGE AREAS**

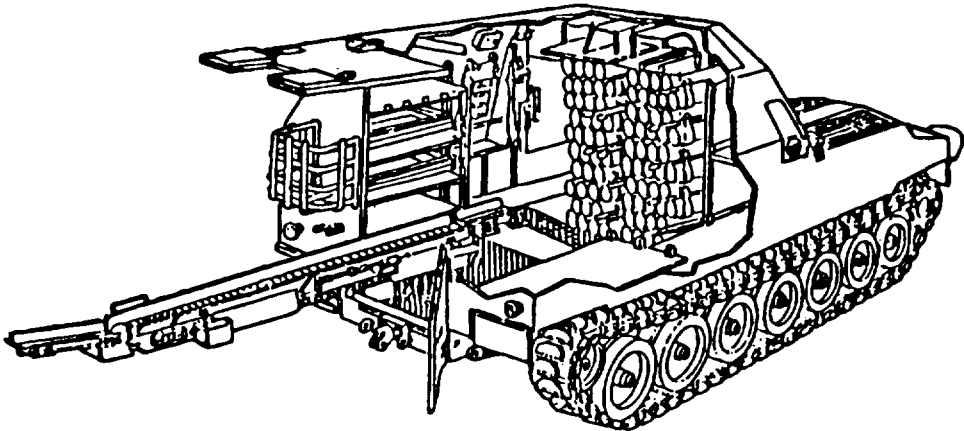
**Stowage Locations**

**WARNING**

**Handle explosive ammunition and components containing explosives with extreme care. DO NOT DROP, DRAG, THROW, OR STRIKE ammunition or related components. Explosive elements in primers and fuses are sensitive to shock.**

The M992A1 canister storage areas are designed to carry 99 propelling charges in round or square containers for the M109A6 howitzer. A restraint system, using straps and bars, has been designed for canister storage areas to secure canisters during transit. The ratcheting straps should be checked and tightened as often as possible.

To take advantage of available space, an exact arrangement of canisters is specified. The basic areas for canister stowage are in left rear shelf area (1), on left sponson (2), above projectile rack assemblies (3), in right front shelf area (4), and in right rear shelf area (5). These areas also provide stowage for fuse boxes, 0.50-caliber ammunition, primer, and copperhead rounds.



**PROPELLING-CHARGE STOWAGE AREAS (continued)**

The following charts show stowage locations and quantities for charges, fuses, 0.50-caliber ammunition, primer, and copperhead rounds when using round or square containers.

*ROUND CHARGES (CONTAINERS M14A2, M13A1, PA37AI, AND PA68)*

R.H. SIZE	CHARGE	R.H. FRONT COMPT	L.H. REAR COMPT	L.H. FRONT COMPT	L.H. REAR COMP	ABOVE RIGHT TRACK	ABOVE LEFT RACK	ON THE SPONSON	TOTAL QTY
155mm	M3A1					11			11
	M4A2	5	5		19			9	38
	M119A2	2	2		15		2		21
	M203	1	28						29
									99

*SQUARE CHARGES (CONTAINERS PA94, PA95, PA99, AND PA91)*

R.H. SIZE	CHARGE	R.H. FRONT COMPT	L.H. REAR COMPT	L.H. FRONT COMPT	L.H. REAR COMP	ABOVE RIGHT TRACK	ABOVE LEFT RACK	ON THE SPONSON	TOTAL QTY
155mm	M3A1					10			10
	M4A2				12			9	26
	M119A2	5	6		22		2		33
	M203	3	30						30
									99

**FUSE BOXES**

**NOTE**

L.H. REAR COMPT	ON THE SPONSON	TOTAL QTY
3	8	11

When stowing square charges, two additional fuse boxes can be stored behind left projectile rack assembly, for a total quantity of 13.

*0.50-CAL PRIMER COPPERHEAD ROUNDS*

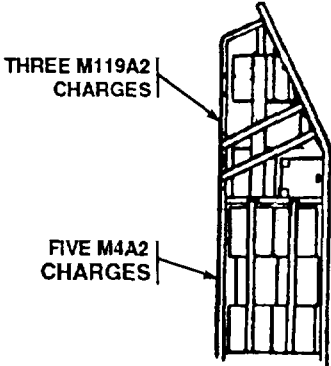
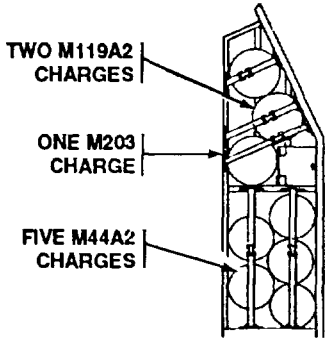
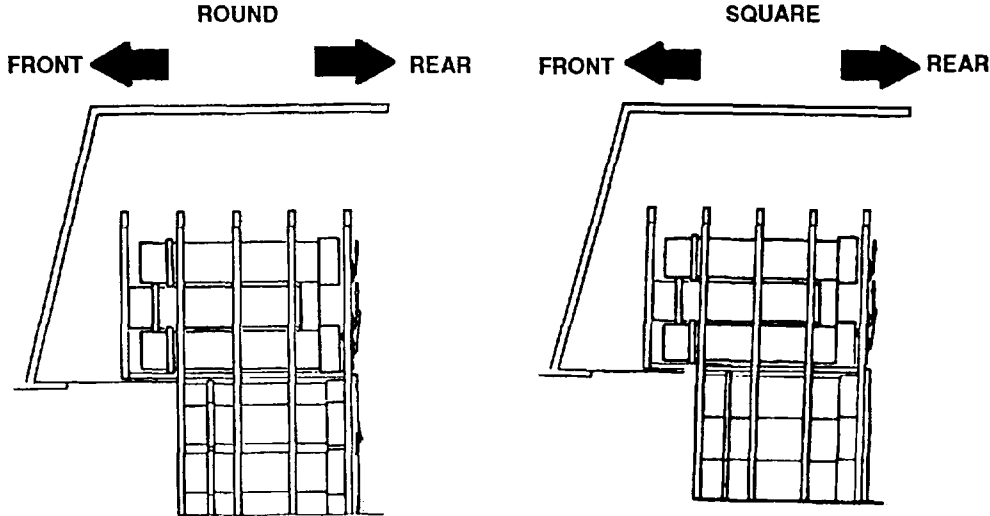
L.H. REAR COMPT	R.H. FRONT COMPT	TOTAL QTY
1	3	4

L.H. REAR COMPT
1

L.H. REAR COMPT
3

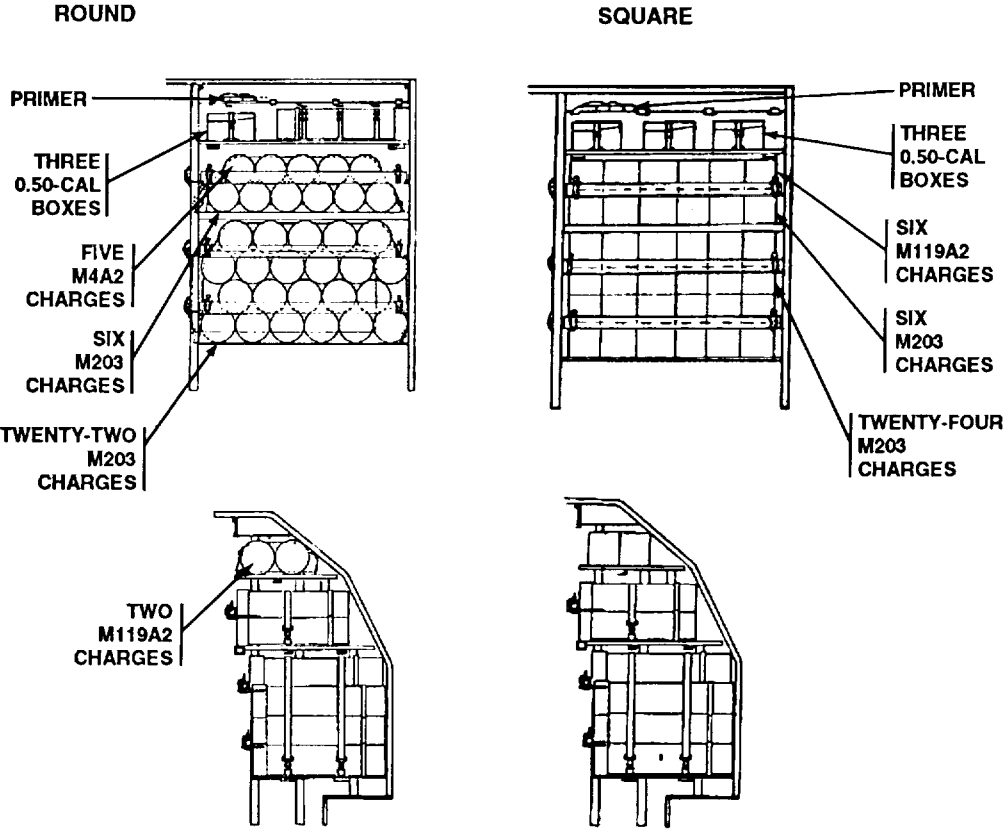
PROPELLING-CHARGE STOWAGE AREAS (continued)

Right Front Compartment



PROPELLING-CHARGE STOWAGE AREAS (continued)

Right Rear Shelf Area



PROPELLING-CHARGE STOWAGE AREAS (continued)

Left Rear Shelf Area

ROUND

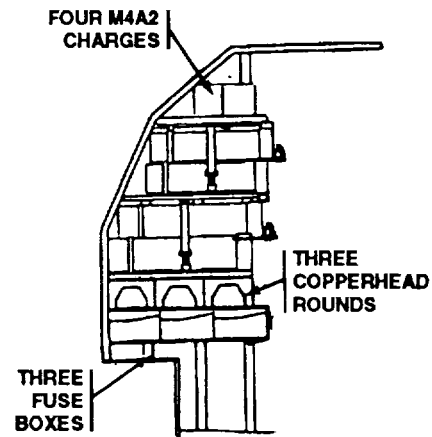
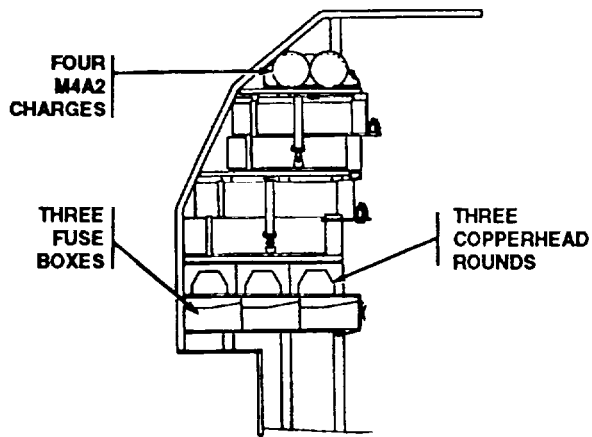
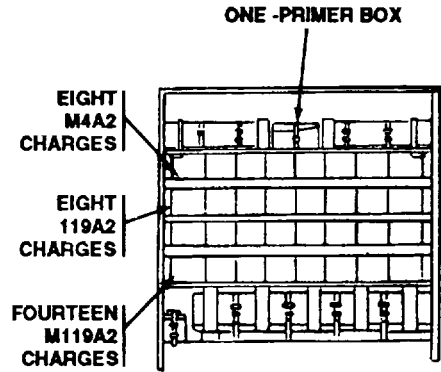
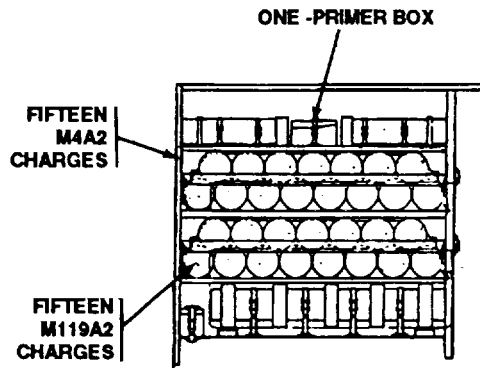
SQUARE

REAR

FRONT

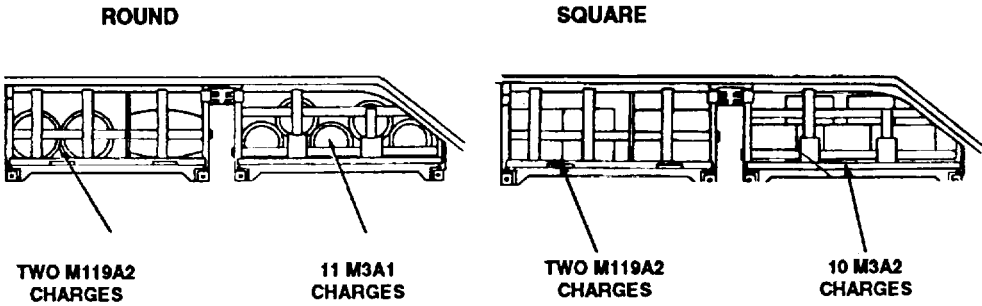
REAR

FRONT

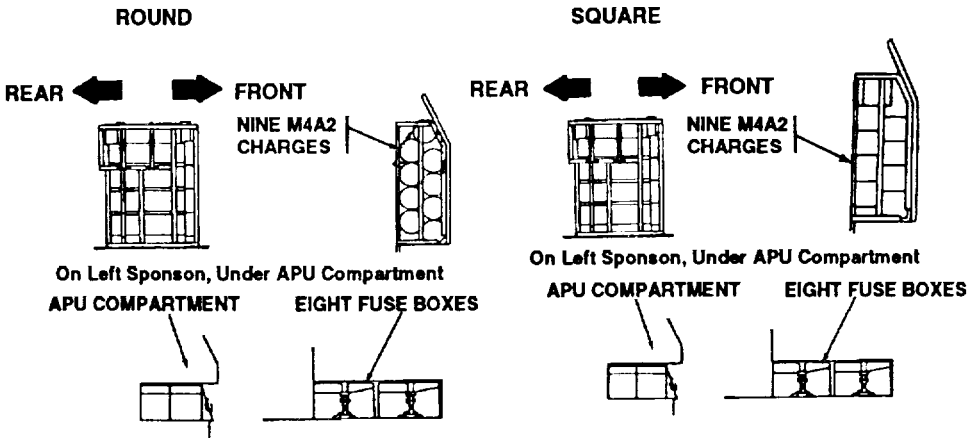


PROPELLING-CHARGE STOWAGE AREAS (continued)

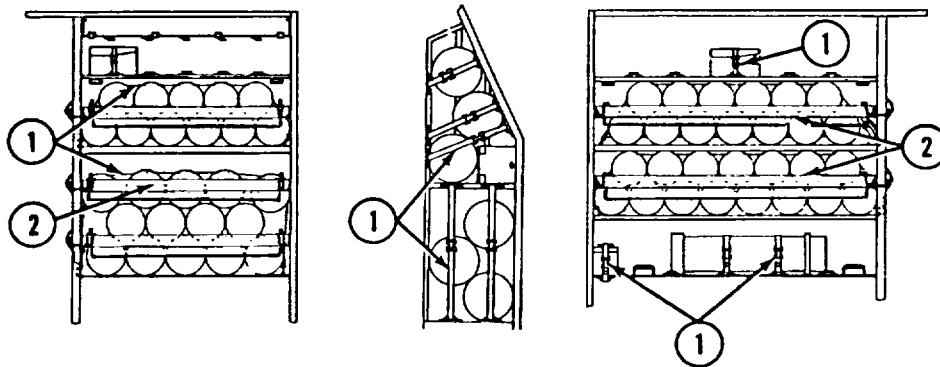
Above Projectile Racks



On The Sponson





**PROPELLING-CHARGE STOWAGE AREAS (continued)****Restraint System**

Straps (1) on canister shelves secure canisters at each shelf. These straps pass over canisters and must be loosened or removed before canisters can be loaded or unloaded. In most cases these straps do not have to be moved to remove charges from canisters.

Restraint bars (2) on right and left rear canister stowage shelves secure canisters for transit. These bars must be removed when canisters are loaded or unloaded. They must also be removed when charges are taken from canisters.

**Loading Propelling-Charge Canisters**

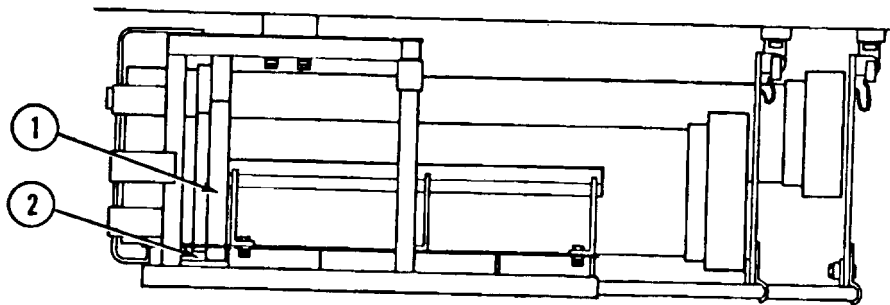
1. Open canister side doors (p. 2-134) and/or deploy conveyor (p. 2-150).
2. Load propelling-charge canisters via conveyor (p. 2-157) or canister compartment side doors.

## PROPELLING-CHARGE STOWAGE AREAS (continued)

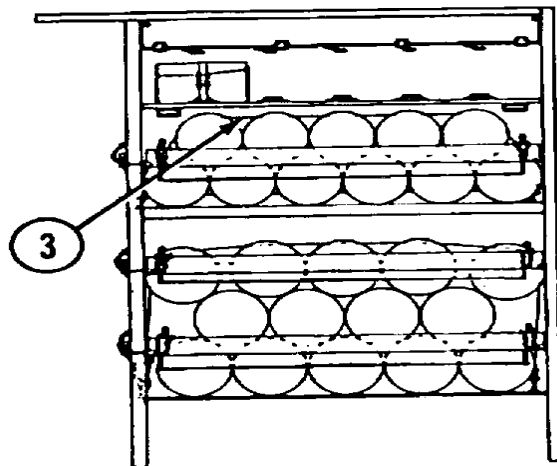
**CAUTION**

- M203 canisters should not be stowed on top layer of right rear top shelf. Six canisters can be stowed on bottom layer on this shelf, with restraint bar in front.
- M203 canisters should not be stowed in left rear top shelf at all, to avoid interference with rear door controls.

3. Place propelling-charge canisters in specified stowage areas (p. 2-169). When loading canisters into stowage boxes above projectile rack assemblies, push canisters fully toward front of vehicle so that flange of canisters (2) drops into slots (1) at bottom of box. This will lock canisters into place.

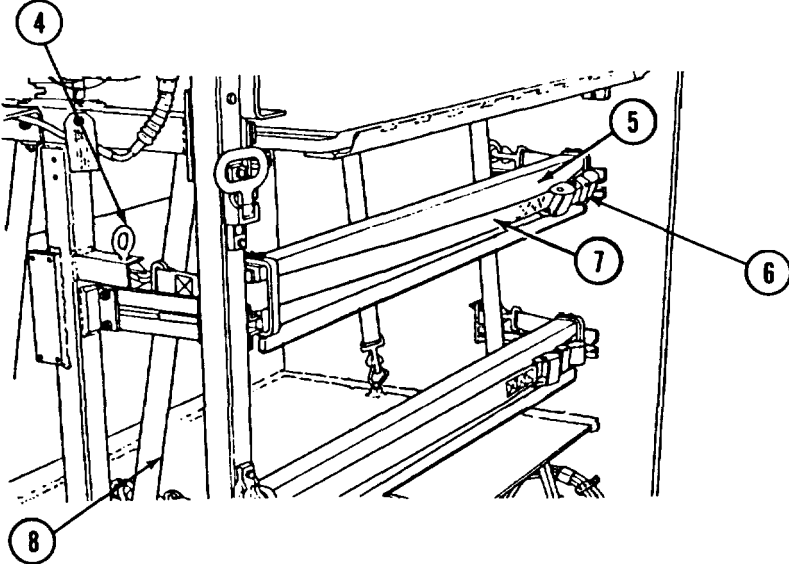
**NOTE**

- When long canisters are stowed on same shelf with short canisters, long canisters should be placed on bottom row with short canisters strapped tightly on top. The restraint bar should be placed in front of long canisters.
  - To ensure canisters are secured properly with ratcheting strap, canisters should be stacked in pyramid style so that fewer canisters are on the top layer than the bottom.
4. Remove straps from hold-open hooks and tighten hold-down straps (3) at each canister stowage area.

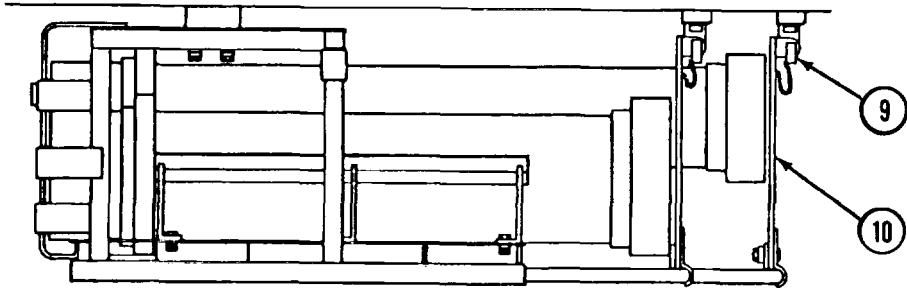


**PROPELLING-CHARGE STOWAGE AREAS (continued)**

- 5. Secure each restraint bar (5) as follows:
  - a. Slide restraint bar (5) into position against canisters.
  - b. Make sure restraint strap (7) is hooked to eyehook (4) at each end.
  - c. Tighten restraint strap (7) securely by pulling free end (6).
  - d. Secure straps (8) on sponson and right front areas.



- 6. Pivot two guard plates (10) upward. Secure two guard plates (10) with two quick-release pins (9).



**PROPELLING-CHARGE STOWAGE AREAS (continued)****Unloading Propelling-Charge Canisters****NOTE**

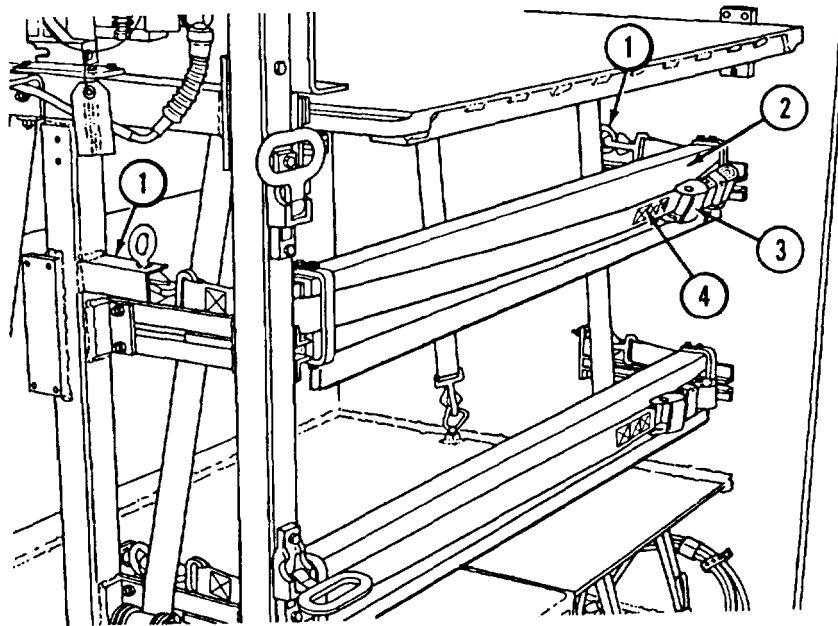
Canisters may be unloaded by hand through canister side door. They may also be unloaded using conveyor (p. 2-150).

1. Open canister side doors (p. 2-134) and/or deploy conveyor (p. 2-150).

**NOTE**

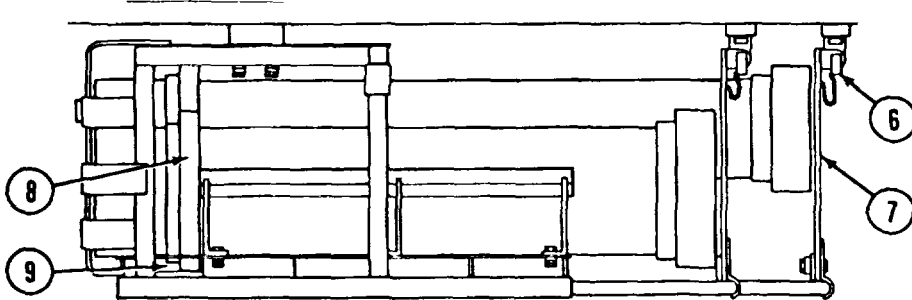
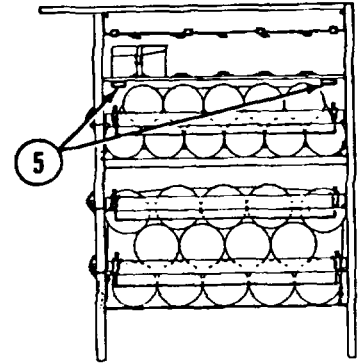
If necessary, bar and strap may be removed by unhooking strap from eyehooks and pulling bar from channels.

2. Loosen restraint straps (4) and bars (2) from stowage areas as follows:
  - a. Loosen strap (4) by depressing lever (3) and pulling strap (4).
  - b. Make sure strap (4) is hooked to eyehook (1) at each end.
  - c. Slide bar (2) out and allow it to suspend from strap (4).



**PROPELLING-CHARGE STOWAGE AREAS (continued)**

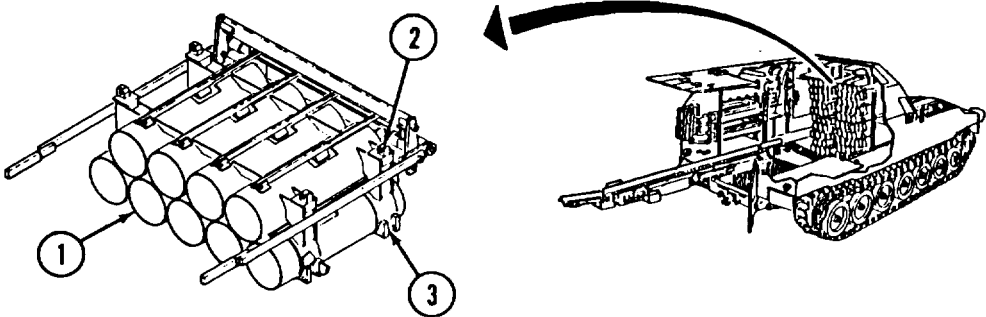
3. Loosen and lay aside all hold-down straps. Straps in left and right rear compartments may be retained by hold-open hooks (5).
4. Remove quick-release pin (6) from front guard plate (7).



5. Remove canisters from left and right rear compartments, sponson, above projectile rack assemblies, and right front shelf area. Canisters may be unloaded via conveyor (p. 2-160) or canister compartment side doors. Canisters stowed above projectile rack assemblies are locked in place by flange of canister (9) fitting into a slot (8) in bottom of box. To remove canisters, tip outer end of canister downward, freeing flange from slot.

**PROJECTILE RACK OPERATION**

The two projectile rack assemblies in the M992A1 carry a total of 90 projectiles. The right rack assembly and the left rack assembly are each arranged in two sets of five rack sections (1). The rack assemblies are mounted against the front wall of cargo compartment and are removable.



Each rack section has four interlocking blocks (2) that project from its top corners. Four interlocking blocks (3) at the base of each rack section slip over the legs of the rack section below. Once in place, rack sections are pinned together with rods (4). Each rack assembly is secured to front wall by brackets (5). Rack assemblies are also secured at top.

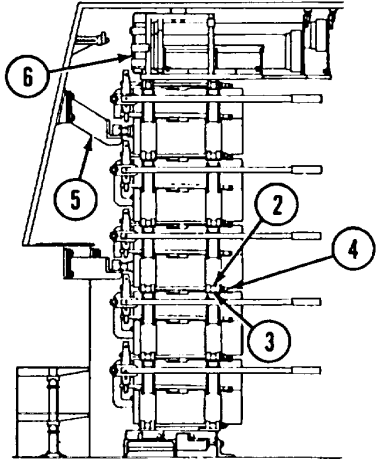
A stowage box (6) attaches to top rack section on each rack assembly.

**WARNING**

Handle projectiles carefully. Contact between projectiles and fire extinguisher could cause extinguisher to discharge, resulting in personal injury or damage to vehicle.

**NOTE**

Right front double seat must be stowed (under APU compartment) before stowing or removing projectiles from tubes in right lower corner.

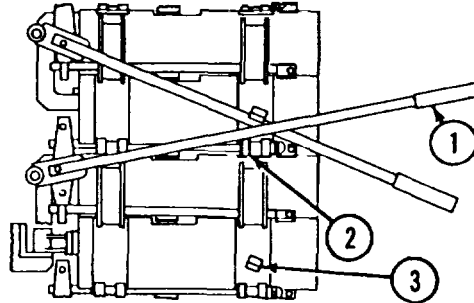


**PROJECTILE RACK OPERATION (continued)****Loading and Stowing Projectiles**

1. Unlock rack section to be loaded by releasing both handles (1) from locking clips (3).

**NOTE**

If necessary, install extension handle over projectile rack handle to obtain additional leverage.



2. Secure handles in unlocked position by pushing them upward and locking them with locking clips (2) on rack section above. Handles of top rack section can be retained by locking clips on stowage boxes.
3. Use conveyor (p. 2-149) to move each projectile to rack section tube.

**WARNING**

To avoid injury to back, hands, and feet, use caution and proper lifting techniques when manually handling projectiles.

**CAUTION**

Do not force projectiles into tubes. If projectile will not slide into tube, check to make sure handles are retained upward. Damage to locking pad could result if projectile is forced into tube with locking handles down.

4. Load each projectile into an unlocked rack section tube.
5. As each rack section is filled, lock projectiles in it by pushing rack handles out and down. Position both rack handles into locking clips.
6. After all projectiles have been loaded and locked into place, pull on each projectile. If any projectile can be pulled out, remove it, relocate it in another tube, or unload it. Lock rack section and notify Unit maintenance.

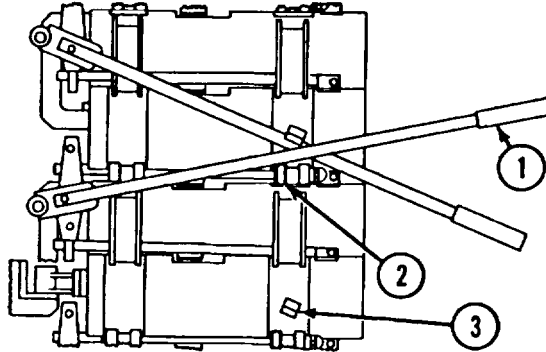
**PROJECTILE RACK OPERATION (continued)****Unloading Projectiles****NOTE**

Before beginning to unload projectiles from rack sections, vehicle must be on level ground.

1. Deploy conveyor (p. 2-150).
2. Unlock rack section to be unloaded by releasing both handles (1) from locking clips (3).

**NOTE**

If necessary, install extension handle over projectile rack handles to obtain additional leverage.



3. Secure handles (1) in unlocked position by pushing them upward and locking them with locking clips (2) on rack section above. Handles on top rack sections can be retained by locking clip on stowage boxes.

**NOTE**

If any projectile sticks, refer to troubleshooting section (pp. 3-14 and 3-15).



**PROJECTILE RACK OPERATION (continued)**

4. Remove projectiles (one at a time) from unlocked rack section. Use conveyor to move projectiles from vehicle.
5. As each rack section is unloaded, lock rack section by pushing handles out and down. Position both rack handles into locking clips.
6. Repeat steps 2 through 5 to unload additional projectiles.

**Moving Projectile Rack Assemblies****WARNING**

- Before moving rack assemblies, park vehicle on level ground. If vehicle is not level, racks may tip, causing injury or damage.
- If both rack assemblies are to be moved, move right rack assembly first. After left rack assembly is moved, leave hoisting hook attached; this support is necessary because the rack assemblies tend to tip forward when both rack assemblies are moved back.
- This operation requires two persons - one on top of vehicle and one inside crew compartment.
- Handle projectiles carefully. Contact between projectiles and fire extinguisher could cause extinguisher to discharge, causing personal injury or damage to the vehicle.

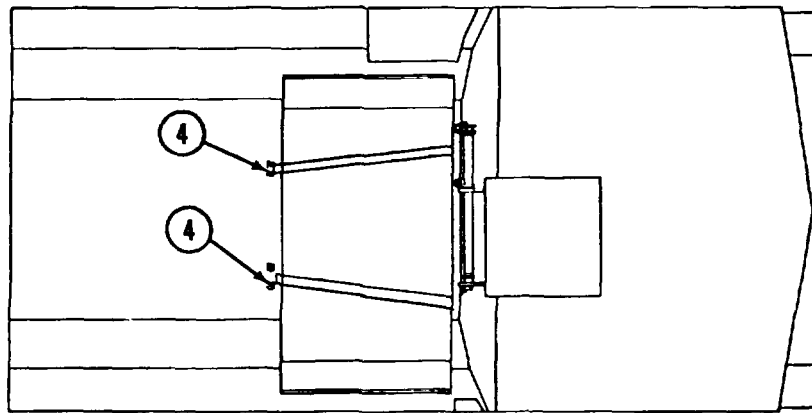
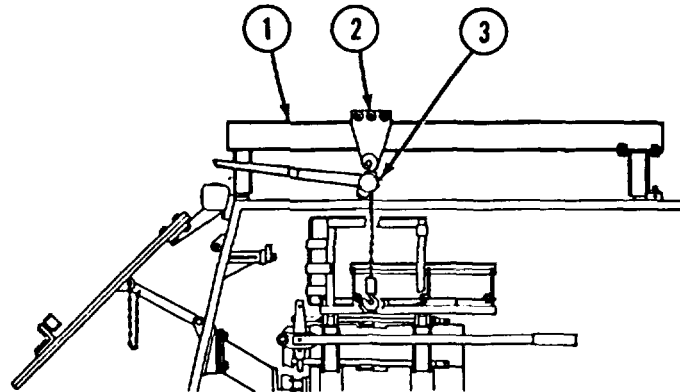
**NOTE**

For some preventative maintenance checks and services, it will be necessary to gain access to area between projectile rack assemblies and front wall.

1. Remove all projectiles from rack assembly to be moved. Also, remove stowed items from stowage box at top of rack assembly. If moving right projectile rack assembly, stow right front double seat (p. 2-117).

**PROJECTILE RACK OPERATION (continued)**

2. Open all three top doors (pp. 2-135 and 2-136).
3. Remove and assemble (if not stowed assembled) beam (1), trolley assembly (2), and hoist (3) from stowage locations.



**NOTE**

Position beam at a slight angle outboard.

4. Position beam (1) and trolley assembly (2) above rack assembly to be moved. If moving right rack assembly, lower beam (1) so that support legs of beam engage two pins (4) on vehicle roof. 2-183

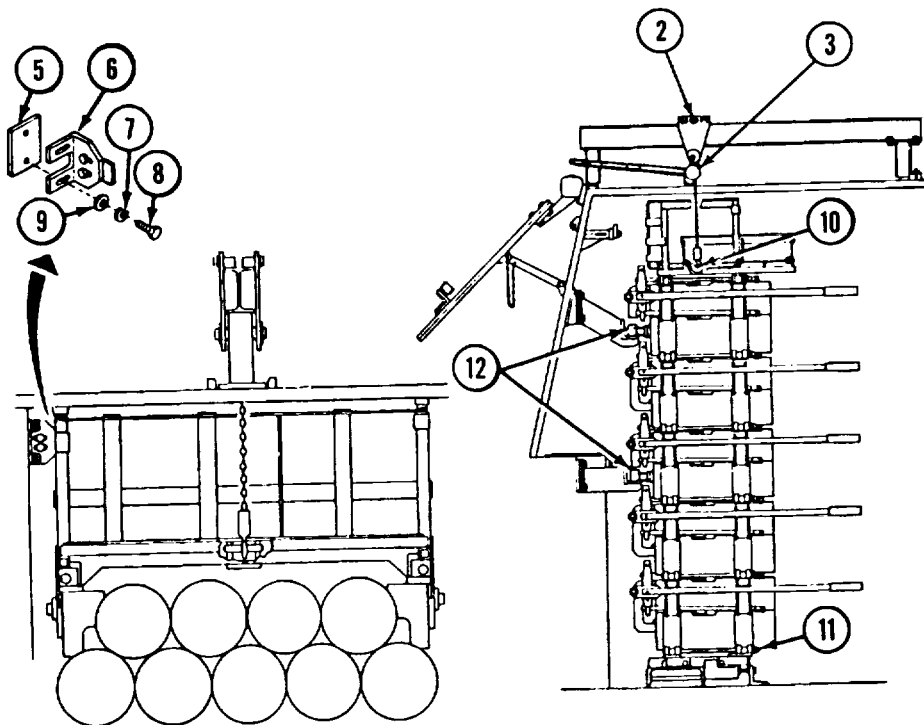
**PROJECTILE RACK OPERATION (continued)**

5. If right rack assembly is to be moved, remove right front double seat (p. 2-117).
6. If left rack assembly is to be moved, remove two screws (8), lockwashers (7), and flat washers (9) from angle (6). Remove angle (6) and spacer (5).
7. Attach hoist (3) to trolley assembly (2).

**NOTE**

Snap hook back to the front.

8. Lower hook of hoist (3) and secure it around lifting rod (10). Pull free end of chain to take up slack.



9. Using 7/8-inch socket, 5-inch extensions, and hinged socket wrench handle, remove bottom connecting rods (11) securing projectile rack assembly to floor.
10. Use hoist (3) to lift rack assembly until rack-mounting socket clears rack-restraint pins (12).

**WARNING**

Before moving rack assembly toward rear of vehicle, make sure floor will provide a level resting place. If floor is not level rack may tip, causing injury or damage.

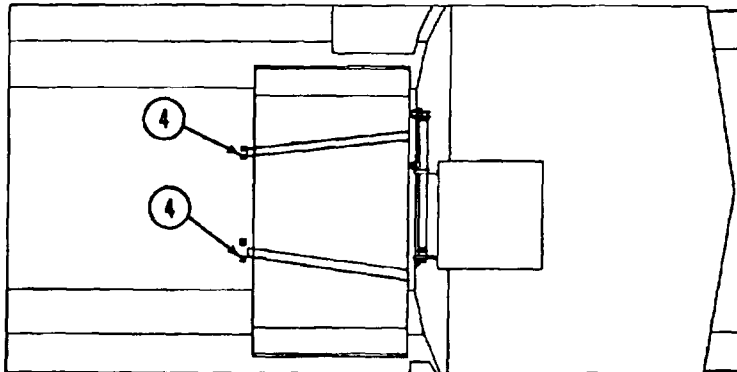
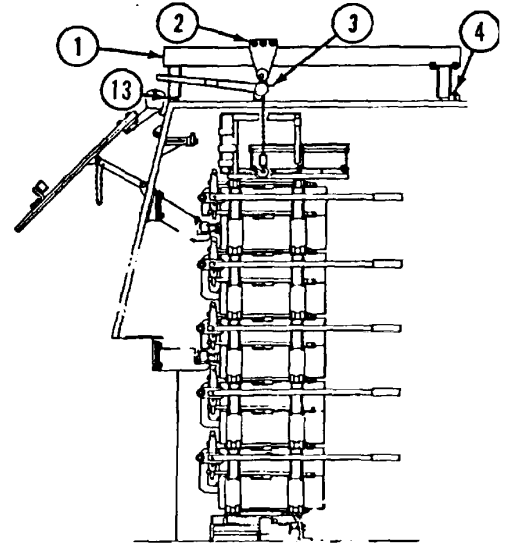
**PROJECTILE RACK OPERATION (continued)**

11. Pull rack assembly toward rear of vehicle until there is room for personnel to move between rack assemblies and front wall.
12. Using hoist (3), lower rack assembly until it rests on floor.

**CAUTION**

Watch clearance on hydraulic lines when moving left projectile rack assembly.

13. If only one rack assembly is to be moved, leave hook of hoist (3) attached for added support. If right rack assembly has been moved and left rack assembly must also be moved, relocate lifting fixture (hoist, beam, and trolley assembly) to left side of roof. Repeat steps 7 through 12 for left rack assembly.

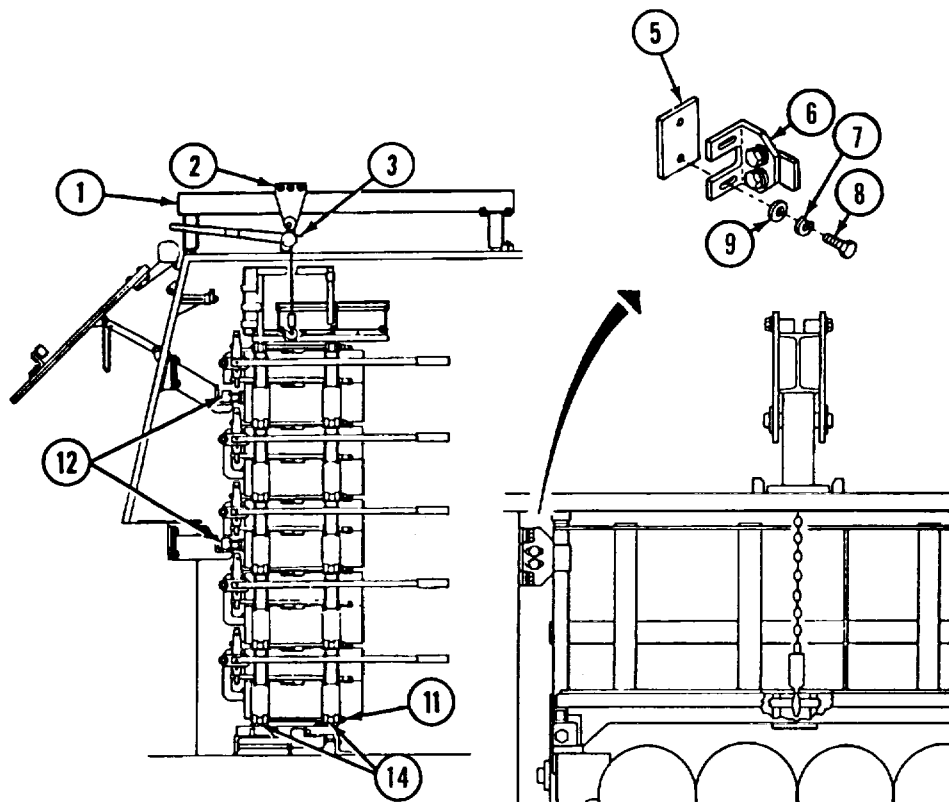
**WARNING**

When installing both rack assemblies, install left rack assembly first. The left rack assembly tends to tip forward, which may cause severe injury to personnel.

14. Position hoist (3), beam (1), and trolley assembly (2) over rack assembly to be moved, engaging block (13) and pin (4) with beam support legs.

**PROJECTILE RACK OPERATION (continued)**

15. Use hoist (3) and trolley assembly (2) to position rack assembly onto rack-restraint pins (12) and floor pins (14). Secure rack assembly to floor by installing bottom connecting rods (i 1i).
16. Repeat steps 14 and 15 for right rack assembly, if necessary.
17. If left rack assembly is installed, secure its upper portion with angle (6), spacer (5), and two flat washers (9), lockwashers (7), and screws (8).
18. Remove hook of hoist (3) and beam (1) and stow beam (1), trolley assembly (2), and hoist (3).
19. If right projectile rack assembly was moved, install right front double seat (p. 2-117).
20. Close top doors (pp. 2-135 and 2-136).



## OPERATING AUXILIARY EQUIPMENT

Pages 2-187 through 2-204 provide operating instructions for personnel heater, ventilation blower, communication equipment (including PLGR), M45 and M27 periscopes, lights, portable fire extinguisher, 0.50-caliber machine gun, chemical agent detection and alarm system, ventilated face piece system, and mounted water ration heater (MWRH).

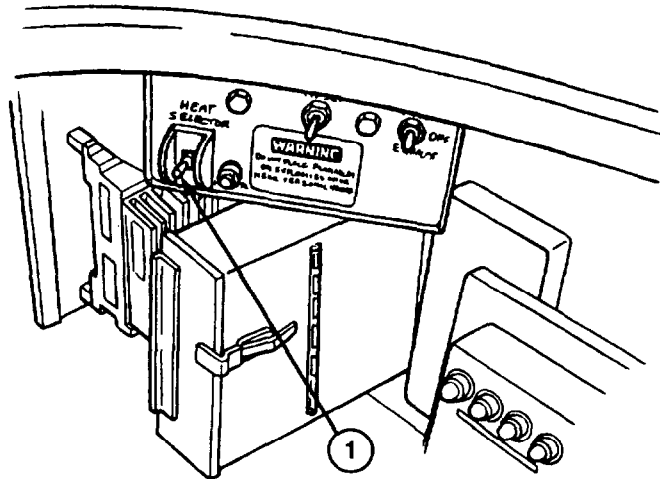
### Operating Personnel Heater

#### WARNING

- Do not place flammable materials or explosives on or near personnel heater. To prevent injury to personnel and damage to equipment, do not block or restrict heater vent.
- Carbon monoxide is a colorless, odorless, deadly, poisonous gas that, when breathed, deprives the body of oxygen and causes suffocation. Breathing carbon monoxide produces headache, dizziness, loss of muscle control, drowsiness, and coma. Permanent brain damage or death can result from exposure. Do not operate heater or engine of vehicle in an enclosed area unless area is adequately ventilated.

### Starting

1. Turn vehicle MASTER switch to ON.
2. Move HEAT SELECT switch (1) to LOW.
3. If heater does not start within 4 minutes, move HEAT SELECT switch to OFF for 15 minutes. The start attempt may be continued for an additional 4 minutes.
4. If heater does not start after a second try, again move HEAT SELECT switch to OFF and notify Unit maintenance.



Change 1

2-187

**OPERATING AUXILIARY EQUIPMENT (continued)**

***Operating***

Any time heater is started, it should be operated for at least 5 minutes to clear heater of all excess fuel introduced during starting. After heater starts, it may be operated at either HIGH or LOW heat by positioning of HEAT SELECT switch.

***Shutting Down***

**WARNING**

Do not use vehicle MASTER switch to shut heater down, as fuel vapors may accumulate in ventilating air circuit.

**CAUTION**

If proper shutdown procedures are not followed, heater may be damaged by reverse burning.

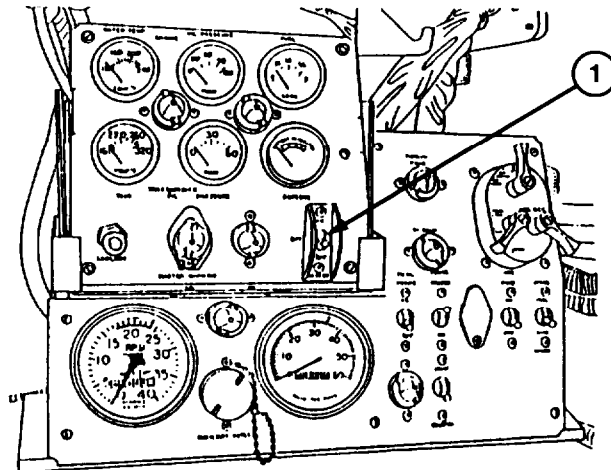
To stop heater operation, move HEAT SELECT switch to OFF. Blower will continue to operate for about 3 minutes to allow system to cool.

**NOTE**

If blower continues to operate or otherwise malfunctions, notify Unit maintenance.

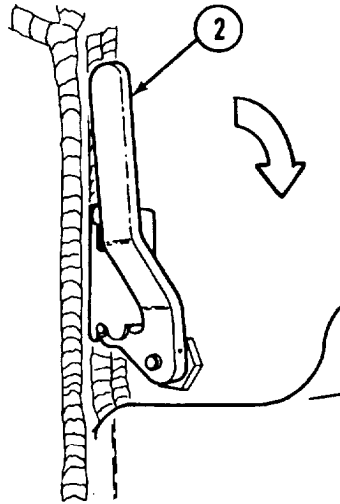
**Operating Ventilation Blower**

1. Turn MASTER switch (1) (on driver's portable panel) to ON.

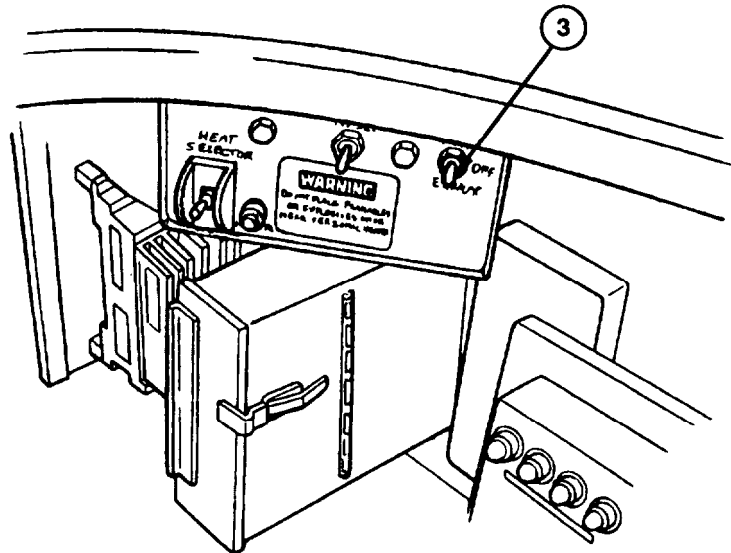


**OPERATING AUXILIARY EQUIPMENT (continued)**

2. To pull in fresh air, pull down air duct control handle (2) in driver's compartment. Turn VENTILATOR BLOWER switch (3) to INTAKE.



3. To clear out smoke, pull down on air duct control handle (2) and turn VENTILATOR BLOWER switch (3) to EXHAUST.
4. If automatic fire extinguishing system activates, ventilator blower turns to exhaust mode. Open vent after extinguisher discharge.



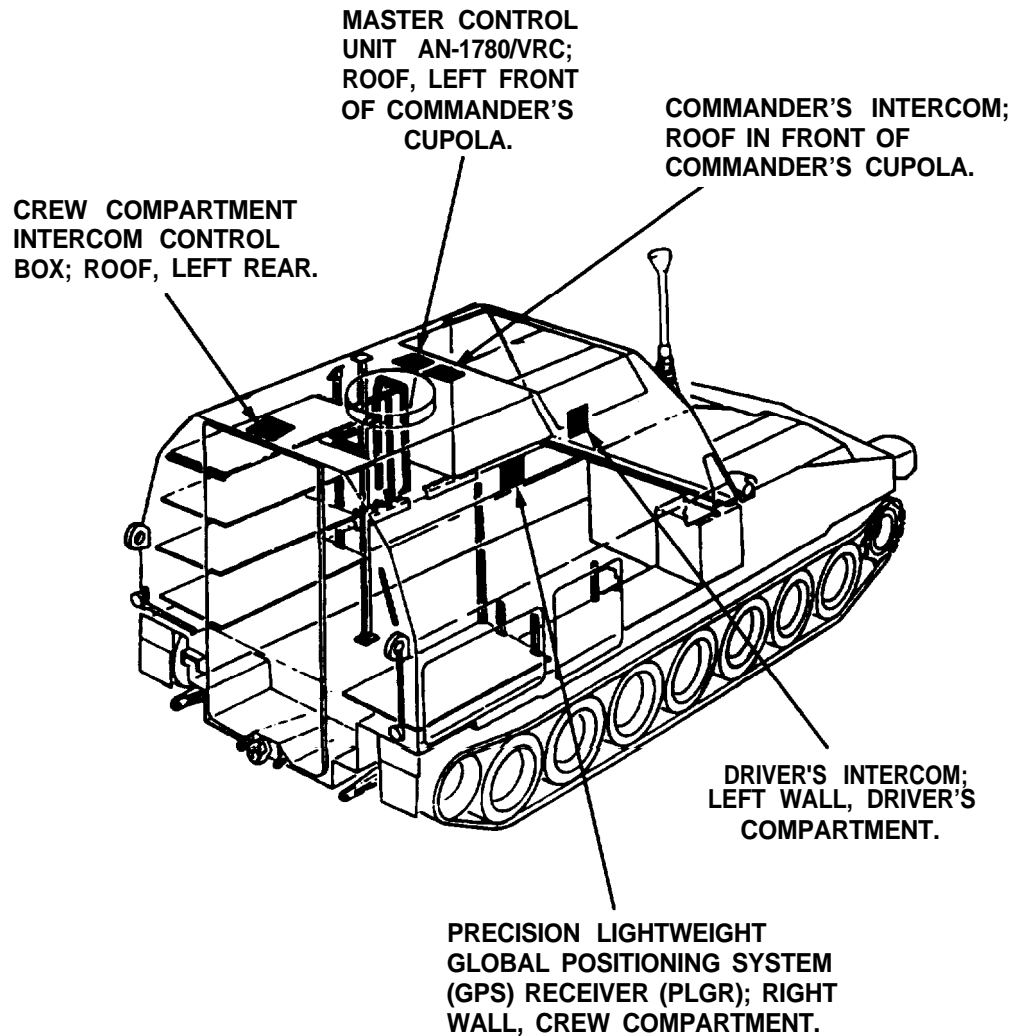


OPERATING AUXILIARY EQUIPMENT (continued)

Operating Communication Equipment

Refer to TM 11-5830-340-12 for operation and maintenance of intercommunication system AN/VIC-1(V). Use of system for intercom only is given below.

Refer to TM 11-5825-291-13 for operation and maintenance of Satellite Signals Navigation Set AN/PSN-11 (PLGR).



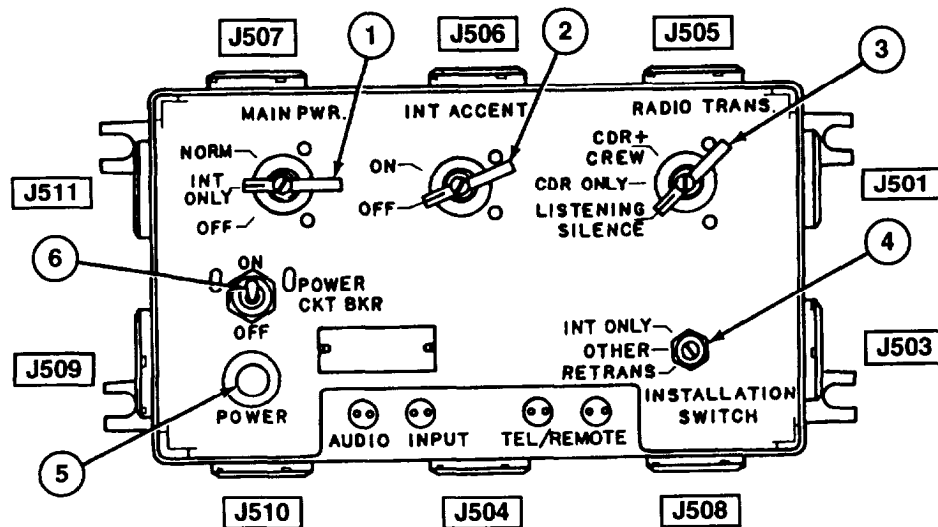
## OPERATING AUXILIARY EQUIPMENT (continued)

*Operating the AN-1780/VRC*

The AN-1780/VRC is the master control for the intercommunication system, AN/VIC-1(V). Nothing works until both driver's MASTER switch and the AN-1780/VRC are turned on.

**CAUTION**

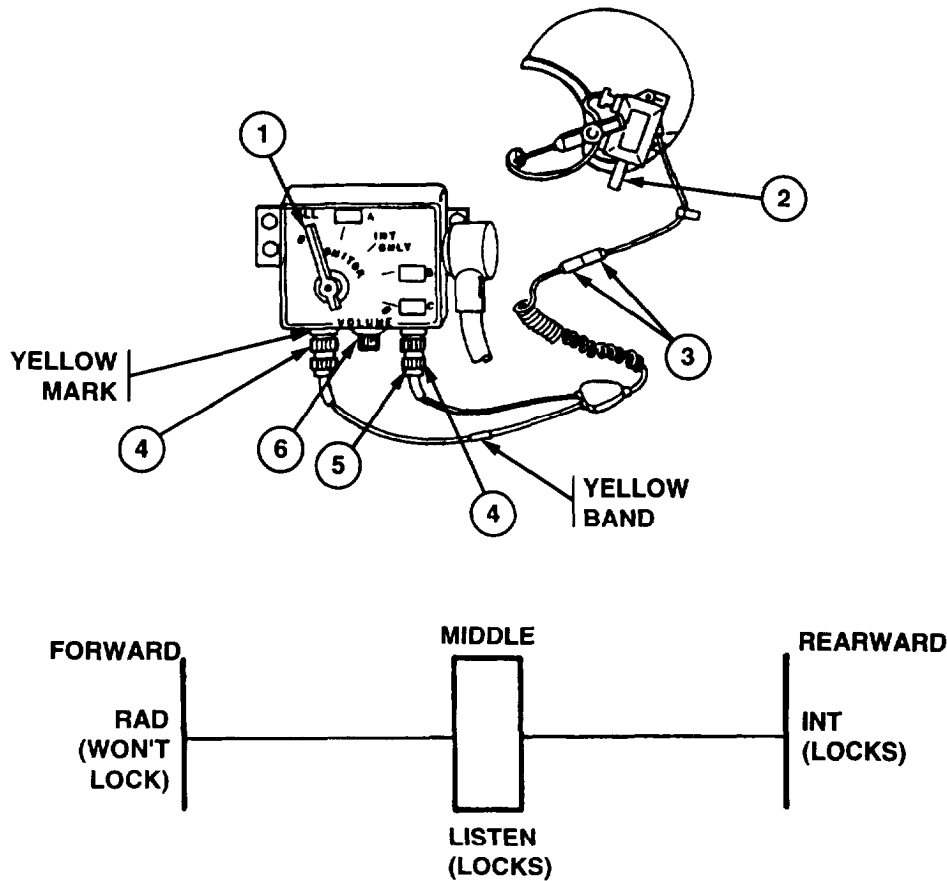
Before starting vehicle engine, make certain MAIN PWR switch is OFF. Otherwise, engine start could damage AN-1780/VRC.



1. With vehicle power on, set MAIN PWR switch(1) to INT ONLY and set POWER CKT BKR switch (6) to ON. POWER lamp (5) should light.
2. Leave INT ACCENT switch (2) at OFF, RADIO TRANS switch (3) at LISTENING SILENCE, and INSTALLATION SWITCH (4) at INT ONLY.

OPERATING AUXILIARY EQUIPMENT (continued)

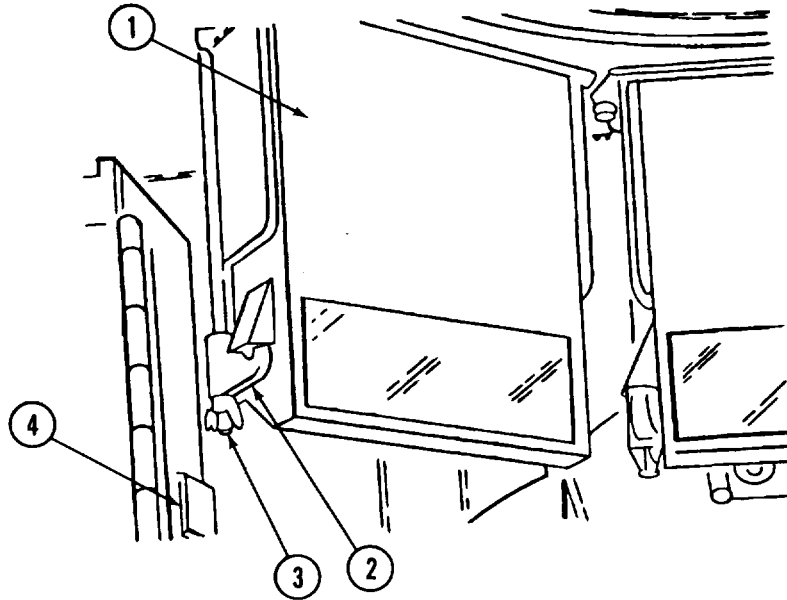
*Positions of CVC Helmet*



1. Connect combat vehicular crewman (CVC) helmet cable connectors (5) to control box receptacles (4). Cable with yellow band (longercable) connects to receptacle with yellow mark.
2. Check to see that bail-out connectors (3) are snapped in place. During operation, adjust VOLUME knob (6) for best reception.
3. MONITOR switch (1) can be at A, ALL, or INT ONLY.
4. Talk to other crew members by pushing helmet switch (2) rearward. Set to middle position when finished.

**OPERATING AUXILIARY EQUIPMENT (continued)****Periscopes*****Removing M45 Periscopes***

1. Remove periscope (1) by loosening two wing nuts (3) to release two lock supports (2).
2. Remove periscope (1) from supports on driver's hatch.
3. If necessary, stow periscope (1) in box (4) on left side of driver's compartment.

***Installing M45 Periscopes***

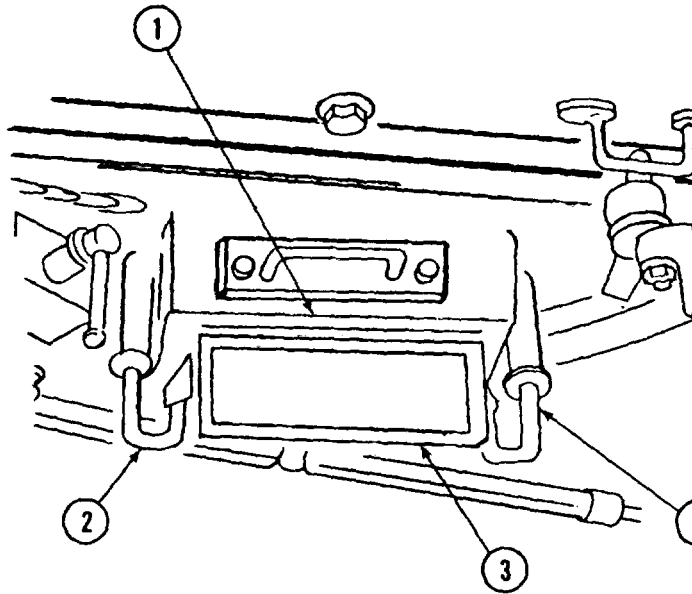
1. If stowed, remove periscope (1) from box (4) in driver's compartment.
2. Slide periscope (1) into supports on driver's hatch.
3. Install two lock supports (2) on periscope (1), and secure with two wing nuts (3).

**OPERATING AUXILIARY EQUIPMENT (continued)*****Removing M27 Periscopes***

1. To remove periscope (3), pull and turn two retainers (2) on cupola (1).
2. Remove periscope (3) from cupola (1).

***Installing M27 Periscopes***

1. Slide periscope (3) into cupola (1).
2. Secure periscope (3) in cupola (1) with two retainers (2).



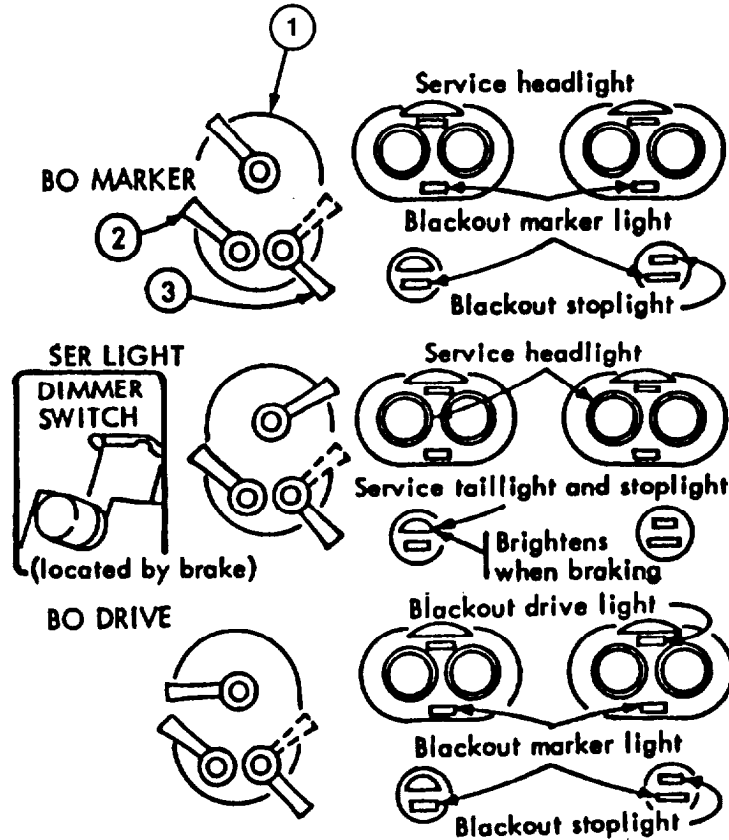
**OPERATING AUXILIARY EQUIPMENT (continued)**

**Operating the Lights**

***Driving Lights and Light Switch Assembly***

The following panels show which lights are turned on by different positions of main light switch.

1. Main light switch (1).
2. Instrument panel light switch (2).
3. Safety switch (3). Push up to unlock main light switch. Release after main light switch is in position.



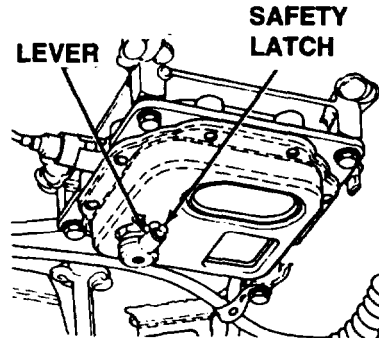
OPERATING AUXILIARY EQUIPMENT (continued)

NOTE

Dome lights may be operated only if MASTER switch is on.

**Dome Lights**

1. Blue-green light on - turn lever fully clockwise.
2. White light on - press safety latch and turn lever counterclockwise past stop.
3. Both lights off - position lever in center.

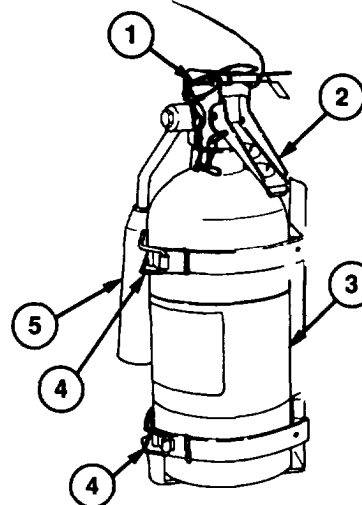


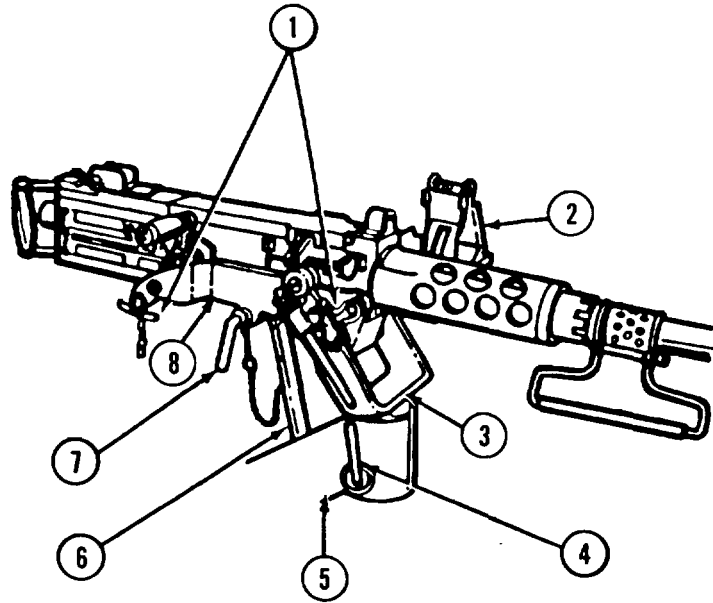
**Portable Fire Extinguisher CO<sub>2</sub> Operation**

WARNING

- For driver's/crew compartment fires, perform EMERGENCY PROCEDURES (p. 2-231).
- Remain CALM. Avoid breathing CO<sub>2</sub>. It may quickly cause rapid breathing, loss of consciousness, and suffocation. Quickly exit vehicle if situation permits. If unable to exit, ventilate to remove the extinguisher gas. The driver is at the greatest risk. Ventilate the vehicle before reentry. Failure to follow this emergency procedure can result in serious injury or death to personnel.
- Fire extinguisher CO<sub>2</sub> can cause severe burns. Do not touch the cone when using fire extinguisher or discharge directly on skin.
- Handle fire extinguisher carefully. Do not bang or drop cylinder.

1. Pull two latches (4) to release fire extinguisher (3). Remove fire extinguisher (3).
2. Break safety wire and remove ring pin (1).
3. Aim discharge nozzle (5) at base of flames.
4. Squeeze trigger (2) to operate and direct the discharge at fire until extinguished.
5. After extinguishing flames, operate ventilation blower (p. 2-188) to clear vehicle.



**OPERATING AUXILIARY EQUIPMENT (continued)****Installing and Removing 0.50-Caliber Machine Gun*****Installation***

1. Pull lock handle (4) down to install pintle (3) and cradle (8) in pintle support (5).
2. Hold travel lock (6) with travel-lock pin (7).
3. Install machine gun in cradle (8) and hold with front and rear locking pins (1). Install ammunition tray (2).

***Removal***

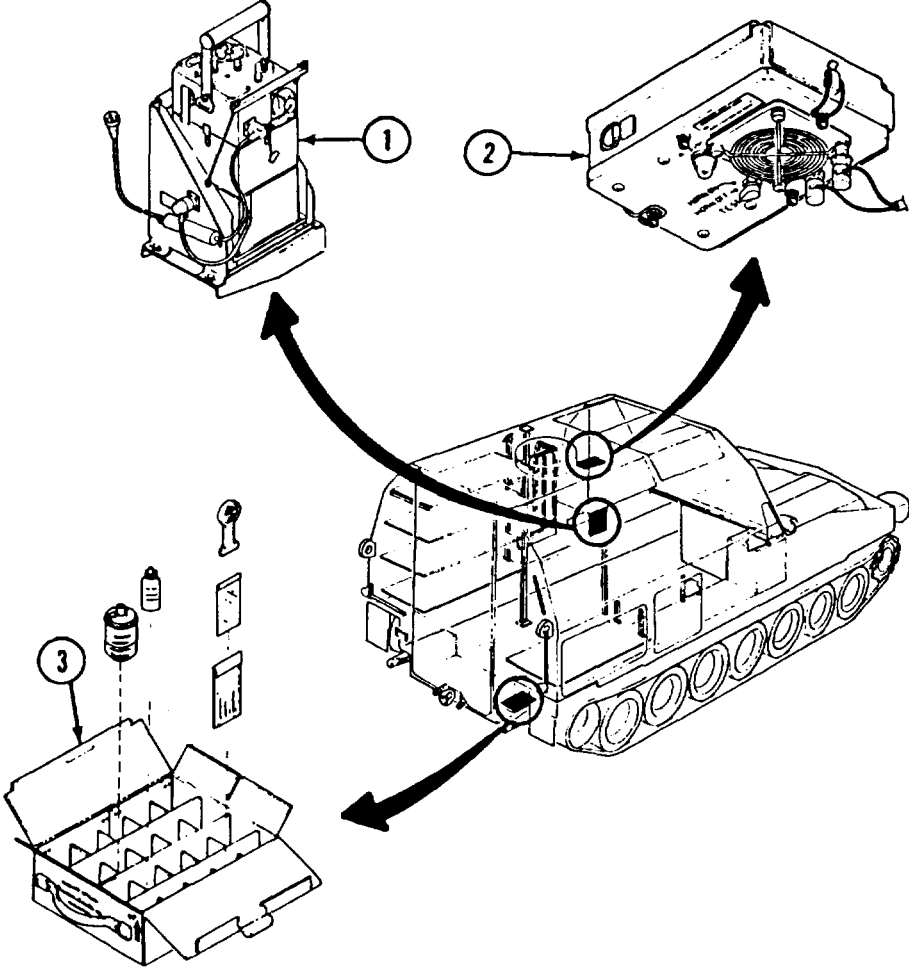
1. Remove ammunition tray (2). Pull front and rear locking pins (1) and remove machine gun from cradle (8).
2. Remove travel-lock pin (7) to release travel lock (6).
3. Pull lock handle (4) and remove pintle (3) and cradle (8) from pintle support (5).



**OPERATING AUXILIARY EQUIPMENT (continued)**

**Chemical Agent Detection and Alarm System**

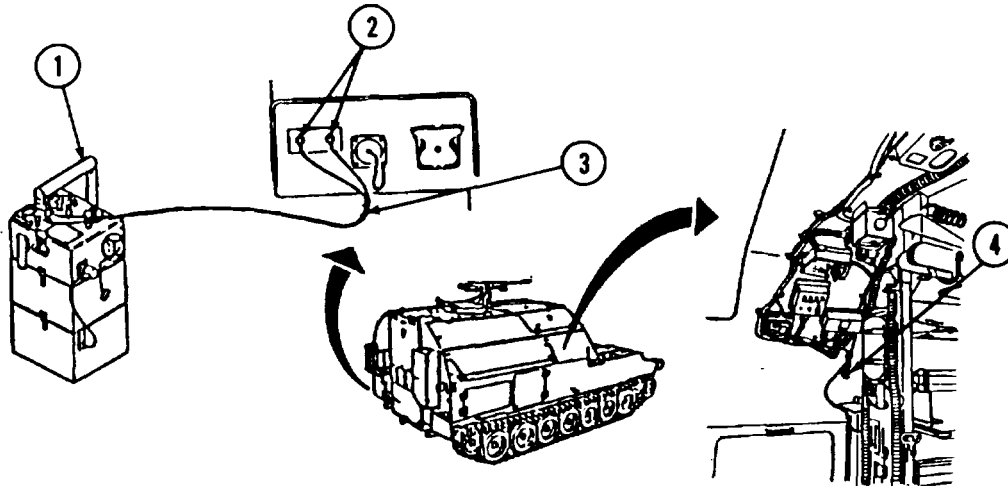
An M43 detector unit (1), an M42 alarm unit (2), and an M229 refill kit (3) provide advance warning of chemical agents in the air.



**OPERATING AUXILIARY EQUIPMENT (continued)*****Operation and Maintenance***

For general operating and maintenance instructions, refer to TM 3-6665-225-12. When used with the M992A1, the instructions that follow also apply.

When vehicle is parked, connect detector unit (1) to vehicle hook-ups (2) via telephone cable (3). Detector unit (1) must then be operated by its own power supply.

**WARNING**

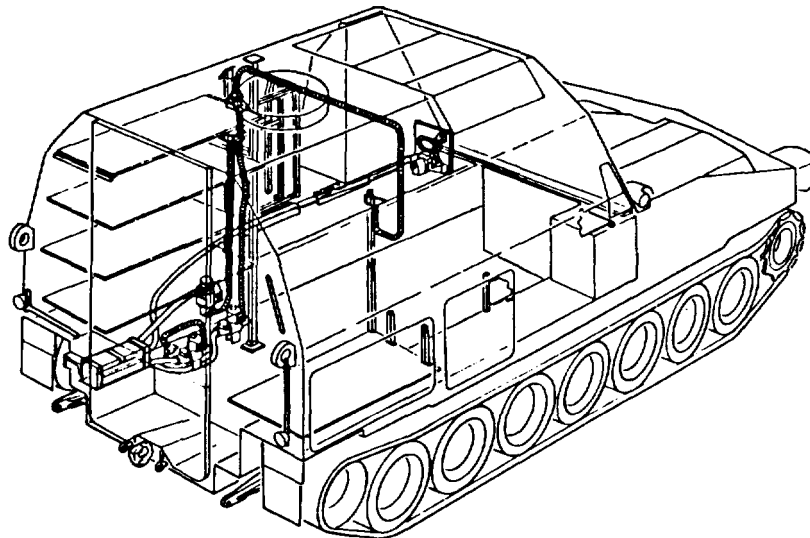
During periods of continuous operation, detector units fluid reservoir and air filter must be changed every 12 hours. When operating less than 12 hours per day, reservoir and filter must be changed daily. See TM 3-6665-22512 for complete Instructions. Failure to do this will greatly reduce effectiveness of the system.

Detector unit may also be used inside cargo compartment during transit, but its effectiveness will be greatly reduced. Power for detector unit operation will come from the vehicle electrical system. To operate detector unit using vehicle power, connect electrical wiring harness (4) to detector, and turn vehicle MASTER switch to ON.

**OPERATING AUXILIARY EQUIPMENT (continued)****Ventilated Face Piece System (VFPS)****WARNING**

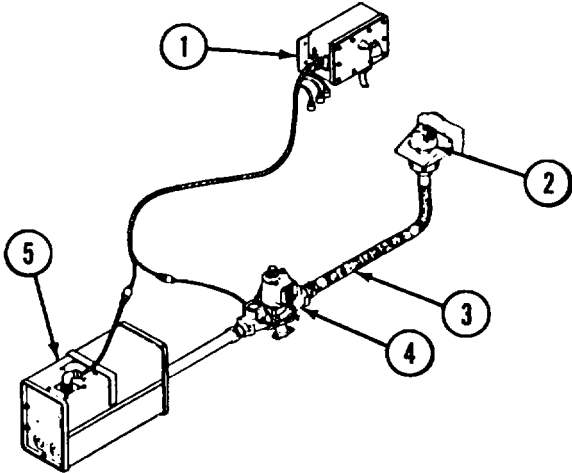
Air purifier unit filters must be kept dry. Filters which have been wet will not provide protection from NBC contaminants.

- If temperature is less than 40°F (4.4°C) outside, there is danger of lung damage from inhaling cold air. DO NOT connect hose to your mask canister until filter unit has been operating for at least 15 minutes with heater turned on.
- Do not try to change filters yourself. If they are contaminated, special safety precautions must be taken.
- After suspected NBC exposure, all air filter media shall be handled only by personnel wearing full NBC protective equipment.



**OPERATING AUXILIARY EQUIPMENT (continued)**

The M992A1 VFPS includes an M2A2 air purifier (5), four M3 heaters (4), eight hose assemblies (3), four air outlet orifices (2), and a control box (1).

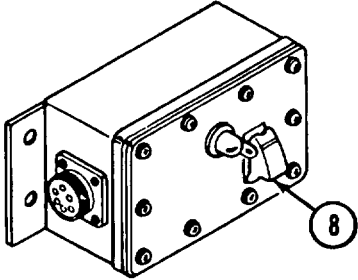
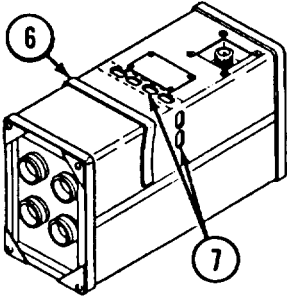


**Starting and Operating**

**NOTE**

MASTER switch must be set to ON to operate VFPS.

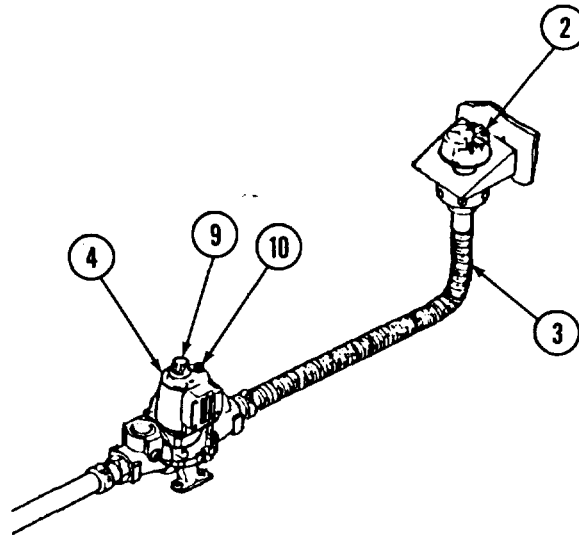
- 1. Put on and adjust face piece.
- 2. Position spring clip (6) up to open two air purifier inlet holes (7).



- 3. Turn vehicle MASTER switch to ON, and turn VFPS control box switch (8) to ON.

**OPERATING AUXILIARY EQUIPMENT (continued)**

4. During cold-weather operations (outside temperatures below 40°F [4.40C]), turn on your individual M3 heater (4) and rotate knob (9) clockwise to increase air temperature. Green light (10) should illuminate when knob is rotated. Allow air to warm for 15 minutes before attaching hose to canister on face piece.
5. Disconnect hose assembly (3) from air outlet orifice (2), and connect hose assembly (3) to canister on face piece.

***Stopping and Stowing***

1. Turn off M3 heater (4), if applicable.
2. Turn VFPS control box switch (8) and vehicle MASTER switch to OFF.
3. Disconnect hose assembly (3) from canister on face piece, and connect hose assembly (3) to air outlet orifice (2).
4. Remove and stow face piece.
5. Move spring clip (6) down to cover two air purifier inlet holes (7).

**OPERATING AUXILIARY EQUIPMENT (continued)*****Maintenance*****WARNING**

**Crewmembers are not authorized to change contaminated filters. Changing contaminated filters can result in severe injury or death to personnel.**

1. Notify Unit maintenance to change M12A1 gas filter and/or M13 particulate filter when one or more of the following conditions are observed:
  - Physical damage
  - Water immersion
  - Low airflow to face pieces
  - 5,000-mile vehicle overhaul (peacetime operation)
  - 10,000 hours of vehicle operation (no chemical agents used-wartime operation)
  - 1500 hours (approximately five months) of vehicle operation (chemical agents used-wartime operation)
  - After each CK (cyanogen chloride-a blood agent) attack
  - At beginning of combat conditions and when use of CK is expected
  
2. Notify Unit maintenance to replace spring clip if:
  - Clip is missing or damaged
  - Rubber gasket is missing or does not seal properly

**[Text Deleted]**

**OPERATING AUXILIARY EQUIPMENT (continued)**

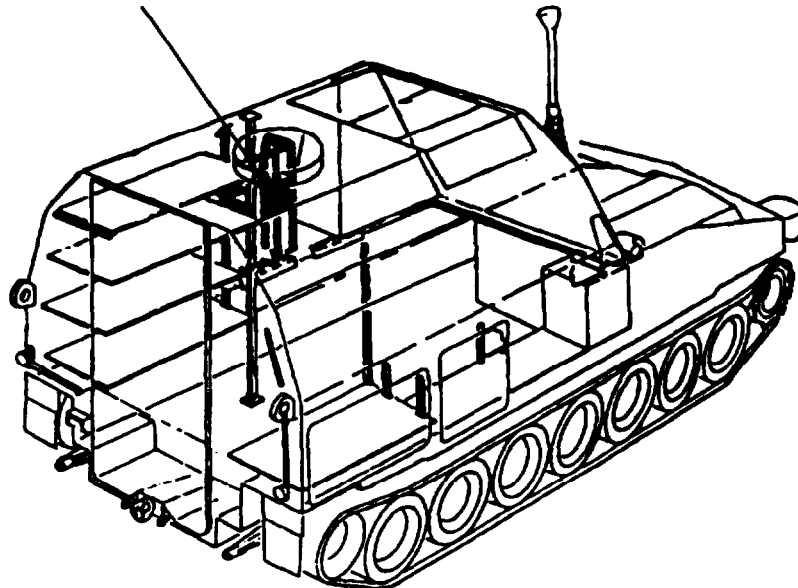
**Operating Mounted Water Ration Heater (MWRH)**

**NOTE**

Fill the MWRH only when it is removed from mounting bracket and set low enough that fill lines can be seen.

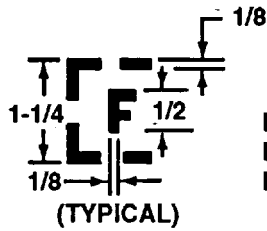
Refer to TM 10-7310-241 -12&P for the operation and maintenance of the MWRH.

**MWRH; LEFT WALL, CREW  
COMPARTMENT.**

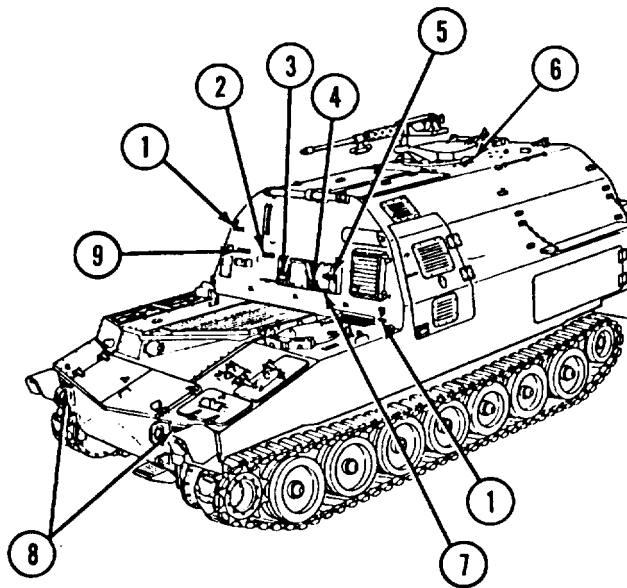


**STENCIL MARKINGS**

Apply stencils to clean, painted surfaces only. Use black enamel (Class A, specification TT-E -489). When possible, position stencil so it is covered by the item named when the item is stowed in its proper place. Stencil dimensions are shown below; stencil locations are shown on pages 2-205 through 2-211.



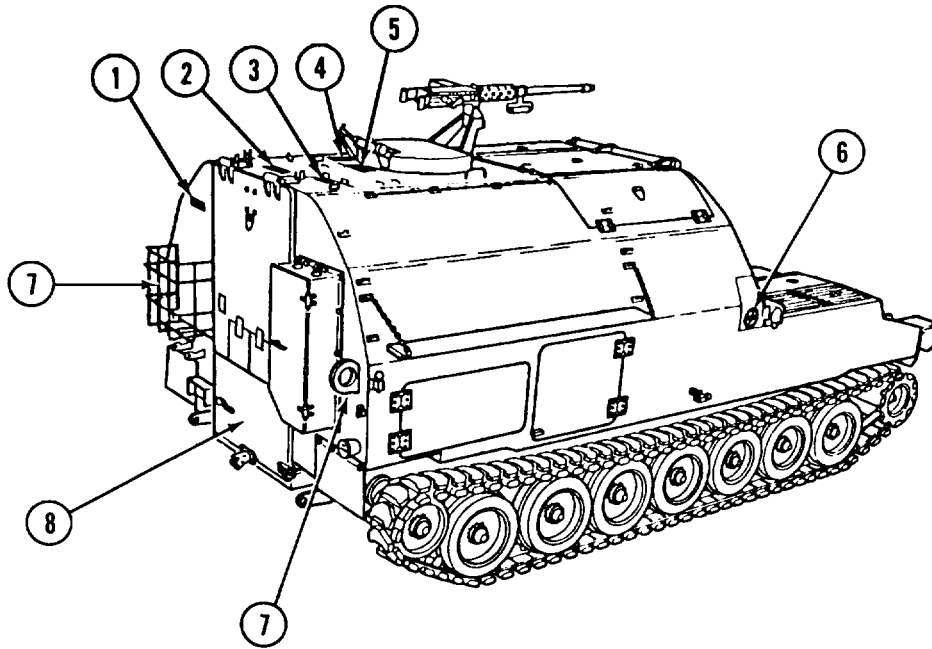
**NOTE:** These are the dimensions for the letters and borders of most stencils. Dimensions are in inches.



- 1. TOW CABLE
- 2. WATER CAN
- 3. AXE
- 4. MATTOCK
- 5. SHOVEL
- 6. LIFTING BEAM
- 7. MATTOCK HANDLE
- 8. LIFT HERE
- 9. TRACK FIXTURE

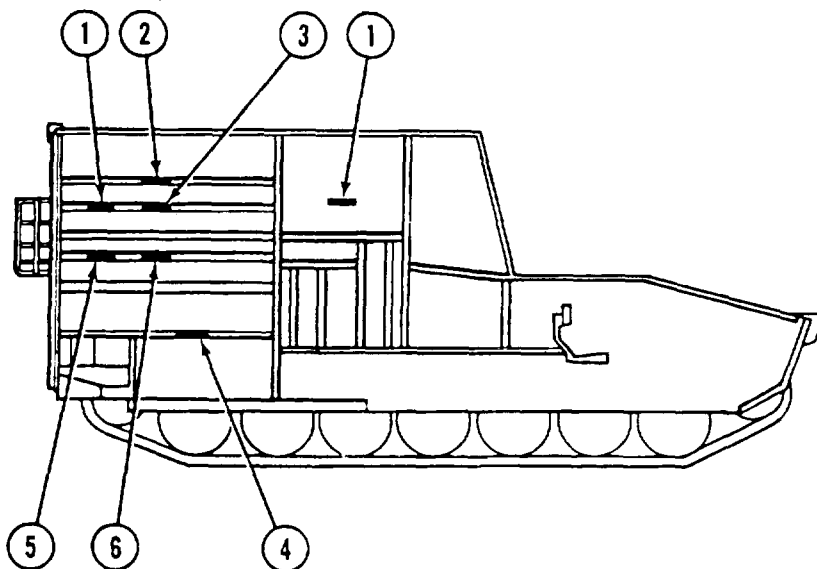


STENCIL MARKINGS (continued)



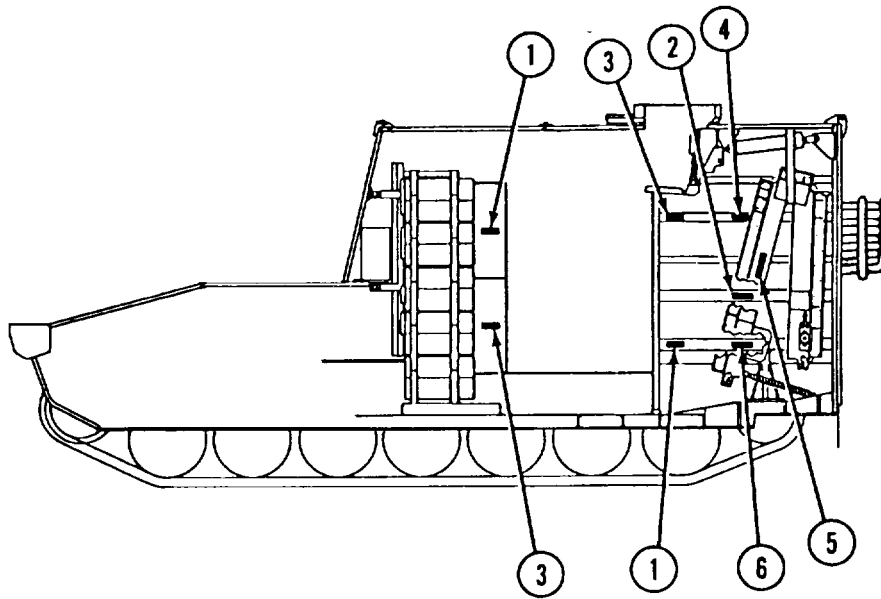
1. BEDROLL
2. SHOVEL
3. PICK
4. CROWBAR
5. 0.50-CAL BARREL
6. DIESEL FUEL
7. LIFT HERE (note: above bracket on both sides of vehicle)
8. DECONTAMINATION APPARATUS

STENCIL MARKINGS (continued)



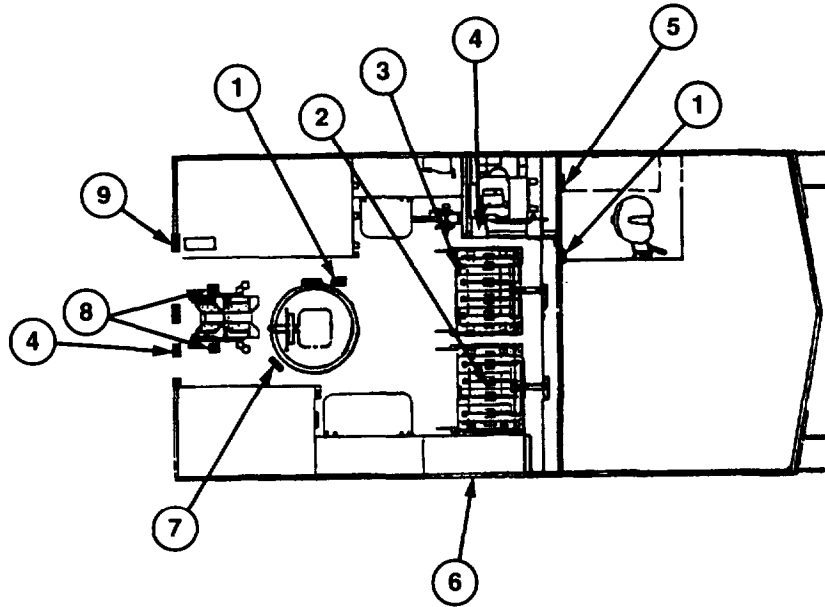
- 1. M13A2 POWDER CAN 155MM
- 2. FUSES
- 3. LRT
- 4. COPPERHEAD CONTAINERS 155MM
- 5. LRB
- 6. PA37A1 POWDER CAN 155MM

STENCIL MARKINGS (continued)



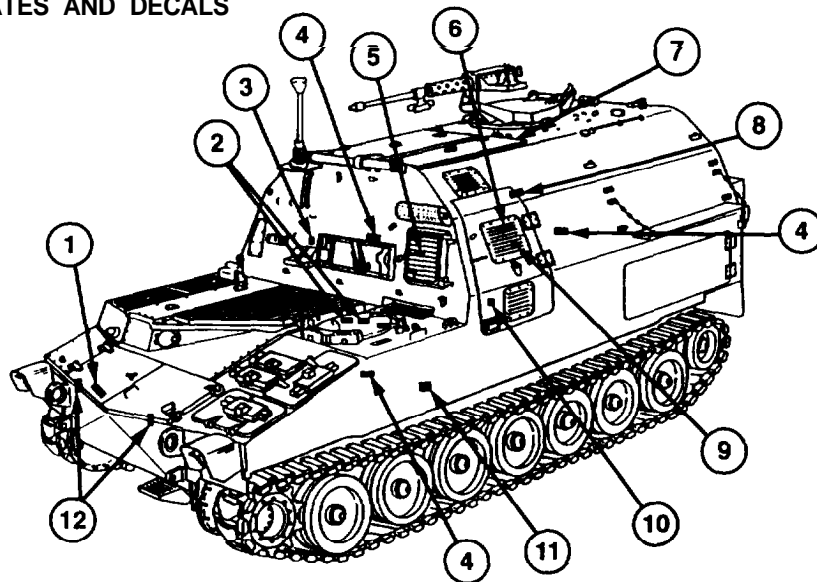
1. PA37A1 POWDER CAN 155MM
2. M13A2 POWDER CAN 155MM
3. RRM
4. RIFLE M16A2 (note: one each side of conveyor)
5. RRT
6. RRB

STENCIL MARKINGS (continued)



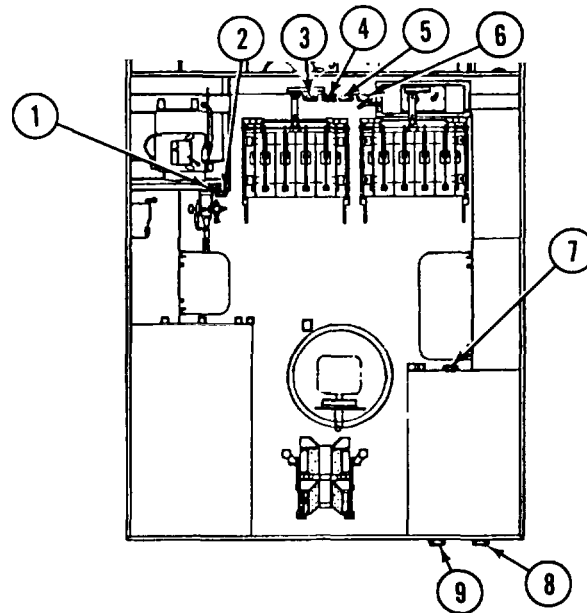
- 1. FLASHLIGHT
- 2. M14A2 POWDER CAN 155 MM
- 3. PA37A1 POWDER CAN 155 MM
- 4. FIRE EXTINGUISHER
- 5. M45 PERISCOPE
- 6. SUITS
- 7. BINOCULARS
- 8. RIFLE M16A2
- 9. UP-DOWN (top and bottom switches)

NAMEPLATES AND DECALS



KEY	ITEM/LOCATION	DESCRIPTION
1	Main engine oil filter change instruction on oil filter	Cautions against use of bypass-type filter elements
2	Engine overheating cautions in driver's compartment	Do's and Don'ts to prevent engine overheating conditions
3	Hydraulic oil filter at front wall of crew compartment	Instructions for frequency and method of changing filter
4	High-intensity noise caution plates in driver's compartment and crew compartment	Warning to wear hearing protection when vehicle is operating
5	APU engine crankcase oil fill/level in APU compartment	Instructions for filling and checking level
6	APU emergency fuel shutoff in the APU	Instructions for shutting off fuel to the APU
7	Communications equipment shutoff caution on ceiling forward of commander's cupola	Caution to turn off communication equipment before starting or stopping engine
8	Selector valve instruction plate at hydraulic controls	Instructions to engage backup pump system
9	APU oil filter at inboard side of APU engine	Instructions for frequency and method of changing filter
10	Chaincase oil drain/fill instruction in APU compartment	Instructions and precautions for servicing APU chaincase
11	Identification plate in drivers compartment	Identification of model and specification information
12	Main engine fuel filter change instruction on fuel filter	Filter-draining instructions

NAMEPLATES AND DECALS (continued)



KEY	ITEM/LOCATION	DESCRIPTION
1	Personnel heater warning decal on APU compartment wall in crew compartment	Warns against placing flammable or explosives on or near heater
2	Crew AFES No. 3 cylinder warning decal on APU compartment wall in crew compartment	Warns against removing locking pin during bottle installation and not removing pin after manual discharge cable has been connected.
3	Crew AFES No. 1 cylinder warning decal on rear wall behind left projectile rack assembly	Warns against removing locking pin
4	Engine AFES No. 1 cylinder warning decal on rear wall behind left projectile rack assembly	Warns against removing locking pin
5	Crew AFES No. 4 cylinder warning decal on rear wall behind left projectile rack assembly	Warns against removing locking pin during bottle installation and not removing pin after manual discharge cable has been connected
6	Engine AFES No. 2 cylinder warning decal on bracket on rear wall behind left projectile rack assembly	Warns against removing locking pin during bottle installation and not removing pin after manual discharge cable has been connected
7	Crew AFES No. 2 cylinder warning decal on right rear canister compartment	Warns against removing locking pin
8	Crew AFES No. 6 cylinder warning decal on rear wall in fire extinguisher box assembly	Warns against removing locking pin
9	Crew AFES NO. 5 cylinder warning decal on rear wall in fire extinguisher box assembly	Warns against removing locking pin

**Section IV. OPERATION UNDER UNUSUAL CONDITIONS**

**NOTE**

- When operating vehicle in extremes of temperature, humidity, and terrain conditions, special care in lubricating and cleaning must be observed.
- FM 21-17 contains important instructions on driver selection, training, and supervision. FM 21-17 also gives driving instructions for operating your equipment under all conditions.

Vehicle armament maintenance procedures are the same as operating under usual conditions. The only difference is to use Lubricating Oil for Aircraft Weapons (LAW) in cleaning and lubricating to ensure proper functioning of your M2 0.50-caliber machine gun.

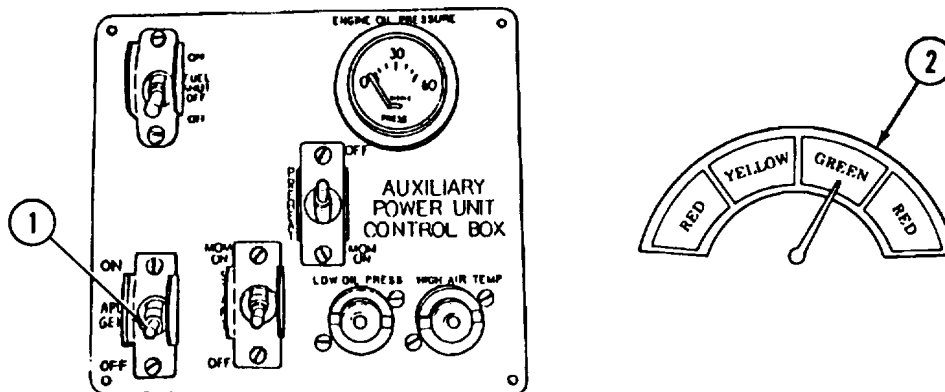
**STARTING MAIN ENGINE IN COLD WEATHER**

**NOTE**

Cold-weather starting procedures are to be used at 00F (-17.8°C) and below. However, these procedures also apply when vehicle won't start at 40°F (4.40C). Glow-plug switch and starter switch must be activated at the same time.

**Prestarting Procedure**

1. Start the APU (p. 2-216).
2. After the APU has been running for 3 minutes, turn ON APU Generator switch (1).
3. After the APU has been running for 15 minutes, turn OFF APU Generator switch (1) and check BATTERY-GENERATOR indicator (2).

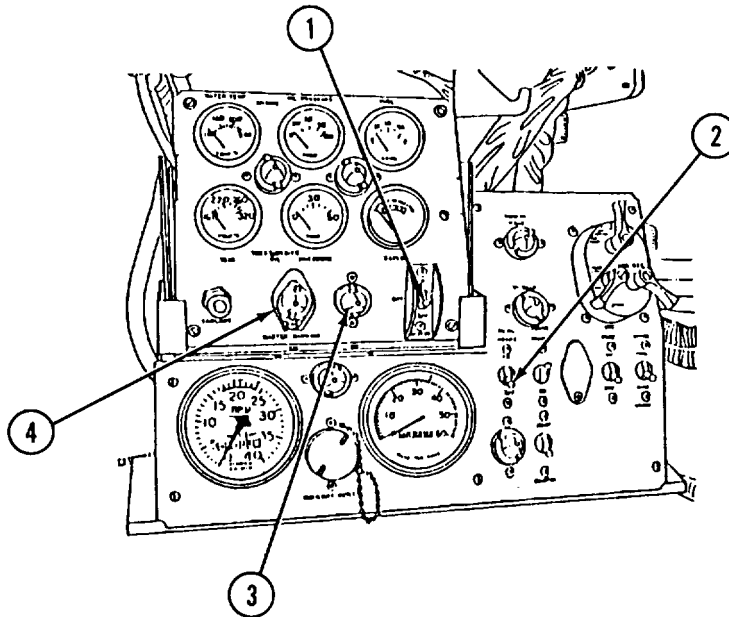


**STARTING MAIN ENGINE IN COLD WEATHER (continued)**

4. If BATTERY-GENERATOR indicator (2) indicates at least mid-yellow, turn APU Generator switch (1) to ON and attempt cold-weather main engine start according to procedure on page 2-213.
5. If BATTERY-GENERATOR indicator (2) indicates less than mid-yellow, again turn APU Generator switch (1) to ON and continue charging batteries before starting.
6. Periodically check BATTERY-GENERATOR indicator (2) by turning APU Generator switch (1) to OFF. When gage indicates mid-yellow or better, commence cold-weather start (p. 2-213).

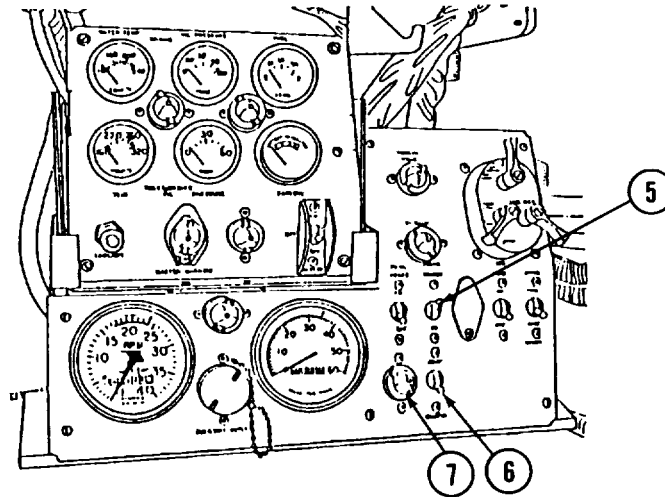
**Starting the Main Engine**

1. Remove and roll up tarpaulins (p. 2-219). Secure tarpaulins with webbing assemblies (p. 2-219).
2. Charge batteries (p. 2-125).
3. Press down on service brake pedal, pull out and down on brake lock handle, then release handle to set brake.
4. Shift into neutral (N).
5. Move MASTER switch (1) to ON. Indicator lamp (3) and MASTER warning lamp (4) will light.



6. Turn FUEL PRIME switch (2) to ON for 45 seconds and release.



**STARTING MAIN ENGINE IN COLD WEATHER (continued)****NOTE**

- When starter switch is engaged, glow-plug lamp will stop flashing and stay on for one minute after release of starter switch.
  - If starter switch is not engaged within one minute after glow-plug lamp starts to flash, glow plugs and glow-plug lamp will turn off.
  - If glow-plug lamp does not turn off after engine starts, notify the Section Chief and Unit maintenance.
7. For all starts using glow-plug system, put engine throttle in full throttle position. Momentarily turn on glow-plug switch (5); glow-plug indicator lamp (7) will turn on. After 35 seconds, when glow-plug indicator lamp (7) flashes on /off, engage starter (6). Hold starter (6) on for two or three seconds, but no more than five seconds. Do not move engine throttle. Engine should start and increase in speed. When engine speed (rpm) reaches 1500-1800 rpm, reduce throttle and hold engine speed to 1200-1500 rpm. If engine does not start after first attempt, turn on glow-plug switch (5) and repeat starting procedure. If engine does not start after four attempts of starter engagement, stop starting ) procedure and notify Unit maintenance.

**CAUTION**

**Manual override procedure should be used in emergencies only. Frequent manual overrides will damage glow-plug system.**

8. If engine does not start, a manual override procedure may be used, as determined by the Section Chief. This procedure is as follows: Hold glow-plug switch (5) at ON. After 35 seconds engage starter (6); when engine starts, continue to hold glow-plug switch (5) on until engine speed reaches 1500 rpm and then release glow-plug switch (5). If engine does not start after four attempts of starter engagement, or glow-plug indicator lamp (7) does not turn on, stop starting procedure and notify Unit maintenance.

**STARTING MAIN ENGINE IN COLD WEATHER (continued)**

9. With brakes still locked, set throttle to run engine at 1200 rpm and shift transmission to fourth gear position. When engine coolant temperature gage indicates 120°F to 140°F, shift into neutral and idle engine. (If transmission temperature approaches 300°F during warm-up, immediately shift to neutral until temperature approaches normal range.)
10. During warm-up, refer to instrument panel checkout procedure (p. 2-88).

**STARTING THE APU IN EXTREMELY COLD WEATHER****CAUTION**

**To avoid damaging radio components, turn OFF all electrical and radio switches before starting the APU.**

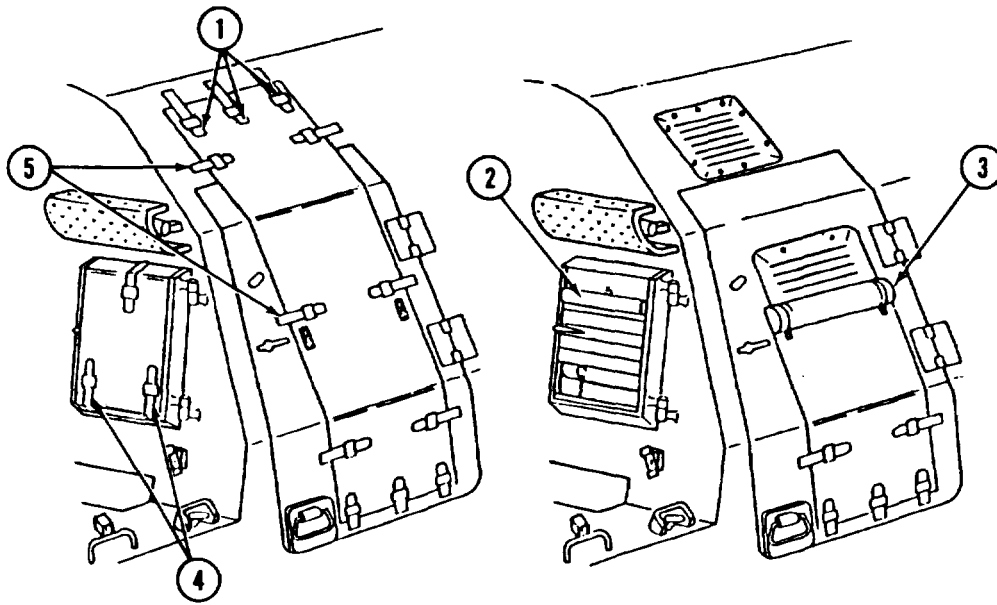
**NOTE**

- Before you start the APU in extremely cold weather (<sup>0°</sup> to -65°F; -17.80C to -53.90C), refer to Appendix E to check:
  - Engine crankcase oil grade and level
  - Chaincase oil grade and level
  - Hydraulic oil grade and level
- Change oil as necessary (see Appendix E).
- When temperature is below -25°F (-31.7°C) outside, preheat APU compartment (p. 2-219) prior to starting the APU.

**Starting When Temperature is 0<sup>0°</sup> to -25°F (-17.8°C to -31.7°C)****CAUTION**

**To avoid excessive demand on batteries, do not crank engine longer than 1 minute at a time. Do not attempt to start the APU for longer than 5 minutes total. If the APU does not start in 5 minutes, notify Unit maintenance.**

## STARTING THE APU IN EXTREMELY COLD WEATHER (continued)

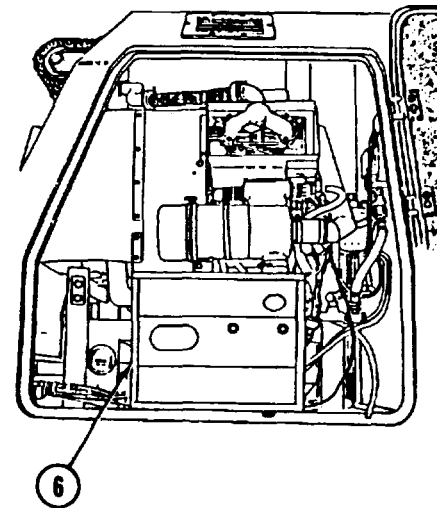


1. Unfasten two straps of paulin (4) at APU front door. Roll paulin upward into smallest tube possible and secure with webbing and chape (2).
2. Unfasten three straps (1) across top of APU side door paulin, and unfasten strap (5) at each side near top.
3. Place ends of unfastened straps (5) inward, and roll freed portion of paulin downward into smallest tube possible. Secure rolled paulin with webbing and chape (3).
4. Open side APU door and APU plenum door (6), and close side APU door.

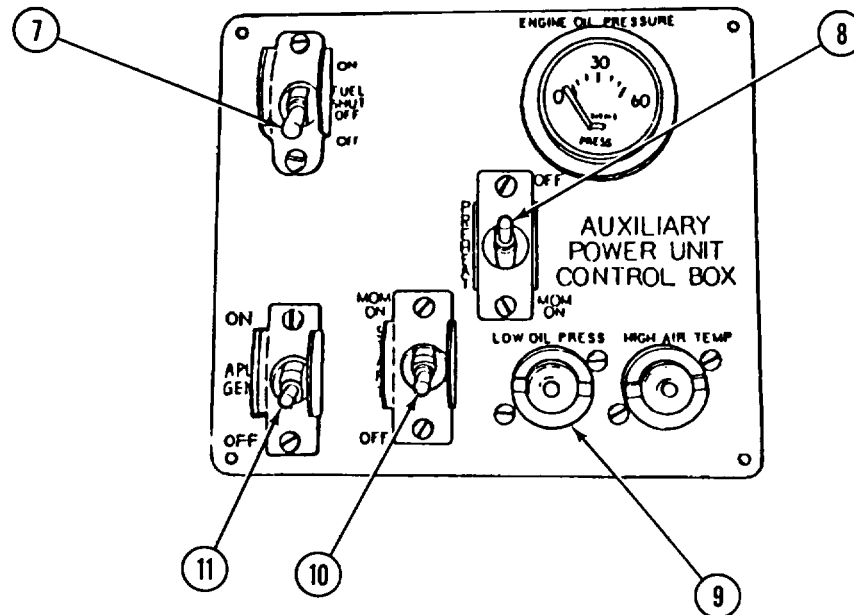
**CAUTION**

**To avoid damaging radio components, turn off all electrical and radio switches before starting the APU.**

5. Turn OFF all electrical and radio switches.
6. Turn MASTER switch to ON.



## STARTING THE APU IN EXTREMELY COLD WEATHER (continued)



7. Check that APU Generator switch (11) is set to OFF.
8. Turn FUEL SHUTOFF switch (7) to ON. The LOW OIL PRESSURE lamp (9) will light until APU engine starts.
9. Turn PREHEAT switch (8) to MOMentary ON. Hold switch at ON for 2 minutes.

**NOTE**

If APU engine doesn't start within 30 seconds, release START switch but continue to hold PREHEAT switch at ON for another minute. After allotted time, position START switch at ON again. If engine still does not start after another 30 seconds of starting procedure, refer to procedure for starting the APU when outside temperature is -25° to -65°F (-31.70C to -53.90°C) (p. 2-219).

10. While holding PREHEAT switch at ON, position and hold START switch (10) at MOMentary ON. Hold both switches at ON until 30 seconds have passed, then release. APU should start.

**STARTING THE APU IN EXTREMELY COLD WEATHER (continued)****NOTE**

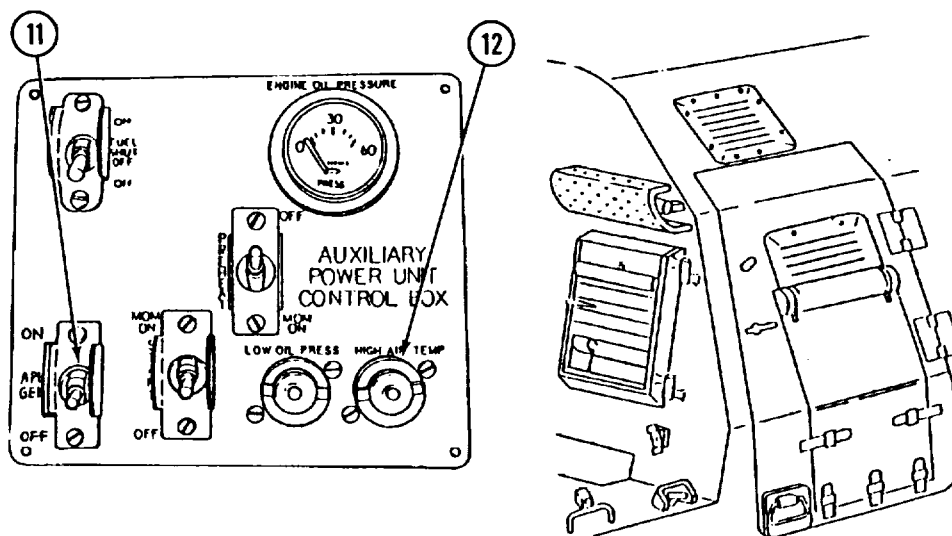
If the APU gasps or stalls after a successful start, secure all straps on paulin at APU side door. Monitor APU HIGH AIR TEMPerature lamp.

11. After the APU has run smoothly for at least 3 minutes, turn APU GENerator switch (11) to ON.

**CAUTION**

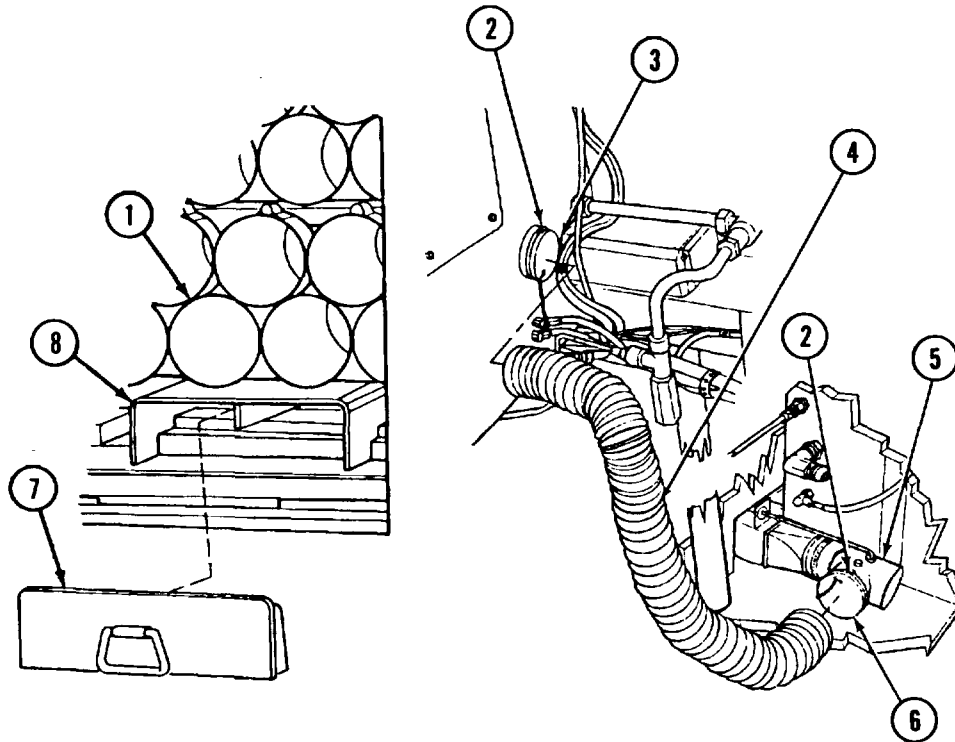
**Watch APU HIGH AIR TEMPerature lamp closely when operating the APU with side door paulin installed. Failure to do this may lead to damage to the APU.**

12. If APU HIGH AIR TEMPerature lamp (12) lights, close APU plenum door. This will cool the APU.



**STARTING THE APU IN EXTREMELY COLD WEATHER (continued)****Starting When Temperature Is -25° to -65°F (-31.70C to -53.9°C)**

1. Open driver's hatch door (p. 2-143).
2. Open lower rear door (p. 2-137).
3. Install cover plate (7) into opening of heater vent (8) under projectile rack assemblies (1). Install top of cover plate (7) first and bottom last. Plate should flex sufficiently to fit over vent opening completely.



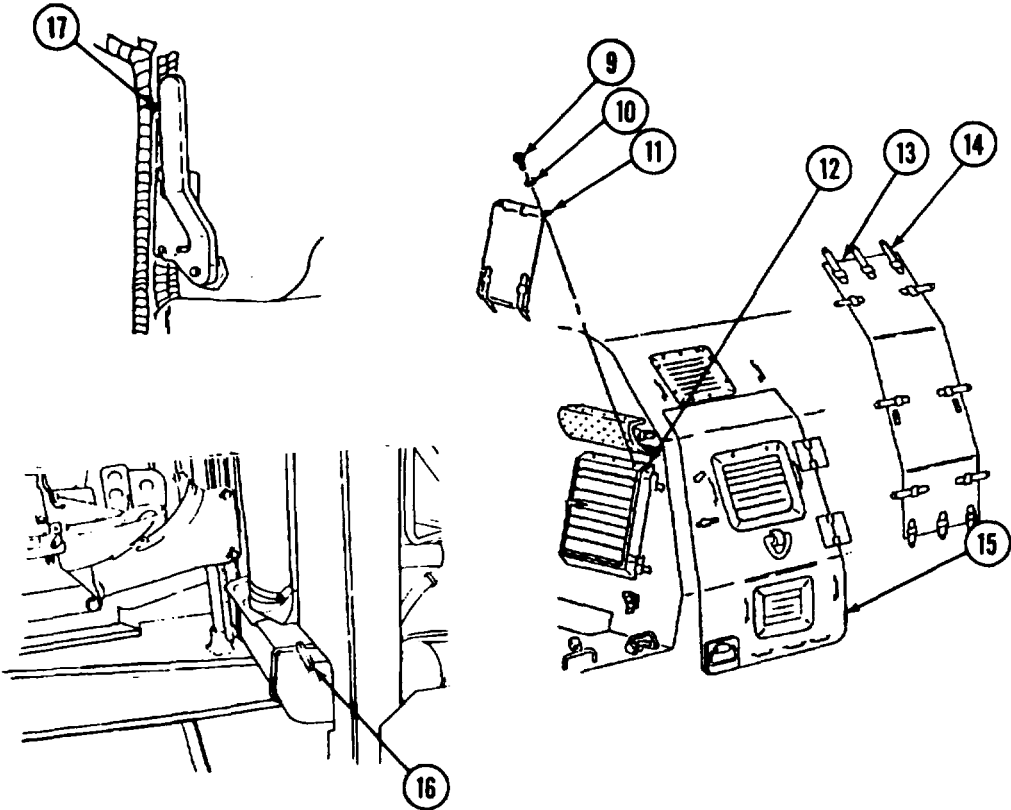
4. Loosen two clamps (2) and remove two caps (3 and 6) from APU compartment wall and personnel heater duct (5).
5. Install hose (4) on APU compartment wall (2) and personnel heater duct (5) with two clamps (2).

**STARTING THE APU IN EXTREMELY COLD WEATHER (continued)**

**NOTE**

Pushing tee handle will restrict flow of warm air to driver's station.

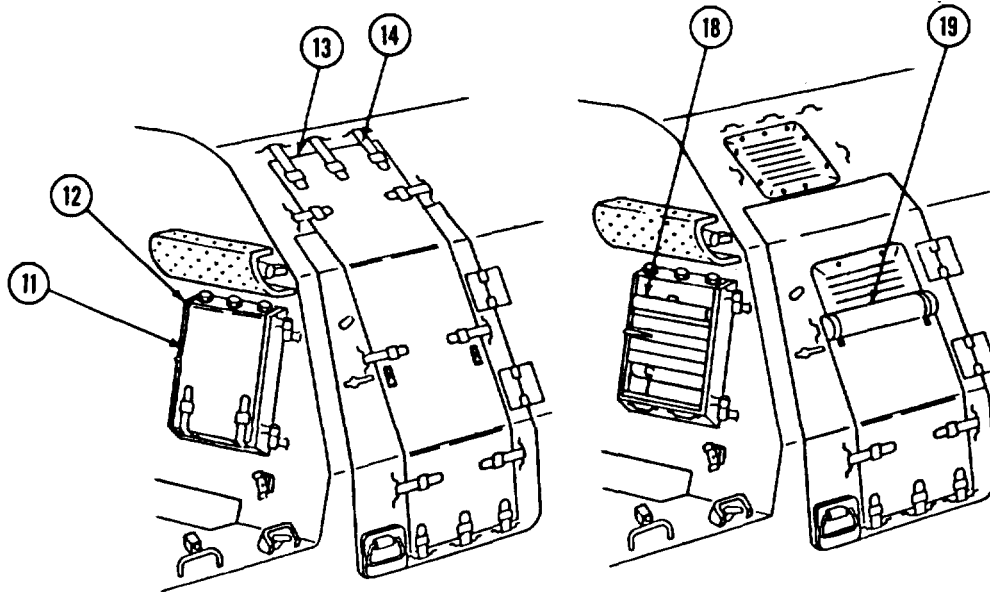
- 6. Install front door paulin (11) on APU front door (12) with three screws (9) and washers (10).
- 7. Install side door paulin (13) on APU side door (15) with 11 straps (14).
- 8. Push in tee handle (16) on driver's heat control.
- 9. Turn ON personnel heater (p. 2-186)
- 10. Push up on air duct control handle (17) located behind driver's seat, thereby restricting flow of warm air into exhaust air and blower plenum box.



**STARTING THE APU IN EXTREMELY COLD WEATHER (continued)****NOTE**

All heated air from personnel heater should now be ducted through APU heater hose into APU compartment.

11. Allow APU compartment to warm for 15 to 30 minutes (depending on outside temperature) before attempting to start the APU.
12. Turn OFF personnel heater (p. 2-187).



13. Unfasten two straps of paulin (11) at APU front door (12). Roll paulin upward into smallest tube possible and secure with webbing and chape (18).
14. Unfasten three straps (14) across top of APU side door paulin (13), and unfasten two straps (14) at each side near top.
15. Place both ends of unfastened straps (14) inward, and roll freed portion of paulin downward into smallest tube possible. Secure rolled paulin with webbing and chape (19).



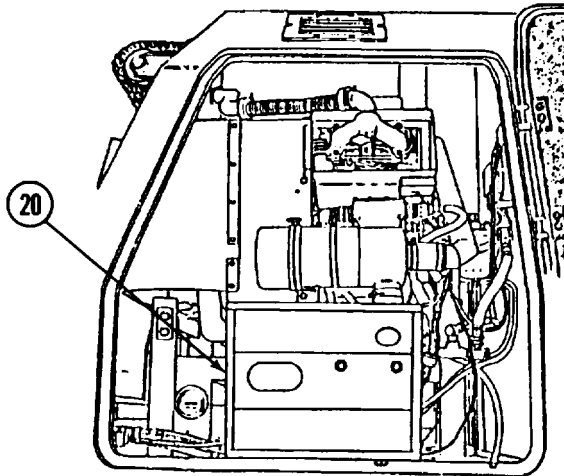
**STARTING THE APU IN EXTREMELY COLD WEATHER (continued)**

16. Open side APU door (p. 2-142) and APU plenum door (20), and close side APU door.

**CAUTION**

**To avoid damaging radio components, turn off all electrical and radio switches before starting the APU.**

17. Turn OFF all electrical and radio switches (except MASTER switch and personnel heater switches).
18. Make sure APU GENERator switch (26) is OFF.



19. Turn FUEL SHUT OFF switch (21) to ON. The LOW OIL PRESSure lamp (24) will light until APU engine starts.
20. Turn PREHEAT switch (22) to MOMentary ON. Hold switch ON for 2 minutes.

**CAUTION**

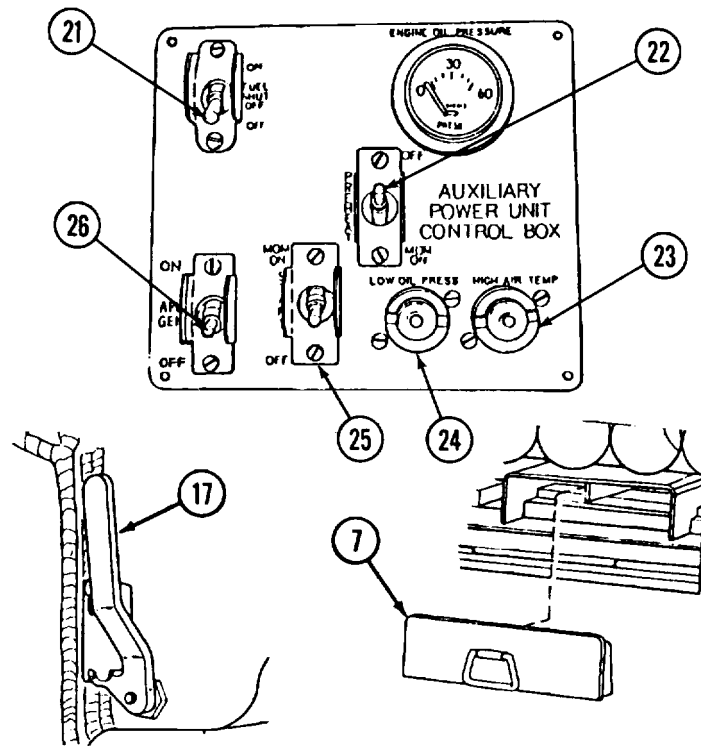
**To avoid excessive demand on batteries, do not crank engine longer than 1 minute at a time. Do not attempt to start the APU for longer than 5 minutes total. If the APU doesn't start in 5 minutes, notify Unit maintenance.**

21. While holding PREHEAT switch (22) at ON, position and hold START switch (25) at MOMentary ON. Hold both switches at ON until 30 seconds have passed, then release. APU should start.
22. If APU engine does not start, hold PREHEAT switch (22) at ON for another minute. After allotted time, repeat step 21. If engine still does not start, turn FUEL SHUT OFF switch (21) to OFF and allow the APU to heat for an additional 15-30 minutes and repeat steps 18 through 21. Troubleshoot the APU if engine has not started after this action.

## STARTING THE APU IN EXTREMELY COLD WEATHER (continued)

**CAUTION**

Watch APU HIGH AIR TEMPerature lamp closely when operating the APU with winterization kit installed. If HIGH AIR TEMPerature lamp lights, remove paulin from APU side door and close plenum door. Failure to do this may lead to damage to the APU.

**NOTE**

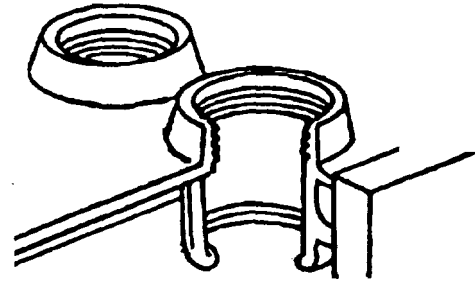
If the APU gasps or stalls after successful start, loosen cover on APU front door and restart.

23. After the APU has run smoothly for at least 3 minutes, turn on APU GENERATOR switch (26) at APU control panel. Remove cover plate (5) from heater vent (4).
24. If APU HIGH AIR TEMPerature lamp (23) lights, remove paulin from APU side door (p. 2-220) and close APU plenum door. This will cool the APU.
25. Pull down on air duct control handle (17) to allow vent blower to exhaust air, if required.
26. Close lower rear door (p. 2-137) and personnel door (p. 2-134).
27. Start main engine (p. 2-212), if desired.

## SLAVE STARTING DISABLED VEHICLE USING MAIN ENGINE

Before trying to slave start a disabled vehicle, take these preliminary actions:

- Check batteries for damage. Notify Unit maintenance if batteries are damaged.
- Check electrolyte level (TM 9-6140200-14). Add distilled water as necessary.



FILL TO BOTTOM OF RING

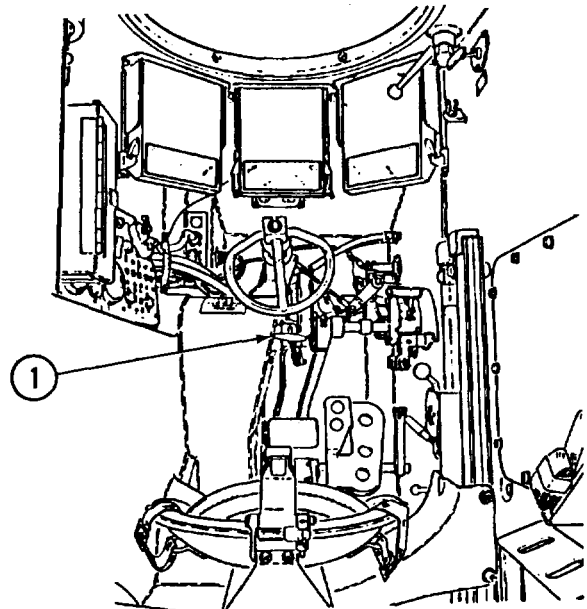
### **WARNING**

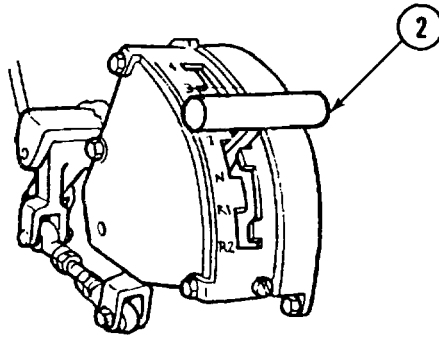
- Do not park M992A1 in front of disabled vehicle. Personnel injury or damage to vehicles could occur if vehicle rolls forward.
- Do not allow vehicles to touch. Allow enough space between them to permit working room. Shorted circuits could allow electricity to flow through vehicles, causing injury to personnel and/or damage to equipment

### **NOTE**

- Use only front slave receptacle to slave start vehicle.
- Before applying the service brake while on steep slopes (greater than 20 percent), adjust the driver's seat so you can apply maximum leverage to the brake.

1. Set parking brakes (1) on both vehicles (p 2-84).



**SLAVE STARTING DISABLED VEHICLE USING MAIN ENGINE (continued)**

2. Place shift lever (2) of each vehicle in neutral (N) position.
3. Turn ON MASTER switch in disabled vehicle and check to see if there is enough power to activate gages and interior lights. If not, refer to Charging Dead Batteries with the APU (p. 2-127).

**WARNING**

**To avoid personal injury and vehicle damage, turn OFF MASTER switch and other electrical switches.**

4. Turn MASTER switch (3) in each vehicle to OFF.

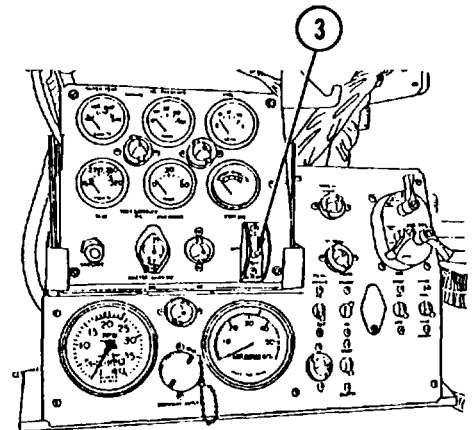
**NOTE**

It is not necessary to stop M992A1 main engine. It will continue to run with MASTER switch OFF.

5. Turn OFF all electrical switches in disabled vehicle.

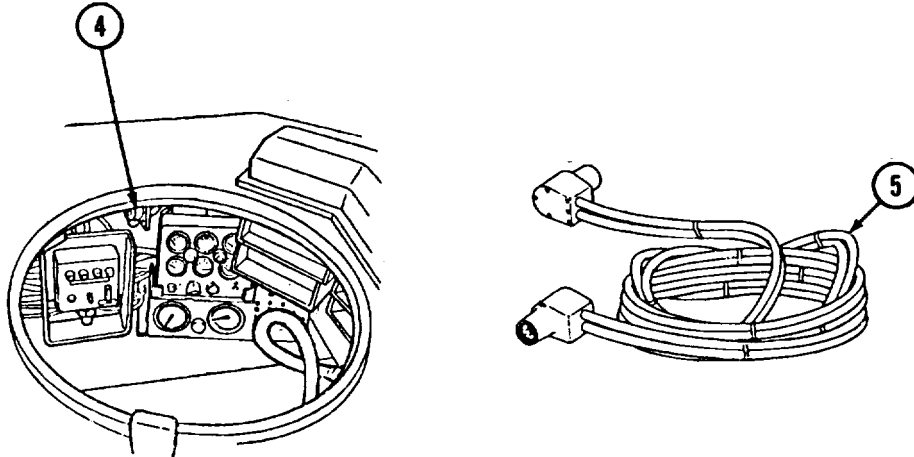
**NOTE**

Only use slave receptacle in driver's compartment of M992A1 for this procedure.



**SLAVE STARTING DISABLED VEHICLE USING MAIN ENGINE (continued)**

6. Attach slave cable (5) securely to slave receptacle (4) at each vehicle.



7. Turn MASTER switch to ON in operational M992A1. Set engine speed to 600 rpm.  
 8. Turn MASTER switch to ON in disabled vehicle.  
 9. Allow batteries in disabled vehicle to charge for 5 minutes before trying to start vehicle.  
 10. Try to start disabled vehicle. If it will not start, notify Unit maintenance.

**WARNING**

**To prevent injury, make sure that MASTER switch is turned to OFF in both vehicles before disconnecting slave cable.**

**CAUTION**

**To avoid damaging the charging system of the functioning vehicle, do not rev its engine above 600 rpm while slave starting another vehicle.**

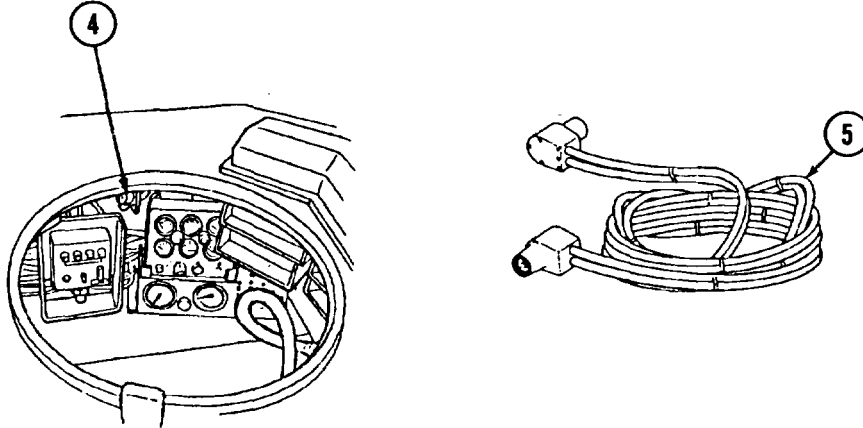
**NOTE**

It is not necessary to turn MASTER switches to OFF in both vehicles if both vehicles are M992A1 s. If slave starting any other vehicle, refer to that vehicle's operator's manual for slave starting.

11. After engine in disabled vehicle is running smoothly, turn MASTER switches OFF in both vehicles.

**SLAVE STARTING DISABLED VEHICLE USING MAIN ENGINE (continued)**

12. Disconnect slave cable (5) from slave receptacle (4) at each vehicle.
13. Turn both MASTER switches to ON again.

**NOTE**

After disconnecting slave cable, run both engines at 1000 rpm to stabilize generators (alternators) and charge batteries.

**DRIVING OVER UNUSUAL TERRAIN****Mud**

- Use first gear. Move steadily to prevent becoming stuck.
- If vehicle becomes stuck, do not dig deeper by attempting to drive out. Arrange for towing.
- If freezing temperatures are expected, park vehicle on solid ground to prevent tracks from freezing in mud.

**Snow**

- Drive carefully.
- When ascending grades, steer as straight as possible. Avoid sharp turns.
- It may be possible for vehicle to ride on heavily crusted snow with only occasional breakthrough. To climb back onto crust, shift into first gear and accelerate slowly to obtain forward movement without slippage.

**Ice**

- Drive slowly and cautiously to avoid skidding. If vehicle skids, slow down and proceed with caution. Do not spin tracks.

**DRIVING OVER UNUSUAL TERRAIN (continued)**

- Avoid grades and sharp turns, if possible.
- When ascending grades, steer as straight as possible.

**Sand**

- Avoid spinning tracks.
- Drive slowly to move vehicle steadily.
- Do not make sharp turns in first gear. Instead, make wide sweeping turns in second or third gear.

**Dust****WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.**

- Frequently check air cleaner restriction indicator (p. 2-148). Clean filter if necessary.

**OPERATING IN EXTREME HOT WEATHER****Driving in Hot Weather**

- Keep ventilating system on during operation.
- Check temperature gages and warning lights often.
- Vehicle may overheat during long, hard towing operations in high gear or when driving at high speeds. Stop to cool vehicle whenever practical.

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.**

- Inspect air cleaner restriction indicator and air cleaners often.
- Inspect oil coolers often. Clean dust, insects, and other debris from oil coolers by brushing off screens or flushing with low-pressure water.

**Parking in Hot Weather**

- Do not park vehicle in sun for long periods of time.

**Parking in Hot Weather (continued)**

- Lubricate weapons more often than in moderate weather because oil evaporates.

**OPERATING IN HUMID OR SALTY ENVIRONMENTS**

When operating in humid or salty climates, you must protect your vehicle against rust and fungus.

1. Check vehicle often for rust and fungus. Clean and lubricate areas where either is evident. Pay particular attention to:
  - Hydraulic tank components.
  - Vision devices (periscopes, lenses).
  - Recesses and low areas where moisture may collect.
2. Wherever paint is chipped, touch-up paint is required immediately to prevent rusting.
3. Lubricate weapons more often.

**OPERATING IN DUSTY OR SANDY ENVIRONMENTS**

Observe the following precautions:

- Park vehicle under shelter; if none is available, cover vehicle with tarpaulins.
- Keep all weapons lubricated and covered when not in use.
- Before firing machine gun, remove lubricants from bolt assembly, receiver, trigger, feed tray, cover assembly, barrel, and other moving parts.

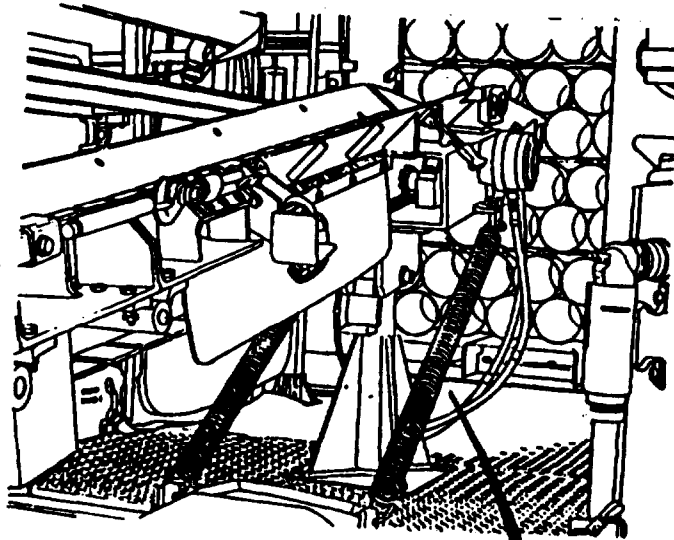
**FORDING****CAUTION**

**Normal fording (without extra equipment) is allowable to a depth up to 42 inches. Make sure hull plates are installed prior to fording operations. Check for soft mud or sandy bottoms. Reduce 42-inch fording depth by estimated amount of vehicle sinkage.**

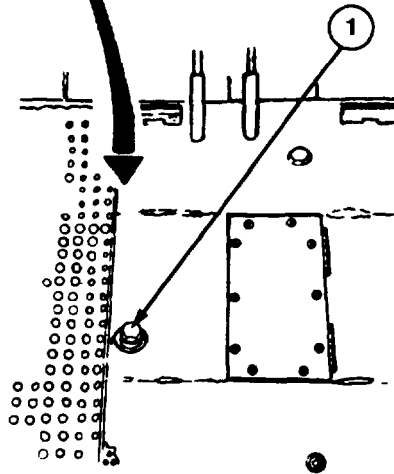
1. Make sure all access plates and 15 drain plug assemblies are installed on bottom of hull. ■



FORDING (continued)



2. Close drain valve (1).
3. To prevent stalling while fording, make sure engine is warm.
4. Enter water slowly.
5. Turn BILGE PUMP switch to ON.
6. Perform after-fording operations.



**After-Fording Operations**

1. Open drain valve (1).
2. Check engine and transmission oil for presence of water. If oil color has changed or water is detected, notify Unit maintenance.
3. When bilge pump is discharging only air, turn BILGE PUMP switch to OFF.
4. Run engine to blow out and evaporate water in/on engine.
5. Perform necessary lubrication procedures (Appendix E) immediately. Pay special attention to roadwheel hubs and idler wheel hubs (p. E-17) after fording.

## EMERGENCY PROCEDURES

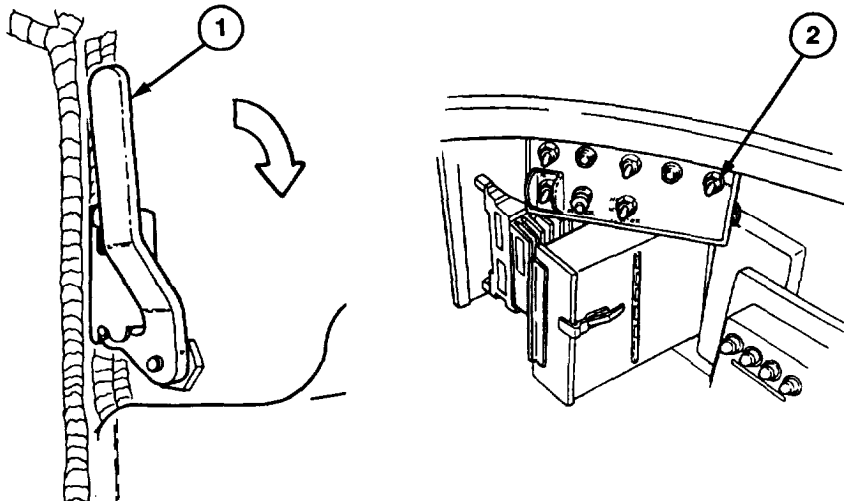
Portable Fire Extinguisher CO<sub>2</sub>**WARNING**

- Remain CALM. Avoid breathing CO<sub>2</sub>. It may quickly cause rapid breathing, loss of consciousness, and suffocation. Quickly exit vehicle if situation permits. If unable to exit, ventilate to remove the extinguisher gas. The driver is at the greatest risk. Ventilate the vehicle before reentry. Failure to follow this emergency procedure can result in serious injury or death to personnel.
  - Fire extinguisher CO<sub>2</sub> can cause severe burns. Do not touch the cone when using fire extinguisher or discharge directly on skin.
  - Handle fire extinguisher carefully. Do not bang or drop cylinder.
1. Immediately notify othercrew members, particularly the driver, of fire detection and intent to use the portable extinguisher CO<sub>2</sub>.

**NOTE**

If vent door will not open or blower motor does not operate in ventilation mode, the driver should open driver's hatch and othercrew members should open the remaining hatches and doors.

2. The driver must immediately pull down on air duct control handle (1) to open the vent door and turn VENTILATOR BLOWER switch (2) to EXHAUST.



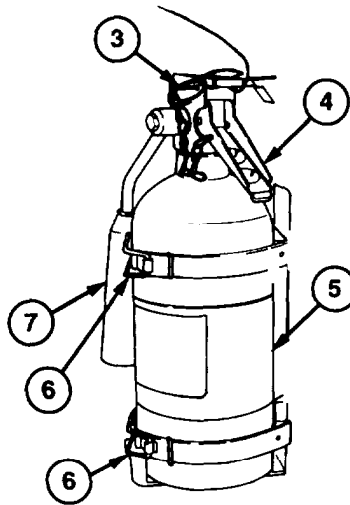
Change 1

2-231

EMERGENCY PROCEDURES (continued)

**WARNING**

- Remain CALM. Avoid breathing CO<sub>2</sub>. It may quickly cause rapid breathing, loss of consciousness, and suffocation. Quickly exit vehicle if situation permits. If unable to exit, ventilate to remove the extinguisher gas. The driver is at the greatest risk. Ventilate the vehicle before reentry. Failure to follow this emergency procedure can result in serious injury or death to personnel.
  - Fire extinguisher CO<sub>2</sub> can cause severe burns. Do not touch the cone when using fire extinguisher or discharge directly on skin.
  - Handle fire extinguisher carefully. Do not bang or drop cylinder.
3. Pull latch (6) to release fire extinguisher (5). Remove fire extinguisher (5).
  4. Break safety wire and remove ring pin (3).
  5. Aim discharge nozzle (7) at base of flames.
  6. Squeeze trigger (4) to operate and direct the discharge at the fire until extinguished.
  7. After discharging fire extinguisher, crew members, if able, will exit the vehicle to prevent overexposure to CO<sub>2</sub>. Ventilate the vehicle prior to reentry.
  8. If unable to exit, continue ventilation of the vehicle to clear all smoke, fire fumes, and CO<sub>2</sub>.



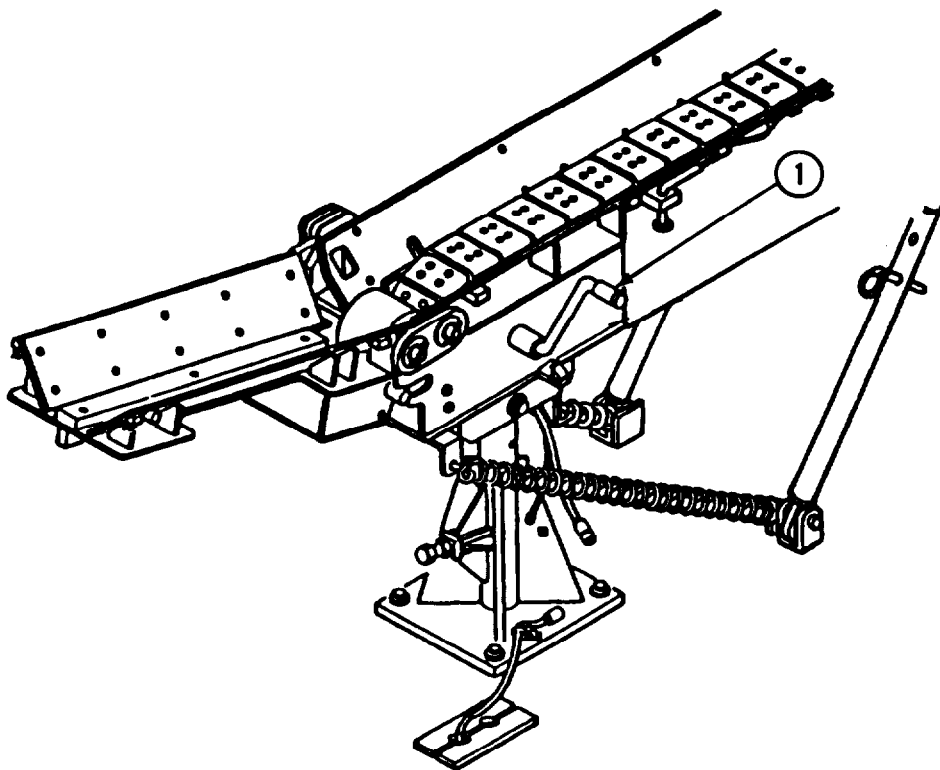
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**EMERGENCY PROCEDURES (continued)**

**Conveyor**

Hydraulic Failure. If conveyor motor or hydraulic system fails, conveyor may be operated according to the procedures below. Report conveyor motor or hydraulic system failure to Unit maintenance.

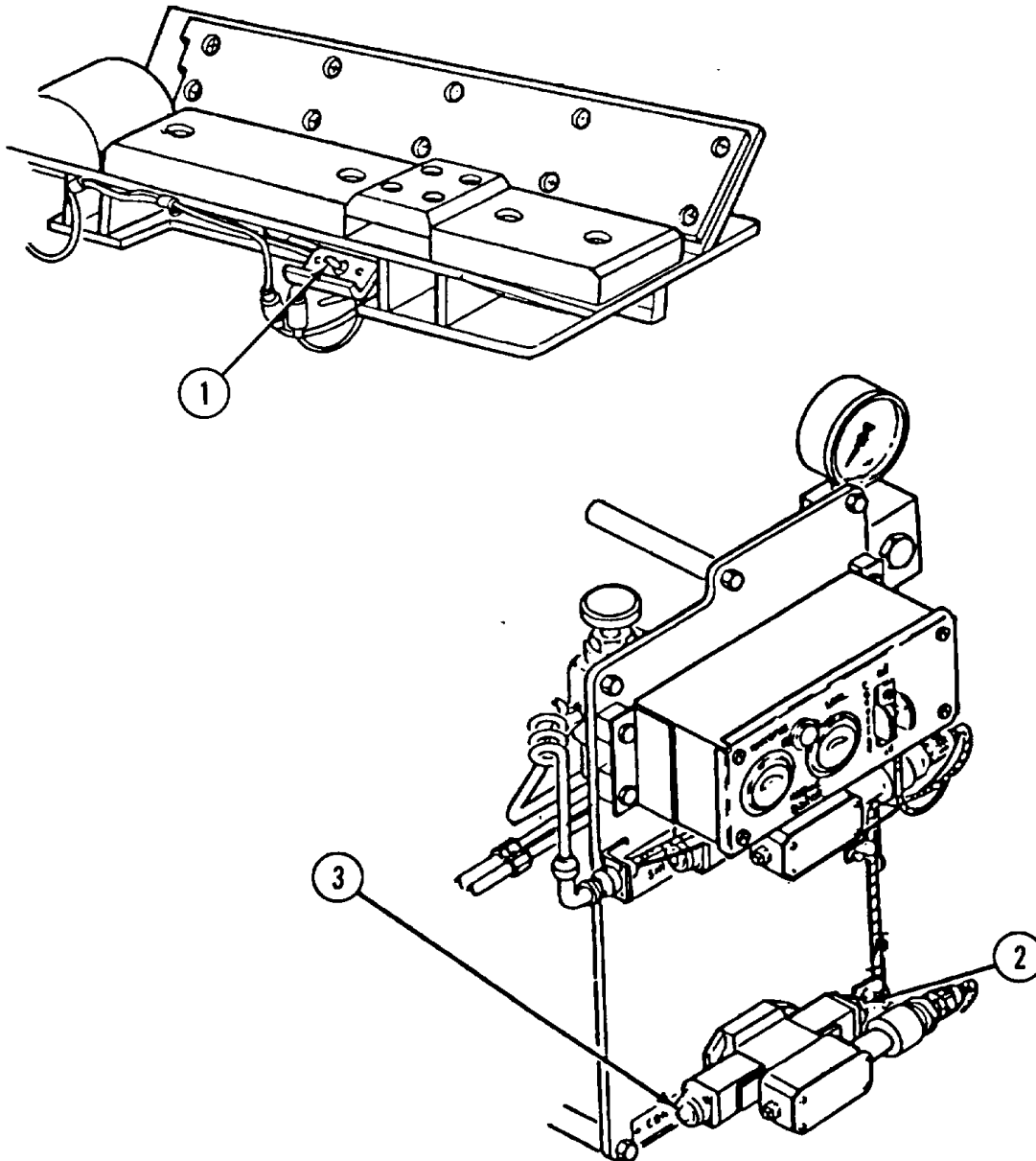
1. Check for broken chain. If chain is broken, repair (p. 3-42) and retry conveyor operation hydraulically.
2. If chain is not broken, insert manual handcrank (1) into socket at inboard end of conveyor.
3. Turn handle clockwise to move chain out, counterclockwise to move chain in.
4. If chain does not move properly, troubleshoot conveyor (pp. 3-13 and 3-14).



**EMERGENCY PROCEDURES (continued)**

Electrical Failure. If conveyor electrical switching fails but hydraulic power is available, conveyor may be hydraulically operated according to procedures below. Report electrical failure to Unit maintenance.

1. Check to make sure outboard conveyor safety switch (1) is ON.
2. To move conveyor chain out, firmly press button (2) on right-hand side of directional
3. To move conveyor chain in, firmly press button (3) on left-hand side of directional control control valve.



**EMERGENCY PROCEDURES (continued)****Upper Rear Door (Ballistic Shield)**

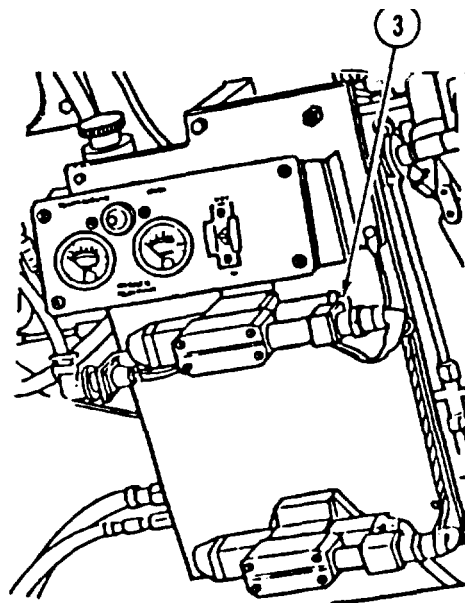
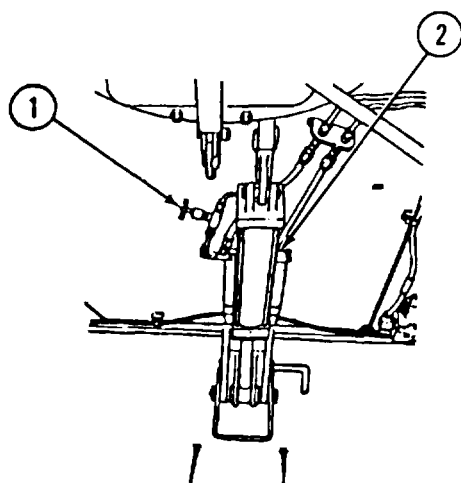
Hydraulic Failure. If hydraulic system fails, upper rear door may be opened manually according to the following procedures. Report cylinder or hydraulic system failure to Unit maintenance.

**WARNING**

- Upper rear door is very heavy. Three persons (one inside the vehicle and two outside the vehicle) are required to open or close it manually. Injury may result from attempting this procedure alone.
- Keep hands and feet clear of door frame. Failure to do so may result in injury.
- Open dump valve only when operating upper rear door manually. ALWAYS CLOSE DUMP VALVE AFTER COMPLETING OPENING PROCEDURE. Failure to do this will result in door dropping very quickly during normal operation.

**EMERGENCY PROCEDURES (continued)**

1. To open upper rear door:
  - a. Turn MASTER switch to ON.
  - b. Open dump valve (1) on hydraulic actuator (2).



- c. Have an assistant hold upper rear DOOR switch in UP position. If electrical power is not available, have assistant firmly press button (3) on right side of BALLISTIC SHIELD directional control valve.
- d. With an assistant, pull open upper rear door until safety lock engages at 45-degree position from closed.
- e. Close dump valve on hydraulic actuator (2).

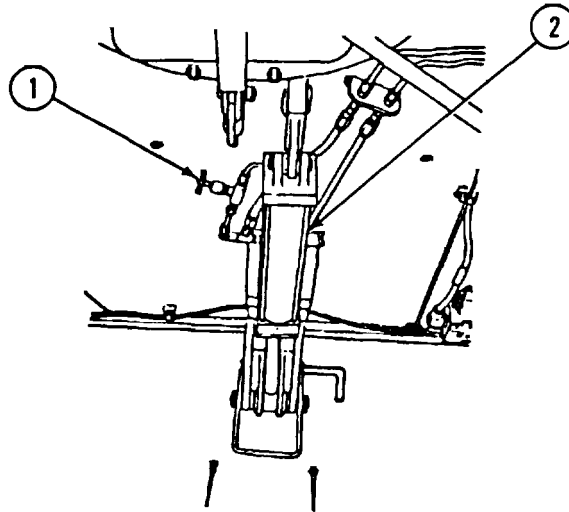


## EMERGENCY PROCEDURES (continued)

**WARNING**

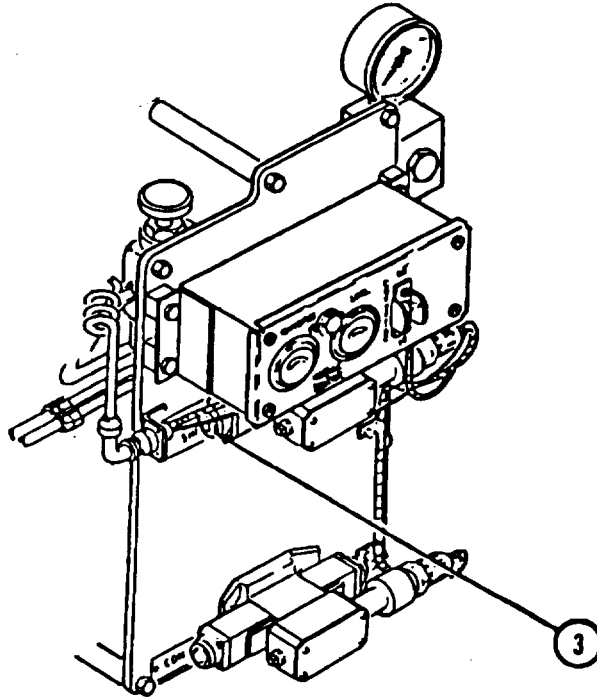
- When safety handle is released in this procedure, door may drop rapidly. Two persons should support weight of door throughout this procedure to make sure door lowers slowly.
- Keep hands and feet clear of doorway.

2. To close upper rear door
  - a. Turn MASTER switch to ON.
  - b. Open dump valve (1) on hydraulic actuator (2).



**EMERGENCY PROCEDURES (continued)**

- c. With an assistant, push up on door enough to remove door's weight from safety lock.
- d. While holding door, release safety lock by pivoting handle down and toward rear.
- e. While supporting door, have an assistant hold upper rear DOOR switch in DOWN position. Allow door to close slowly. If electrical power is not available, have assistant firmly press button (3) on left side of BALLISTIC SHIELD directional control valve.
- f. After door has closed completely, close dump valve (1) on hydraulic actuator (2).

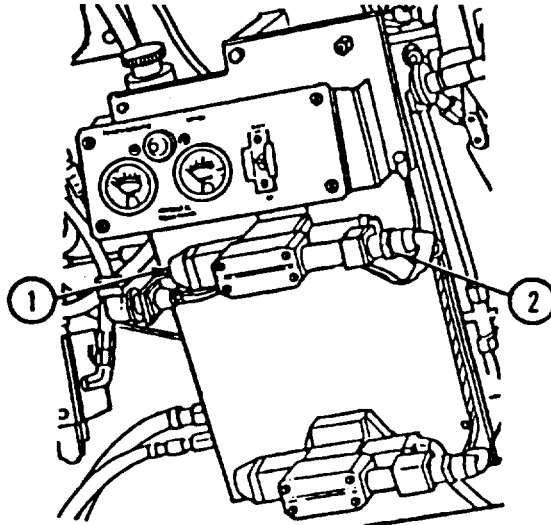


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**EMERGENCY PROCEDURES (continued)**

Electrical Failure. If upper rear door electrical switching fails, but hydraulic power is available, upper rear door may be hydraulically positioned according to procedure below. Report electrical system failure to Unit maintenance.

1. Activate hydraulic pump.
2. To close door, firmly press button (2) on right side of BALLISTIC SHIELD directional control valve.
3. To open door, release safety lock and have an assistant firmly press button (1) on left side 3. of BALLISTIC SHIELD directional control valve.

**VENTILATED FACE PIECE SYSTEM (VFPS)**

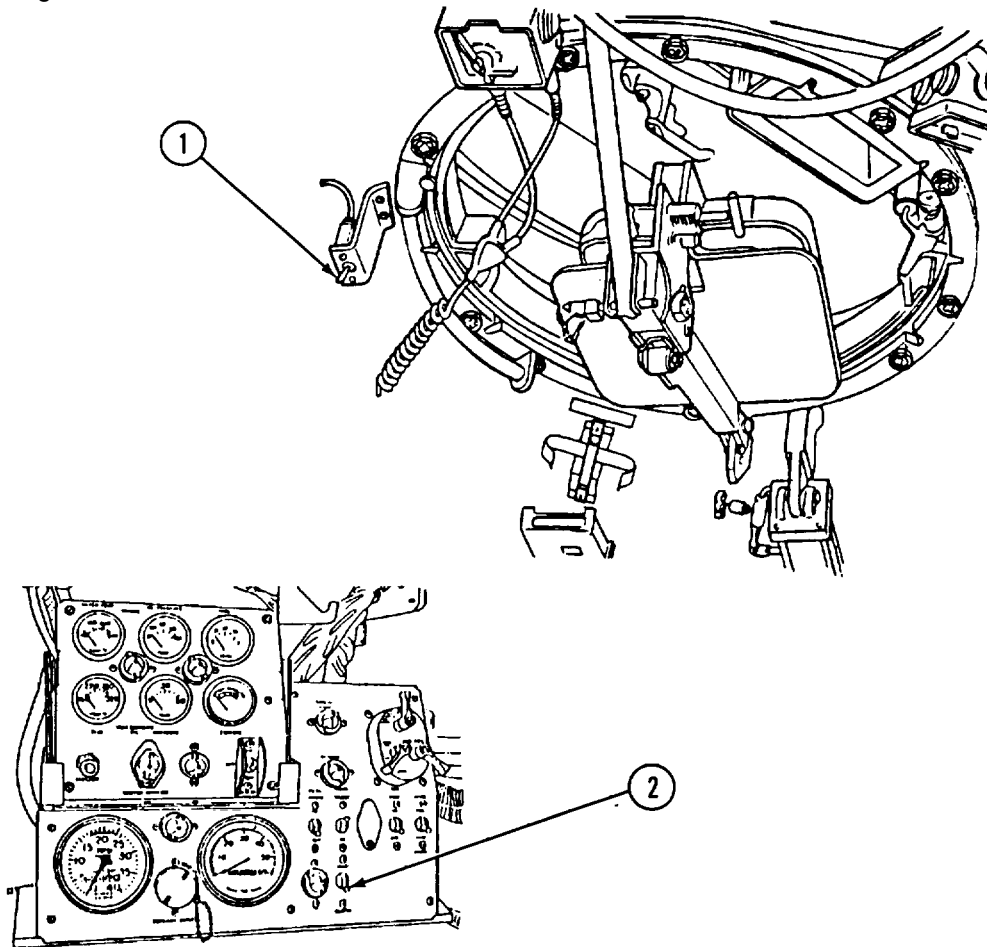
If this system fails, use individual face mask protection.

**EMERGENCY PROCEDURES (continued)****COMBAT STARTER OVERRIDE SWITCH****CAUTION**

**Do not operate starter continuously for over 30 seconds. If engine does not start, allow one-minute cool-off period before again engaging starter. Failure to comply may result in damage to the starter. Notify Unit maintenance if engine fails to start after fourth try.**

The combat starter override switch overrides the starter protection relay that prevents continuous cranking of the starter motor for more than 30 seconds. Report the failure of the engine to start after 30 seconds of cranking to Unit maintenance.

While the driver continues to hold the STARTER switch (2) to START, push and hold the combat starter override switch (1) until the vehicle engine starts.



## CHAPTER 3 MAINTENANCE INSTRUCTIONS

### Chapter Overview

This chapter contains vehicle maintenance actions which crew members are authorized and required to perform. Chapter 3 contains the following information:

- Lubrication instructions for normal or unusual operating conditions.
- Troubleshooting tables listing observed malfunctions, step-by-step tests or inspections, and corrective actions.
- Maintenance procedures that are normally performed by operator and crew.

Chapter 3 is divided into the following sections:

Section I LUBRICATION INSTRUCTIONS  
Section II TROUBLESHOOTING  
Section III MAINTENANCE PROCEDURES

### Section I. LUBRICATION INSTRUCTIONS

#### Service Intervals - Normal Conditions

For application of materials and service intervals, see Appendix E or appropriate instructions for specific components.

#### Service Intervals - Unusual Conditions

Lubricate more often to compensate for unusual operation and extreme conditions. High or low temperatures, prolonged periods of high-rate operation, continued operation in sand or dust, or exposure to moisture may quickly destroy the protective qualities of the lubricant. Lubrication intervals may be extended during inactive periods.

**Section II. TROUBLESHOOTING**

The troubleshooting table (pp. 3-4 through 3-18.1) lists common malfunctions you may find during operation or maintenance of an M992A1 or its components. You should perform tests/inspections and corrective actions in the order listed.

This manual cannot list all malfunctions that may occur, nor can it list all tests, inspections, and corrective actions. If a malfunction is not listed or is not corrected by the corrective action listed, notify your supervisor.

**NOTE**

Before you use the troubleshooting table, be sure you have performed all the applicable operating checks presented in Chapter 2.

The following Symptom Index is intended to assist you in locating the correct troubleshooting procedure quickly.

**SYMPTOM INDEX**

Symptom	Troubleshooting Procedure: Page
<b>MAIN ENGINE</b>	
1. Engine fails to crank, or cranks slowly, when starter switch is activated	3-4
2. Engine cranks but fails to start	3-4
3. Engine loses power	3-5
4. Engine lacks acceleration	3-5
5. Engine overheats (coolant warning lamp is lit)	3-6
6. Engine has low or no oil pressure	3-7
<b>TRANSMISSION</b>	
7. Transmission does not drive in any range	3-7
<b>STEERING</b>	
8. Vehicle is difficult to steer	3-7
<b>BATTERIES/GENERATING SYSTEM</b>	
9. Batteries will not crank engine	3-8
10. Batteries do not stay charged	3-8
11. Batteries will not charge	3-8
12. MASTER switch lamp does not light	3-8
<b>TRACKS AND SUSPENSION</b>	
13. Vehicle pulls to one side with steering wheel centered	3-9
14. Vehicle throws tracks	3-9
<b>PERSONNEL HEATER</b>	
15. Heater smokes, bangs upon starting, or doesn't start	3-9
16. Heat output is too low	3-10
17. Heat exchanger loads up with soot and/or carbon	3-10

**SYMPTOM INDEX (continued)**

	Troubleshooting Procedure: Page
<b>BILGE PUMP</b>	
18. Bilge pump does not operate	3-10
<b>AUXILIARY POWER UNIT (APU) ENGINE</b>	
19. APU engine does not start	3-10
20. APU engine starts, then stalls or runs roughly	3-11
21. APU engine is difficult to start	3-11
22. APU engine is hard to start in cold weather	3-11
23. APU engine overheats	3-12
24. APU engine misfires	3-12
25. APU engine lacks power	3-12
<b>HYDRAULIC SYSTEM</b>	
26. No response to any control	3-12
27. Slow operation	3-13
<b>CONVEYOR</b>	
28. Conveyor chain will not move	3-13
29. Conveyor chain moves slowly or erratically	3-14
<b>PROJECTILE RACKS</b>	
30. Projectile does not go into tube	3-14
31. Projectile is not held immobile in tube	3-15
32. Projectile will not come out of tube	3-15
<b>VENTILATED FACE PIECE SYSTEM (VFPS)</b>	
33. Airflow to ventilated face piece is lacking or reduced	3-15
34. Heat does not reach ventilated face piece, but airflow is normal	3-16
35. Precleaner does not operate when switch is on	3-16
<b>UPPER REAR DOOR (BALLISTIC SHIELD)</b>	
36. Upper rear door does not operate when switch is engaged	3-17
37. Upper rear door cylinder operation is slow or erratic	3-17
38. Upper rear door drifts closed	3-17
<b>AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES)</b>	
39. Lamp does not light during lamp test or fails during operation	3-17
40. Fault lamp lights	3-18
41. Crew AFES T/A panel fire detection LEDs light but no fire	3-18
42. AFES or component is damaged or fails during operation	3-18
43. Extinguisher cylinders are empty or damaged or have low pressure	3-18
44. Bottle discharges when vehicle sits idle, or when vehicle is in motion	3-18
<b>MWRH</b>	
45. MWRH does not operate	3-18.1
<b>PLGR</b>	
46. PLGR does not operate	3-18.1

**TROUBLESHOOTING**

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<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
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**NOTE**

- For corrective actions of malfunctions not listed in this table, notify Unit maintenance.
- Wherever the word "lubricate" appears, see Appendix E.
- Malfunctions, tests or inspections, and corrective actions are listed/indented according to the heading at the top of each page.

**MAIN ENGINE**

1. ENGINE FAILS TO CRANK, OR CRANKS SLOWLY, WHEN STARTER SWITCH IS ACTIVATED

Step 1. Check to see if MASTER switch is set to ON.

If not on, move switch to ON.

Step 2. Check to see if transmission lever is in neutral (N).

If not in N, place lever in N.

Step 3. Check to see if battery cables are loose, broken, or corroded.

If loose, broken, or corroded, notify Unit maintenance.

Step 4. Check to see if BATTERY-GENERATOR indicator gage reads in normal range.

If indicator gage reads low, notify Unit maintenance.

2. ENGINE CRANKS BUT FAILS TO START

Step 1. Check to see if FUEL gage indicates empty (E).

If no fuel, fill tank.

Step 2. Check to see if FUEL SHUT OFF control handle is pulled out.

If pulled out, push handle in completely.



## TROUBLESHOOTING (Main Engine) (continued)

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 3. Check for blocked fuel lines and hoses.

Disconnect and straighten kinked or pinched tubes and hoses. If lines or hoses are broken, notify Unit maintenance.

Step 4. Check for water or other contaminants in fuel filters.

Open drain cocks on fuel filters, and drain until clear fuel appears (p. 3-21).

Step 5. Prime fuel lines.

Hold fuel prime switch at ON for 1 minute. Then use normal start procedures (p. 2-82). If condition persists, notify Unit maintenance.

### 3. ENGINE LOSES POWER

Check to see if water is in fuel.

If water is in fuel, drain fuel filters (p. 3-21). If condition persists, notify Unit maintenance.

### 4. ENGINE LACKS ACCELERATION

Step 1. Check for fuel leaks.

If there are leaks, tighten lines and filters.

#### **WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.**

Step 2. Check to see if air cleaner filter is restricted. Check for red sleeve on restriction indicator.

If restricted, clean air cleaner filter (p. 3-27). Reset restriction indicator.

Step 3. Check to see if accelerator pedal is bent or binding.

If bent or binding, notify Unit maintenance.

Step 4. Check accelerator linkage for binding or damage. binding or damaged, notify Unit maintenance.

## TROUBLESHOOTING (Main Engine) (continued)

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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If incorrect fuel is suspected, notify Unit maintenance.

## 5. ENGINE OVERHEATS (COOLANT WARNING LAMP IS LIT)

**WARNING**

**NEVER remove radiator cap on an overheated engine until engine has cooled.**

Step 1. Check to see if engine coolant is low and if any leaks are visible.

If low, fill (p. 3-20).

If leaks are visible, notify Unit maintenance.

Step 2. Check to see if engine oil is low.

If low, fill (Appendix E).

Step 3. Check radiator cap for tight fit.

If cap is loose, tighten cap.

Step 4. Check to see if cooling fan is operating properly.

If fan is not operating properly, notify Unit maintenance.

Step 5. Check to see if radiator/grille is clogged.

If clogged, unclog radiator/grille.

Step 6. Check to see if engine has been left idling for long periods at low rpm.

Increase idle speed to 1000-1200 rpm.

If temperature does not drop after a period of fast idling, shut down engine (p. 2-99) and notify Unit maintenance.

**TROUBLESHOOTING (Main Engine) (continued)**

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
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6. ENGINE HAS LOW OR NO OIL PRESSURE

Step 1. Check to see if oil level is low.

If low, fill engine (Appendix E).

Step 2. Check engine compartment for evidence of oil leaks.

If leaks are evident, notify Unit maintenance.

**TRANSMISSION**

7. TRANSMISSION DOES NOT DRIVE IN ANY RANGE

Step 1. Check for bent, broken, damaged, or missing transmission selector lever linkage.

If linkage is bent, broken, damaged, or missing, notify Unit maintenance.

Step 2. Check oil level.

If low, fill transmission (Appendix E).

Step 3. Check for disconnected or broken universal joints.

If disconnected or broken, notify Unit maintenance.

**STEERING**

8. VEHICLE IS DIFFICULT TO STEER

Step 1. Check steering linkage for binding or foreign material.

If binding is caused by foreign material, remove foreign material.

Step 2. Check for broken, bent, or missing linkage components.

If linkage components are bent, broken, or missing, notify Unit maintenance.

Step 3. Check condition of steering linkage bushing in drives compartment bulkhead for signs of damage or deterioration.

If bushing is damaged or deteriorated, notify Unit maintenance.

TROUBLESHOOTING (Batteries/Generating System) (continued)

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**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

---

**BATTERIES/GENERATING SYSTEM**

9. BATTERIES WILL NOT CRANK ENGINE

Step 1. Check to see if battery cables are loose, damaged, or corroded.

If loose, damaged, or corroded, notify Unit maintenance.

Step 2. Check BATTERY-GENERATOR gage on instrument panel, when MASTER switch is set to ON, to see if indicator reads in green range.

If indicator does not read in green range, charge batteries (p. 2-125).  
If condition persists, notify Unit maintenance.

10. BATTERIES DO NOT STAY CHARGED

Step 1. Check for excessive use of electrical systems when engine is not running.

Make sure all electrical accessories are OFF when not in use.

Step 2. Check BATTERY-GENERATOR gage on instrument panel, when MASTER switch is set to ON, to see if indicator reads in green range.

If indicator does not read in green range, charge batteries (p. 2-125).

11. BATTERIES WILL NOT CHARGE

Step 1. With main engine or the APU running, check BATTERY-GENERATOR gage on instrument panel to see if indicator reads in green range.

If indicator does not read in green range, go to step 2.

Step 2. If using the APU, press reset button on APU voltage regulator.

If problem persists, go to step 3.

Step 3. If using the APU, make sure hydraulic pressure is between 100 and 300 psi.

If not, adjust pressure. If problem persists, notify Unit maintenance.

12. MASTER SWITCH LAMP DOES NOT LIGHT

Step 1. Check to see if MASTER switch is set to ON.

If not, turn switch to ON.

Step 2. Check to see if bulb is burned out.

If burned out, replace bulb.

**TROUBLESHOOTING (Tracks and Suspension) (continued)****MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

Step 3. Check for damaged electrical leads.

If damaged electrical leads are found, notify Unit maintenance.

**TRACKS AND SUSPENSION****13. VEHICLE PULLS TO ONE SIDE WITH STEERING WHEEL CENTERED**

Step 1. Check for mud or dirt buildup on tracks.

If buildup is excessive, clean tracks.

Step 2. Check track tension,

If necessary, adjust tension (p. 3-29).

If condition persists, notify Unit maintenance.

**14. VEHICLE THROWS TRACKS****NOTE**

High-speed turns will throw tracks.

Step 1. Check tension adjustment

If necessary, adjust tension (p. 3-29).

If condition persists, notify Unit Maintenance.

Step 1. Look for excessively loose or worn track or end connectors.

If loose or worn, adjust or replace track (pp. 3-29 through 3-38.1). ■

Step 2. Check drive sprockets for excessive wear or cracked or missing teeth (p. 2-59).

If drive sprockets are damaged, notify Unit maintenance.

**PERSONNEL HEATER****15. HEATER SMOKES, BANGS UPON STARTING, OR DOESN'T START**

Check to see if you are starting heater correctly.

See starting procedures (p. 2-187).

If condition persists, notify Unit maintenance.

**TROUBLESHOOTING (Bilge Pump) (continued)**

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**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

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16. HEAT OUTPUT IS TOO LOW

Check to see if heater switch is set at HI.

If not, place switch at HI.

If condition persists, notify Unit maintenance.

17. HEAT EXCHANGER LOADS UP WITH SOOT AND/OR CARBON

Check to see if exhaust outlet is restricted.

If restricted, clean exhaust outlet.

If condition persists, notify Unit maintenance.

**BILGE PUMP**

18. BILGE PUMP DOES NOT OPERATE

Step 1. Check to see if MASTER switch is set to ON.

If not, turn MASTER switch to ON.

Step 2. Check to see if outlet is restricted.

If outlet is restricted, clean outlet.

If condition persists, notify Unit maintenance.

**AUXILIARY POWER UNIT (APU) ENGINE**

19. APU ENGINE DOES NOT START

Step 1. Check to see if MASTER switch is set to ON.

If not, turn MASTER switch to ON.

Step 2. Check for low battery charge indicated on BATTERY-GENERATOR indicator gage (indicator gage should read at least in low yellow range).

If indicator gage reads below low yellow range, notify Unit maintenance.

Step 3. Check to see if APU GENERator switch on AUXILIARY POWER UNIT CONTROL BOX is set to OFF.

If not, turn APU GENERator switch to OFF.

## TROUBLESHOOTING (Auxiliary Power Unit Engine) (continued)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

Step 4. Check battery connections.

If battery connections are loose, broken, or corroded, notify Unit maintenance.

Step 5. Check air intake for restriction.

Remove any restrictions, or clean air filters (p. 3-44).

Step 6. Check fuel level.

If fuel level is low, refuel vehicle (p. 3-24).  
If condition persists, notify Unit maintenance.

20. APU ENGINE STARTS, THEN STALLS OR RUNS ROUGHLY

Step 1. Check for water in fuel filters.

Drain filters (p. 3-44).

Step 2. Check air intake filter for restrictions.

Remove restrictions or clean filters (p. 3-44).

Step 3. Check fuel level.

If low, fill fuel tanks (p. 3-24).  
If condition persists, notify Unit maintenance.

21. APU ENGINE IS DIFFICULT TO START

Check for water in fuel filters.

Drain filters (p. 3-44).  
If condition persists, notify Unit maintenance.

22. APU ENGINE IS HARD TO START IN COLD WEATHER

Check to see if plenum door in APU compartment is open.

If not, open plenum door.  
If condition persists, notify Unit maintenance.

**TROUBLESHOOTING (Auxiliary Power Unit Engine) (continued)**

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
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**23. APU ENGINE OVERHEATS**

Step 1. Check air intake passage for obstruction.

Remove obstruction.

Step 2. Check crankcase oil level (Appendix E).

If low, fill (Appendix E).  
If condition persists, notify Unit maintenance.

**24. APU ENGINE MISFIRES**

Step 1. Check air intake filter.

Clean or replace filter element (p. 3-44).

Step 2. Check for contaminants in fuel filters.

Drain filters (p. 3-44).  
If condition persists, notify Unit maintenance.

**25. APU ENGINE LACKS POWER**

Step 1. Check air intake passage for obstruction.

Remove obstruction.

Step 2. Check for contaminants in fuel filters.

Drain filters (p. 3-44).  
If condition persists, notify Unit maintenance.

**HYDRAULIC SYSTEM**

**26. NO RESPONSE TO ANY CONTROL**

Step 1. Check hydraulic fluid supply (Appendix E).

If low, fill reservoir (Appendix E).

Step 2. Check that ball valve in suction line is open.

If closed, open valve.



**TROUBLESHOOTING (Hydraulic System) (continued)****MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

[Step Deleted]

**27. SLOW OPERATION**

Step 1. Check hydraulic reservoir temperature.

If greater than 160°F, turn off hydraulic system and allow fluid to cool. Notify Unit maintenance if fluid overheats repeatedly.

Step 2. Check hydraulic fluid level (Appendix E).

Refill reservoir as necessary (Appendix E).

Step 3. Conveyor operation only: Check flow-control valve settings (p. 3-39).

Adjust valve as necessary (p. 3-39).  
If condition persists, notify Unit maintenance.

[Step Deleted]

**CONVEYOR****28. CONVEYOR CHAIN WILL NOT MOVE**

Step 1. Check to see if conveyor safety (override) switch is set to ON.

If not, turn switch to ON.

Step 2. Check to make sure conveyor deadman switch is not stuck in the closed position.

If deadman switch is stuck, free switch.

Step 3. Check flow-control valve setting (p. 3-39).

Turn flow-control valve counterclockwise slowly until chain speed is satisfactory.

**TROUBLESHOOTING (Conveyor) (continued)**

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**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

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Step 4. Check that conveyor chain is not jammed, broken, or off a drive sprocket.

Remove obstruction and place chain around sprocket(s) or repair chain (p. 3-42).

Step 5. Check chain tension.

If necessary, adjust chain tension (p. 3-43).

Step 6. Check hydraulic control panel pressure gage for reading of between 100 and 300 psi.

If pressure is not within range, notify Unit maintenance.

**29. CONVEYOR CHAIN MOVES SLOWLY OR ERRATICALLY**

Step 1. Check chain tension.

Adjust chain tension (p. 3-43).

Step 2. Check chain alignment.

Reposition chain on sprockets (p. 3-43).

Step 3. Check flow-control valve setting.

Turn flow-control valve knob counterclockwise slowly until chain speed is satisfactory.

Step 4. Check main hydraulic pressure gage for reading of 100 to 300 psi.

If pressure is not within range, notify Unit maintenance.

**PROJECTILE RACKS**

**30. PROJECTILE DOES NOT GO INTO TUBE**

Step 1. Check inner diameter of tube for obstruction or damage.

Remove obstruction if possible. Notify Unit maintenance if tube is damaged.

**TROUBLESHOOTING (Ventilated Face Piece System) (continued)**


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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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Step 2. Check locking shoe for locked position.

Open locking handles.  
If condition persists, notify Unit maintenance.

**31. PROJECTILE IS NOT HELD IMMOBILE IN TUBE**

Step 1. Check that handles are in locked position.

If not, place handles in locked position.

Step 2. Check for defective lock.

If damaged, notify Unit maintenance.

**32. PROJECTILE WILL NOT COME OUT OF TUBE**

Step 1. Check that rack section is unlocked and handles are positioned up (released).

If not, unlock rack section.

If rack section is unlocked, remove projectile by pulling on nose plug with cargo hook.

If projectile cannot be removed, notify Unit maintenance.

**VENTILATED FACE PIECE SYSTEM (VFPS)****33. AIRFLOW TO VENTILATED FACE PIECE IS LACKING OR REDUCED**

Step 1. Check to see if vehicle MASTER switch is set to ON.

If not, turn MASTER switch to ON.

Step 2. Make sure BATTERY-GENERATOR indicator gage reads in green range.

If BATTERY-GENERATOR indicator gage reads below green range, charge battery by running main engine (p. 2-82) or the APU (p. 2-125). After BATTERY-GENERATOR indicator gage reads well into green range, turn off engine.

Notify Unit maintenance if indicator gage does not remain in green range.

## TROUBLESHOOTING (Ventilated Face Piece System) (continued)

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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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Step 3. Check to see that VFPS control box switch is on.

If not, turn switch to ON.

Step 4. Check hoses and connectors for damage or kinks.

Remove any kinks if possible. Report any damage to Unit maintenance.

Step 5. Check that spring clip is removed from inlet holes.

If not, remove spring clip.

Step 6. Check that air intake is unobstructed.

If intake is unobstructed, notify Unit maintenance about clogged filters.

Step 7. Listen for fan operation.

If fan is not operating, notify Unit maintenance.

**34. HEAT DOES NOT REACH VENTILATED FACE PIECE, BUT AIRFLOW IS NORMAL**

Step 1. Check rotary switch on each of four heaters. Make sure rotary switch is turned fully clockwise on each.

Turn on rotary switch. Power lamp should light.

Step 2. Inspect outlet hose(s) and check for airflow.

If hose(s) is damaged or if airflow is restricted, notify Unit maintenance.

Step 3. Wait a few minutes after completing step 2, then check periodically for warm airflow. Air should warm within 15 minutes.

If air does not warm, notify Unit maintenance.

**35. PRECLEANER DOES NOT OPERATE WHEN SWITCH IS ON**

Check to see if vehicle MASTER switch is set to ON.

If not, set vehicle MASTER switch to ON.

If condition persists, notify Unit maintenance.

TROUBLESHOOTING (continued)

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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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UPPER REAR DOOR (BALLISTIC SHIELD)

36. UPPER REAR DOOR DOES NOT OPERATE WHEN SWITCH IS ENGAGED

Step 1. Check flow-control valve setting.

Turn valve fully counterclockwise and attempt operation. Refer to page 3-36 for adjustment procedure.

Step 2. Check that hydraulic pressure is between 100 and 300 psi.

If pressure is not within range, notify Unit maintenance.

Step 3. Check that dump valve is closed.

If dump valve is open, close dump valve.

Step 4. Operate BALLISTIC SHIELD directional control valve manually.

If valve can be operated manually, notify Unit maintenance of electrical failure. If valve is not manually operable, notify Unit maintenance of hydraulic failure.

37. UPPER REAR DOOR CYLINDER OPERATION IS SLOW OR ERRATIC

Check flow-control valve setting on upper rear door cylinder.

Adjust flow-control valve (p. 3-39).  
If condition persists, notify Unit maintenance.

38. UPPER REAR DOOR DRIFTS CLOSED

Check to make sure upper rear door dump valve is closed.

If dump valve is closed, notify Unit maintenance.

**AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES)**

39. LAMP DOES NOT LIGHT DURING LAMP TEST OR FAILS DURING OPERATION

Replace lamp (p. 3-47). Run lamp test (pp. 2-31 and 2-34).

If new lamp or light-emitting diode (LED) does not light during test, notify Unit maintenance.

**TROUBLESHOOTING (Automatic Fire Extinguishing System) (continued)**

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<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
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40. FAULT LAMP LIGHTS		Record indication of test and alarm (T/A) panel LEDs. Notify Unit maintenance of the LED indication.
41. CREW AFES T/A PANEL FIRE DETECTION LEDs LIGHT BUT NO FIRE		Cover window "eye" of the indicated optical fire sensing assembly (OFSA) to exclude sunlight, and repeat test with "eye" covered. If LED lights, notify Unit maintenance.
42. AFES OR COMPONENT IS DAMAGED OR FAILS DURING OPERATION		Notify Unit maintenance.
43. EXTINGUISHER CYLINDERS ARE EMPTY OR DAMAGED OR HAVE LOW PRESSURE		Notify Unit maintenance.
44. BOTTLE DISCHARGES WHEN VEHICLE SITS IDLE, OR WHEN VEHICLE IS IN MOTION		Notify Unit Maintenance.

## TROUBLESHOOTING (continued)

**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****MWRH**

## 45. MWRH DOES NOT OPERATE

Step 1. Check to see if vehicle MASTER switch is set to ON.

If not, set vehicle MASTER switch to ON. If MASTER switch is set to ON, go to step 2.

Step 2. Check to see if 90° connector is securely plugged into the MWRH.

If not, install 90° connector securely into the MWRH. If secure, go to step 3.

Step 3. Check to see if control switch on the MWRH is set to LO or HI.

If not, move control switch to proper setting. If the MWRH still does not operate, notify Unit maintenance.

**PLGR**

## 46. PLGR DOES NOT OPERATE

Step 1. Check to see if vehicle MASTER switch is set to ON.

If not, set vehicle MASTER switch to ON. If MASTER switch is set to ON, go to step 2.

Step 2. Check to see if power cable is plugged into back of PLGR unit.

If not, plug in power cable. If cable is plugged in, go to step 3.

Step 3. Check to see if power button on the PLGR is set to ON.

If not, turn on. If the PLGR still does not operate, notify Unit maintenance.

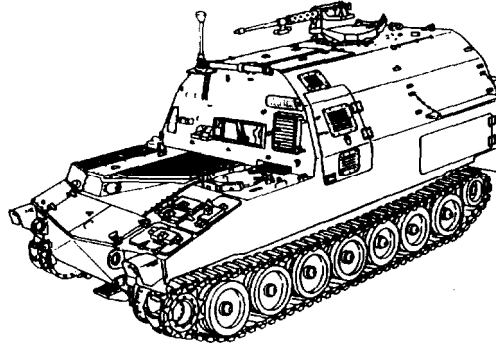




### Section III. MAINTENANCE PROCEDURES

This section covers maintenance procedures to be performed by the driver and crew. These procedures are engine cooling system maintenance, servicing of fuel system, refueling, servicing of batteries, aircleaner maintenance, track maintenance, conveyor speed adjustment, conveyor chain maintenance, APU maintenance, AFES maintenance, decal maintenance, strap webbing maintenance, restraining strap maintenance, and MWRH maintenance.

#### ENGINE COOLING SYSTEM MAINTENANCE



#### Adding Coolant

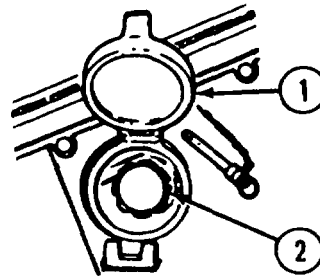
##### WARNING

NEVER remove radiator cap on an overheated engine until engine has cooled.

##### NOTE

Overheating is caused by a faulty cooling system or low coolant level. Proper maintenance of cooling system will help prevent overheating.

1. Park vehicle on level ground. Lower the rpm below cruising speed on an overheated engine until temperature drops to operating range. If temperature continues to rise, shut down completely and allow 10 minutes for engine to cool before adding coolant.
2. Open radiator cap access cover(1). Using a rag, slowly unscrew radiator cap (2). When steam subsides, remove cap (2).
3. Start engine and idle. Add coolant to top of filler neck and replace cap (2).
4. Run engine for 1 minute longer to eliminate any air locks; recheck coolant level and add coolant if necessary.



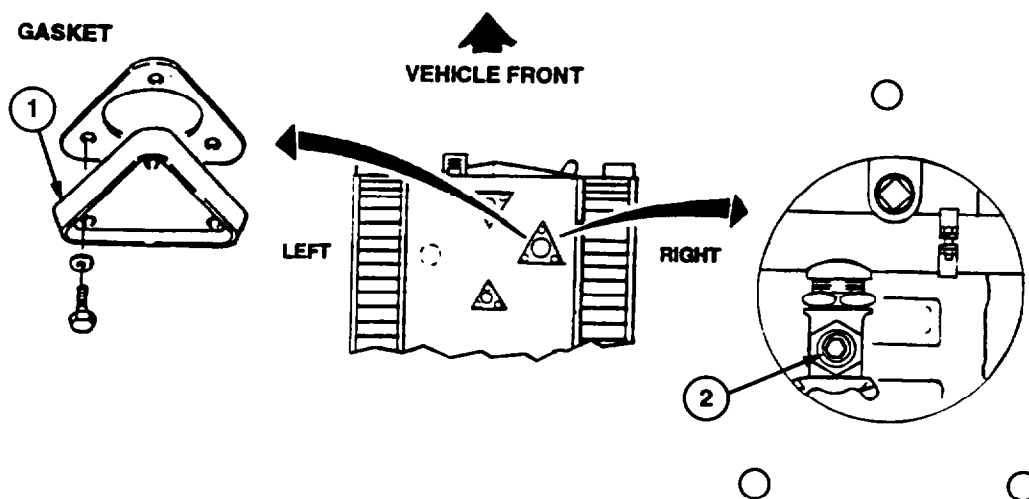
#### Faulty Cooling System

If radiator is clogged or dirty, notify Unit maintenance.

**ENGINE COOLING SYSTEM MAINTENANCE (continued)**

**Draining Coolant**

1. Monitor engine temperature on ENGINE WATER TEMPerature gage (p. 2-89), and allow engine to cool to below 185°F.
2. Place vehicle on an incline, nose down, to facilitate coolant draining.
3. Remove access cover (1) from bottom of vehicle.
4. Using a 9/16-inch socket head screw key, remove coolant drain plug (2) from radiator.
5. Drain coolant into suitable container.
6. Slowly remove radiator cap from radiator.
7. Replace plug (2) in radiator and refill with coolant (p. 3-19).
8. Place vehicle on level ground and recheck coolant level.
9. Install access cover (1).



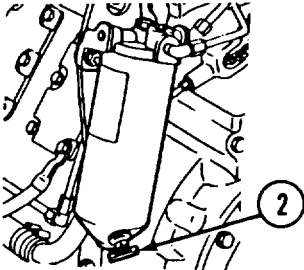
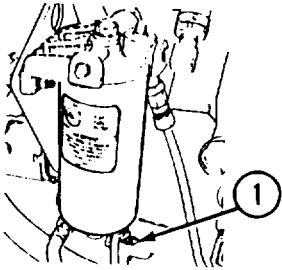
**Coolant Temperature Ranges**

- 65°F to -40°F ..... Arctic-type antifreeze (full strength) (Item 3, Appendix D)
- 40°F to +80°F ..... Antifreeze (50% water mixture) (Item 4 or 5, Appendix D)
- Above +80°F ..... Corrosion inhibitor (22 1/2 oz per vehicle) (Item 26, Appendix D)

SERVICING OF FUEL SYSTEM

**WARNING**

Diesel fuel is **FLAMMABLE**. **DO NOT** smoke in vicinity while performing servicing operations.



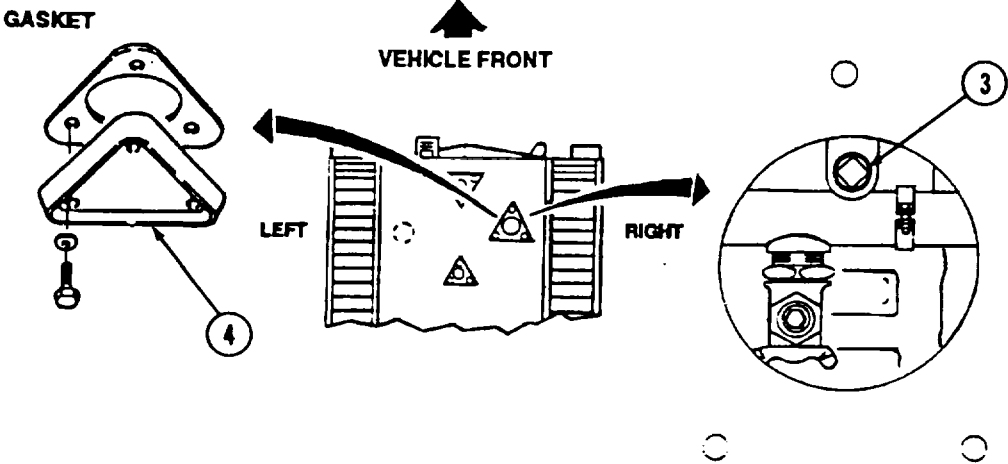
1. Open two drain cocks on primary (1) and secondary (2) fuel filters to remove water and dirt. Place container under drain cocks.
2. When clear fuel is visible, close two drain cocks.

**NOTE**

- After primary and secondary fuel filters have been drained, purge air from fuel system by turning on FUEL PRIME switch for one minute prior to starting engine.
- Fuel tanks hold 135 gallons of fuel. Before draining, provide enough container capacity to hold fuel to be drained.

**SERVICING OF FUEL SYSTEM (continued)**

- 3. When necessary, remove water and dirt from fuel tanks as follows:
  - a. Remove access cover (4) from bottom of vehicle.
  - b. Using adjustable wrench, remove fuel tank plug (3) from fuel tank drain.
  - c. When clear fuel is visible, replace fuel tank plug (3) in fuel tank drain.
  - d. Install access cover (4) on bottom of vehicle.

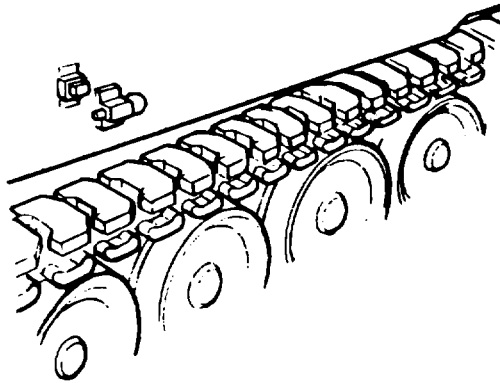
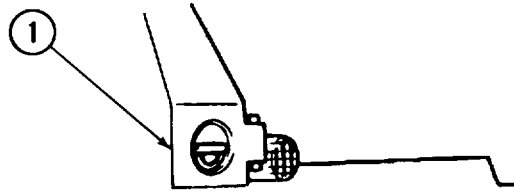


**NOTE**

After operation, keep fuel tanks full to minimize condensation.

**WARNING**

Diesel fuel is **FLAMMABLE**. **DO NOT** smoke within 50 feet of vehicle while refueling.



1. Shut off engine.
2. Open fuel cap access cover (1).
3. Clean any debris from compartment and around fuel cap prior to removing fuel cap.
4. Remove fuel cap slowly. Make sure fuel strainer is properly placed in mouth of filler neck.

**NOTE**

Do not lay fuel hose across vehicle.

5. Fill to a level 6 inches below top of filler neck.
6. Replace fuel cap and close access cover (1).

**FUEL FILL STRAINER AND FILL CAP MAINTENANCE**

1. Using hinged socket wrench handle and 9/16-inch socket, remove eight screws (5), lockwashers (4), and washers (3) and access plate (2) from hull.
2. Unscrew fill cap (1) from fuel fill strainer (6).
3. Make sure fill cap (1) is securely chained to strainer (6). If chain is damaged, notify Unit maintenance.

**WARNING**

**Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.**

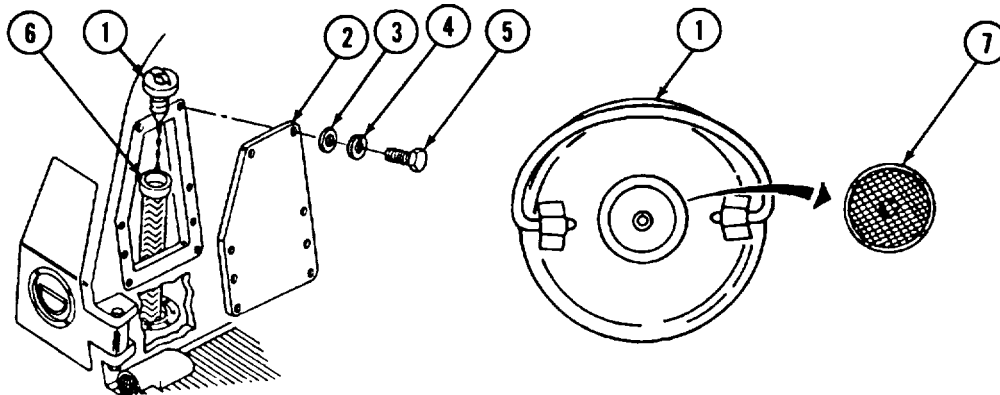
4. Pull strainer (6) from access opening.
5. Check strainer (6) for rips, excessive clogging, or other unserviceable conditions. If strainer (6) is unserviceable, notify Unit maintenance.

**WARNING**

• Drycleaning solvent P-D-680 is TOXIC and flammable. Wear protective goggles and gloves; use only in well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

• If personnel become dizzy while using drycleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothing, flush with cool water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

6. Remove breather cap (7) from fill cap (1). Clean breather cap (7) with drycleaning solvent (Item 13, Appendix D).



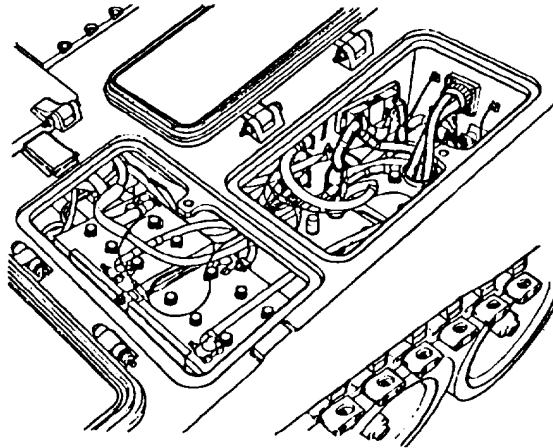
**FUEL FILL STRAINER AND FILL CAP MAINTENANCE (continued)**

7. Apply thin coating of grease (Item 23, Appendix D) to mating surfaces of breather cap (7) and fill cap (1). Install breather cap (7) in fill cap (1).
8. Install strainer (6) in access opening. Install fill cap (1) on strainer (6).

**NOTE**

Notify Unit maintenance if lockwashers are unserviceable.

9. Using hinged socket wrench handle and 9/16-inch socket, install access plate (2) on hull with eight screws (5), lockwashers (4), and washers (3).

**SERVICING OF BATTERIES****Loose Connections**

1. Connectors should be tight and all the way down on battery posts (refer to TM 9-6140-200-14).
2. Battery hold-downs should be tight, but not so tight as to damage battery case.
3. If bolt threads are corroded so as to prevent a tight hold, notify Unit maintenance for replacement.
4. If cables or terminals are loose or broken, notify Unit maintenance.

**WARNING**

**Lead-acid battery gases can explode. Don't smoke, have open flames, or make sparks around a battery, especially if caps are off. If a battery is gassing, it can explode and cause injury to you.**

**SERVICING OF BATTERIES (continued)****Electrolyte Level**

1. Clean off caps before removing. Do not allow dirt or foreign matter to get into battery cells.
2. To allow gases to escape from cells, keep vent holes in caps clean.
3. Electrolyte level must not drop below top of battery plates. If this condition exists, fill with distilled water to cover plates.

**Corrosion****WARNING**

**Battery corrosion is an acid and will eat holes in your clothing or burn your skin. Wash any acid off skin immediately.**

1. Corrosion tends to build up on battery posts, terminals, and cables and may damage cables and terminals. If corroded, notify Unit maintenance.

**NOTE**

Make sure battery caps are tight and no cracks are visible in battery case.

2. Clean top of battery with a damp cloth and wipe dry.

**Unserviceable Batteries****CAUTION**

**Complete discharge of batteries will lessen battery life and, in freezing weather, will burst battery case. Avoid running battery down.**

If batteries fail, notify Unit maintenance (refer to TM 9-6140-200-14).



## AIR CLEANER MAINTENANCE

**WARNING**

**If NBC exposure is suspected, all air filter media will be handled by personnel wearing full NBC protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.**

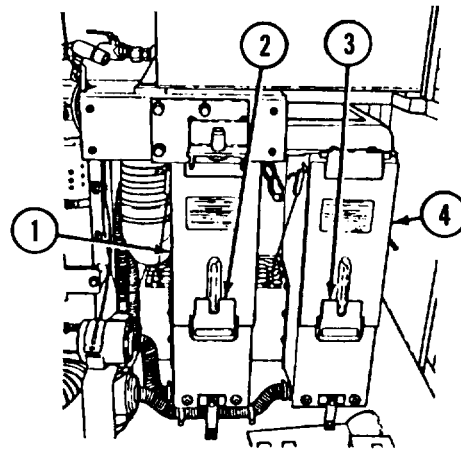
Depending on conditions, air cleaner must be removed periodically for cleaning. Loss in engine power, an overheating engine, or excessive black exhaust may indicate need for more frequent cleaning. If yellow sleeve of air cleaner restriction indicator has climbed into red zone, air cleaner is restricted and air filters must be checked.

1. Park vehicle on level ground.
2. Shut off engine (p. 2-99).
3. Remove all projectiles from right rack assembly (p. 2-181).
4. Remove canisters from stowage box on top of right rack assembly.
5. Move right rack assembly toward rear of vehicle (p. 2-182).
6. Remove right access door (4) by pulling down locking latch (3) and lifting door.

**CAUTION**

**Do not pull up left door too far as this will cause binding and damage to door when removing.**

7. Remove left access door (1) by pulling down locking latch (2), pulling door up slightly, and sliding door to right.



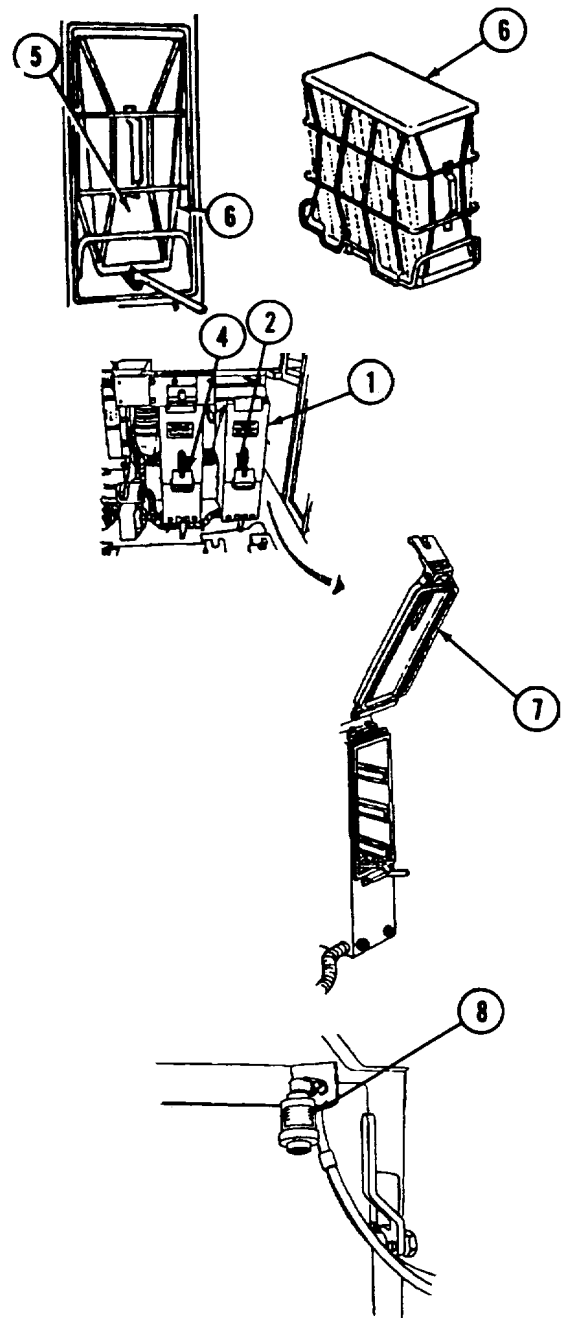
**AIR CLEANER MAINTENANCE (continued)**

8. Pull down locking handles (5). Push two air filters (6) in, lift, and pull out from air cleaner box.

**WARNING**

Compressed air used for cleaning purposes should not exceed 30 psi (206.8 kPa). Use compressed air only with effective chip-guarding and personal protective equipment (e.g., goggles/shield, gloves). Failure to do this may result in injury to personnel.

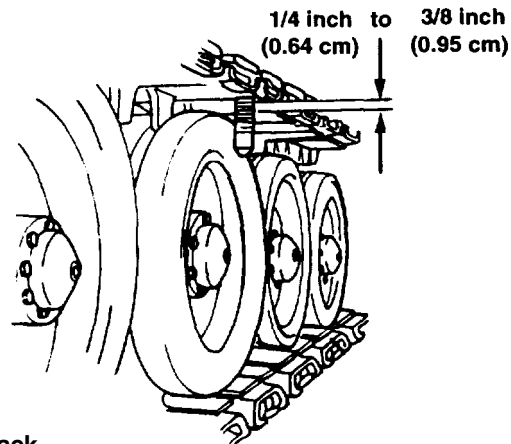
9. Clean air filters (6) with compressed air. (Emergency clean by rapping bottom or sides of air filter against flat surface. Do not strike open edge or sealing edge.)
10. Clean air filter compartments with damp rags (Item 40, Appendix D).
11. Clean air duct into air filter box with damp rags (Item 40, Appendix D) as far as possible.
12. Check seal (7) on right and left access doors (4 and 1) for damage or unserviceable condition. If seal is damaged or in unserviceable condition, notify Unit maintenance.
13. Replace air filters (6); aline with outlet gaskets to assure proper sealing, and secure locking handles (5).
14. Slide right and left access doors (4 and 1) on air cleaner, and secure doors by pulling locking latch (2) down and then up.
15. Reset air cleaner restriction indicator (8) by pushing up on reset button (located on bottom of cylinder).
16. Start engine (p. 2-82). If yellow sleeve in indicator (8) climbs into red zone, notify Unit maintenance.
17. Install right projectile rack assembly (p. 2-1 85)



## TRACK MAINTENANCE

### Checking Track Tension

1. Move vehicle forward and backward several times on level ground, stopping without applying brakes.
2. Measure distance from top of third roadwheel (third from drive sprocket) to track. If distance is more than  $\frac{3}{8}$  inch (0.95 cm) or less than  $\frac{1}{4}$  inch (0.64 cm), track tension needs adjustment.

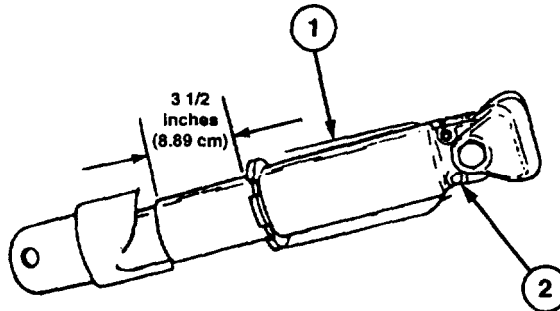


### Increasing Tension Track

Pump grease into clean fitting (2) on track adjuster (1) until correct tension is obtained.

#### CAUTION

When increasing track tension, do not let track adjuster extend beyond  $3 \frac{1}{12}$  inches (8.89 cm) or adjuster will bind in extended position and will require force to collapse.



#### NOTE

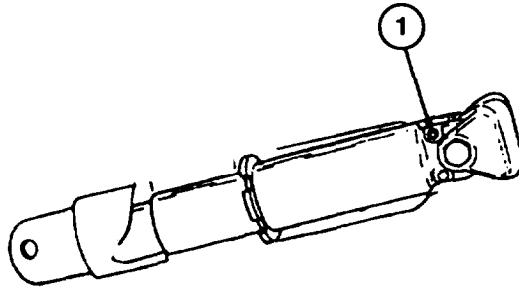
If track sag cannot be taken up, decrease track tension, remove track shoe, and adjust.

TRACK MAINTENANCE (continued)

Decreasing Track Tension

**WARNING**

Lubricant is under high pressure. Loosen bleed plug slowly to avoid injury to personnel.



Open bleed plug (1) on track adjuster and reduce pressure until tension is adjusted. Tighten plug (1) and wipe away excess grease.

Disconnecting Track

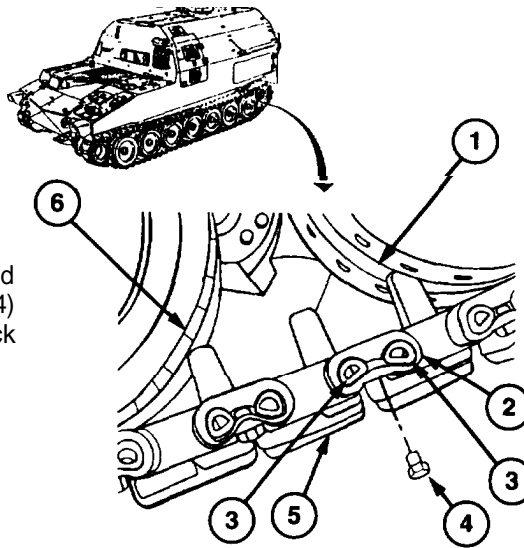
**NOTE**

At least two people are required to disconnect and connect track.

1. Position track disconnection point midway between no. 7 roadwheel (6) and idler wheel (1).
2. Shut off vehicle engine (p. 2-99), and block track with logs or rocks. Do not set parking brake.

**WARNING**

Lubricant is under high pressure. Loosen bleed plug slowly to avoid injury to personnel.



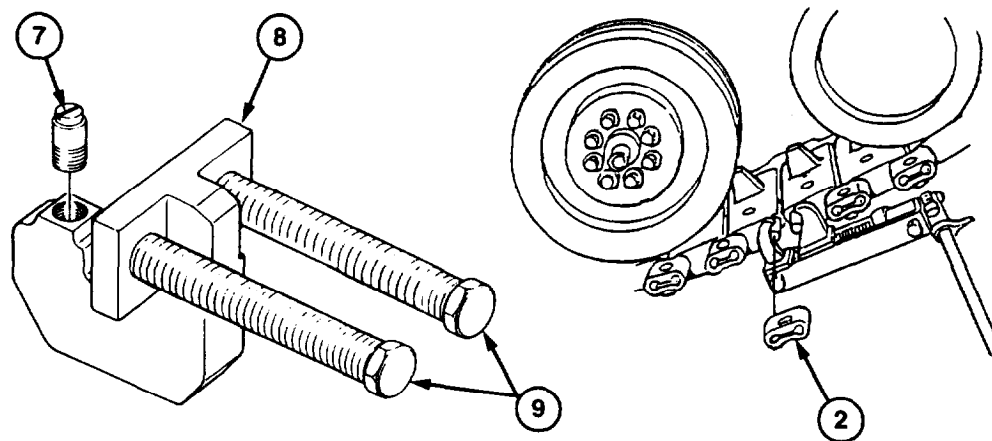
3. Decrease track tension (p. 3-30).
4. Using 3/4-inch drive socket wrench and 1 1/8 inch socket, remove two bolts (4) from two end connectors (2) on track

**Disconnecting Track (continued)**

5. Install straight pin (7) in end connector puller (8). Install end connector puller (8) through bolt hole in end connector (2). Puller must rest flat against end connector (2) and straight pin (7) must engage bolt hole on both sides of end connector (2) so bolts of end connector puller (8) engage track link pins (3). Tighten or loosen straight pin (7) until end connector puller (8) is properly adjusted.

**CAUTION**

- **Tighten bolts on end connector puller evenly, so end connector is pulled evenly off track link pins. Failure to do this can result in damage to puller and track link pins.**
- **When tapping end connector puller with hammer, strike bolts squarely to avoid mushrooming the heads of bolts and damaging the puller.**

**NOTE**

To help loosen end connectors, tap bolts of end connector puller with hammer while moving or removing end connector.

6. Using end connector puller (8) 3/4-inch drive, socket wrench, and 1 1/2 inch socket, move end connector (2) about 1 inch away from track shoe (5). If bolts on end connector puller (8) bind, tap end connector puller bolts (9) with hammer.
7. Install track connecting fixture on two track link pins (3).
8. Using end connector puller (8), remove end connector (2) from two track link pins (3). If end connector (2) becomes cocked during removal, remove end connector puller (8) and tap end connector (2) with hammer until end connector (2) is straight on track link pins (3). Reinstall end connector puller (8), and continue to remove end connector (2).
9. Repeat steps 5 through 8 on end connector (2) on inside of track.

Disconnecting Track (continued)

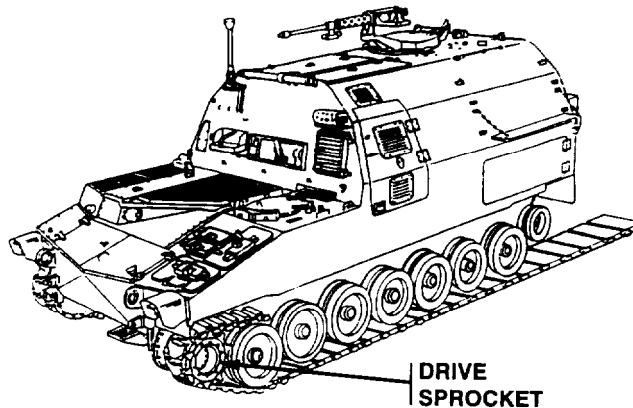
**WARNING**

Release tension on track connecting fixtures evenly. Track is under tension and can move suddenly, causing severe injury to personnel.

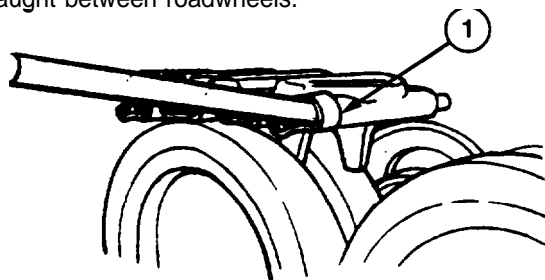
10. Remove two track connecting fixtures from track.

**Installing Track**

1. Lay out track (80 shoes per side) in front of vehicle in straight line directly ahead of, and touching, first roadwheel.
2. Start engine (p. 2-82), and slowly drive onto track to point where enough track shoes to cover drive sprocket extend past centerline of first roadwheel.
3. Stop engine (p. 2-99); leave parking brake off.
4. Block opposite track with blocks.

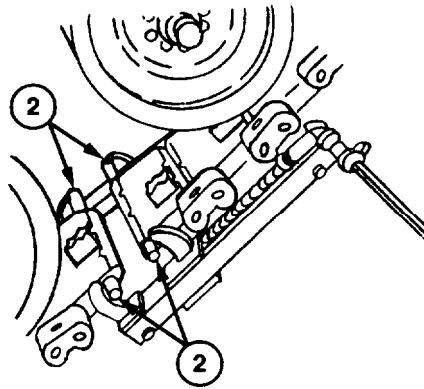


5. Place an end connector (1) on end of track. Using crowbar, lift end of track over drive sprocket until end connectors (1) mesh with drive sprocket.
6. Start engine (p. 2-82); remove blocks from track. Place shift lever in R1. Move vehicle back slowly, allowing track to rest on roadwheels and lifting up on end of track to prevent it from getting caught between roadwheels.



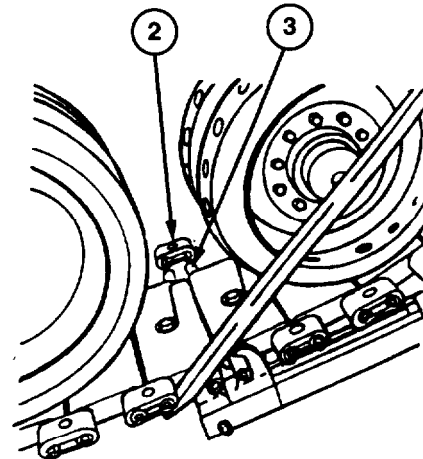
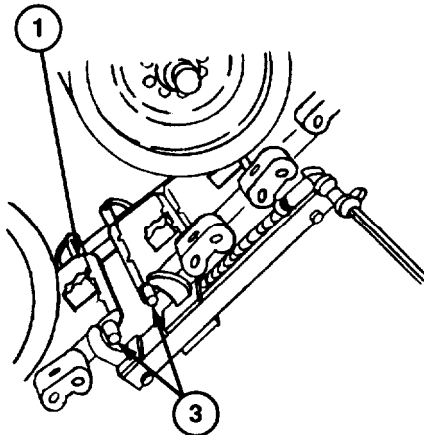
**Installing Track (continued)**

7. Stop engine when two track connecting fixtures can be connected to two track link pins (2) on both sides of track. Connect track (p. 3-33).

**Connecting Track****WARNING**

**Track is very heavy. Keep hands and feet from beneath track while it is being lifted.**

1. Using crowbar, lift track end (1) until it is close enough to other end of track that two track connecting fixtures can be installed.
2. Install two track connecting fixtures on track, and tighten until one end connector (2) will fit over two track link pins (3). If necessary, reposition track connecting fixtures (one at a time) as shown.

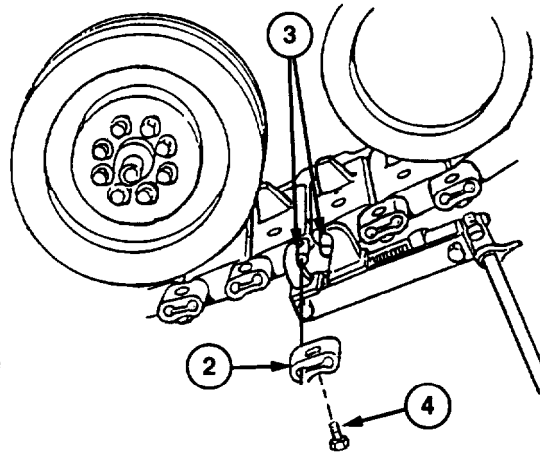
**NOTE**

Track can be maneuvered by lifting with crowbar or pushing against inside of track to bow it out.

3. Maneuver track until end connector (2) can be installed over two track link pins (3) on inside of track. Tap end connector (2) with hammer to install over two track link pins (3).

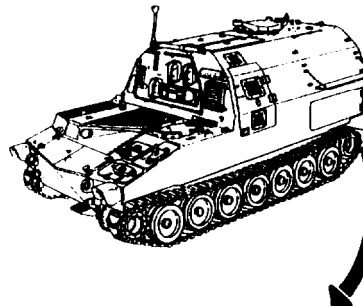
**Connecting Track (continued)**

4. Install one end connector (2) on two track link pins (3) on outside of track.
5. Remove two track connecting fixtures and logs or rocks from track.
6. Tap two end connectors (2) with hammer to seat end connectors (2) against track.
7. Install two bolts (4) in two end connectors (2).
8. Adjust track tension (p. 3-29).
9. Mark replaced end connectors (2).
10. Drive vehicle at a speed not to exceed 10 miles per hour for a short distance, alternating right and left steers.
- 11 Stop vehicle and visually inspect for any end connectors that may have shifted. If any end connectors have shifted, reposition. Tighten end connector bolts (4) that have been repositioned. Notify Unit maintenance to torque bolts between 360 and 420 ft-lb (518 and 570 N•m) wet at earliest opportunity.



**NOTE**

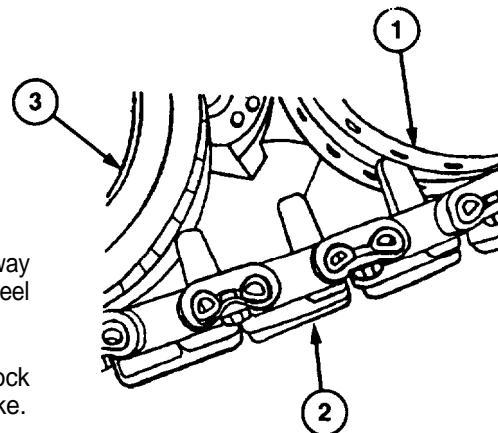
- Notify Unit maintenance to retorque end connector bolts after 50 miles.
- If track is new, remove one track shoe after 50 miles.



**Removing Track Shoe**

**NOTE**

- At least two persons are required to replace a track shoe.
  - If available, use penetrating oil on bolts on track shoe.
1. Position track shoe (2) to be removed midway between no. 7 roadwheel (3) and idler wheel (1).
  2. Shut off vehicle engine (p. 2-99) and block track with blocks. Do not set parking brake.



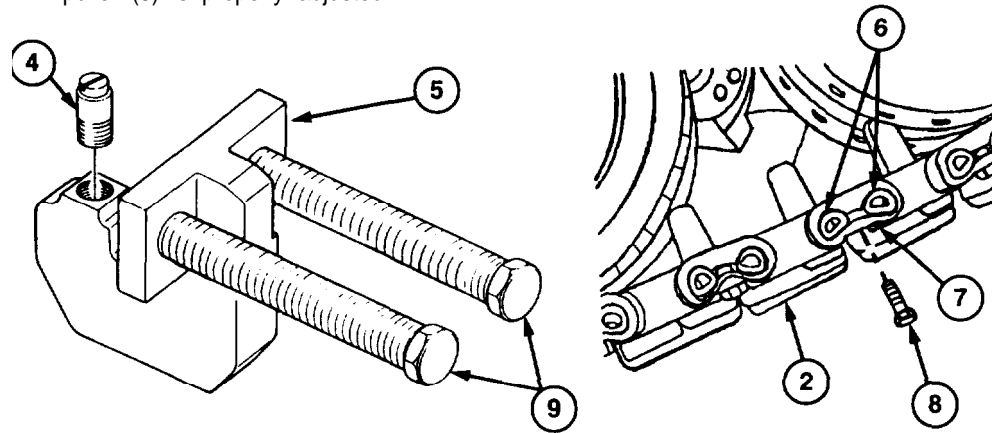


## Removing Track Shoe (continued)

**WARNING**

Lubricant is under high pressure. Loosen bleed plug slowly to avoid injury to personnel.

3. Decrease track tension (p. 3-30).
4. Using 3/4-inch drive socket wrench and 1 1/8 inch socket, remove two bolts (8) from two end connectors (7) on track shoe (2).
5. Install straight pin (4) in end connector puller (5). Install end connector puller (5) through bolt hole in end connector (7). Puller must rest flat on end connector (7) and straight pin (4) must engage bolt hole on both sides of end connector (7) so bolts of end connector puller (5) engage track link pins (6). Tighten or loosen straight pin (4) until end connector puller (5) is properly adjusted.

**CAUTION**

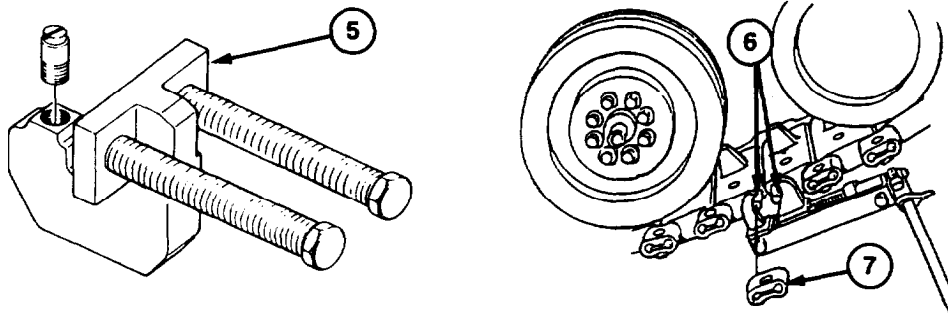
- Tighten bolts on end connector puller evenly, so end connector is pulled evenly off track link pins. Failure to do this can lead to damage to puller and track link pins.
- When tapping end connector puller with hammer, strike bolts squarely to avoid mushrooming the heads of bolts and damaging puller.

**NOTE**

To help loosen end connectors, tap bolts of end connector puller with hammer while moving or removing end connector.

6. Using end connector puller (5), 3/4-inch drive socket wrench, and 1 1/2 inch socket, move end connector (7) about 1 inch away from track shoe (2). If bolts on end connector puller (5) bind, tap end connector puller bolts (9) with hammer.

Removing Track Shoe (continued)



7. Install track connecting fixture on two track link pins (6).
8. Using end connector puller (5), 3/4-inch socket wrench, and 1 1/2 inch socket, remove end connector (7) from two track link pins (6). If end connectors become cocked during removal, remove end connector puller (5) and tap end connector (7) with hammer until end connector (7) is straight on track link pins (6). Install end connector puller (5), and continue to remove end connector (7).
9. Repeat steps 5 through 8 on end connector (7) on inside of track.

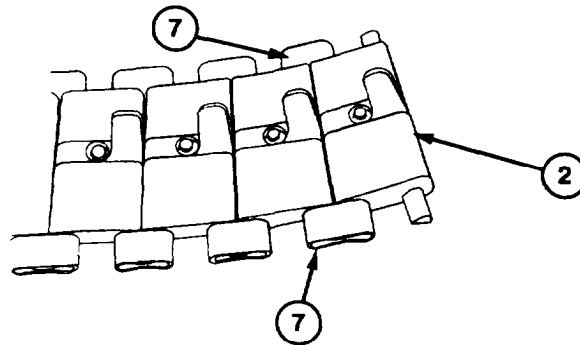
**WARNING**

**Release tension on track connecting fixtures evenly. Track is under tension and can move suddenly, causing severe injury to personnel.**

Remove two track connecting fixtures from ends of track.

Repeat steps 4,5,6, and 8 on two end connectors (7) securing track shoe (2) to track.

Remove track shoe (2) from track.



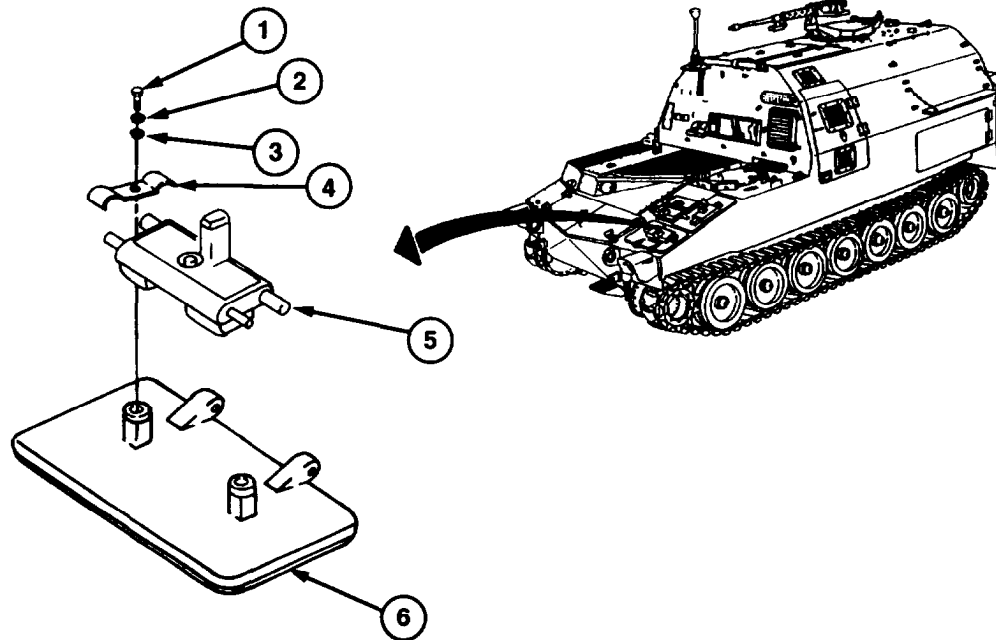
**TRACK MAINTENANCE (continued)**

**Removing Track Shoe from Stowage**

1. Remove two screws (1), lockwashers (2), washers (3), and retaining straps (4) and track shoe (5) from battery access door (6).

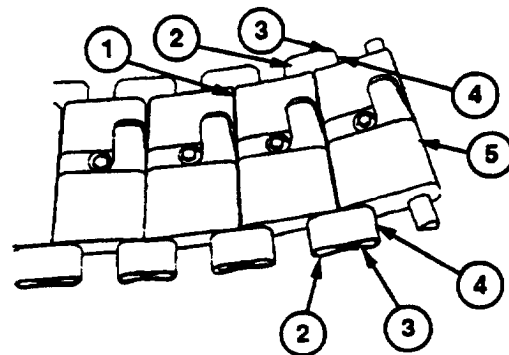
**Stowing Track Shoe**

1. Install trackshoe (5) on battery access door (6) with two retaining straps (4) washers (3) lo&washers (2), and screws (1).



**Installing Track Shoe**

1. Install end connector (4) on track link pin (2) on track end (1).
2. Position new track shoe (5) on track end (1).
3. Lift end of new track shoe (5) until track link pin (3) will fit into end connector (4). Tap end connector (4) with hammer until it seats against new trackshoe (5).
4. Install end connector (4) on two track link pins (2 and 3) on opposite side of track end (1) and track shoe (5). Tap end connector (4) with hammer until it seats against track shoe (5).



TRACK MAINTENANCE (continued)

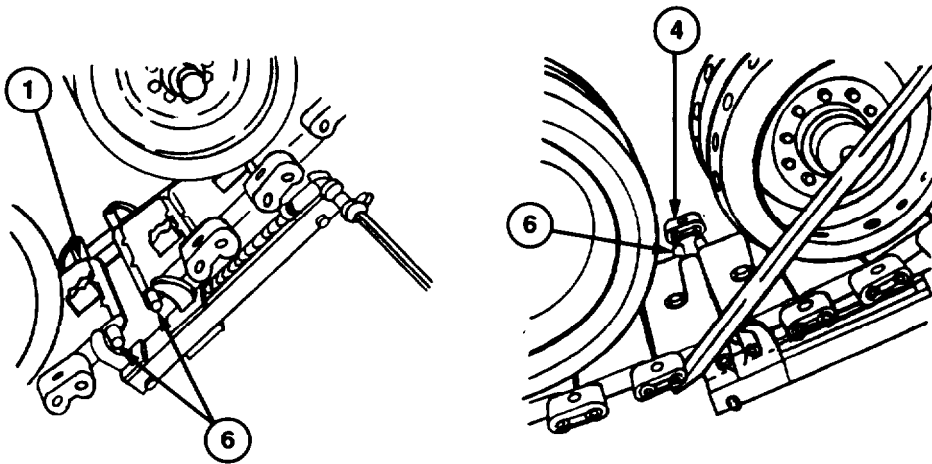
**WARNING**

Track is very heavy. Keep hands and feet from beneath track while it is being lifted.

**NOTE**

An assistant is needed to lift track end.

5. Using crowbar, lift track end (1) until it is close enough to other end of track so that two track connecting fixtures can be installed.
6. Install two track connecting fixtures on track and tighten until one end connector (4) will fit over two track link pins (6). If necessary, reposition track connecting fixtures (one at a time) as shown.



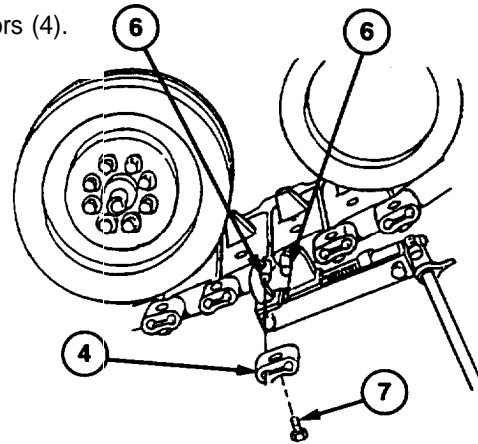
**NOTE**

Track can be maneuvered by lifting with crowbar or pushing against inside of track to bow it out.

7. Maneuver track until end connector (4) can be installed over two track link pins (6) on inside of track. Tap end connector (4) with hammer to install over two track link pins (6).

**TRACK MAINTENANCE (continued)**

8. Install one end connector (4) on two track link pins (6) on outside of track.
9. Remove two track connecting fixtures and logs or rocks from track.
10. Tap two end connectors (4) with hammer to seat end connectors (4) against track.
11. Install four bolts (7) in four end connectors (4).
12. Adjust track tension (p. 3-29).
13. Mark replaced end connectors (4).
14. Drive vehicle at a speed not to exceed 10 miles per hour for a short distance, alternating right and left steers.
15. Stop vehicle and visually inspect for any end connectors that may have shifted. If any end connectors have shifted, reposition. Tighten end connector bolts (7) that have been repositioned. Notify Unit maintenance to torque bolts between 380 and 420 ft-lb (518 and 570 N•m) wet at earliest opportunity.

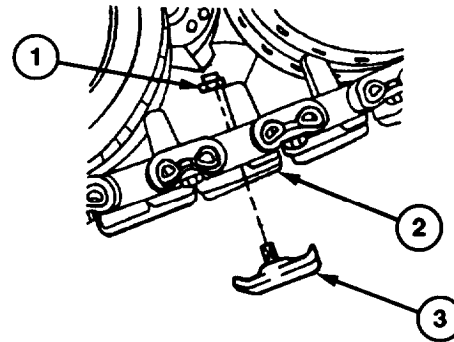


**NOTE**

Notify Unit maintenance to retorque end connector bolts after 50 miles.

**Removing Track Shoe Pads**

Using breaker bar and 15/16-inch socket, remove nut (1) and track shoe pad (3) from track shoe (2).



**Installing Track Shoe Pads**

**NOTE**

When installing track shoe pads, avoid creating a "hill and valley" profile. Isolated high points will wear quickly. Adjacent pads should be the same height. Do not install pads in an irregular profile; shuffle pads to maintain a smooth profile.

1. Install track shoe pad (3) and nut (1) on track shoe (2). Tighten nut (3) using breaker bar and 15/16-inch socket.
2. Notify Unit maintenance to torque nut (1) between 110 and 150 ft-lb (149 and 203 N•m) at earliest opportunity.



**CONVEYOR SPEED ADJUSTMENT****NOTE**

- Flow-control valve on hydraulic control panel regulates operating speed of the conveyor. Flow-control valve is manually adjustable.
  - Do not let pressure rise to above 800 psi, or APU generator will not operate.
1. To increase speed of conveyor, turn flow-control valve (1) counterclockwise.
  2. To decrease speed of conveyor, turn flow-control valve (1) clockwise.

**UPPER REAR DOOR FLOW-CONTROL VALVE ADJUSTMENT****WARNING**

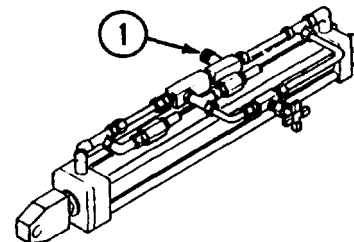
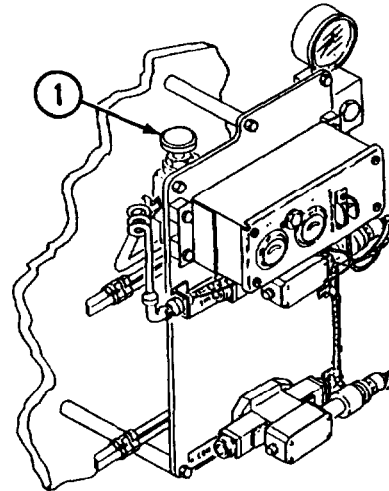
Never operate upper rear door until door-travel area is clear of personnel. Door may strike personnel, causing severe injury.

**NOTE**

The upper rear door is most prone to erratic operation during the first three seconds of closing. This valve is designed to smooth door closing.

To adjust:

- 1. Activate hydraulic system (p. 2-131).
2. Open upper rear door (p. 2-138).
3. Turn flow-control valve (1) counterclockwise until fully open.
4. While closing door (p. 2-140), slowly turn flow-control valve (1) clockwise until door closes smoothly.
5. Open door (p. 2-138) and repeat step 4. Continue to operate and adjust flow-control valve (1) until door operates smoothly for entire closing cycle.



CONVEYOR CHAIN MAINTENANCE

**WARNING**

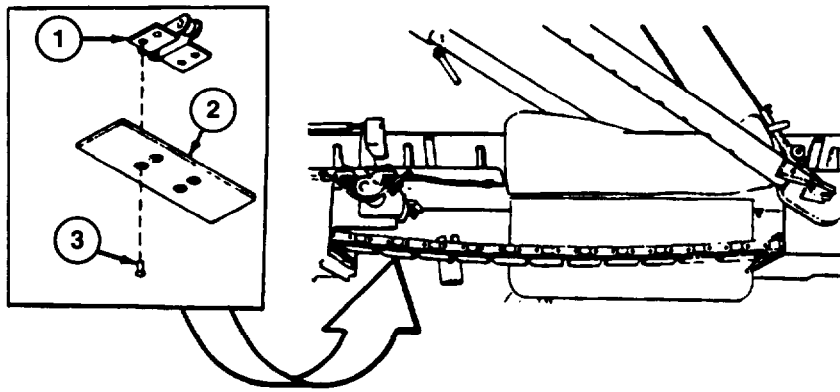
Keep hands clear of conveyor hinges during maintenance procedures.

**Conveyor Chain Pad Replacement**

**NOTE**

- Replace chain pad(s) when pad is bent or when metal that could damage projectile bands is exposed.
- It is not necessary to remove chain link(s) to replace damaged conveyor pad(s).

1. Turn off hydraulic system.
2. Use conveyor manual crank to move damaged pad (2) to bottom side of conveyor.

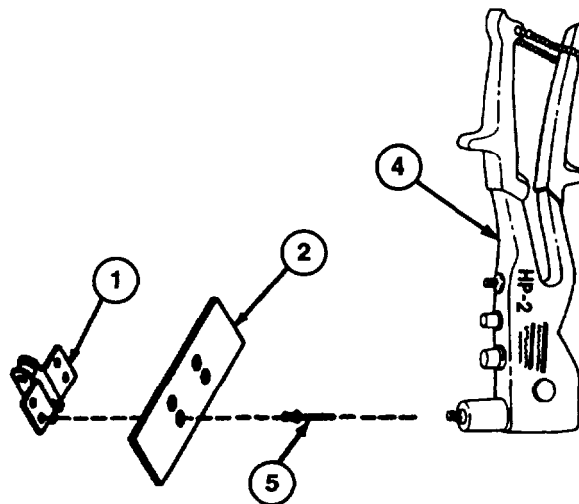


3. Insert chisel between pad (2) and plate (1). Tap with hammer to cut four rivets (3). Remove rivets (3) using a hammer and punch, and remove pad (2).



**CONVEYOR CHAIN MAINTENANCE (continued)**

4. Using four new rivet and nail assemblies (5) and rivet gun (4) install new pad(s) (2) as follows:
  - a. Spread rivet gun (4) handles.
  - b. Insert rivet and nail assemblies (5) into rivet gun (4) as shown, pointed end first.
  - c. Place rivet end of nail through hole of pad (2) and plate (1).
  - d. While holding pad (2) against plate (1) with rivet and nail assembly (4) and rivet gun (4), repeatedly squeeze rivet gun handles together until rivet "pops" from nail.
  - e. Spread rivet gun (4) handles and remove nail.
  - f. Repeat steps a through e for each pad hole until all replacement pads are installed.



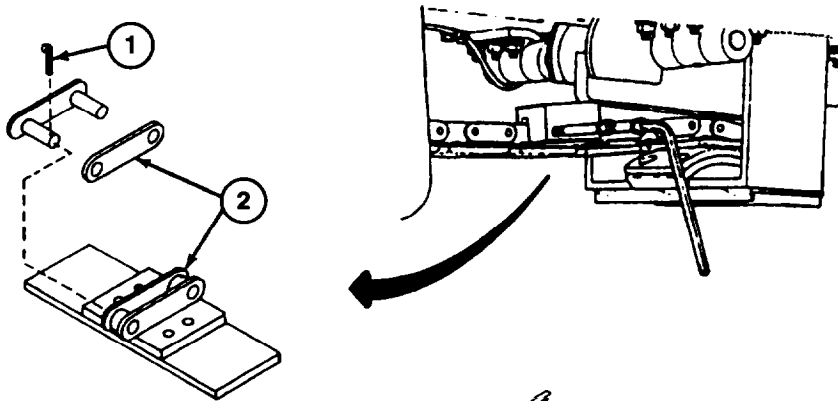
CONVEYOR CHAIN MAINTENANCE (continued)

Chain Repair

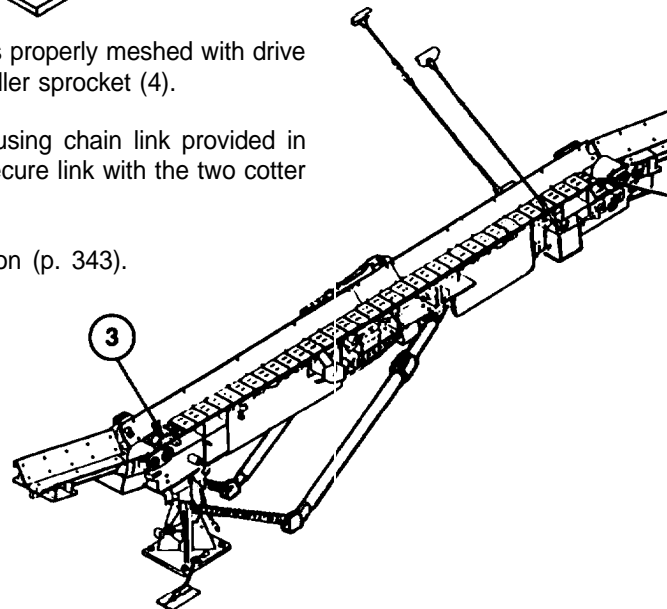
NOTE

It is not necessary to break conveyor chain to replace damaged conveyor pad.

1. Turn off hydraulic system.
2. Use conveyor manual crank to move damaged portion of chain to bottom side of conveyor.
3. Relieve chain tension (p. 3-43).
4. Remove any damaged link (2) by removing two cotter pins (1) or by using chain breaker.



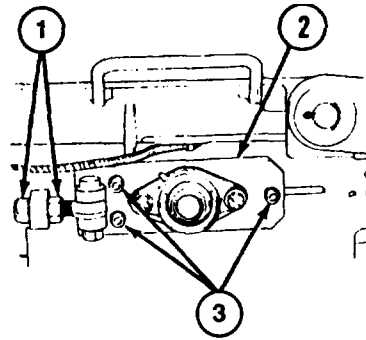
5. Make sure chain is properly meshed with drive sprocket (3) and idler sprocket (4).
6. Reconnect chain using chain link provided in chain repair kit. Secure link with the two cotter pins provided.
7. Adjust chain tension (p. 343).



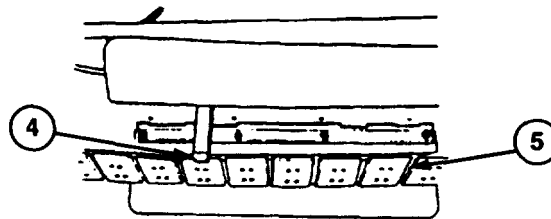
**CONVEYOR CHAIN MAINTENANCE (continued)****Chain Tension Adjustment****CAUTION**

Screws are secured by nuts located internally. Nuts must be held in position while screws are loosened. If this precaution is not taken, damage to equipment may result.

1. Loosen each of two takeup plates (2) on both sides of conveyor by loosening three screws (3) on each plate.
2. Loosen or tighten rod-end adjusting nuts (1) on both sides to move takeup plates (2) forward or backward.

**CAUTION**

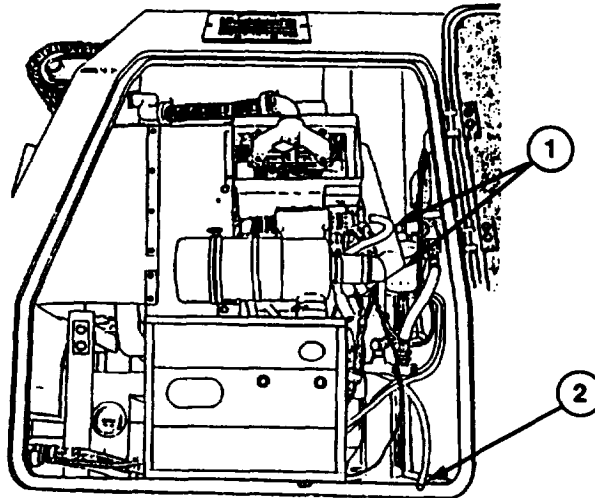
Adjust tension evenly on both sides of sprocket.



3. Adjust tension so that conveyor chain pads (5) hang evenly with bottom of chain-tension indicator (4). If conveyor chain pads (5) hang no lower than bottom of indicator (4) or no higher than scribed line on indicator (4) no adjustment is necessary.
4. Secure two takeup plates (2) by tightening three screws (3) on each takeup plate (2).
5. Activate hydraulic system and operate conveyor in both directions to check for proper operation.

APU MAINTENANCE

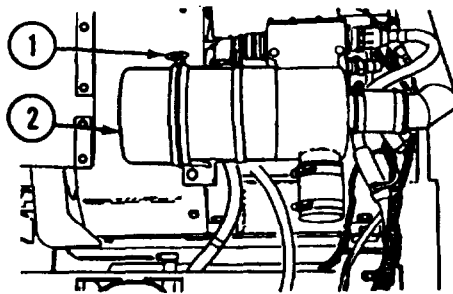
Draining Fuel Filters



1. Open APU side door. Locate two APU fuel filters (1) at inside rear wall of APU compartment.
2. Hold a glass or other small container beneath drain-hose end (2) of each filter.
3. Open each drain cock, starting with filter at rear, and allow contaminants to drain from filters.
4. Close drain cocks.
5. Inspect fuel from each filter (1) for signs of water or other contaminants. Report excessive amounts to Unit maintenance.
6. Close and secure APU side door.

Servicing APU Air Cleaner

1. Open APU compartment side door.

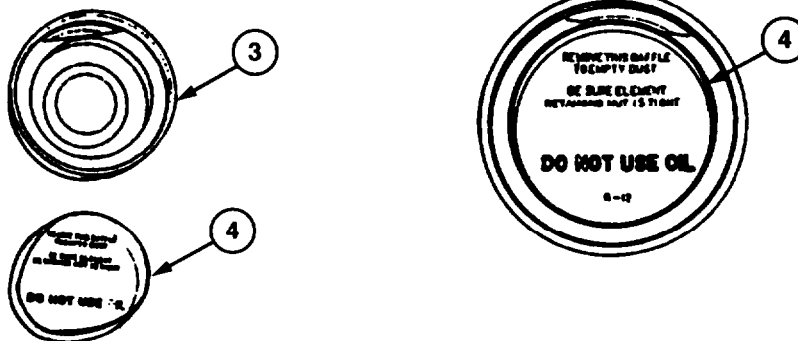


2. Loosen air filter housing clamp (1) to remove dust cap assembly (2).

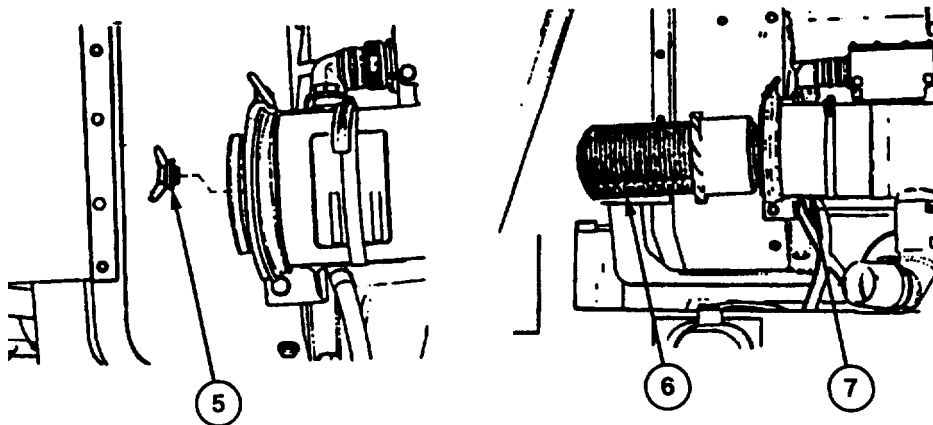
APU MAINTENANCE (continued)

**WARNING**

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal instructions.



3. Remove baffle (4) from dust cap (3).
4. Empty dust cap (3).
5. Reinstall baffle (4).



6. Remove wing nut (5)
7. Remove filter element (6) from air filter housing (7).

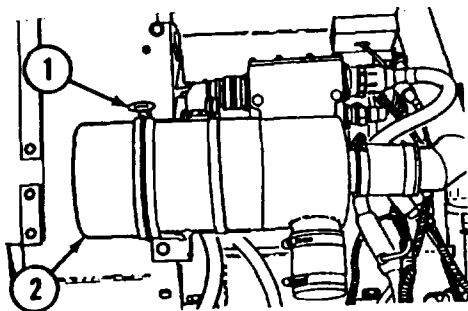
APU MAINTENANCE (continued)

8. If filter element (6) is torn, notify Unit maintenance.

**WARNING**

Compressed air used for cleaning purposes should not exceed 30 psi (206.8 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., goggles/shield, gloves). Failure to do this can result in injury to personnel.

9. If dirty or clogged, clean element (6) with low-pressure compressed air directed to inside of element (6).
10. Wipe inside of air filter housing (7) with clean, damp rag (Item 40, Appendix D). Inspect outside of hoses for holes and tears.
11. Place element (6) in air filter housing (7).
12. Install wing nut (5).



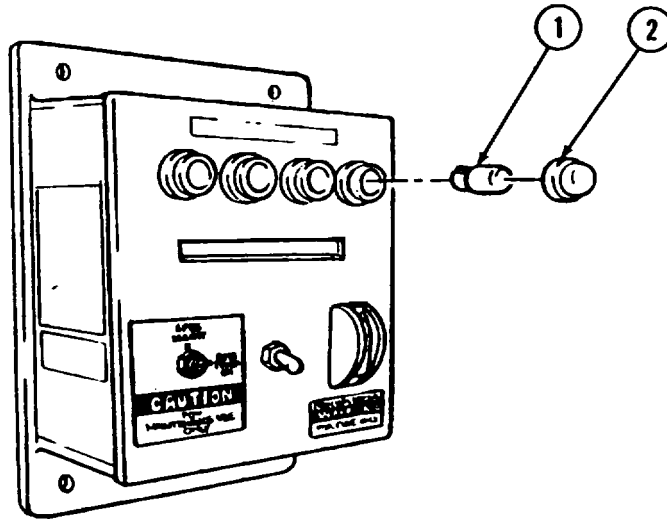
**NOTE**

When installing cap, make sure outer edge of cap marked TOP is located at top of air cleaner.

13. Install dust cap assembly (2) and secure air filter housing clamp (1).

**AFES MAINTENANCE****Test and Alarm (TIA) Panel or Remote Status Indicator Lamp Replacement**

1. Remove lens cover (2) from lamp (1) to be replaced.
2. Remove and discard burned-out lamp (1).
3. Install new lamp (Item 26, Appendix B).
4. Install lens cover (2).



## DECAL MAINTENANCE

### Decal Replacement

#### **WARNING**

- Drycleaning solvent(P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (380C) and for type II is 138°F (500C). Failure to do so may result in Injury or death to personnel.
  - If personnel become dizzy while using cleaning solvent, Immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.
1. Lift up one corner of old decal. Slowly peel decal from surface. If decal rips or tears, use a rag and drycleaning solvent to help loosen sticky substance or adhesive backing. Scrub decal from surface. Dry surface using a rag (Item 40, Appendix D). Discard decal.

#### **NOTE**

**Surface area must be clean and dry before attaching new decal.**

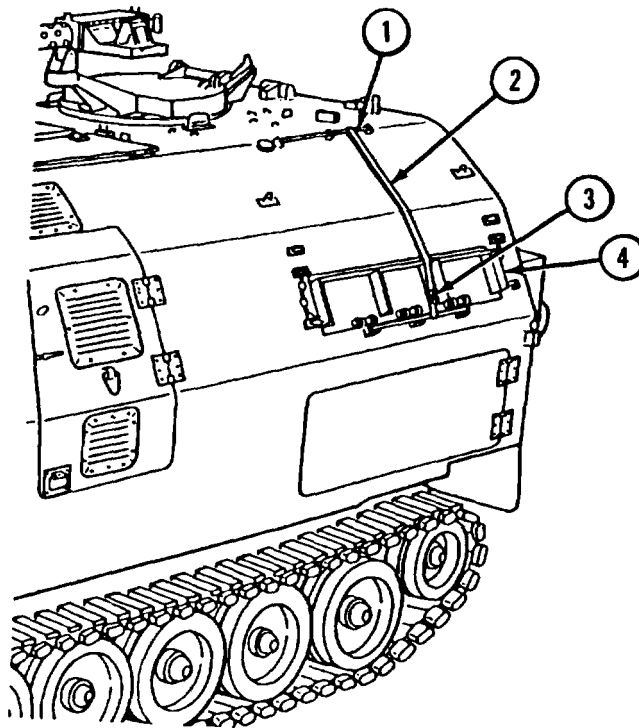
2. Remove protective backing from new decal. Position decal on surface. Using a dry rag, press decal into position starting from its center. Press outward to remove any air bubbles.



**STRAP WEBBING MAINTENANCE****WARNING**

Duffle bag shelves are heavy. To avoid serious injury, stand clear of shelf when it is being deployed.

1. Release buckle clamp (3), allowing duffle bag shelf (4) to deploy. Pull strap (2) from around upper bar assembly (1) at top of hull.
2. Turn in strap (2) and any unserviceable hardware.
3. Install replacement strap (2) with buckle clamp (3) facing upward, so that running end of strap (2) enters buckle from lower side.
4. Insert strap (2) gradually around upper bar assembly (1) at top of hull. Raise shelf (4) to stowed position. Install strap (2) around box on shelf (4). Insert end of strap (2) through buckle clamp (3) and pull until tight.



**RESTRAINING STRAP MAINTENANCE**

**NOTE**

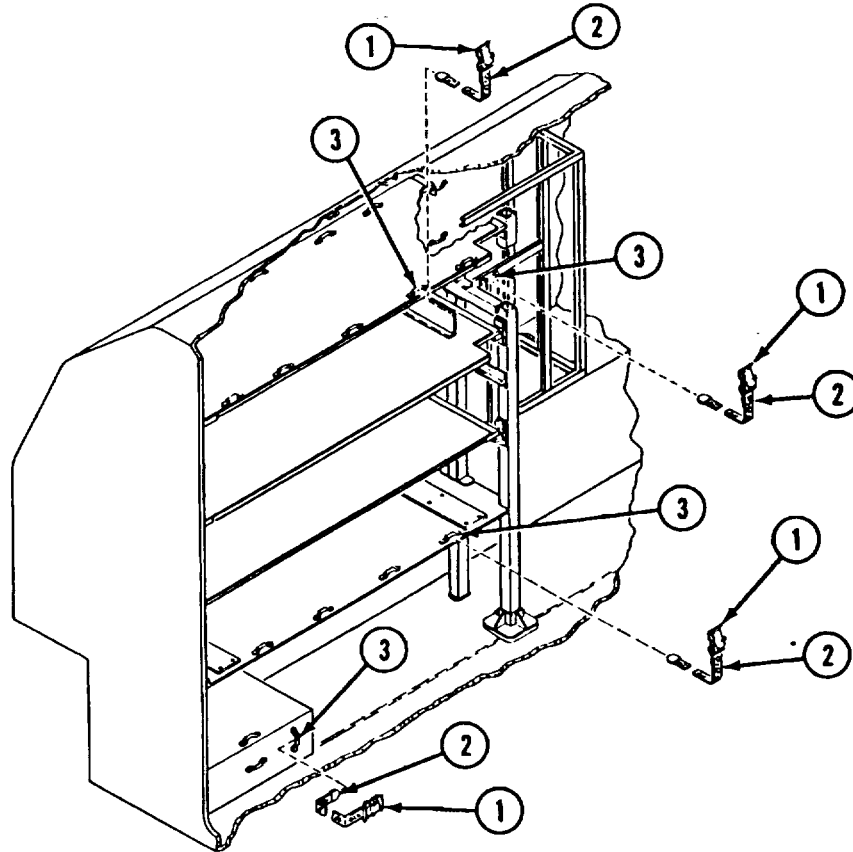
The following procedure refers to stowage straps for lower and top shelves, conveyor crank, and canister compartment.

1. Release buckle (1) and pull strap (2) out of welded loop (3).
2. Turn in strap (2) and any unserviceable hardware.

**NOTE**

Install replacement strap with running end on top.

3. Insert new strap (2) gradually through loop (3). Insert end of strap (2) through buckle (1) and pull until tight.



**MOUNTED WATER RATION HEATER (MWRH) MAINTENANCE****Installing the MWRH****CAUTION**

**Before installing the MWRH, make sure vehicle MASTER switch is in OFF position.**

1. Place the MWRH in mounting bracket with controls facing user.
2. Secure the MWRH to mounting bracket using three washers and wingnuts.
3. Connect mounting strap and adjust until snug against the MWRH.

**NOTE**

Route power cable over MWRH mounting bracket before connecting to the MWRH.

4. Make sure MWRH control switch is in OFF position. Connect 90° connector to the MWRH.

**Removing the MWRH****CAUTION**

**Before removing the MWRH, make sure vehicle MASTER switch is in OFF position.**

1. Make sure MWRH control switch is in OFF position. Disconnect 90° connector from the MWRH.
2. Disconnect mounting strap from the MWRH.
3. Remove three wingnuts and washers from the MWRH.
4. Remove the MWRH from mounting bracket.



## CHAPTER 4 AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES)

### Section I. EQUIPMENT DESCRIPTION

#### Characteristics

The Automatic Fire Extinguishing System (AFES) is an automatic electrical system that, when activated, provides fire extinguishing capability for the engine and crew compartments. It consists of test and alarm (T/A) panels, sensors, and associated equipment explained later in this section and in Section III, Operating Instructions.

Automatic electrical operation will automatically sense and discharge an agent to extinguish hydrocarbon fires. The crew system provides an automatic electrical second-shot capability should the fire continue burning or a second fire occur.

Manual electrical operation must be manually activated by the crew to discharge the agent to extinguish fires. The crew system second-shot manual electrical activation is available if the fire continues to burn. That system must be manually activated by a crew member.

These systems will not activate unless the crew/engine T/A panel maintenance switches are in the horizontal AFES POWER ON normal operational position.

#### Capabilities

##### AFES Engine Compartment:

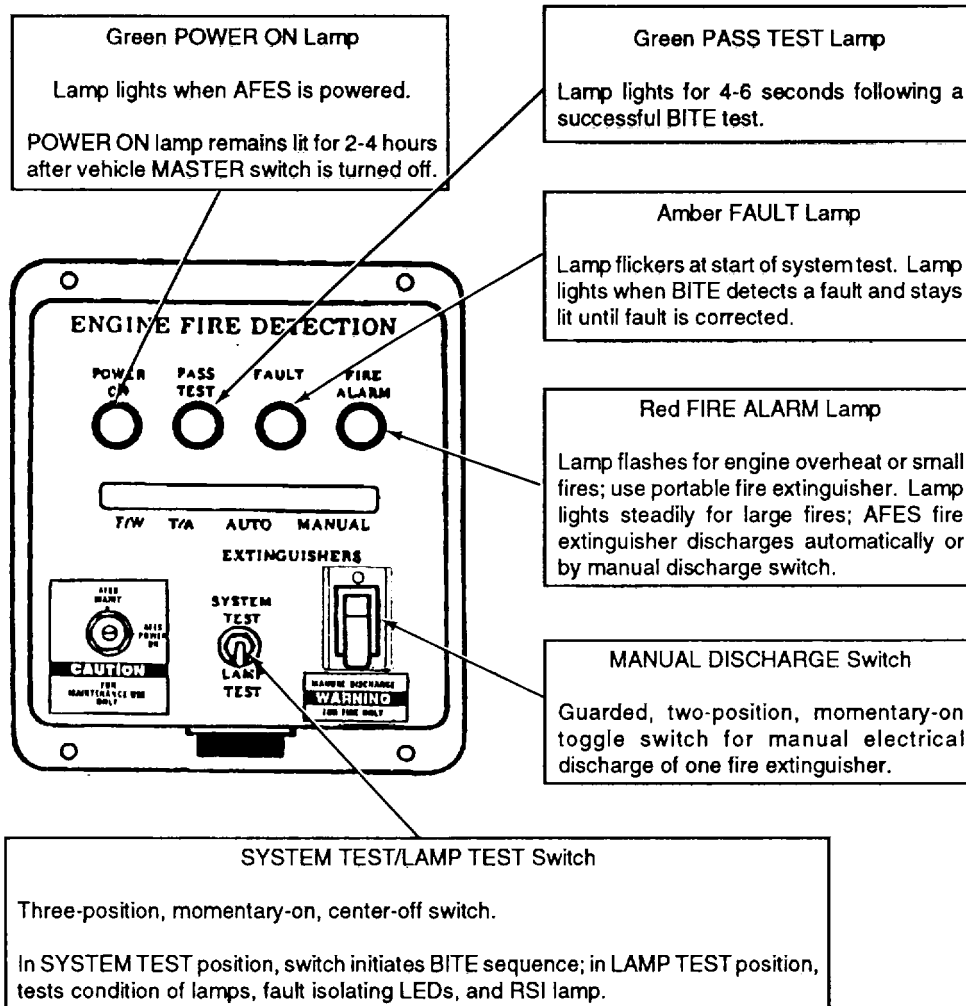
- An automatic electrical function that allows detection and discharge of an agent to extinguish hydrocarbon fires.
- A manual discharge backup to the electrical function that enables the operator to electrically discharge an agent into the engine compartment when the automatic system does not function and fire is detected.

##### AFES Crew Compartment:

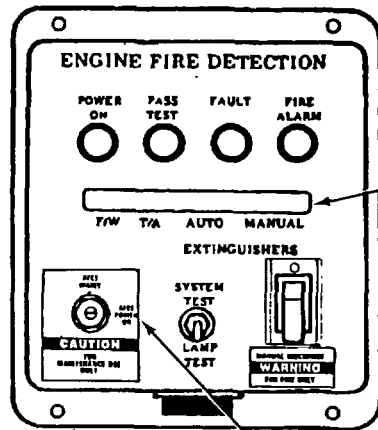
- An automatic electrical function that allows detection and discharge of an agent to extinguish hydrocarbon fires. There is a second-shot discharge capability for use after 5 seconds if another fire ignites that discharges a second set of fire extinguishers.
- A manual electrical discharge function that enables the crew to electrically discharge an agent into the crew or engine compartment when the automatic electrical function fails to work and a fire is detected.
- A manual electrical discharge capability that allows for a second-shot capability after 5 seconds if another fire ignites that discharges a second set of fire extinguishers.

Features

CONTROLS AND INDICATORS FOR ENGINE AFES



CONTROLS AND INDICATORS FOR ENGINE AFES (continued)



Fault Isolation LEDs

If FAULT lamp lights during BITE, fault isolating LEDs will also light to indicate which component(s) is nonoperational and requires fault correction. The four LEDs are:

- F/W ..... Fire Wire
- T/A ..... Test and Alarm Panel
- AUTO ..... Fire extinguisher no. 1
- MANUAL ..... Fire extinguisher no. 2

LEDs will not light if battery is low.

MAINTenance Switch

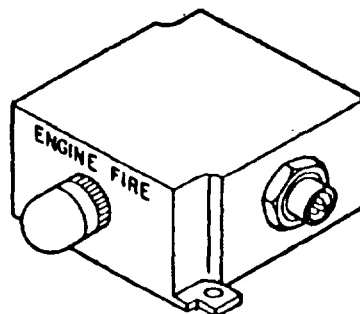
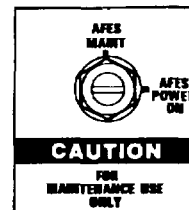
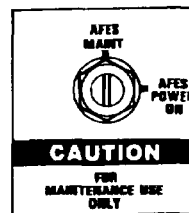
**CAUTION**

**MAINTenance switch is to be used by authorized Unit and Direct Support maintenance personnel only.**

Two-position, screwdriver-activated, rotary switch.

Vertical position: Power off, AFES deenergized. Maintenance can be safely performed. Locking pins must be installed in fire extinguisher no. 2 valve actuator guard to prevent accidental discharge. Check no. 1 extinguisher pin.

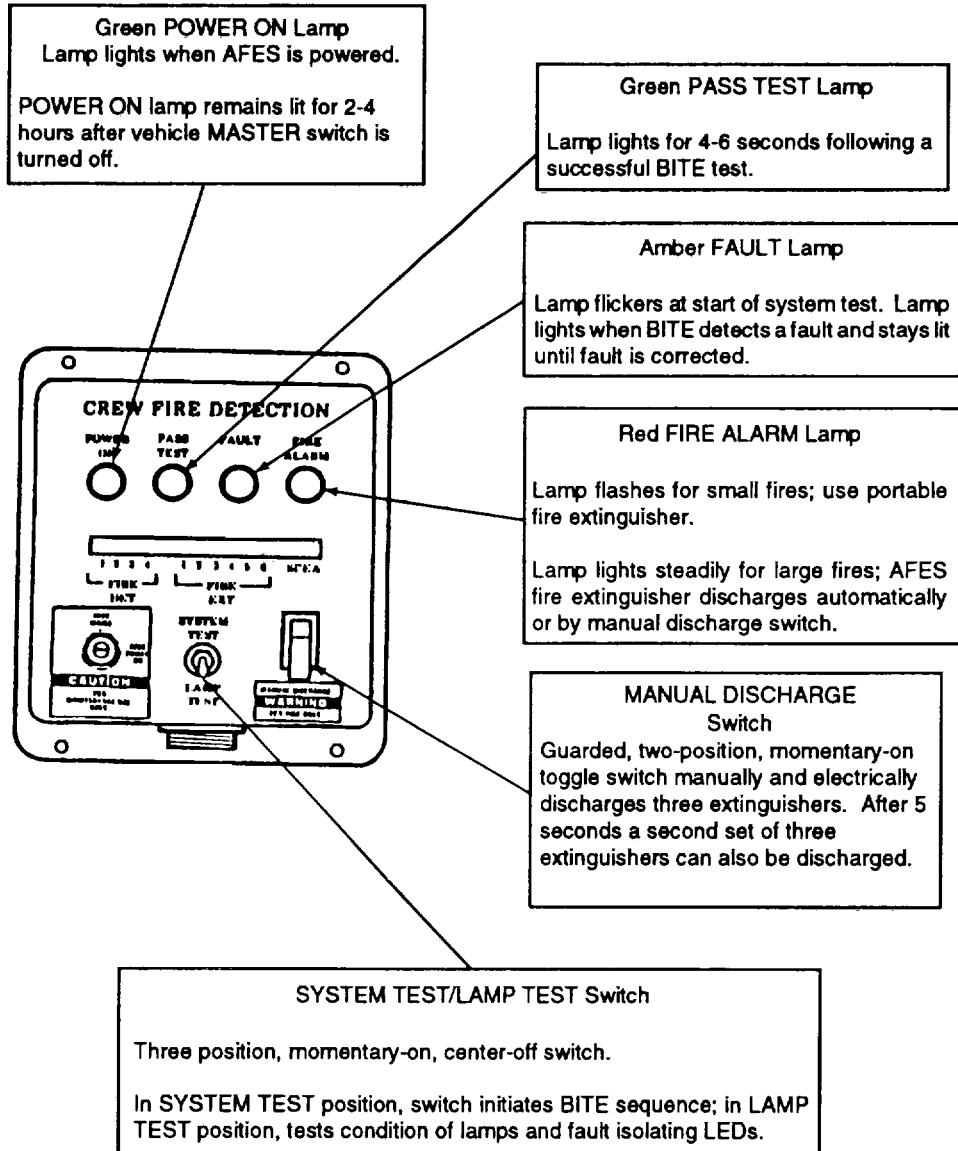
Horizontal position: Power on. Normal operational position. AFES extinguishers capable of automatic discharge. Locking pins must be removed from engine fire extinguisher no. 2 valve actuator guard.



Red Remote Status Indicator (RSI)

Lamp flashes in crew compartment during an engine overheat or small fire; lamp lights steadily during a large engine fire. Normally, lamp is not lit.

CONTROLS AND INDICATORS FOR CREW AFES





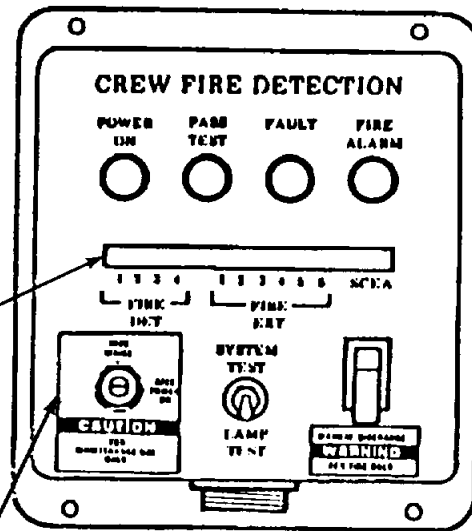
CONTROLS AND INDICATORS FOR CREW AFES (continued)

**Fault Isolation LEDs**

If the FAULT lamp lights during BITE, fault isolating LEDs will also light to indicate which component (s) is nonoperational and requires fault correction. The eleven LEDs are:

	1 .....	OFSA no. 1
FIRE	2 .....	OFSA no. 2
DET	3 .....	OFSA no. 3
	4 .....	OFSA no. 4
	1 .....	Extinguisher no. 1
	2 .....	Extinguisher no. 2
FIRE	3 .....	Extinguisher no. 3
EXT	4 .....	Extinguisher no. 4
	5 .....	Extinguisher no. 5
	6 .....	Extinguisher no. 6
SCEA	.....	Standard Control Electronic Amplifier

LEDs will not light if battery is low.



**MAINTenance Switch**

**CAUTION**

**MAINTenance switch is to be used by authorized Unit and Direct Support maintenance personnel only.**

Two-position, screwdriver-activated rotary switch.

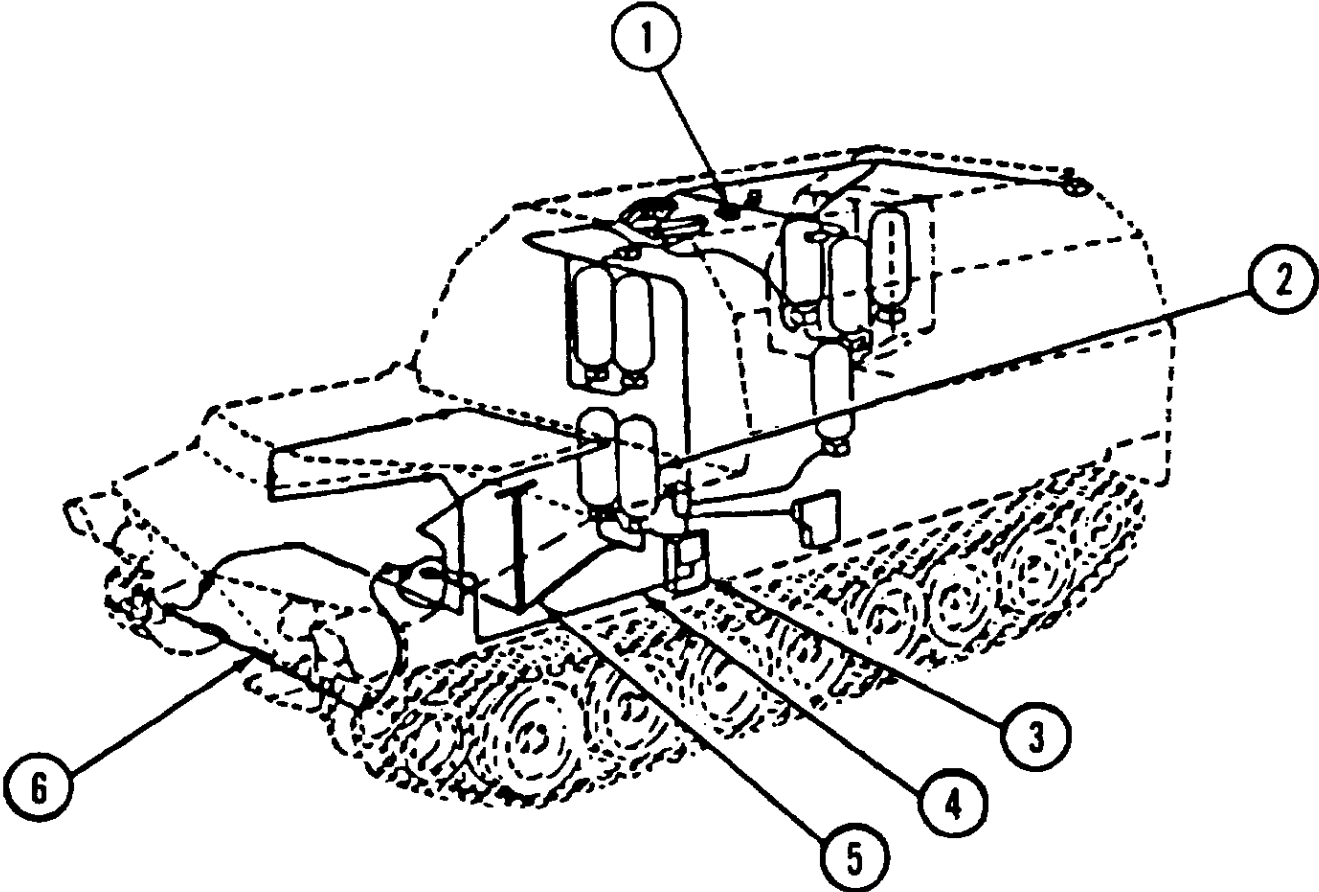
Vertical position: MAINT Power off. AFES deenergized. Maintenance can be safely performed. Locking pins must be installed on crew fire extinguishers no. 3 and no. 4 valve actuator guards to prevent accidental discharge. Check other extinguisher pins.

Horizontal position: AFES Power on. Normal operational position. AFES extinguishers capable of automatic discharge. Locking pins must be removed from crew fire extinguishers no. 3 and no. 4.

Section II. COMPONENT LOCATION

Automatic Fire Extinguishing System (AFES) Components

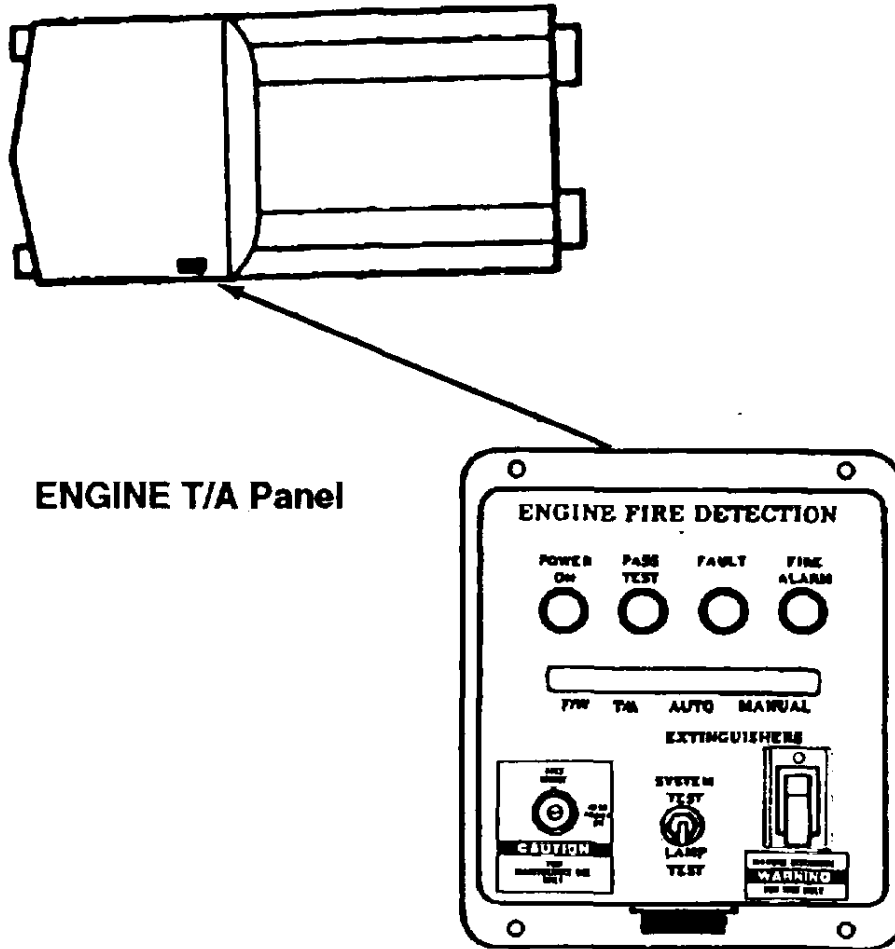
ENGINE AFES COMPONENTS



- 1. RSI
- 2. Engine Fire Ext. No. 1
- 3. Engine T/A Panel

- 4. Ext. Wire Harness W4
- 5. Halon Distribution System
- 6. Thermal Detection System

## ENGINE AFES COMPONENTS (continued)

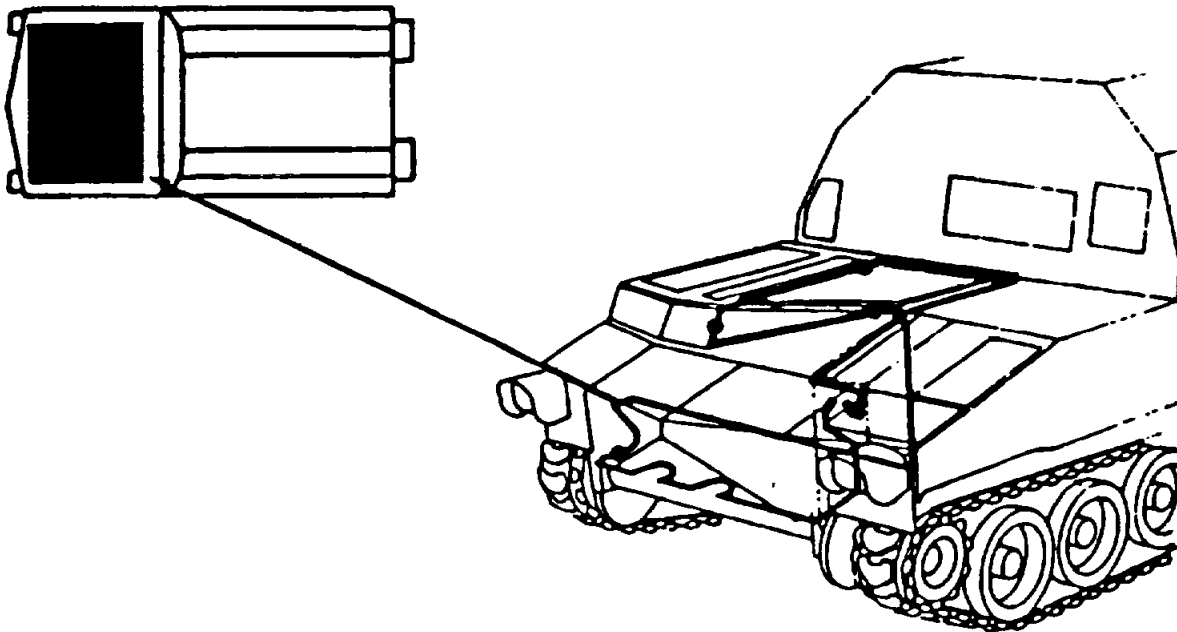


ENGINE T/A Panel

The engine AFES activates automatically when the thermal detection system detects engine fires. Engine AFES components are described on pages 4-7 through 4-9.

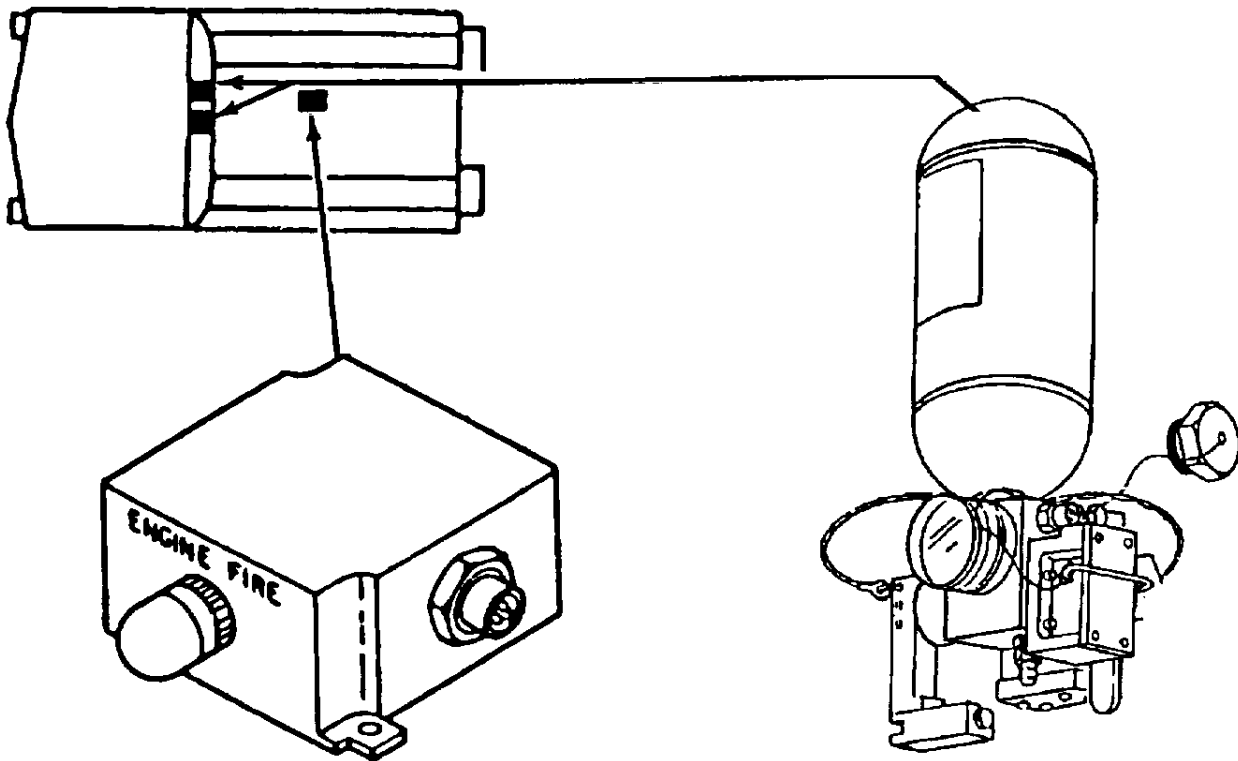
#### Engine Test and Alarm (T/A) Panel

- The T/A panel provides status lights and switches and contains the electronic circuitry necessary to automatically monitor the engine AFES.
- The T/A panel monitors the thermal sensing element (fire wire) and activates one of the engine fire extinguishers when an engine fire is detected.
- When fire is detected, the red FIRE ALARM indicator on the T/A panel and the red ENGINE FIRE indicator on the remote status indicator (RSI) in the crew compartment light.
- The T/A panel is also equipped with a red-guarded, two-position MANUAL DISCHARGE toggle switch that allows the driver to discharge the two engine fire extinguishers.
- The engine AFES contains built-in test equipment (BITE) that automatically monitors the status of AFES components.
- BITE permits the driver to check the status of AFES components for normal operation.

**ENGINE AFES COMPONENTS (continued)****Thermal Detection System****Thermal Detection System**

- The thermal detection system consists of fire sensing elements and couplings looped throughout the engine compartment.
- The fire sensing elements detect both engine overheat conditions and fires.
- When the system detects an engine overheat condition, the T/A panel FIRE ALARM lamp and the RSI ENGINE FIRE lamp flash.
- When the system detects an engine fire, both indicator lamps light and the system automatically activates the engine automatic fire extinguisher.

## ENGINE AFES COMPONENTS (continued)

**Remote Status Indicator****10-lb Fire Extinguisher (two)****Remote Status Indicator (RSI)**

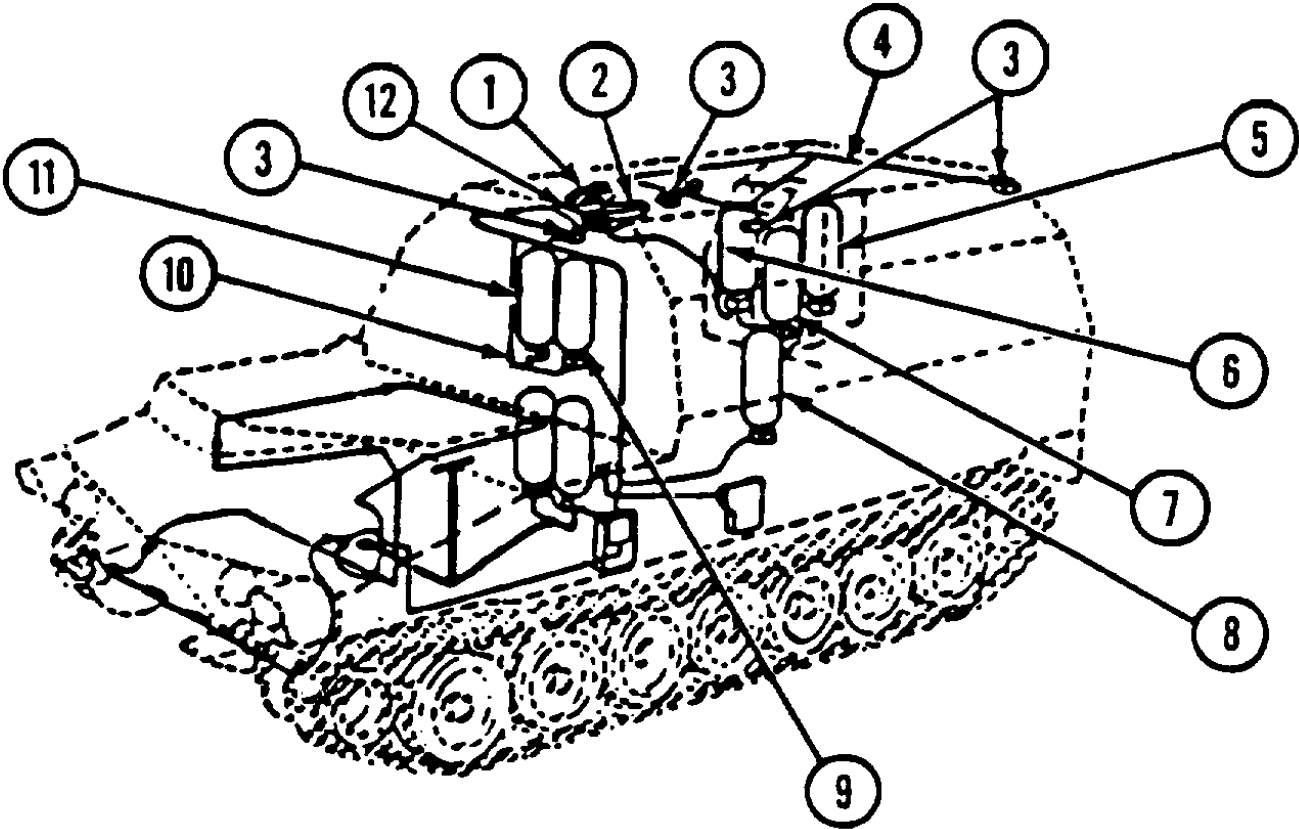
- The RSI is a red alarm light that warns personnel in the crew compartment of engine overheating and fires.
- The red RSI ENGINE FIRE warning lamp and the red FIRE ALARM lamp on the engine T/A panel light at the same time.

**Fire Extinguishers**

- The fire extinguishers consist of steel cylinders filled with Halon and equipped with a quick-release valve assembly.
- AFES cylinders contain Halon fire suppressant pressurized with dry nitrogen for use on hydrocarbon fuel fires only.

The engine compartment has two fire extinguishers, each weighing 10 pounds. One fire extinguisher interfaces with the thermal detection system through the engine compartment T/A panel. It activates automatically when the thermal detection system senses an engine fire. The second fire extinguisher is dedicated to the AFES manual discharge system (AFES/MDS). It is activated by pulling one of the lanyard cable pull handles. One is located on the outside of the vehicle near the driver's hatch, and the other is located in the driver's compartment.

CREW AFES COMPONENTS

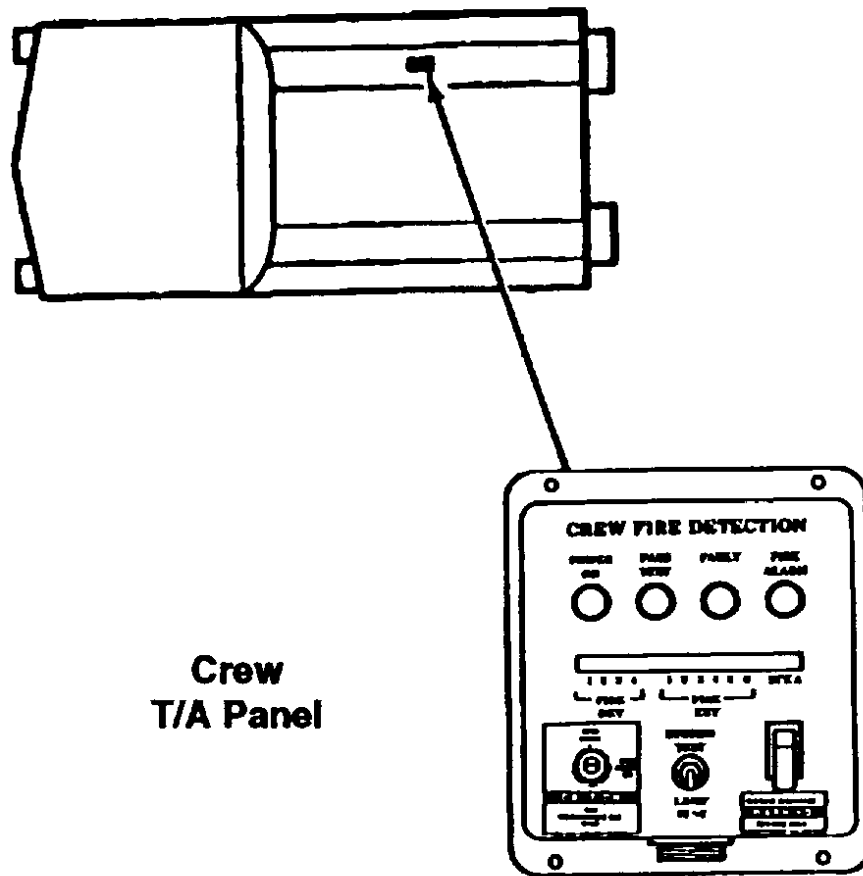


- 1. Crew T/A Panel
- 2. SCEA
- 3. OFSA
- 4. OFSA Wire Harness W1
- 5. Crew Fire Ext. No. 2
- 6. Crew Fire Ext. No. 6

- 7. Crew Fire Ext. No. 5
- 8. Crew Fire Ext. No. 3^
- 9. Crew Fire Ext. No. 1
- 10. Ext. Wire Harness W3
- 11. Crew Fire Ext. No. 4^
- 12. SCEA Wire Harness W2

\* Activated either by crew AFES or by AFES/MDS

## CREW AFES COMPONENTS (continued)



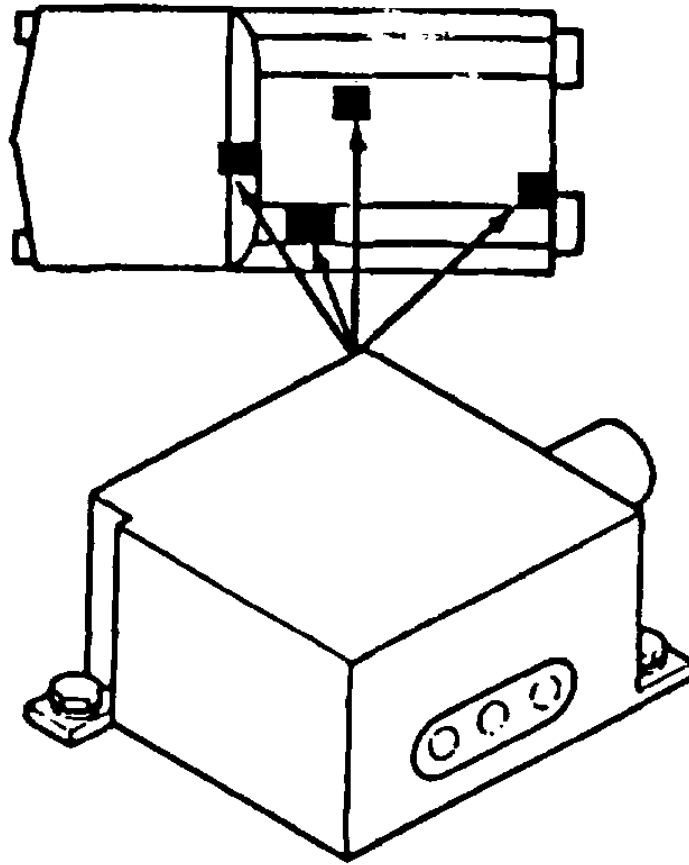
**Crew  
T/A Panel**

The crew AFES activates automatically when one of four optical fire sensing assemblies (OFSAs) detects hydrocarbon fuel fires. Crew AFES components are described on pages 4-11 through 4-15.

#### **Crew Test and Alarm (TIA) Panel**

- The T/A panel provides status lights and switches and contains the electronic circuitry necessary to monitor the crew AFES.
- The T/A panel interfaces with the standard control electronic amplifier (SCEA) and the OFSA.
- The crew AFES has built-in test equipment (BITE), which automatically monitors the status of components and allows crew members to test the components for normal operation.
- A red-guarded, two-position MANUAL DISCHARGE toggle switch permits the crew to manually discharge crew compartment fire extinguishers.

## CREW AFES COMPONENTS (continued)



## Optical Fire Sensing Assembly (OFSA)

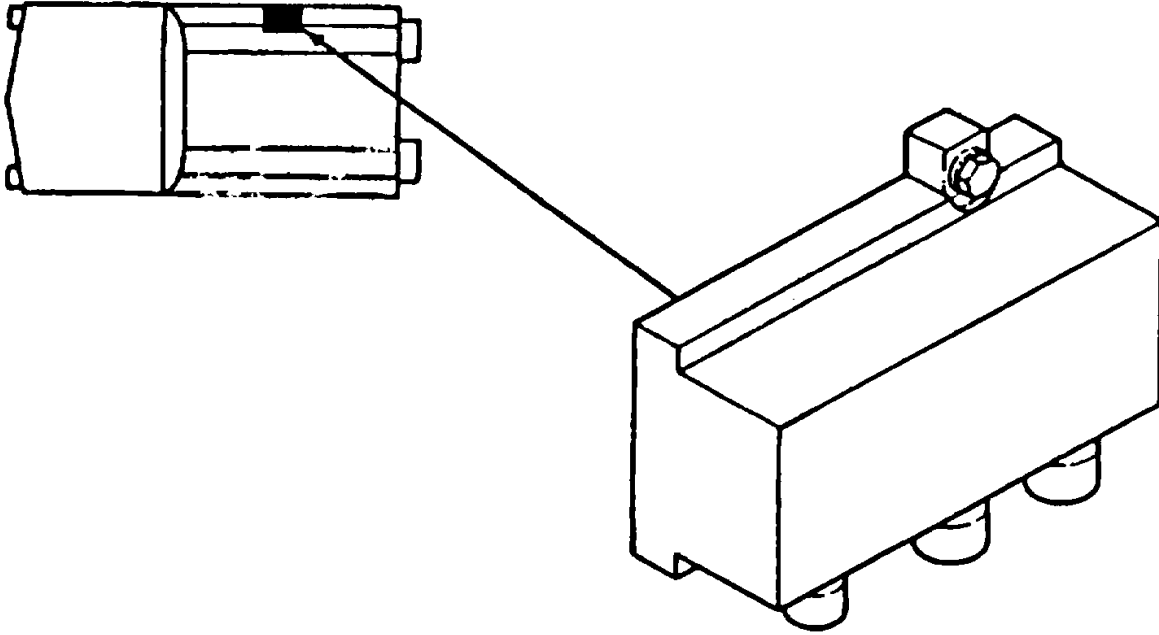
### CAUTION

Do not use high-pressure washing on AFES components. Moisture will contaminate electrical connections, which will result in failure of the system.

### Optical Fire Sensing Assembly (OFSA)

- OFSA consists of four sensor units located in the crew compartment, each using three infrared (IR) wave bands designed to detect hydrocarbon fuel fires.
- OFSA does not detect sunlight, electrical discharges, or lamps, flashes, fragmentation, or radiation from warheads or other battlefield activity.
- OFSA units are housed in individual shock-resistant aluminum casings mounted on brackets.
- OFSA units have built-in test equipment (BITE), which internally tests each unit for normal operation. BITE indicates a fault in the OFSA by lighting an LED on the T/A panel.
- The four OFSA units provide complete coverage of the crew compartment.



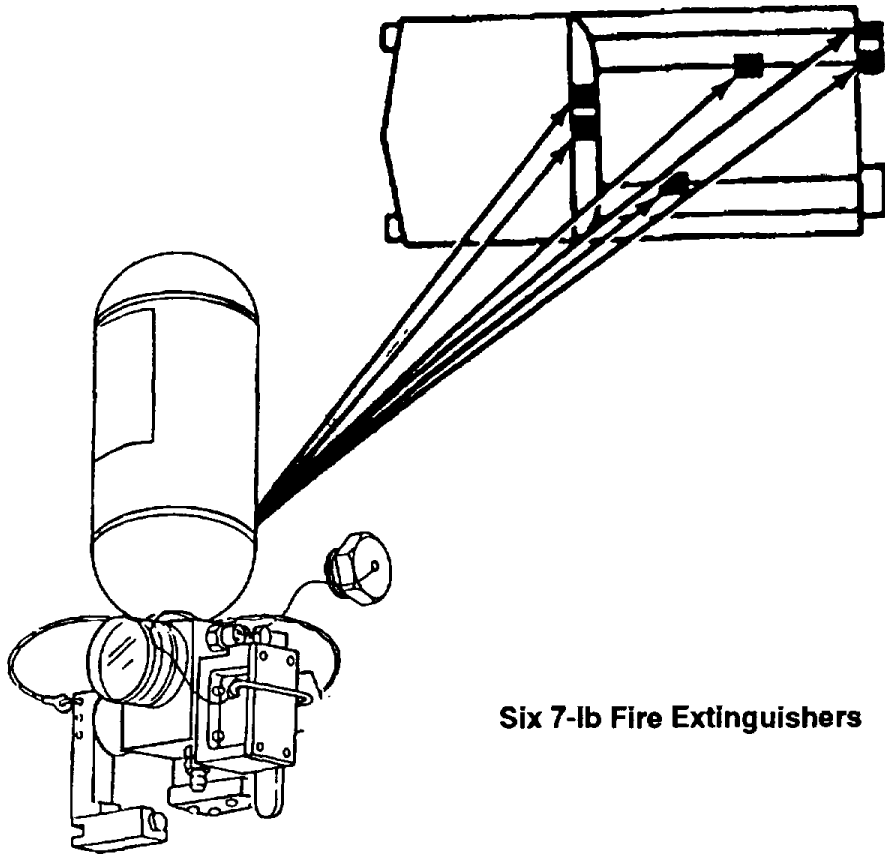


**Standard Control  
Electronic Amplifier (SCEA)**

**Standard Control Electronic Amplifier (SCEA)**

- Processes input signals from OFSA units when hydrocarbon fuel fire is detected.
- If the fire is large, the SCEA lights the FIRE ALARM lamp on the crew compartment T/A panel and activates the three fire extinguishers.
- If a large fire continues, or a second large fire occurs, the SCEA activates the remaining crew compartment fire extinguishers.
- If the OFSA detects a small fuel fire, the SCEA signals the T/A panel and the red FIRE ALARM lamp on the T/A panel flickers. The crew uses a portable fire extinguisher or activates the red-guarded MANUAL DISCHARGE toggle switch on the T/A panel to put out the small fire.
- The SCEA contains built-in test equipment (BITE), which internally tests the unit for normal operation.
- An LED on the T/A panel lights to indicate a fault in the SCEA unit.

## CREW AFES COMPONENTS (continued)



Six 7-lb Fire Extinguishers

**Fire Extinguishers**

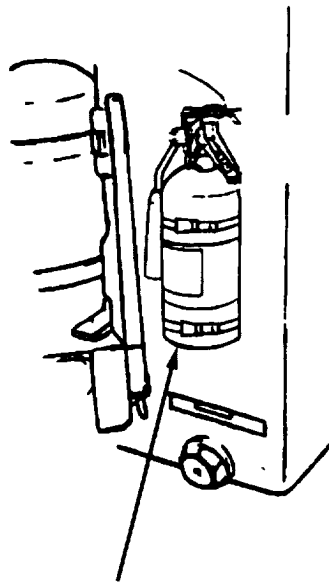
- The crew AFES has six 7-pound automatic fire extinguishers.
- The fire extinguishers consist of steel cylinders filled with Halon 1301 and equipped with a quick-release valve assembly.
- The cylinders contain Halon fire suppressant pressurized with dry nitrogen for use on hydrocarbon fuel fires only.
- Crew AFES fire extinguishers discharge automatically when the SCEA receives an electrical pulse from an OFSA unit, or manually when a crew member operates the MANUAL DISCHARGE toggle switch on the crew T/A panel.
- When the crew AFES activates, the ventilator blower automatically turns to the exhaust mode 8 seconds after extinguisher discharge, but the crew must open the exhaust blower vent (p. 2-188).

**CREW AFES COMPONENTS (continued)**

- Two crew and one engine compartment AFES fire extinguishers may be discharged from outside the vehicle by pulling the lanyard cable pull handle located near the drivers hatch or the pull handle located in the drivers compartment.

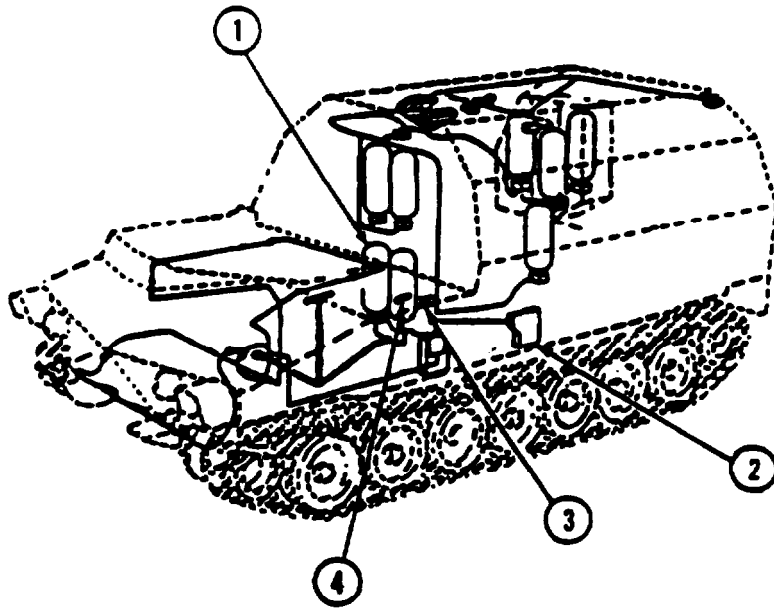
**NOTE**

Two portable fire extinguishers are also located in the crew compartment and are separate from the AFES. One portable fire extinguisher is located on the lower rear door, and the second is located on the left side of the crew compartment on the APU wall. These portable fire extinguishers may be used as needed on fuel and electrical fires.



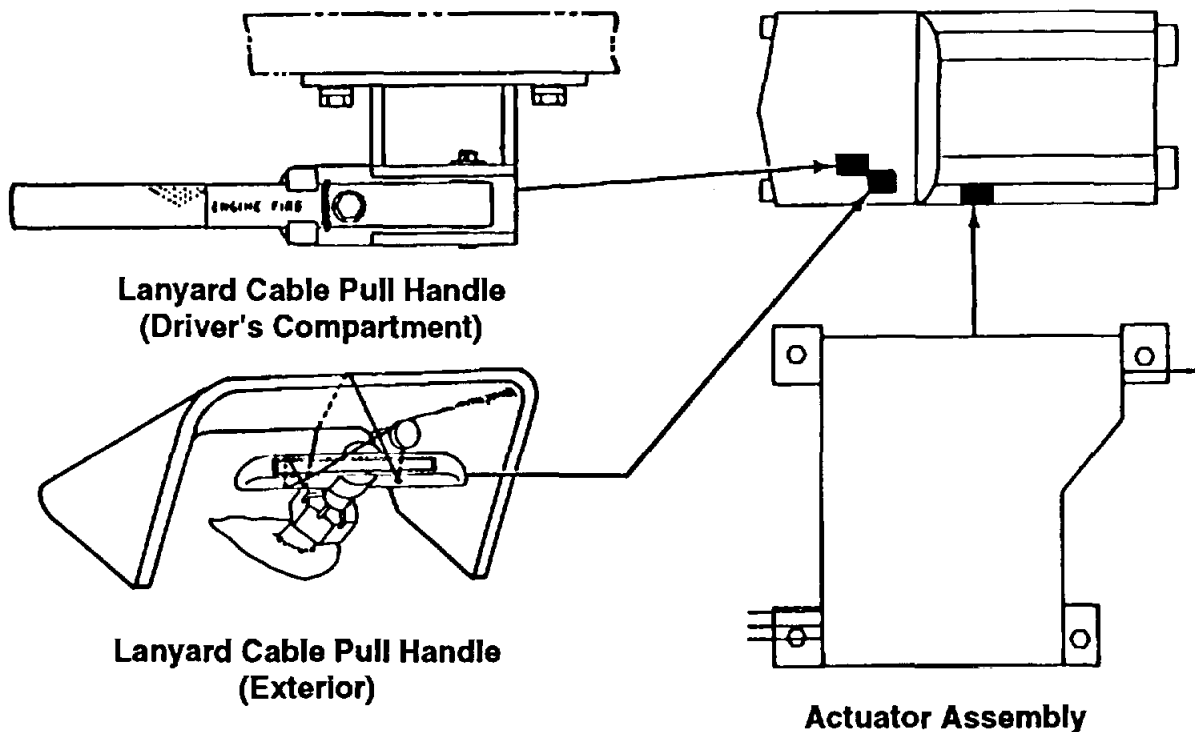
**Portable Fire Extinguisher**

**AUTOMATIC FIRE EXTINGUISHING SYSTEM MANUAL DISCHARGE  
SYSTEM (AFES/MDS) COMPONENTS**



- |                           |   |
|---------------------------|---|
| 1. Engine Fire Ext. No. 2 | 3. Lanyard Cable Pull Handle (Exterior)             |
| 2. Actuator Assembly      | 4. Lanyard Cable Pull Handle (Driver's Compartment) |

**AUTOMATIC FIRE EXTINGUISHING SYSTEM MANUAL DISCHARGE SYSTEM (AFES/MDS) COMPONENTS**  
(continued)

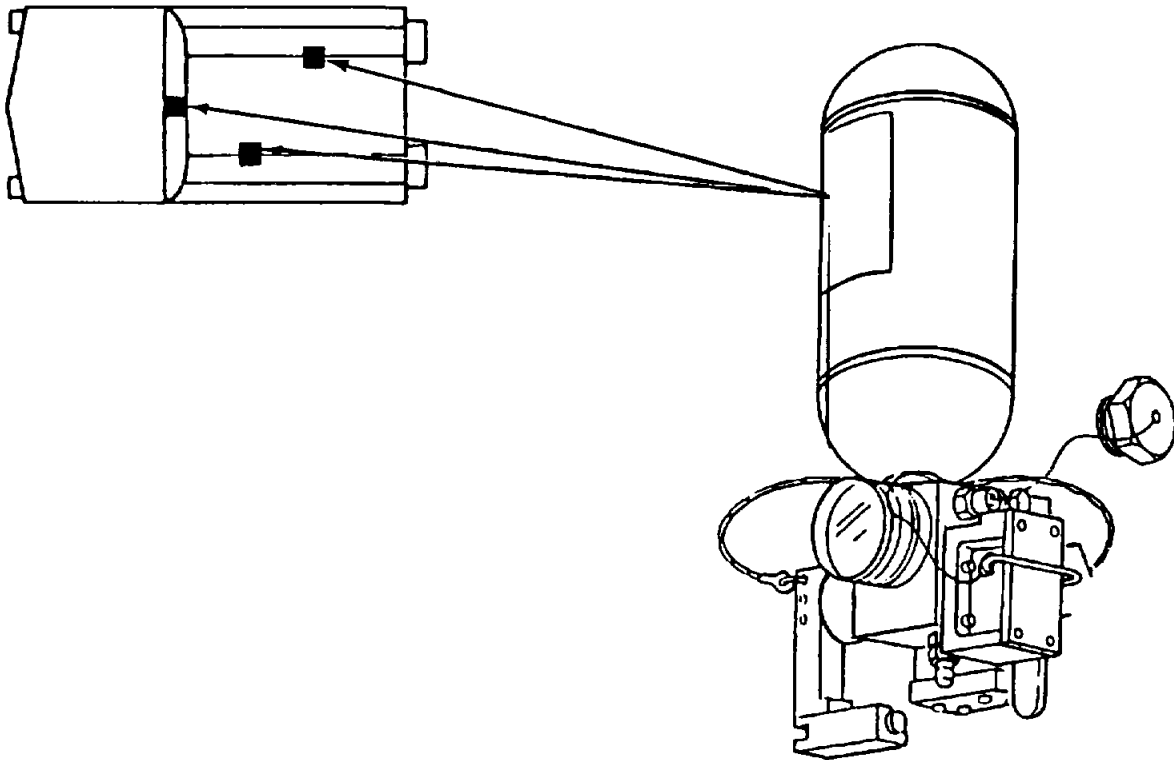


The AFES/MDS allows the crew to manually activate, by mechanical means, one engine and two crew compartment fire extinguishers. The following are AFES/MDS components:

**ACTUATOR ASSEMBLY:** The assembly controls and protects the mechanical cabling connecting the fire extinguishers to two lanyard cable pull handles.

**LANYARD CABLE PULL HANDLE (EXTERIOR):** Located outside the vehicle near the driver's hatch, the handle mechanically activates one engine and two crew compartment fire extinguishers. A crew member must exert a 25-pound pull to break the sealed safety wire on the handle and must pull the handle out as far as possible to discharge the extinguishers. The safety wire prevents unauthorized/accidental discharge of the AFES/MDS.

**LANYARD CABLE PULL HANDLE (DRIVER'S COMPARTMENT):** Located on the left wall in the driver's compartment, the handle mechanically activates one engine compartment fire extinguisher. A crew member must pull forward on the handle to break the sealed safety wire and discharge the extinguisher. This prevents unauthorized/accidental discharge of the AFES/MDS.

**AUTOMATIC FIRE EXTINGUISHING SYSTEM MANUAL DISCHARGE SYSTEM (AFES/MDS) COMPONENTS**  
(continued)**Fire Extinguishers**

- The AFES/MDS has three fire extinguishers. The one for engine fires can be activated only by using either lanyard cable pull handle. The other two AFES/MDS fire extinguishers, located in the crew compartment, can be activated automatically by the SCEA or by activating the MANUAL DISCHARGE toggle switch.
- All fire extinguishers will not activate at the same time when a crew member pulls either lanyard cable pull handle. Handle must be pulled to fullest extension to discharge extinguishers.
- The fire extinguishers consist of steel cylinders filled with Halon 1301 and equipped with a quick-release valve assembly.
- The cylinders contain Halon fire suppressant pressurized with dry nitrogen for use on hydrocarbon fuel fires only.

Section III. OPERATING INSTRUCTIONS

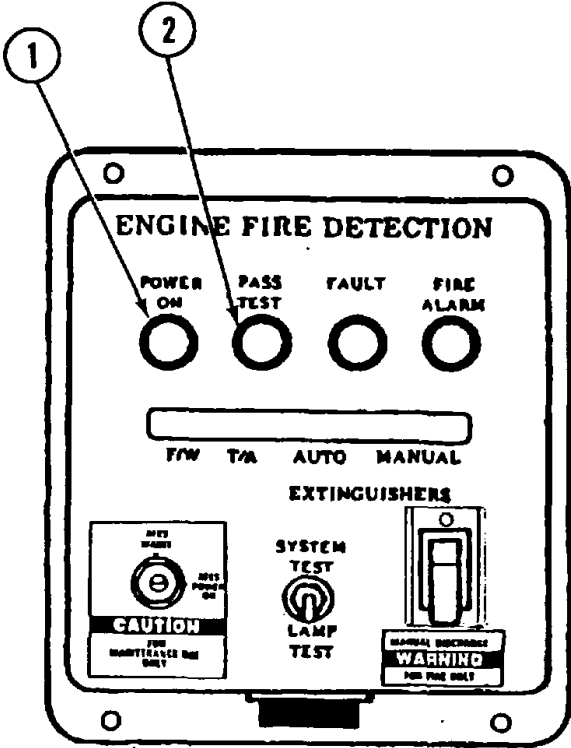
Automatic Fire Extinguisher System (AFES) Operational Checks

NOTE

Operational checkout is the same for engine and crew.

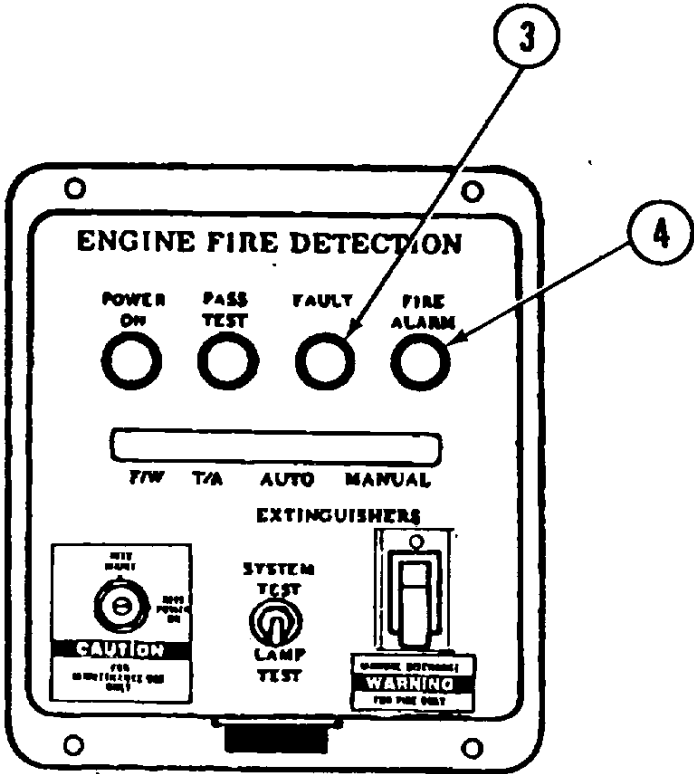
This section describes, locates, and illustrates the controls and instruments of the M992A1 AFES. The location and function of all controls must be learned before operating the vehicle.

AUTOMATIC BUILT-IN TEST EQUIPMENT (BITE) TEST CYCLE



Key	Control or Indicator	Function
<p>1</p> <p>2</p>	<p>Turn MASTER Switch to ON.</p> <p>POWER ON Lamp</p> <p>PASS TEST Lamp</p>	<p>Lamp is lit.</p> <p>Lights for 4-6 seconds after successful BITE test.</p> <p style="text-align: center;">4-19</p>

AUTOMATIC BUILT-IN TEST EQUIPMENT (BITE) TEST CYCLE (continued)



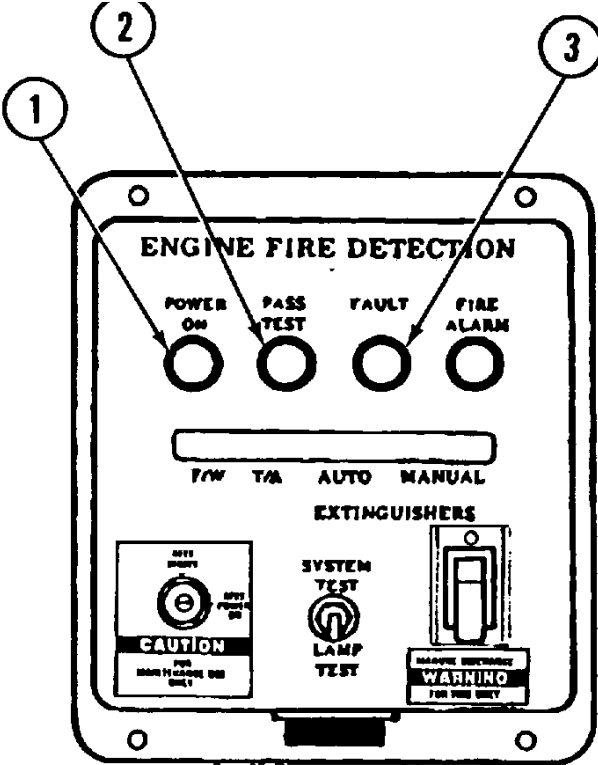
Key	Control or Indicator	Function
3	FAULT Lamp	<p>Lamp is lit:</p> <ul style="list-style-type: none"> <li>Perform Lamp/LED test.</li> <li>Replace Lamp/LED.</li> <li>Perform system test.</li> </ul> <p>FAULT lamp or LED remains lit:</p> <ul style="list-style-type: none"> <li>Notify Unit maintenance.</li> </ul>
4	FIRE ALARM Lamp	<p>Lamp flickers:</p> <ul style="list-style-type: none"> <li>Small engine fire or engine compartment overheat exists. Investigate, and use portable fire extinguisher if required.</li> </ul> <p>Lamp is lit:</p> <ul style="list-style-type: none"> <li>Large engine fire exists. Automatic discharge should occur. Lamp will go out when fire is out. If lamp stays lit, notify Unit maintenance. Evacuate vehicle.</li> </ul> <p style="text-align: center;"><b>4-20</b></p>



**ENGINE AFES INDICATOR POWER-ON OPERATION**

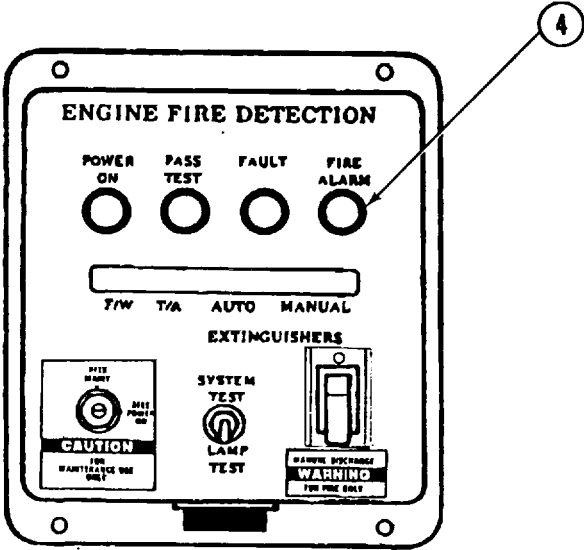
**NOTE**

The engine AFES detects and indicates fire automatically, but the system may not automatically extinguish all fires. The driver should continually monitor the engine test and alarm (T/A) panel during vehicle operation, watching for the following indications, and should be prepared to take emergency action (p. 4-27).

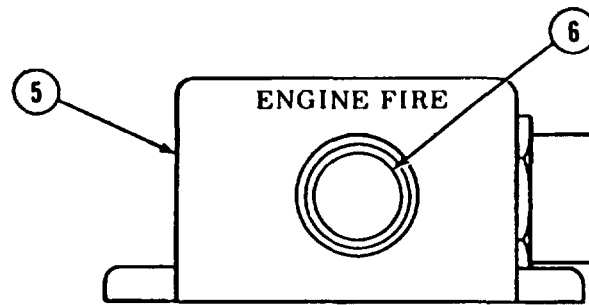


Key	Control or Indicator	Function
1	POWER ON Lamp	Lamp should remain lit throughout operation. If lamp goes out during operation, troubleshoot AFES (p. 3-18)
2	PASS TEST Lamp	Lights 4-6 seconds after successful completion of BITE test.
3	FAULT Lamp	Lamp is not lit: No action is required. Lamp is lit (Amber): Notify Unit maintenance.

ENGINE AFES INDICATORS POWER-ON OPERATION (continued)



Key	Control or Indicator	Function
4	FIRE ALARM Lamp	<p>Lamp is not lit: During normal operations, no action required.</p> <p>Lamp flickers: Small fire or engine overheat. Investigate and use portable fire extinguisher, if required.</p> <p>Lamp is lit (Red): Large fire exist in engine compartment. Automatic discharge should occur. Lamp will go out when fire is out.</p>

**ENGINE AFES INDICATORS POWER-ON OPERATION (continued)**

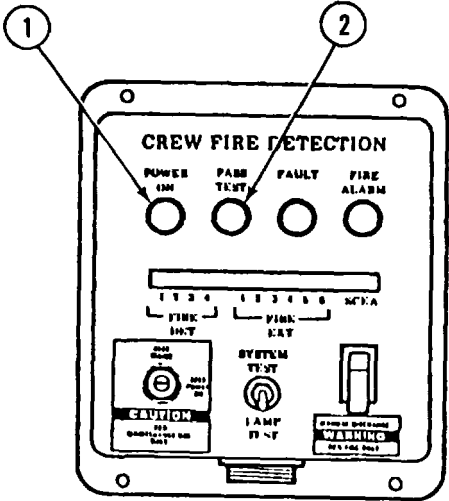
In addition to the indicators on the engine T/A panel, a remote status indicator (RSI) (5) is mounted on the crew compartment ceiling to alert crewmen to an engine fire. An ENGINE FIRE lamp (6) also lights whenever a large engine fire exists. During lamp test, this lamp will not light. During normal operation, this lamp will not be lit.

Ventilation blower turns to exhaust mode when Halon discharges. Open vent after extinguisher discharges by pulling down on air duct control handle (p. 2-188).

CREW AFES INDICATORS POWER-ON OPERATION

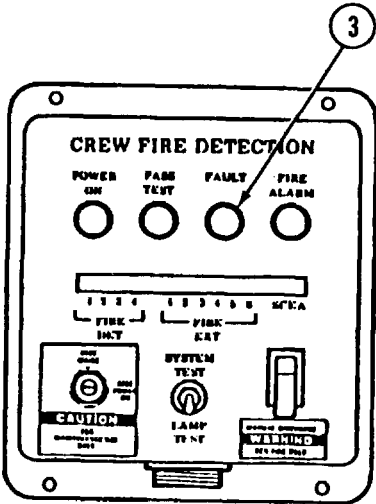
NOTE

The crew AFES detects and indicates fire automatically, but the system may not automatically extinguish all fires. The crew must continually monitor the crew T/A panel and the RSI during vehicle operation, watching for the following indications, and must be prepared to take emergency action (p. 4-29).



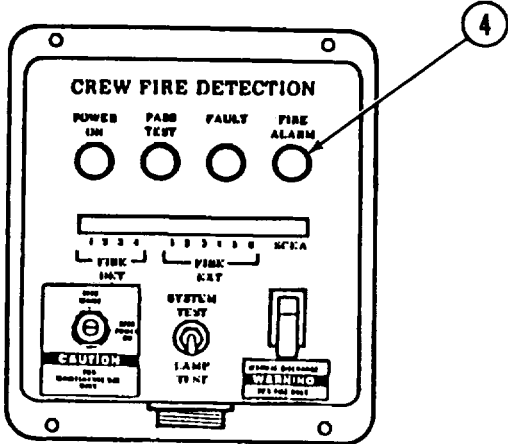
Key	Control or Indicator	Function
1	POWER ON Lamp	Lamp is lit:  Lamp should remain lit through-out operation. If lamp goes out during operation, troubleshoot AFES (p. 3-18)
2	PASS TEST Lamp	Lights for 4-6 seconds after successful BITE test.

CREW AFES INDICATORS POWER-ON OPERATION (continued)



Key	Control or Indicator	Function
3	FAULT Lamp	Lamp is not lit: During normal operations, no action is required when lamp is not lit.  Lamp is lit (Amber)  Troubleshoot AFES (p. 3-18).

CREW AFES INDICATORS POWER-ON OPERATION (continued)



Key	Control or Indicator	Function
4	FIRE ALARM Lamp	<p>Lamp is not lit:</p> <p>During normal operations, no action is required when lamp is not lit:</p> <p>Lamp flashes (Red):</p> <p>Small fire exists in crew compartment. Extinguish fire using portable fire extinguisher.</p> <p>Lamp is lit (Red):</p> <p>Large fire exists in crew compartment. Automatic discharge should occur. Open ventilation vent after discharge and evacuate. Lamp will go out when fire is extinguished.</p>

Section IV. EMERGENCY PROCEDURES

AFES MANUAL DISCHARGE- ENGINE COMPARTMENT FIRES

During normal AFES operation, the automatic fire extinguishing system will discharge an agent to extinguish fires.

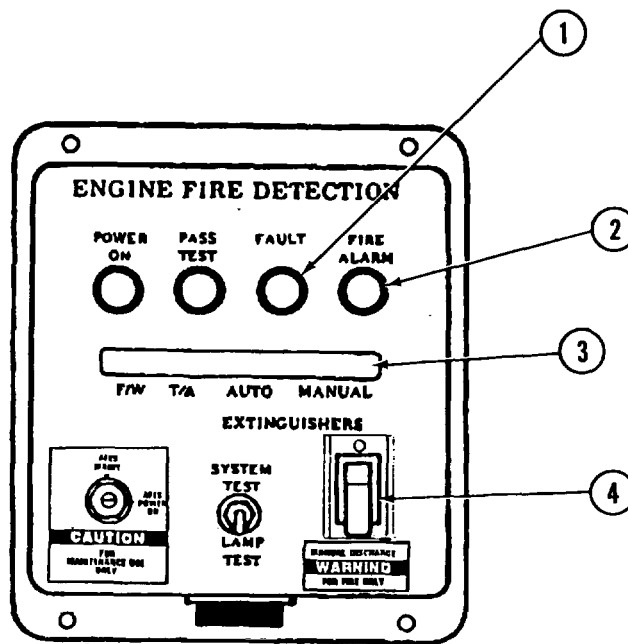
The driver must be alert to manually discharge extinguishers if the automatic system malfunctions.

NOTE

For small fires, use portable fire extinguishers.

Use the following procedures if the automatic feature of the AFES malfunctions:

1. Lift MANUAL DISCHARGE switch guard (4). Press switch up and release; FAULT lamp (1) and AUTO LED (3) will light, signifying cylinder has discharged. FIRE ALARM lamp (2) will go out when fire is extinguished.

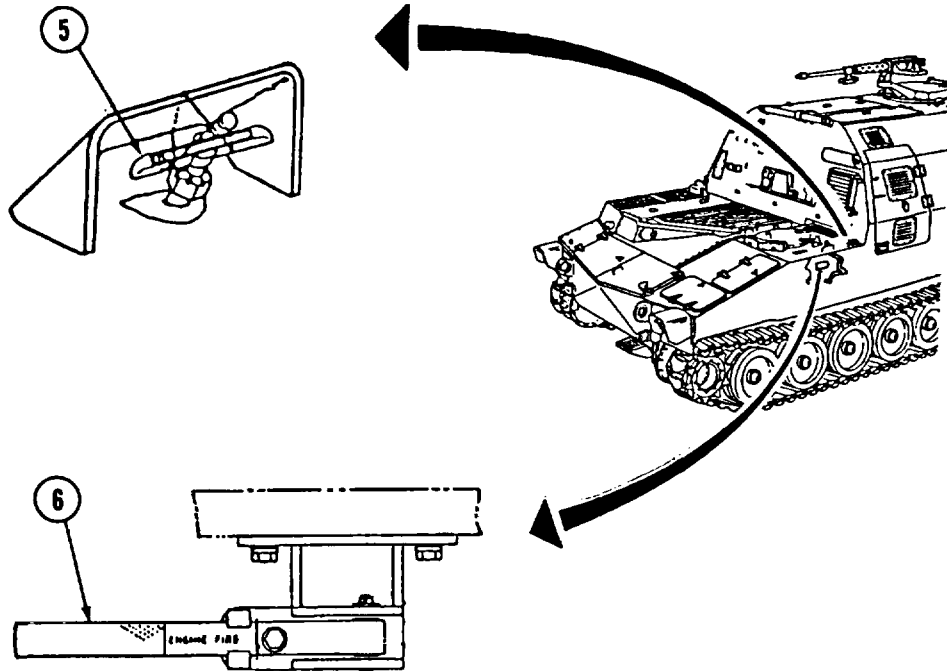


**AFES MANUAL ELECTRONIC DISCHARGE-ENGINE COMPARTMENT FIRES  
(continued)****WARNING**

**Not all emergency fire extinguisher bottles will manually discharge at the same time. A second shot will occur five seconds later. Stay away from nozzles. Severe Injury to personnel will result**

2. The following procedures must be followed if the fire does not go out:

- Turn OFF vehicle MASTER switch.
- Pull FUEL SHUT OFF handle until engine stops.
- If electrical power is not available or if AFES malfunctions, driver must pull the MDS lanyard cable pull handle (6) located on the left side of the driver's compartment, or pull the MDS lanyard cable pull handle (5) located outside the vehicle near the driver's hatch.





**AFES MANUAL ELECTRONIC DISCHARGE-CREW COMPARTMENT FIRES**

During normal AFES operation, the automatic system will discharge agent to extinguish fires.

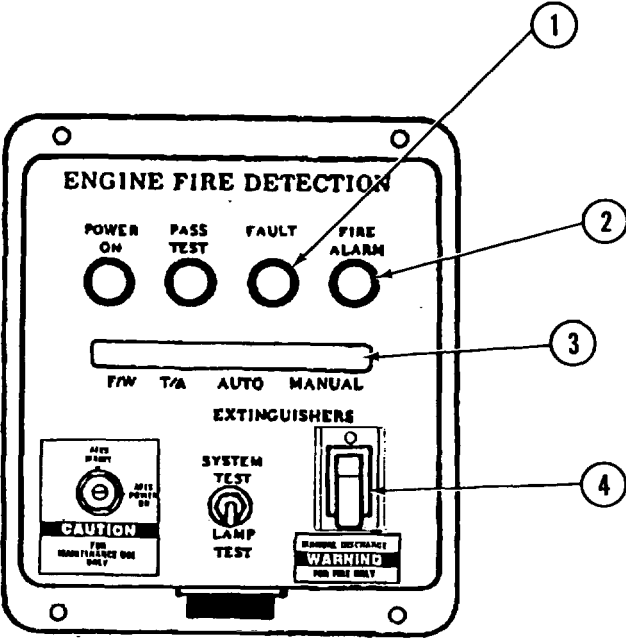
The crew must be alert to manually discharge extinguishers if the automatic system malfunctions.

**NOTE**

**For small fires, use portable fire extinguishers.**

Use the following procedures if the automatic feature of the AFES malfunctions:

- 1. Lift MANUAL DISCHARGE switch guard (4). Press switch up and release. FAULT lamp (1) and FIRE EXTINGUISHER LEDs (3) will light, signifying cylinders have discharged. If fire is not extinguished after 5 seconds, again press switch up and release to discharge second set of fire extinguishers. FIRE ALARM lamp (2) will go off when fire is extinguished. Open vent after extinguishers discharge.



## AFES MANUAL ELECTRIC DISCHARGE-CREW COMPARTMENT FIRES (continued)

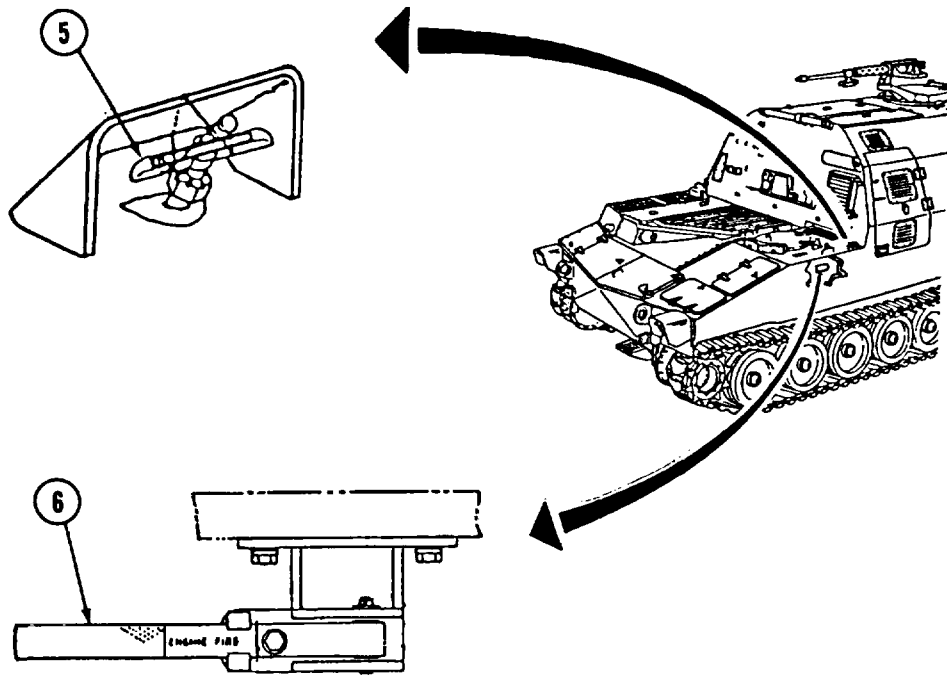
**WARNING**

Not all emergency fire extinguisher bottles will manually discharge at the same time. A second shot will occur five seconds later. Stay away from nozzles. Severe Injury to personnel will result.

**NOTE**

When pulling lanyard cable pull handle located outside the vehicle near driver's hatch, handle must be pulled all the way as far as it will pull. Otherwise only the engine compartment extinguisher will discharge, and not the crew compartment extinguishers.

2. If electrical power is not available or if AFES malfunctions, driver must pull MDS lanyard cable handle (6), located in the driver's compartment, or pull the MDS lanyard cable pull handle (5) located outside the vehicle near the driver's hatch.



**APPENDIX A  
REFERENCES**

This appendix lists all forms, manuals, regulations, pamphlets, and bulletins referenced in this manual, as well as other pertinent publications. Appropriate indexes should be consulted frequently for the latest revisions and additions.

**Forms**

Recommended Changes to Publications and Blank Forms.....	DA Form 2028
Hand Receipt/Annex Number .....	DA Form 2062
Equipment Inspection and Maintenance Worksheet.....	DA Form 2404
<b>[Item Deleted]</b>	
Oil Analysis Log .....	DA Form 2408-20
Maintenance Request .....	DA Form 5504
Motor Equipment Utilization Record.....	DD Form 1970
Operator Report on Motor Vehicle Accidents .....	SF 91
Product Quality Deficiency Report .....	SF Form 368

**Field Manuals**

Army Medical Department Expendable/Durable Items .....	CTA 8-100
Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items) .....	CTA 50-970
NBC Protection .....	FM 3-4
NBC Decontamination.. ..	FM 3-5
Field Hygiene and Sanitation .....	FM 21-10
First Aid for Soldiers .....	FM 21-11
Driver Selection, Training and Supervision, Track Combat Vehicles.....	FM 21-17
Manual for the Track Combat Vehicle Driver .....	FM 21-306
Browning Machine Gun, Caliber .50 HB, M2 .....	FM 23-65
Basic Cold Weather Manual .....	FM 31-70
Northern Operations.. ..	FM 31-71

**Technical Manuals**

Operator's and Organizational Maintenance Manual: For Alarm, Chemical Agent, Automatic: Portable, Manpack, M8 (NSN 6665-00-935-6955) Fixed Emplacement, M10 (6665-00-169-1446) for Trucks, Utility: 1/4-Ton, M11 (6665-00-169-1447); for Truck: 3/4-Ton, M12 (6665-00-169-1448); for Truck: 2 1/2-Ton, M13 (6665-00-169-1449); for Full-Tracked, Armored Personnel Carriers and Recovery Vehicles, M14 (6665-00-169-1450); for Carrier, Command and Reconnaissance, Armored, M15 (6665-00-169-1451) with Power Supply for Truck, Utility: 1/4-Ton, M16 (6665-00-169-1452); with Power Supply for Truck: 3/4-Ton, M17 (6665-00-169-1453) and with Power Supply for Truck: 2 1/2-Ton, M18 (6665-00-169-1454) .....TM 3-6665-225-12

Operator's Manual: Machine Gun, Cal. .50, Browning, M2, Heavy Barrel, Flexible, W/E (NSN 1005-00-322-9715); Mount, Tripod, Machine Gun, Cal. .50, M3 W/E (NSN 1005-00-433-9726) and Mount, Machine Gun, Antiaircraft: Cal. .50, M63 W/E (NSN 1005-00-673-3246) ..... TM 9-1005-213-10

Hand Receipt: Carrier, Ammunition, Tracked, M992A1 ..... TM 9-2350-287-10-HR

Operator's Manual: Towbar, Motor Vehicle .....TM 9-4910-496-10

Operator's, Unit, Intermediate Direct Support and Intermediate General Support Maintenance Manual for Lead-Acid Storage Batteries ..... TM 9-6140-200-14

Operation and Maintenance Manual. Mounted Water Ration Heater ..... TM 10-7310-241-12&P

Operations and Maintenance Manual. Satellite Signals Navigation Set AN/PSN-11 ..... TM 11-5825-291-13

Operator's and Unit Organizational Maintenance Manual for Intercommunication Set, AN/VIC-1 (V) (NSN 5830-00-856-3273); and Control, Intercommunication Set, C10456/VRC (5830-01-082-0804). ..... TM 11-5830-340-12

Procedures for Destruction of Improved Conventional Munitions (ICM) to Prevent Enemy Use ..... TM 43-0002-33

Painting Instructions for Army Materiel ..... TM 43-0139

Destruction of Conventional Munitions and Improved Conventional Munitions to Prevent Enemy Use (Excluding Toxic and Incapacitating Agents) (For Combat Use) ..... TM 750-244-5-1

Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use ..... TM 750-244-6

**Regulations, Pamphlets**

The Army Integrated Publishing and Printing Program .....AR 25-30

Packaging of Army Materiel for Shipment and Storage .....AR 746-1

The Army Maintenance Management System (TAMMS) .....DA Pam 738-750

**APPENDIX B**  
**COMPONENTS OF END ITEM**  
**AND BASIC ISSUE ITEMS LIST**

---

**Section I. INTRODUCTION**

**Scope**

This appendix lists components of the end item and basic issue items for the M992A1 to help you inventory the items for safe and efficient operation of the equipment.

**General**

The appendix contains the following two sections:

Section II, Components of End ITEM (COEI). This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the M992A1. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and packaged separately for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Section III, Basic Issue Items (BII). These items are required in order to place the M992A1 in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the M992A1 during operation and whenever it is transferred between property accounts. This list is your authority to request/requisition BII for replacement based on authorization of the end item by the Table of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE). Illustrations are furnished to help you find and identify the items.

**Explanation of Columns**

The following is an explanation of the columns in Section II and Section III.

Column (1) Illus. Number, gives you the number of the item illustrated.

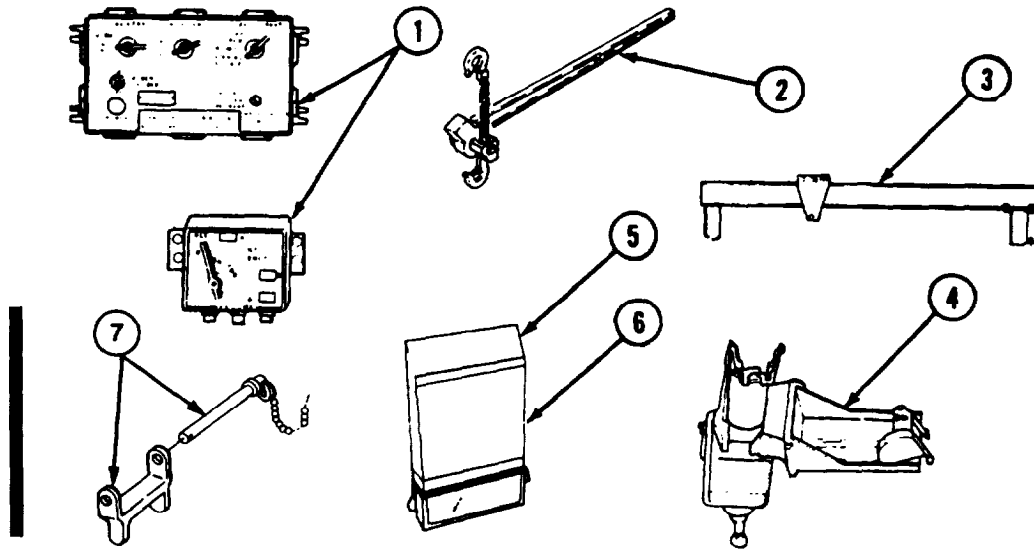
Column (2), National Stock Number, identifies the national stock number of the item; this number will be used for requisitioning purposes.

Column (3), Description, CAGEC and Part Number, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

Column (4), U/M (unit of measure), indicates how the item is issued for the national stock number shown in the second column. Except for SET, this measure is expressed by a two-character alphabetical abbreviation (EA for "each," PR for "pair").

Column (5), Qty. Rqr., indicates the quantity required for use with/on the equipment.

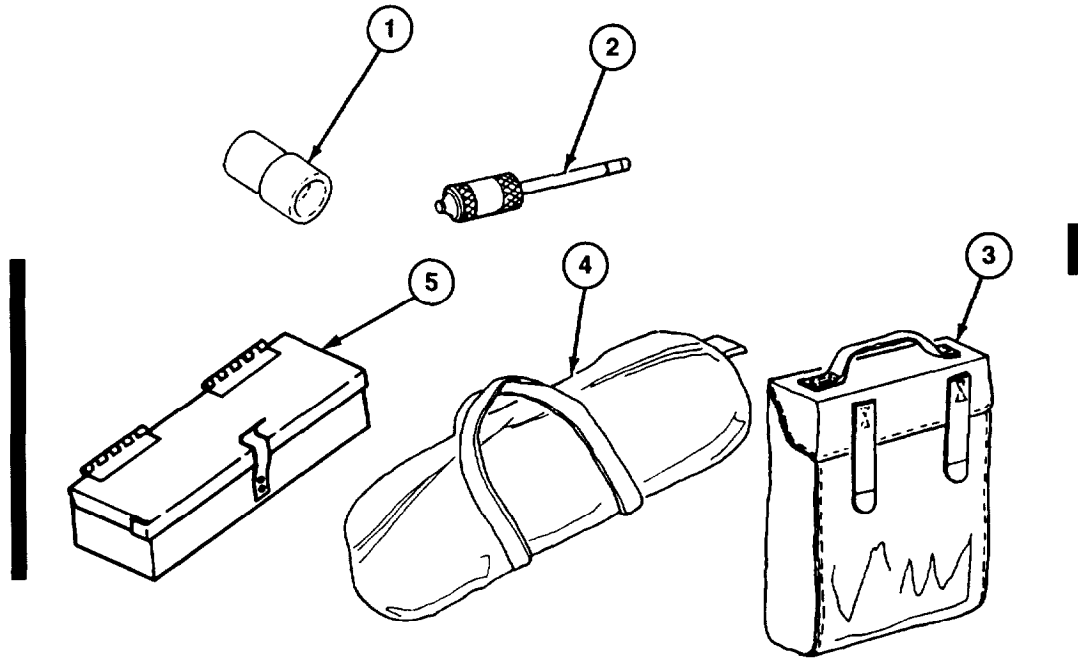
Section II. COMPONENTS OF END ITEM (COEI)



(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
1	5820-01-128-6184	AN-WC-1 INTERCOM SYSTEM (at crew positions) (80063) PPL10062	SET	1
2	3990-01-179-9141	BINDER, LOAD HOIST (in crew compartment) (79805) 1100020	EA	1
3	2590-01-220-0123	LIFTING FIXTURE (on top of vehicle) (19207) 12333570	EA	1
4	1005-00-704-6650	MOUNT, MACHINE GUN CALIBER 0.50 (on commanders cupola) (19204) 7046650	EA	1
5	1240-01-319-8995	PERISCOPE, ARMORED VEHICLE, M27 (at commander's cupola) (19200) 12357792	EA	1
6	6650-01-418-6658	PERISCOPE, ARMORED VEHICLE, M45 (at driver's hatch) (19207) 12370033	EA	3
7	1025-01-202-0418	ARM, ADAPTER ASSEMBLY (machine gun mount) (19200) 12011777	EA	1

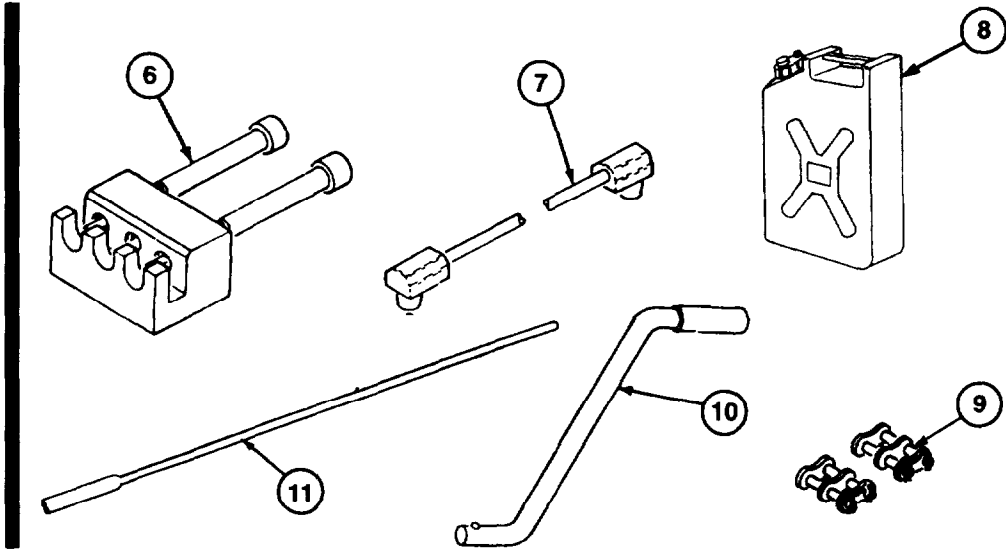
B-2 Change 1

Section III. BASIC ISSUE ITEMS (BI)



(1) ILLus. number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
1	5935-00-322-8959	ADAPTER, CONNECTOR CABLE (in satchel tool bag) (19207) 11677570	EA	2
2	4930-00-204-2550	ADAPTER, GREASE GUN (on grease gun) (19207) 5349744	EA	1
3	2540-00-670-2459	BAG ASSEMBLY, PAMPHLET (in stowage bag) (19207) 11676920	EA	1
4	5140-00-473-6256	BAG, TOOL, SACHEL (under right-hand rear canister compartment) (34623) 11655979	EA	1
5	2540-00-906-4741	BOX ASSEMBLY, SPARE BULB (in drivers compartment) (19207) 10870949	EA	1

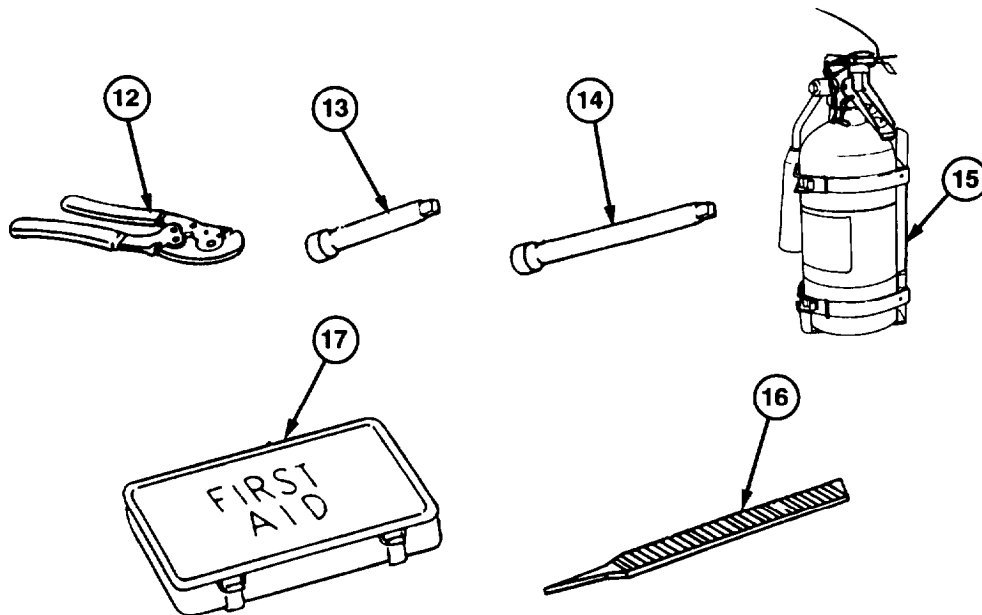
Section III. BASIC ISSUE ITEMS (BII) (continued)



(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty Rqr.
6	5120-01-179-8995	BREAKER, CHAIN (in satchel tool bag) (19207) 12330762	EA	1
7	6150-01-248-9555	CABLE ASSEMBLY, POWER (under right-hand rear canister compartment) (19207) 11682336-6	EA	1
8	7240-00-089-3827 7240-01-365-5317	CAN, WATER, MILITARY, 5-GALLON (front exterior cargo compartment) (81349) MIL-C-43613 TYPE-1 (TAN) TYPE-2 (GREEN)	EA	1
9	3020-00-231-8732	CONNECTING LINK ASSEMBLY, COUPLING (in satchel tool bag) (73433) D40-2CL	EA	2
10	5340-01-179-8994	CRANK, HAND (in satchel tool bag) (19207) 12333374	EA	1
11	5120-00-224-1390	CROWBAR (on top plate of cargo compart- ment, exterior, left of commander's cupola) (80064) 1833244	EA	1

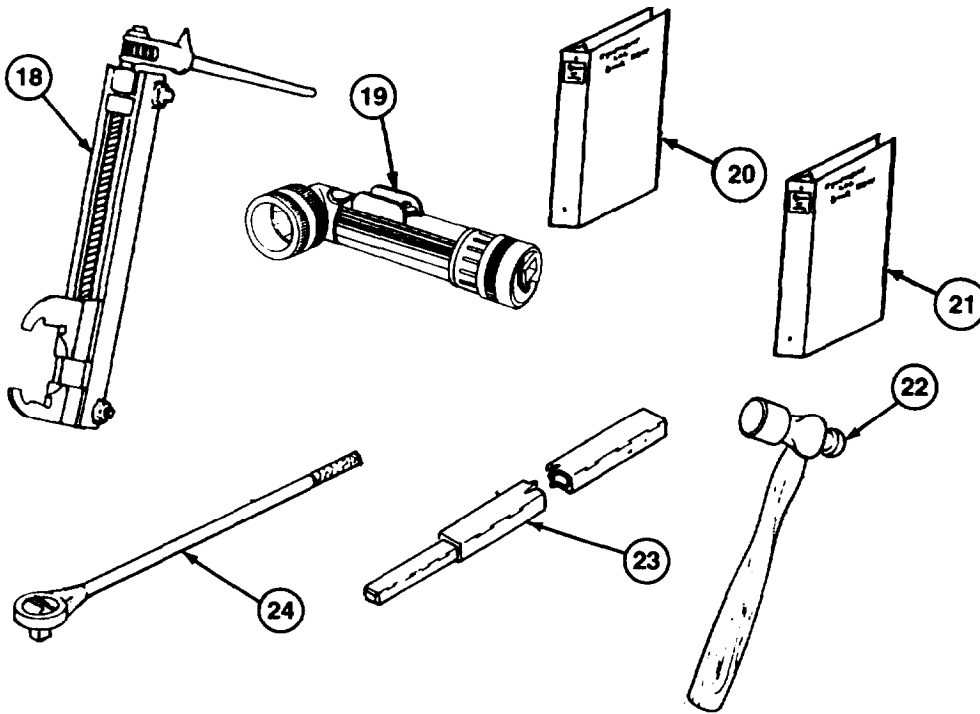


Section III. BASIC ISSUE ITEMS (BII) (continued)



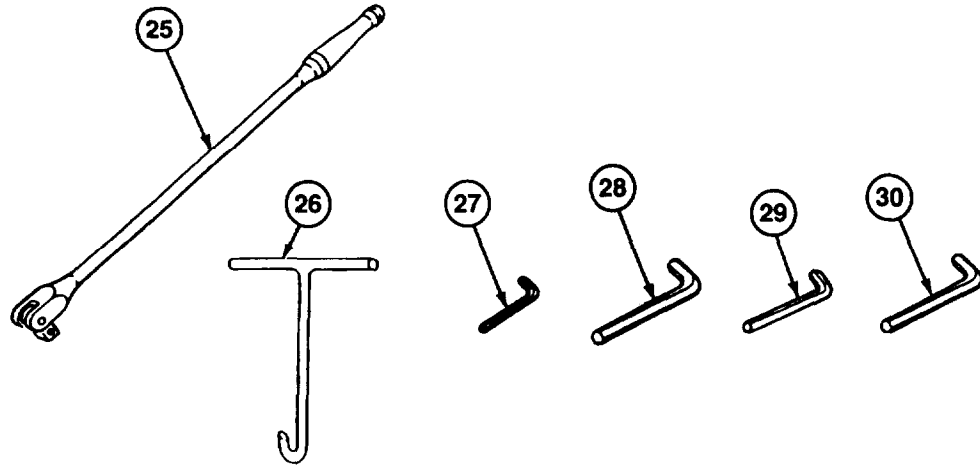
(1) ILLus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
12	5110-00-595-8229	CUTTER, WIRE ROPE (in satchel tool bag) (19207) 11655981	EA	1
13	5120-00-243-7326	EXTENSION, SOCKET WRENCH, 5-INCH, 1/2 DRIVE (in satchel tool bag) (95683) 41B306	EA	1
14	5120-00-227-8074	EXTENSION, SOCKET WRENCH, 10-INCH, 1/2 DRIVE (in satchel tool bag) (19207) 11655788-1	EA	1
15	4210-01-388-7854	EXTINGUISHER, FIRE (CO <sup>2</sup> ) (one on interior of lower rear door, one on rear APU compartment bulkhead) (58536) A52471-1-S	EA	2
16	5110-00-156-0059	FILE, HAND (in satchel tool bag) (19204) 41F1030	EA	1
17	6545-00-922-1200	FIRST AID KIT (in stowage box) (64616) SC C-6545-IL VOL 2	EA	1

Section III. BASIC ISSUE ITEMS (BII) (continued)



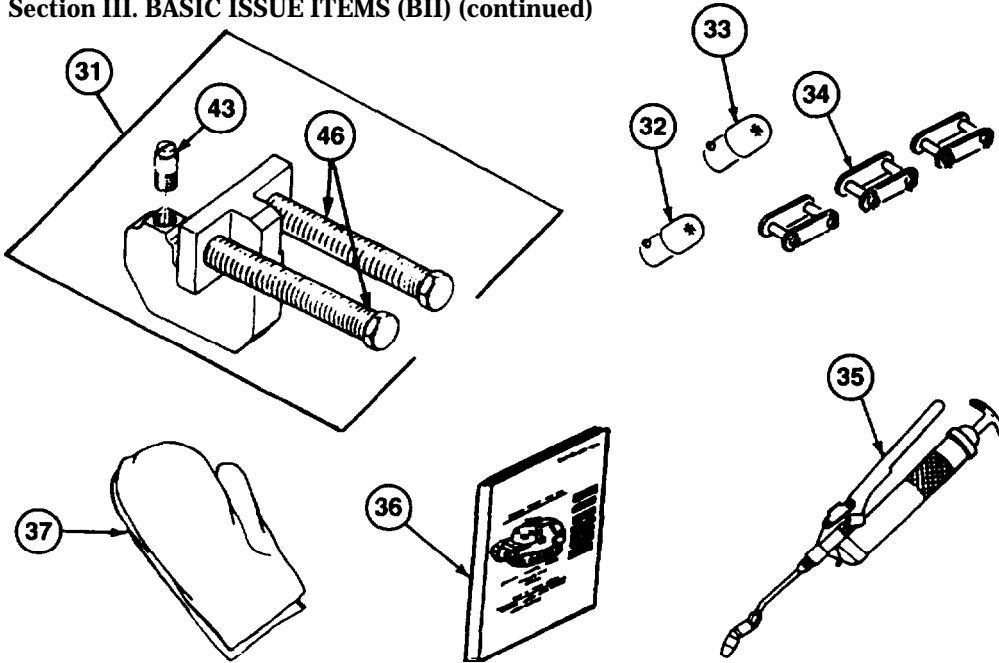
(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty Rqr.
18	5120-00-605-3926	FIXTURE, TRACK (on exterior of front cargo compartment, right of drivers hatch) (19207) 8741739	EA	2
19	6230-00-264-8261	FLASHLIGHT (one at drivers position, one at commanders position) (21108) MX-991/4	EA	2
20	7510-01-065-0166	FOLDER, EQUIPMENT RECORD (in pamphlet bag) (81349) MIL-F-43986	EA	1
21	5120-00-228-9517	FORMS, EQUIPMENT LOGBOOK (in binder) DA Form 2408	EA	1
22	5120-00-061-8546	HAMMER, HAND (in satchel tool bag) (81348) GGG-H-86	EA	1
23	5340-01-199-9941	HANDLE EXTENSION, PROJECTILE LOCK (under right-hand rear canister compartment) (19207) 12351610	EA	1
24	5120-00-249-1076	HANDLE, SOCKET WRENCH, 3/4 DRIVE (in satchel tool bag) (80064) 1940708	EA	1

Section III. BASIC ISSUE ITEMS (BII) (continued)



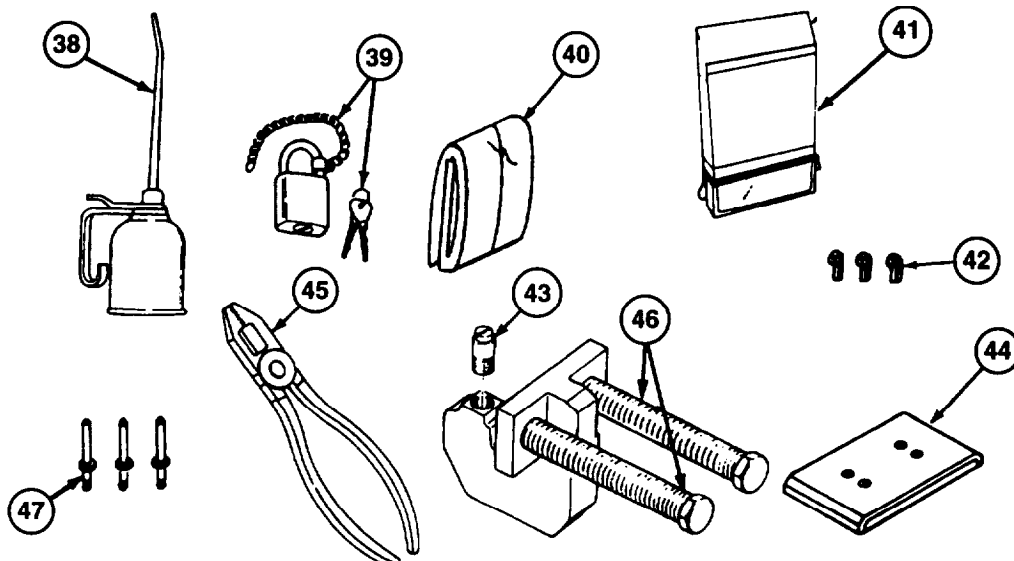
(1) Illus. number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
25	5120-00-236-7590	HANDLE, SOCKET WRENCH, HINGED, 1/2 DRIVE (in satchel tool bag) (19207) 11655786-1	EA	1
26	5120-01-179-8997	HOOK, CARTRIDGE REMOVER (in satchel tool bag) (19207) 12333373	EA	1
27	5120-00-240-5300	KEY, SOCKET HEAD SCREW, 3/16-INCH: HEXAGON (in satchel tool bag) (94697) A05522-011	EA	1
28	5120-00-240-5274	KEY, SOCKET HEAD SCREW, 5/16-INCH: HEXAGON (in satchel tool bag) (55719) AW10	EA	1
29	5120-00-198-5390	KEY, SOCKET HEAD SCREW, 3/8-INCH: HEXAGON (in satchel tool bag) (80064) 1940722	EA	1
30	5120-00-224-2510	KEY, SOCKET HEAD SCREW, 5/8-INCH: HEXAGON (in satchel tool bag) (74445) 57036	EA	1

Section III. BASIC ISSUE ITEMS (BII) (continued)



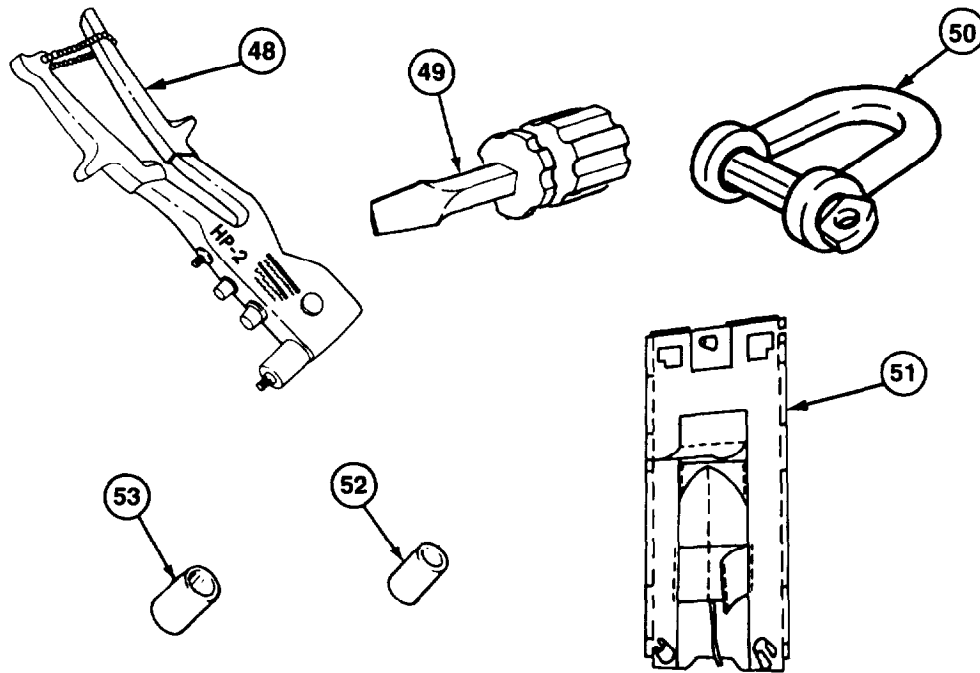
(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty Rqr.
31	5180-01-388-7855	KIT, PULLER, CONNECTOR, TRACK (in satchel tool bag) (19207) 57K3156, which consists of:  PIN, THREADED (See item 43)  PULLER BOLT (See item 46)	EA	1
32	6240-00-266-9940	LAMP, INCANDESCENT (in spare lamp box) (96906) MS25231-1829	EA	3
33	5980-01-296-2793	LIGHT-EMITTING DIODE (LED) (in spare lamp box) (19207)12360890-3	EA	2
34	3020-01-251-7713	LINK, ROLLER CHAIN CONVEYOR (in satchel tool bag) (76474) C2060H	EA	5
35	4930-00-766-3545	LUBRICATION GUN, HAND (in satchel tool bag) (36251) 102758	EA	1
36	TM 9-2350-287-10	MANUAL, OPERATOR'S (in pamphlet bag)	EA	1
37	8415-01-092-0039	MITTEN, HEAT PROTECTION (in satchel tool bag) (81349) MIL-M-11199	PR	2

Section III. BASIC ISSUE ITEMS (BII) (continued)



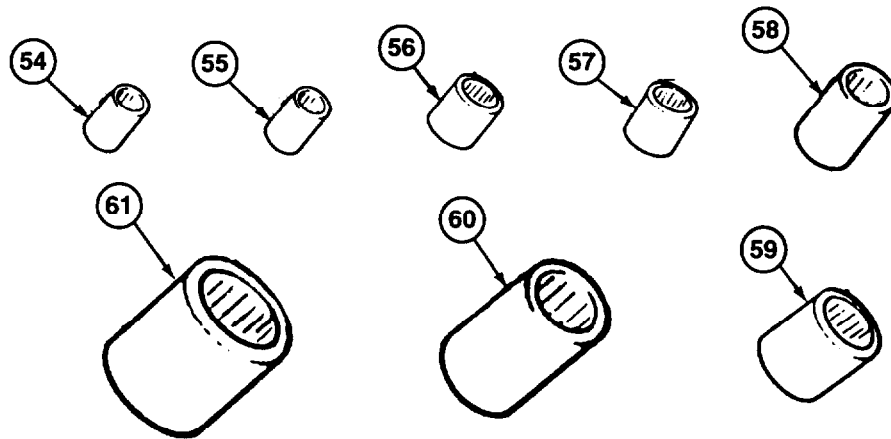
(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
38	4930-00-262-8868	OILER, HAND (in satchel tool bag) (72798)328	EA	1
39	5340-01-269-9345	PADLOCK SET (in satchel tool bag) (96906) MS 21313-53	EA	1
40	8345-00-174-6865	PANEL MARKER (in satchel tool bag) (64067) 8345-00-1 74-6865	EA	2
41	6650-01-418-6658	PERISCOPE, ARMORED VEHICLE, M45 (in driver's stowage box) (19207) 12370033	EA	1
42	5315-00-829-1480	PIN, COTTER (in satchel tool bag) (96906) MS24665-208	EA	5
43	5315-01-412-5332	PIN, THREADED (on puller) (19207) 12438988	EA	1
44	5340-01-158-7062	PLATE, MENDING, CONVEYOR PAD (in satchel tool bag) (19207) 12376413	EA	5
45	5120-00-239-8251	PLIERS (in satchel tool bag) (72368) 1950	EA	1
46	5306-01-388-5186	PULLER BOLT (on puller) (19207) 12447293	EA	2
47	5320-01-193-6934	RIVET, BLIND, 0.188 DIA (in satchel tool bag) (19207) 12351907-1	EA	20

Section III. BASIC ISSUE ITEMS (BI) (continued)



(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
48	5120-01-367-3873	RIVET GUN, PIN (in satchel tool bag) (55719) HP2	EA	1
49	5120-00-596-8502	SCREWDRIVER, FLAT TIP (in satchel tool bag) (96906) MS15221-2	EA	1
50	4030-01-397-7347	SHACKLE (in satchel tool bag) (19207) 12438986	EA	1
51	2540-01-381-2587	SHROUD ASSEMBLY, DOOR (under right rear canister racks) (19207) 12447290	EA	1
52	5120-00-237-0984	SOCKET, SOCKET WRENCH, 1/2-INCH, 1/2 DRIVE (in satchel tool bag) (95683) 41W3007	EA	1
53	5120-00-189-7932	SOCKET, SOCKET WRENCH, 9/16-INCH, 1/2 DRIVE (in satchel tool bag) (05506) ST-1218	EA	1

Section III. BASIC ISSUE ITEMS (BII) (continued)

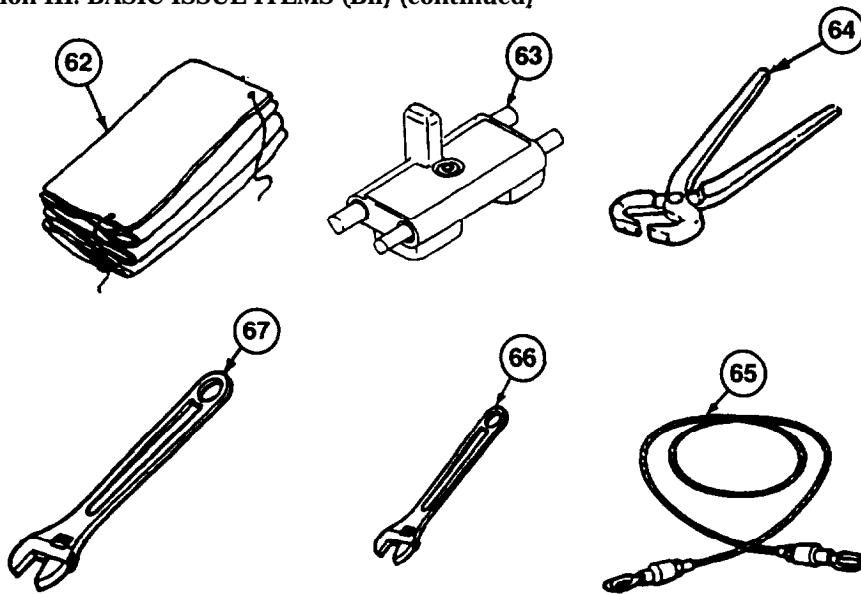


(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
54	5120-00-189-7985	SOCKET, SOCKET WRENCH, 3/4-INCH, 1/2 DRIVE (in satchel tool bag) (19207) 11677025-4	EA	1
55	5120-00-189-7946	SOCKET, SOCKET WRENCH, 5/8-INCH, 1/2 DRIVE (in satchel tool bag) (05506) ST-1220	EA	1
56	5120-00-189-7934	SOCKET, SOCKET WRENCH, 7/8-INCH, 1/2 DRIVE (in satchel tool bag) (19207) 1167025-5	EA	1
57	5120-00-935-7425	SOCKET, SOCKET WRENCH, 15/16-INCH, 1/2 DRIVE (in satchel tool bag) (30106) A-30	EA	1
58	5120-00-189-7927	SOCKET, SOCKET WRENCH, 1-INCH, 1/2 DRIVE (in satchel tool bag) (19207) 11677025-7	EA	1
59	5120-00-239-0021	SOCKET, SOCKET WRENCH, 1 1/8-INCH, 3/4 DRIVE (in satchel tool bag) (34871) FACO1027	EA	1
60	5120-00-235-5871	SOCKET, SOCKET WRENCH, 1 1/4-INCH, 3/4 DRIVE (in satchel tool bag) (28265) 3105A	EA	1
61	5120-00-293-0094	SOCKET, SOCKET WRENCH, 1 1/2-INCH, 3/4 DRIVE (in satchel tool bag) (26848) 47148	EA	1

Change 1

B-11

Section III. BASIC ISSUE ITEMS (BII) (continued)



(1) Illus. Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty. Rqr.
62	2540-00-653-7589	TARPAULIN (under right-hand rear canister compartment) (19207) 6537589	EA	1
63	2530-01-346-9233	TRACK SHOE ASSEMBLY, T-154 (exterior left-hand top front hull and battery access doors) (19207) 12268550-1	EA	4
84	5110-00-221-1499	NIPPERS, END CUTTING (in satchel tool bag) (80224) GGG-N-350 TY1 CL2STA	EA	1
65	4010-01-041-9752	WIRE ROPE ASSEMBLY (15-foot) (on exterior surface of front cargo compartment plate) (19207) 7360553-1	EA	1
66	5120-00-240-5328	WRENCH, ADJUSTABLE, 8-INCH (in satchel tool bag) (92878) 11655778-3	EA	1
67	5120-00-264-3796	WRENCH, ADJUSTABLE, 12-INCH (in satchel tool bag) (19207) 11655778-5	EA	1



**APPENDIX C**  
**ADDITIONAL AUTHORIZATION LIST**

---

**Section I. INTRODUCTION**

**Scope**

This appendix, Additional Authorization List (AAL), lists additional items you are authorized for the support of the M992A1.

**General**

The list in Section II identifies items that do not have to accompany the M992A1 and do not have to be turned in with it. These items are all authorized to you by CTA 50-970.

**Explanation of Listing**

The national stock number, description, Commercial and Government Entity Code (CAGEC) (in parentheses), part number, unit of measure (U/M), and quantity recommended (Qty Recm) are provided for each item to help you identify and request the additional items you require to support this equipment.

## Section II. ADDITIONAL AUTHORIZATION LIST (AAL)

(1) National Stock Number	(2) Description CAGEC and Part Number	(3) U/M	(4) Qty. Recm
4930-00-288-1511	ADAPTER, GREASE GUN (36251) 120349	E A	1
5895-01-119-9900	AMPLIFIER, POWER SUPPLY GROUP OG-174 VRC (37695) 706672-801	EA	1
5110-00-293-2336	AX, SINGLE BIT 6150925	EA	1
5120-00-526-6044	BAR, PINCH: 1/2-INCH (19204) 5266044	EA	1
6135-00-450-3528	BATTERY, NONRECHARGEABLE, DRY (81349) BA3517U	EA	1
6135-00-930-0030	BATTERY, NONRECHARGEABLE, DRY (80058) BA3030U	EA	4
2540-00-906-4741	BOX, ACCESSORIES STOWAGE (19207) 10870949	EA	1
5140-00-261-4994	CARRIER, TOOL (19207) 11655787	EA	1
1290-00-824-7245	CASE, FUSE SETTER (19200) 8247245	EA	1
6665-01-105-5623	CHEMICAL AGENT ALARM, MBA1 (81361) C5-15-8800	EA	1
5110-00-236-3272	CHISEL, COLD, HAND (80244) GGG-C-313 TY4 CL1	EA	1
4230-01-133-4124	DECONTAMINATION APPARATUS, M13 (81361) E5-51-527	EA	1
6665-01-133-4964	DETECTOR KIT, M256	EA	1
5120-00-227-8079	EXTENSION, SOCKET WRENCH, 16-INCH, 3/4 DR (55719) L122	EA	1
5120-00-273-9208	EXTENSION, SOCKET WRENCH, 3-INCH, 3/4 DR (55719) L32	EA	1

## Section II. ADDITIONAL AUTHORIZATION LIST (AAL) (continued)

(1) National Stock Number	(2) Description CAGEC and Part number	(3) U/M	(4) Qty Recm
5110-00-241-9160	FILE, HAND (19204) 41F1572	EA	1
5120-00-900-6097	HAMMER, HAND (80244) GGG-H-86 TY10 CL1	EA	1
5120-00-288-6574	HANDLE, MATTOCK PICK (19207) 11677021	EA	2
5120-00-241-3142	HANDLE, SOCKET WRENCH: T-SLIDING (55719) 510	EA	1
5120-00-249-1071	HANDLE, SOCKET WRENCH: NUT SPEEDER (58536) A-A-2166	EA	1
5120-00-230-6385	HANDLE, SOCKET WRENCH: RATCHET (80064) 14U1502	EA	1
5120-00-099-8544	HANDLE, SOCKET WRENCH: T-SLIDING (34871) FAC01022	EA	1
5110-00-222-0457	HATCHET, CLAW (80244) GGG-H-131 TYB	EA	1
5120-00-224-4659	KEY, SOCKET HEAD SCREW, 1/4-INCH: HEX (80064) 1940720	EA	1
5120-00-240-5292	KEY, SOCKET HEAD SCREW, 1/8-INCH: HEX (55719) AW4	EA	1
5120-00-198-5392	KEY, SOCKET HEAD SCREW, 5/32-INCH: HEX (16786) P848000210	EA	1
5120-00-242-7410	KEY, SOCKET HEAD SCREW, 3/32-INCH: HEX (92674) BA27077-4	EA	1
5120-01-108-1729	MAINTENANCE KIT, CBR EQUIPMENT, M273 (81361) D5-15-8194	EA	1
5120-00-243-2395	MATTOCK: PICK W/O HANDLE (19207) 11677022	EA	1
7310-01-387-1305	MOUNTED WATER RATION HEATER (MWRH) (98308) MIL-H-44466	EA	1

Change 1

C-3

## Section II. ADDITIONAL AUTHORIZATION LIST (AAL) (continued)

(1) National Stock Number	(2) Description CAGEC and Part Number	(3) U/M	(4) Qty Recm
5120-00-194-9458	PICK, DIGGING: RAILROAD W/O HANDLE (58538) A-A-338	EA	1
5315-00-861-1473	PIN, LOCK (19206) 8767184	EA	1
5120-00-223-7397	PLIERS, SLIP JOINT: COMB. SLIP JOINT, W/CUTTER (82799) PL-8	EA	1
5825-01-374-6643	PRECISION LIGHTWEIGHT GLOBAL POSITIONING SYSTEM (GPS) RECEIVER (PLGR) (80058) AN/PSN-11	EA	1
5120-00-293-0791	PUNCH, DRIVE PIN (80244) TY8 CLA 5TISZ5	EA	1
5820-01-879-9260	RADIO SET (35643) AN/PRC 68	EA	1
4933-00-796-4537	ROLL ASSEMBLY, TOOL (19207) 7964537	EA	1
5120-00-234-5223	RULE, STEEL MACHINIST'S (57163) C604R-6	EA	1
5120-00-236-2127	SCREWDRIVER, FLAT TIP, 3-INCH (89905) 133690-10	EA	1
5120-00-278-1283	SCREWDRIVER, FLAT TIP, 6-INCH (19207) 41S1104	EA	1
5120-00-227-7338	SCREWDRIVER, FLAT TIP, 5-INCH (77946) D339	EA	1
5120-00-188-8450	SHOVEL, HAND: GENERAL PURPOSE, LG HANDLE (80244) TY4 CLB ST1SZ2	EA	1
5120-00-293-3336	SHOVEL, HAND (19207) 11655784	EA	1
5120-00-189-7931	SOCKET, SOCKET WRENCH, 17/16-INCH, 3/4 DR (58536) A-A-1394	EA	1

## Section II. ADDITIONAL AUTHORIZATION LIST (AAL) (continued)

(1) National Stock Number	(2) Description CAGEC and Part Number	(3) U/M	(4) Qty Rem
5120-00-189-7930	SOCKET, SOCKET WRENCH, 1 3/8-INCH, 3/4 DR (19204) TKEX 3BU	EA	1
5120-00-232-5681	SOCKET, SOCKET WRENCH, 1 5/16-INCH, 3/4 DR (34871) FAC0140	EA	1
5120-00-189-7913	SOCKET, SOCKET WRENCH, 1 1/16-INCH, 1/2 DR (05506) ST-1234	EA	1
5130-00-221-8007	SOCKET, SOCKET WRENCH, 9/1 6-INCH, 1/2 DR (47805) IP180	EA	1
5130-00-221-8005	SOCKET, SOCKET WRENCH, 7/16-INCH, 1/2 DR (05506) IM140	EA	1
5120-00-189-7924	SOCKET, SOCKET WRENCH, 7/16-INCH, 1/2 DR (05506) ST-1214	EA	1
5120-00-189-7911	SOCKET, SOCKET WRENCH, 3/8-INCH, 1/2-DR (8Z799) ST-812	EA	1
5120-00-189-7914	SOCKET, SOCKET WRENCH, 1 1/8 INCH, 1/2 DR (05506) ST-1230	EA	1
7310-01-310-5155	STOVE, MULTIFUEL BURNER (81349) MIL-S-44344	EA	1
5120-00-269-7971	UNIVERSAL JOINT SOCKET, 1/2-INCH DRIVE (53711) 5166189	EA	1
4010-00-202-2425	WIRE ROPE ASSEMBLY (10-FOOT) (19207) 7360553	EA	1
5120-00-277-7025	WRENCH, OPEN END, 15/6 X 1 (19207) 11655789-5	EA	1
5120-00-187-7130	WRENCH, OPEN END, 13/16 X 7/8: ENGR, 15-DEG ANGLE, DBLE HD (03914) 26-133	EA	1
5120-00-224-3102	WRENCH, OPEN END, 5/8 X 3/4: ENGR, 15-DEG ANGLE, DBLE HD (58536) A-A-1356	EA	1

Change 1

C-5

Section II. ADDITIONAL AUTHORIZATION LIST (AAL) (continued)

(1) National Stock Number	(2) Description CAGEC and Part Number	(3) U/M	(4) Qty Recm
5120-00-293-2134	WRENCH, OPEN END, 9/16 X 11/16: ENGR, 15-DEG ANGLE, DBLE HD (19207) 5323330	EA	1
5120-00-187-7123	WRENCH, OPEN END, 7/16 X 1/2: ENGR, 15-DEG ANGLE, DBLE HD (14674) E1416	EA	1
5120-00-277-2307	WRENCH, OPEN END, 5/16 X 3/8: ENGR, 15-DEG ANGLE, DBLE HD (95683) 41W1176-10	EA	1
5120-00-264-3777	WRENCH, SPANNER, ADJUSTABLE FACE PIN (82799) 484	EA	1
5120-00-277-9076	WRENCH, SPANNER, ADJUSTABLE HOOK (19207) 5218469	EA	1

**APPENDIX D  
EXPENDABLE AND DURABLE ITEMS LIST**

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**Section I. INTRODUCTION**

**Scope**

This appendix lists expendable and durable items that you will need to operate and maintain the M992A1. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970 or CTA 8-100.

**Explanation of Columns**

Column (1), Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g., "Use cleaning compound, Item 7, Appendix D").

Column (2), Level. This column identifies the lowest level of maintenance that requires the item.

- C - Operator/Crew
- O - Unit
- F - Direct Support
- H - General Support

Column (3), National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.

Column (4), Item Name, Description, CAGEC [Commercial and Government Entity Code] [in parentheses], Part Number. This provides the additional information you need to identify the item.

Column (5), U/M [unit of measure]. This code shows the measure or count of an item: BE (bundle), CN (carton), DR (drum), GL (gallon), HD (hundred), KT (kit), LB (pound), OZ (ounce), PG (package), PT (pint), QT (quart), and TU (tube).

## Section II. EXPENDABLE AND DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description CAGEC, Part Number	(5) U/M
1	C	8040-00-262-7929	ADHESIVE (81349) MIL-A-5092 Type 1	PT
2	C	8040-00-262-9025	ADHESIVE (81349) MIL-A-5092 Type 1	OZ
3	C	6850-00-174-1806	ANTIFREEZE, ARCTIC TYPE 55-GAL DRUM (81349) MIL-A-11755	DR
4	C	6850-00-181-7929	ANTIFREEZE, PERM O-A-548, GAL CAN (81349) MIL-A-46153	GL
5	C	6850-00-181-7933	ANTIFREEZE, PERM O-A-548, 5-GAL CAN (81349) MIL-A-46153	GL
6	C	6850-00-224-6665	CLEANING COMPOUND (81349) MIL-C-1 1090	CN
7	C	6850-00-227-1887	CLEANING COMPOUND (81349) MIL-C-43454	QT
8	C	6850-00-598-7328	CLEANING COMPOUND, 2CCMP CAN (81349) MIL-C-10597	KT
9	C	6850-00-224-6657	CLEANING COMPOUND, RIFLE (81349) MIL-C-372	CN
10	C	6850-00-224-6663	CLEANING COMPOUND, RIFLE (81349) MIL-C-372	GL
11	C	5350-00-221-0872	CLOTH, ABRASIVE CROCUS, 50 SHEETS (81348) PC458	PG
12	C	6850-00-901-0591	DEICING-DEFROSTING COMPOUND, 5-GAL CAN (81349) MIL-A-8243	CN
			<b>D-2</b>	



## Section II. EXPENDABLE AND DURABLE ITEMS LIST (continued)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description CAGEC, Part Number	(5) U/M
13	C	6850-00-281-3061	DRY CLEANING SOLVENT, 4 OZ (81348) P-D-680	OZ
14	C	6850-00-664-5685	DRY CLEANING SOLVENT, 1 QT (81348) P-D-680	QT
15	C	8010-00-527-2050	ENAMEL, GLOSS, BLACK, 1 GAL (81348) TT-E-489 CLASS A	GL
16	C	8010-00-527-2053	ENAMEL, GLOSS, BLACK, 1-QT CAN (81348) TT-E-489 CLASS A	QT
17	C	8010-00-297-2105	ENAMEL, SEMIGLOSS, OLIVE DRAB (81348) TT-E-485	GL
18	C	8010-00-297-2109	ENAMEL, SEMIGLOSS, OLIVE DRAB (81348) TT-E-485TYPE2	PT
19	C	8010-00-664-7653	ENAMEL, SYN, GLOSS, WHITE (81348) TT-E-489	QT
20	C	9110-00-391-7813	FUEL, JELLIED, ALCOHOL, 2.625- OZ CAN (94745) 4006	CN
21	C	9150-00-190-0904	GREASE, AUTOMOTIVE ARTILLERY (GAA), 1.75-LB CAN (98308) MIL-G-10924	LB
22	C	9150-00-190-0905	GREASE, AUTOMOTIVE ARTILLERY (GAA), 6.5-LB CAN (98308) MIL-G-10924	LB
23	C	9150-00-935-1017	GREASE, AUTOMOTIVE ARTILLERY (GAA), 14-OZ CAN (81349) MIL-G-10924	TU
24	C	9150-01-326-5424	GREASE, MOLYBDENUM DISULFITE (39428) 1062K57	OZ
25	C	9150-00-935-9808	HYDRAULIC FLUID, PET, OHT (98308) MIL-H-6083	GL
			<b>D-3</b>	

## Section II. EXPENDABLE AND DURABLE ITEMS LIST (continued)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description CAGEC, Part Number	(5) U/M
26	C	8030-00-065-0957	INHIBITOR, CORROSION (81349) MIL-C-81 706	QT
27	C	9150-00-188-9858	LUBRICATING OIL (81349) MIL-L-2104D	CN
28	C	9150-00-189-6727	LUBRICATING OIL (81349) MIL-L-2104D	QT
29	C	9150-00-186-6668	LUBRICATING OIL, ENG (81349) MIL-L-2104	CN
30	C	9150-00-186-6681	LUBRICATING OIL, ENG (81349) MIL-L-2104D	QT
31	C	9150-00-231-2356	LUBRICATING OIL, GEN (81349) MIL-L-3150	CN
32	C	9150-00-231-2361	LUBRICATING OIL, GEN (81349) MIL-L-3150	QT
33	C	9150-00-231-6689	LUBRICATING OIL, GEN PL SPC (81348) VV-L-800	QT
34	C	9150-00-231-9062	LUBRICATING OIL, GEN, 5-GAL CAN (81348) VV-L-800	GL
35	C	9150-00 402-2372	LUBRICATING OIL, OEA, 5-GAL CAN (81349) MIL-L-46167	CN
36	C	9150-00-402-4478	LUBRICATING OIL, OEA, 1-CT CAN (81349) MIL-L-46167	CT
37	C	6640-00-285-4694	PAPER, LENS (81348) NNN-P-40	HD
38	C	9150 00-250-0926	PETROLATUM, TECHNICAL (81348) VV-P-236	LB
39	C	9150-00G-250-0933	PETROLATUM, TECHNICAL: 5-LB CAN (81348) VV-P-236	LB
			<b>D-4</b>	

## Section II. EXPENDABLE AND DURABLE ITEMS LIST (continued)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description CAGEC, Part Number	(5) U/M
40	C	7920-00-205-1711	RAG, WIPING (81348) DDD-R-30	BE
41	C	8030-00-159-8176	SEALING COMPOUND (81349) MIL-S-45180	TU
42	C	8030-00-252-3391	SEALING COMPOUND 11-OZ TUBE (62377) FORM A GASKET 2	OZ
43	C	8030-00-889-3535	TAPE, ANTI-SIEZE, TEFLON, 1/2 inch WIDE (81349) MIL-T-27730	RL
43	C	8010-00-558-7026	THINNER, PAINT, MINERAL (81348) TT-T-291	CN
44	C	8010-00-242-2089	THINNER, PAINT MIXER (81348) TT-T-291GR1-1GAL	GL
45	C	5610-00-141-7838	WALKWAY COMPOUND, 1-GAL CAN (81349) MIL-W-5044 TYPE 2	GL
46	C	6550-01-310-1677	WATER, DISTILLED, 1 GAL (8R942) C4350-1	GL
			D-5/D-6	

## APPENDIX E LUBRICATION INSTRUCTIONS

### NOTE

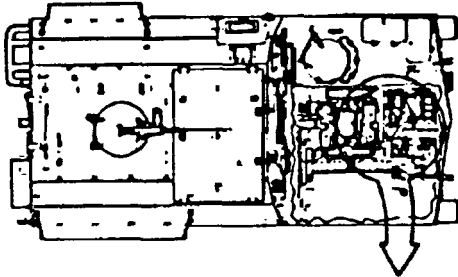
All instructions contained in this appendix are mandatory.

This appendix lists all operator/crew lubrication instructions to be performed on the M992A1. Intervals (on-condition or hard time) and the related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer than usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

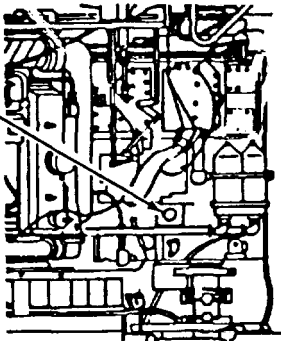
### WARNING

Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using drycleaning solvent, immediately get fresh air and medical help. If solvent contacts your eyes, wash them immediately and get medical aid. Failure to heed this warning can result in Injury or death.

Clean all fittings and areas around lubrication points with dry cleaning solvent (Item 14, Appendix D), or equivalent, before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.



OE/HDO • D  
Transmission Oil  
Fill Cap and Level  
Indicator (Check  
level.) (See key  
and note 1.)



INTERVAL	MAN-HOURS*
D	0.3
A	0.1
25H or 30D	0.1

\*The man-hour time specified is the time you need to do all the services prescribed.

-KEY-

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15°F (Above -9°C)	+40°F to -10°F (+4C to -23°C)	+40°F to -65°F (+4°C to -54°C)	
OE/HDO (MIL-L-2104D) LUBRICATING OIL, Internal Combustion En- gine, Tactical Service					Intervals are as fol- lows: H - Hour D - Day; Daily A - Annually Intervals are based on normal hours of op- eration and moderate operating conditions.
OEA (MIL-L-46167) LUBRICATING OIL, Internal Combustion Engine, Arctic					
Transmission	48 qt (45.43L)	OE/HDO 15W40	OE/HDO 15W40	OEA	

**NOTES:**

1. TRANSMISSION OIL LEVEL CHECK.

**WARNING**

**While performing engine warm-up, make sure personnel stand well clear of vehicle. Vehicle may move suddenly, causing severe injury or death to personnel.**

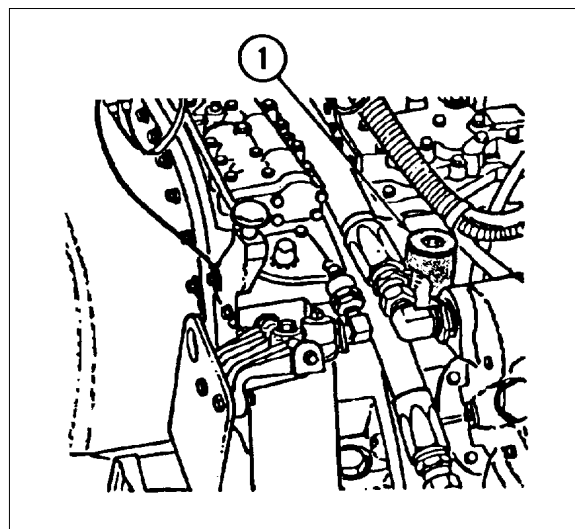
**CAUTION**

**Do not check oil with engine running.  
Do not overfill.**

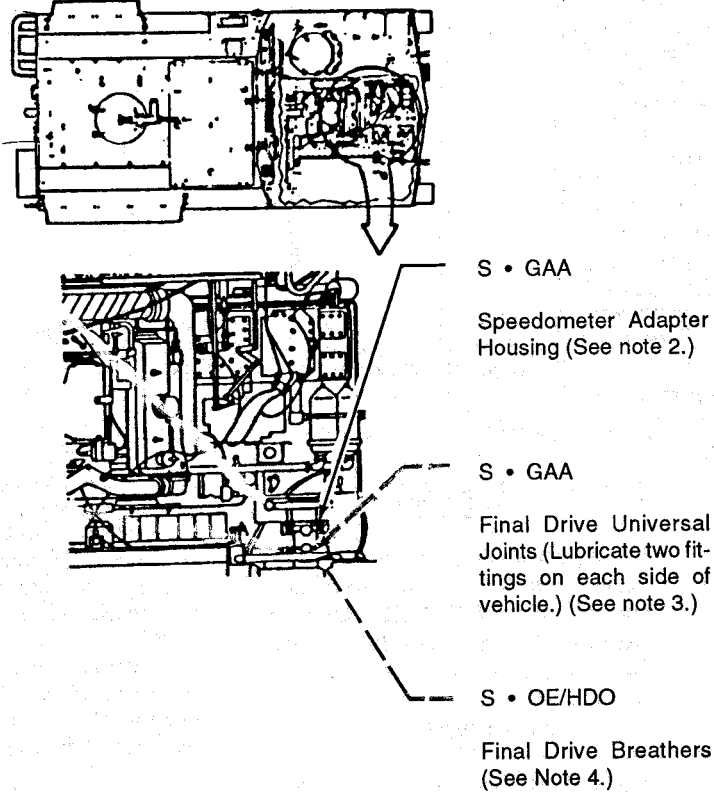
**NOTE**

Transmission and engine contain preservative oil upon receipt. Preservative engine oils PE1 and PE2 are identical to engine oil OE-40, except they contain a preservative additive. PE1 and PE2 will be used in the same manner as the regularly used engine oil OE-40. PE1 or PE2 will also be used in the transmission until the first scheduled 2000-mile or semiannual oil change.

Check oil level before starting engine. Oil level indicator must be within 'OPERATING RANGE' stamped on dipstick and filler cap (1). Add or drain oil (see key for required type) as required. Block vehicle tracks. With brakes applied and transmission in fourth gear, run engine at 1600-1900 rpm to warm the transmission oil. When transmission oil temperature gage reads over 180°F, run engine at 1200-1600 rpm for 1-3 minutes with transmission in neutral (N). After this period of time, oil temperature should stabilize between 180°F and 220°F. Stop engine, wait 3-5 minutes, then check oil level.



**INTERVAL • LUBRICANT**



**NOTE**

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

INTERVAL	MAN-HOURS*
S	0.8

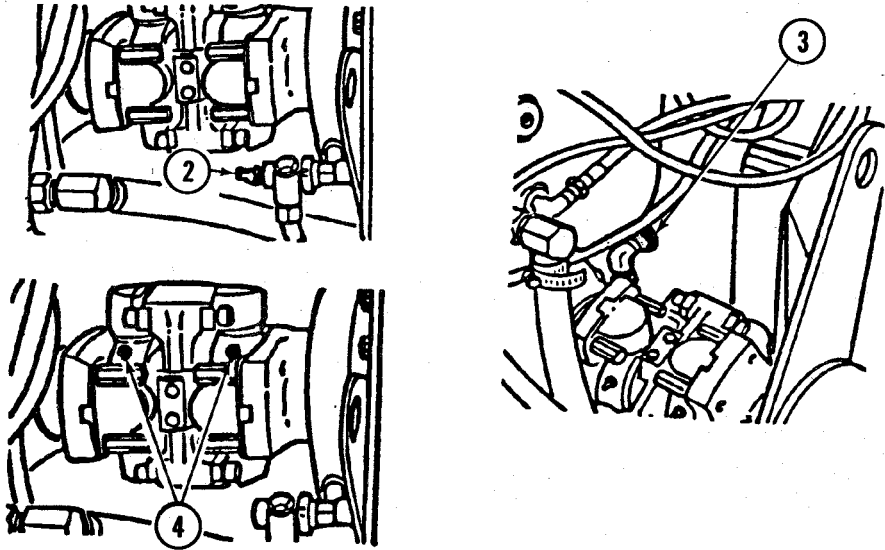
The man-hour time specified is the time you need to do all the services prescribed.

-KEY-

Lubricants	Expected Temperatures			Intervals
	Above 15°F (Above -9°C)	+40°F to -10°F (+4C to -23°C)	+40°F to -65°F (+4°C to -54°C)	
<b>OE/HDO (MIL-L-2104D)</b> Lubricating Oil, Internal Combustion Engine, Tactical Service				Intervals are as follows: S - Semiannually Intervals are based on normal hours of operation and moderate operating conditions.
Final Drive Breather	OE/HDO 15W 40	OE/HDO 15W 40	OEA	
<b>GAA (MIL-G-10924)</b> GREASE, Automotive and Artillery	All Temperatures			
Final Drive Universal Joints Speedometer Adapter Housing				

**NOTES:**

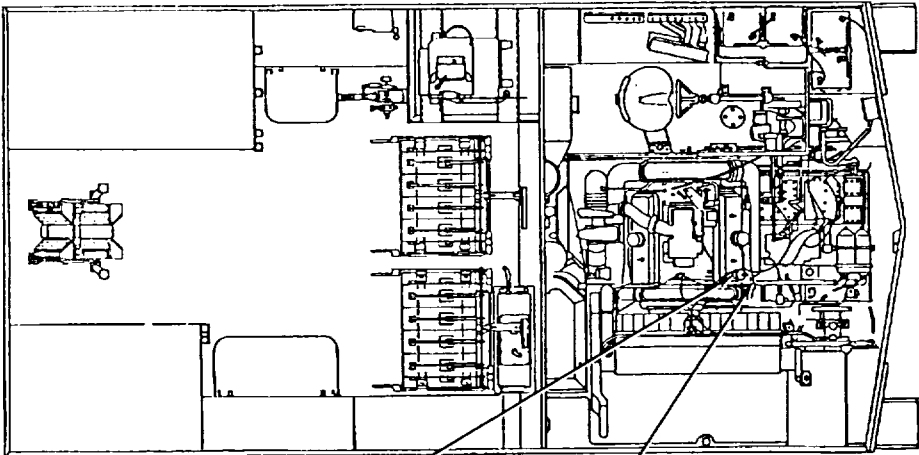
2. SPEEDOMETER ADAPTER HOUSING. Use a grease gun to inject GAA at fitting (2) on speedometer adapter housing.
3. FINAL DRIVE UNIVERSAL JOINTS. Lubricate two fittings (4) on each side of vehicle with GAA.. Rotate universal joints to reach fittings.
- 4..FINAL DRIVE BREATHERS. Remove both breathers (3). Clean with drycleaning solvent (Item 13, Appendix D). Dry, dip in oil, and install (see key for required type).





LUBRICANT•INTERVAL

INTERVAL•LUBRICANT



OE/HDO • A  
 Main Engine Oil Fill Cap  
 (See note 5.)

D • OE/HDO  
 Main Engine Crankcase  
 Oil Level Indicator (Check  
 level.) (Reached through  
 door in front of engine  
 grille.) (See note 5.)

INTERVAL	MAN-HOURS*
D	0.2
A	0.1

\*The man-hour time specified is the time you need to do all the services prescribed.

-KEY-

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15°F (Above -9°C)	+40°F to -10°F (+4C to -23°C)	+40°F to -65°F (+4°C to -54°C)	
OE/HDO (MIL-L-2104D) LUBRICATING OIL, Internal Com- bustion Engine, Tactical Service  OEA (MIL-L-46167) LUBRICATING LUBRICATING OIL, Internal Combustion Engine, Arctic					Intervals are as follows: D-Day; Daily A - Annually Intervals are based on normal hours of operation and moderate operating conditions.
Engine Crankcase	27 qt (25.55L)	OE/HDO 15W/40	OE/HDO 15W/40	OEA	

**NOTE**

**Make sure vehicle is parked on level ground before checking engine oil level.**

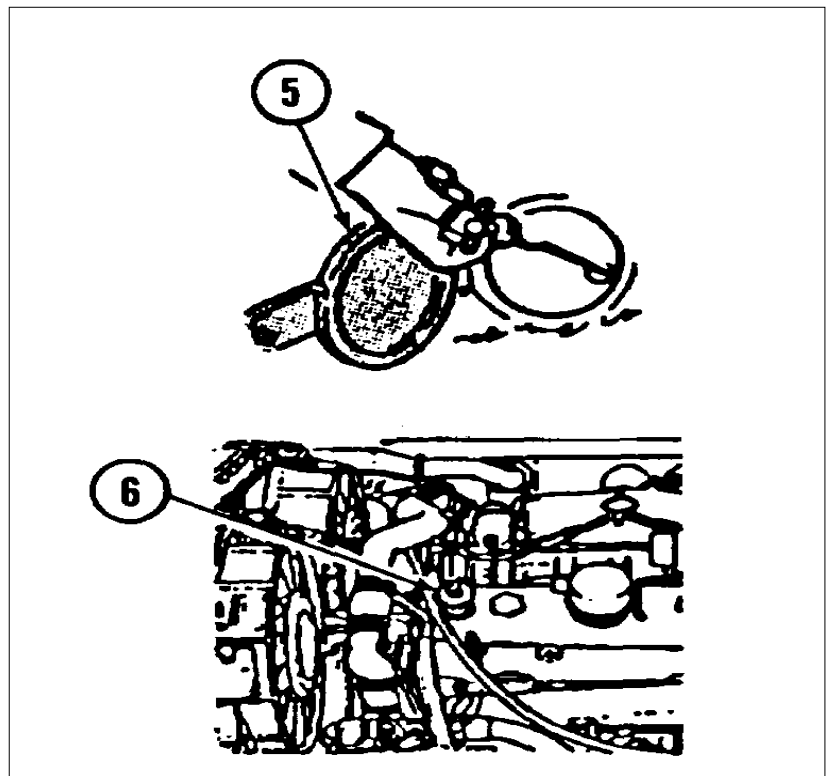
**NOTES:**

5. MAIN ENGINE CRANKCASE OIL LEVEL Before starting engine, open engine oil level access door (5) and check to ensure that oil level is at least to, or above, the low (L) mark on the dipstick. If not, add oil to bring level to above L mark on dipstick (see key for required oil type). Check for hydrostatic lock. Start engine. Warm up engine to normal operating temperature. Stop engine and wait 3-5 minutes. Check oil level again. If oil is within OPERATING RANGE (between Land full, or F, mark on dipstick), do not add oil. If oil level is below the L mark, add oil to within upper limits of OPERATING RANGE on dipstick (see key for required oil type). Main engine oil fill cap (6) is in engine compartment.

**NOTE**

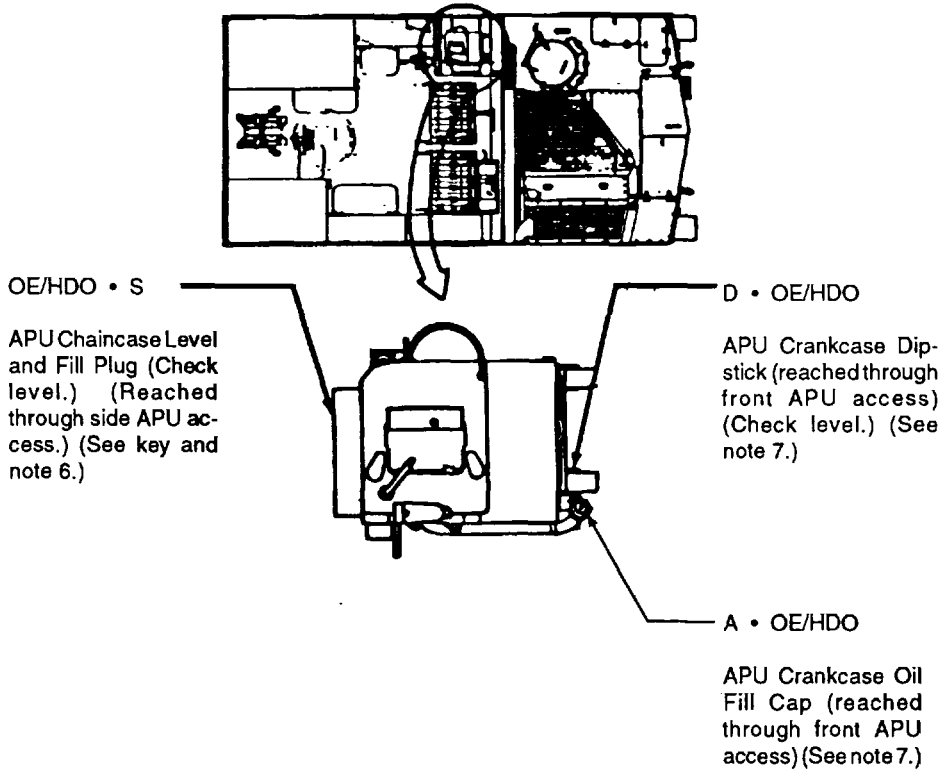
•After an overnight stand, oil level may be from 3/4 to 1 inch above F mark on dipstick. This is not abnormal. However, if oil level is more than 1 inch above F mark, have engine checked for internal coolant or fuel oil leaks.

•Transmission and engine contain preservative oil upon receipt. Preservative engine oils PE1 and PE2 are identical to engine oil OE-40, except they contain a preservative additive. PE1 and PE2 will be used in the same manner as the regularly used engine oil OE-40. PE1 or PE2 will also be used in the transmission until the first scheduled 2000-mile or semiannual oil change.



LUBRICANT•INTERVAL

INTERVAL•LUBRICANT



INTERVAL	MAN-HOURS*
D	0.1
S	0.2
A	0.1

\*The man-hour time specified is the time you need to do all the services prescribed.

-KEY-

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15°F (Above -9°C)	+40°F to -10°F (+4C to -23°C)	+40°F to -65°F (+4°C to -54°C)	
OE/HDO (MIL-L-2104D) LUBRICATING OIL, Internal Com- bustion Engine, Tactical Service					Intervals are as follows: D - Day; Daily Semiannually A -Annually Intervals are based on normal hours of operation and moderate operating conditions.
OEA (MIL-46167) LUBRICATING OIL Internal Com- bustion Engine, Arctic					
APU Crankcase	3 1/2 qt (3.31L)	OE/HDO 15W/40	OE/HDO 15W/40	OEA	
APU Chaincase	1 qt (0.98L)	OE/HDO 15W40	OE/HDO 15W40		

NOTES:

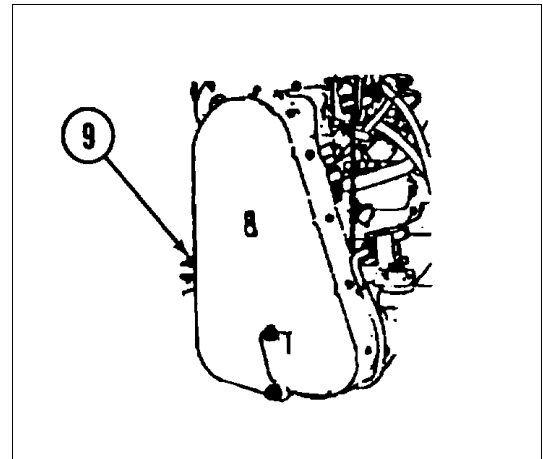
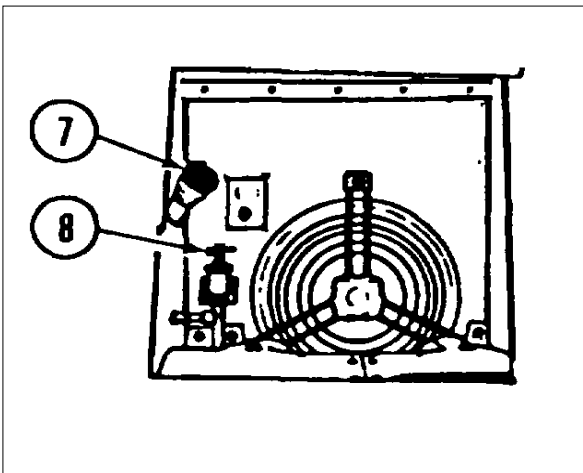
6. APU CHAINCASE OIL LEVEL CHECK.

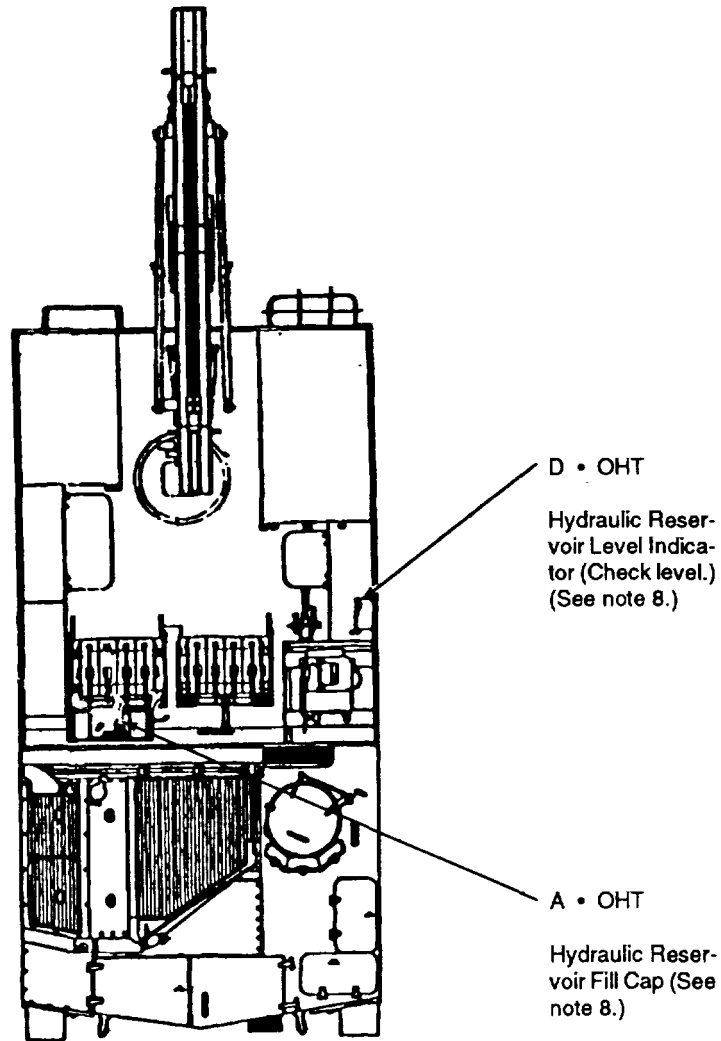
**WARNING**

**APU chaincase oil is hot after operation. Make sure chaincase oil is cool before checking oil level.**

Open side APU access door. Reach around to rear of APU compartment (to your right side) and remove filler plug (9). With finger, check that oil level at fill hole reaches to bottom of threads. If necessary, add oil to chaincase through fill hole until oil level reaches threads (see key for required oil type). Install filler plug (9).

7. APU CRANKCASE LEVEL CHECK. Open front APU access door. Unscrew and remove oil level dipstick (8) and wipe with clean rag. Reinsert dipstick, and remove it again. Observe oil level indicated on dipstick. If oil level reads below full (F) mark, APU crankcase oil fill cap (7) and add oil until level rises to F mark (see key for required oil type). Install dipstick and screw it down. Hand-tighten.





INTERVAL	MAN-HOURS*
D	0.1
A	0.1

\*The man-hour time specified is the time you need to do all the services prescribed.

- KEY-

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
<b>OHT (MIL-H-6083)</b> HYDRAULIC FLUID, Petroleum Base, Preservative, normal hours Hydraulic Equipment Hydraulic Reservoir (69.8L)	18 1/2 gal.	All Temperatures			Intervals are as follows: D - Day; Daily A - Annually Intervals are based on normal hours of operation and moder- ate operating conditions.

NOTES:

8. HYDRAULIC RESERVOIR LEVEL CHECK.

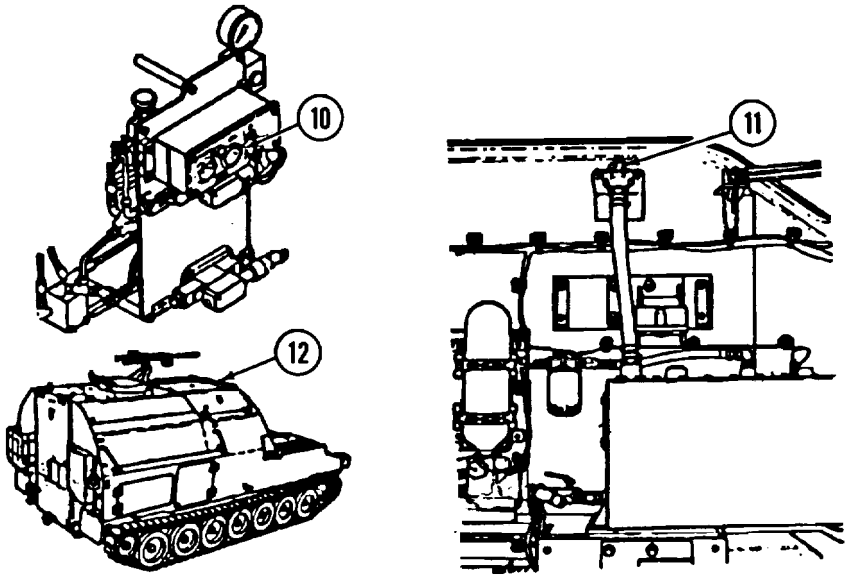
**CAUTION**

Take necessary precautions to prevent entry of contaminants into hydraulic system.

**NOTE**

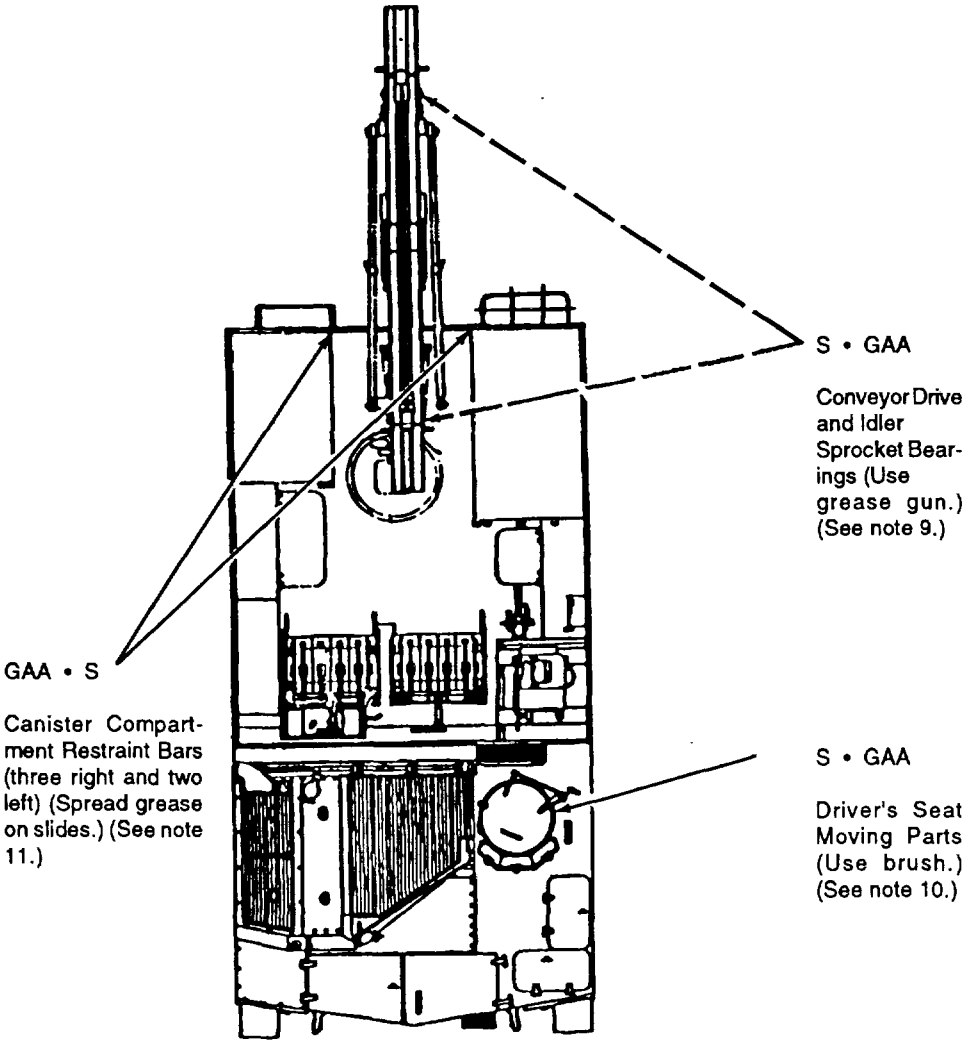
An assistant is needed for this procedure.

Turn MASTER switch to ON and check fluid level gage (10), located on hydraulic control panel. Gage pointer should read within green range. If fluid level is low, open center top loading door (12) and remove hydraulic reservoir fill cap (11). While assistant monitors fluid level on gage, add OHT until fluid level rises to full (F) mark on gage.



LUBRICANT INTERVAL

INTERVAL LUBRICANT



NOTE

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

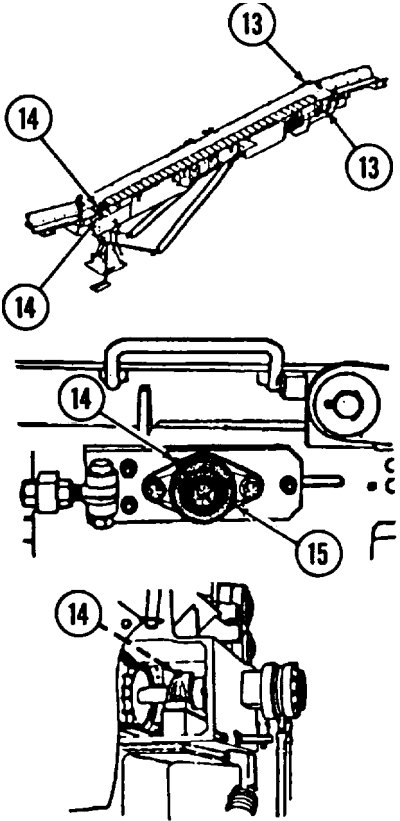
INTERVAL	MAN-HOURS *
S	0.2

\*The man-hour time specified is the time you need to do all the services prescribed.

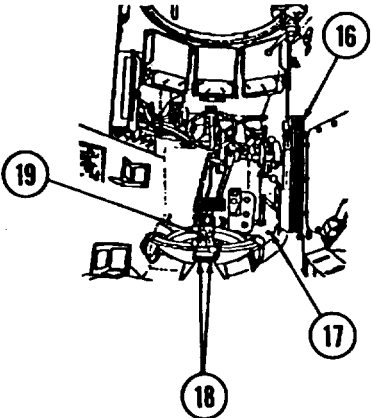
- KEY -

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
<b>GAA (MIL-G-10924)</b> GREASE, Automotive and Artillery					Intervals are as follows: S-Semiannually Intervals are based on normal hours of operation and moderate operations conditions.
Conveyor Drive and Idler Sprocket Bearings		All Temperatures			
Canister Compartment Restraint Bars  Driver's Seat <b>NOTES:</b>					

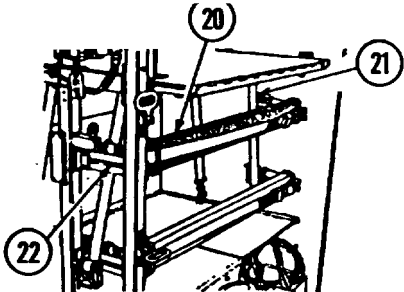
9. CONVEYOR DRIVE AND IDLER SPROCKET BEARINGS. Use a grease gun to inject GAA into the two idler sprocket grease fittings (13) and into the two drive sprocket grease fittings (14) until grease begins to seep from bearing block (15).



10. DRIVER'S SEAT MOVING PARTS. Brush GAA on vertical shaft (16) and horizontal shaft (18). Also, brush GAA on pivot points of seat adjusting lever (17) and backrest post (19).



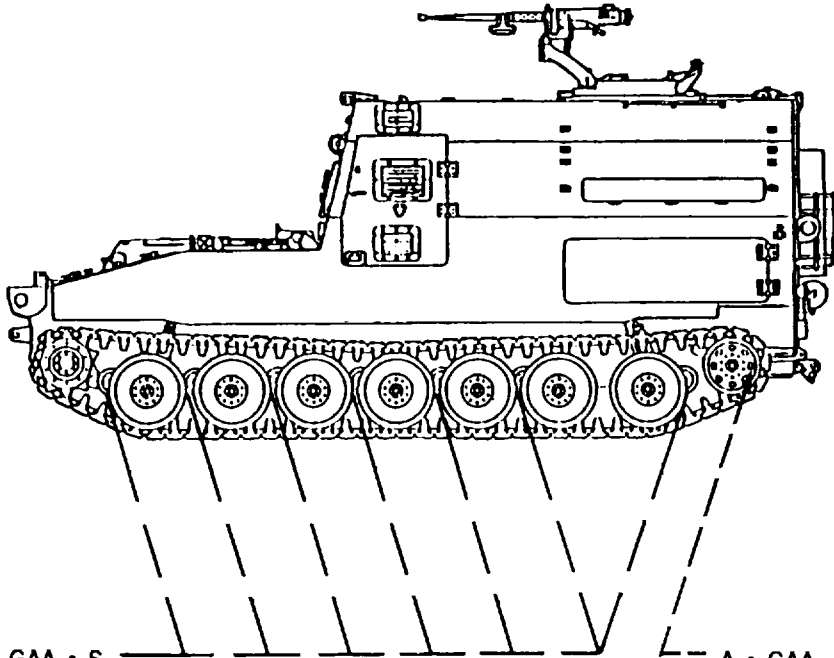
11. CANISTER COMPARTMENT RESTRAINT BARS. Unhook restraint bar straps from eyes (21). Remove restraint bars (20) and apply a light coat of GAA to sliding portions of bars (22). Install restraint bars (20). Hook restraint bar straps to eyes (21).





LUBRICANT INTERVAL

INTERVAL LUBRICANT



GAA • S  
 Roadwheel Arms and  
 Pivot Bearing Housing  
 (Use grease gun.)  
 (See note 12.)

A • GAA  
 Idler Wheel  
 Housing (Use  
 grease gun.)  
 (See note 13.)

NOTE

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

INTERVAL	MAN-HOURS *
S	0.8
A	0.9

\* The man-hour time specified is the time you need to do all the services prescribed.

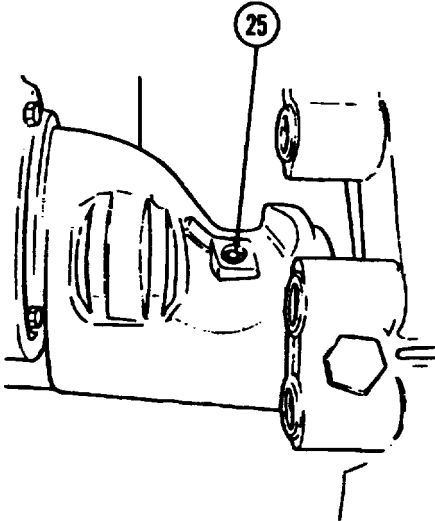
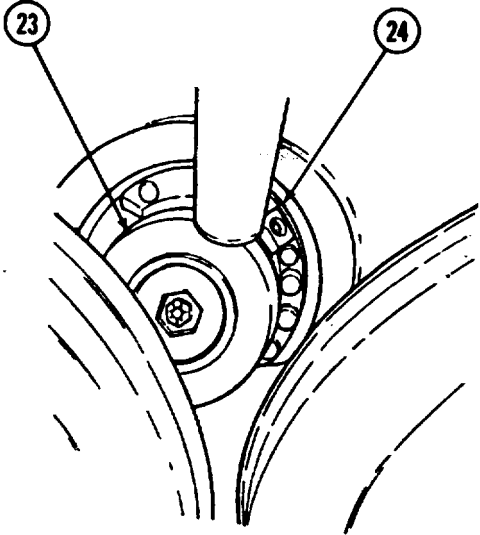
- KEY -

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
GAA (MIL-G-10924) GREASE, Auto- motive and Artillery		All Temperatures			Intervals are as follows: S -Semiannually A - Annually Intervals are based on normal hours of operation and moderate operating conditions.
Roadwheel Arms  Idler Wheel Housing					

NOTES:

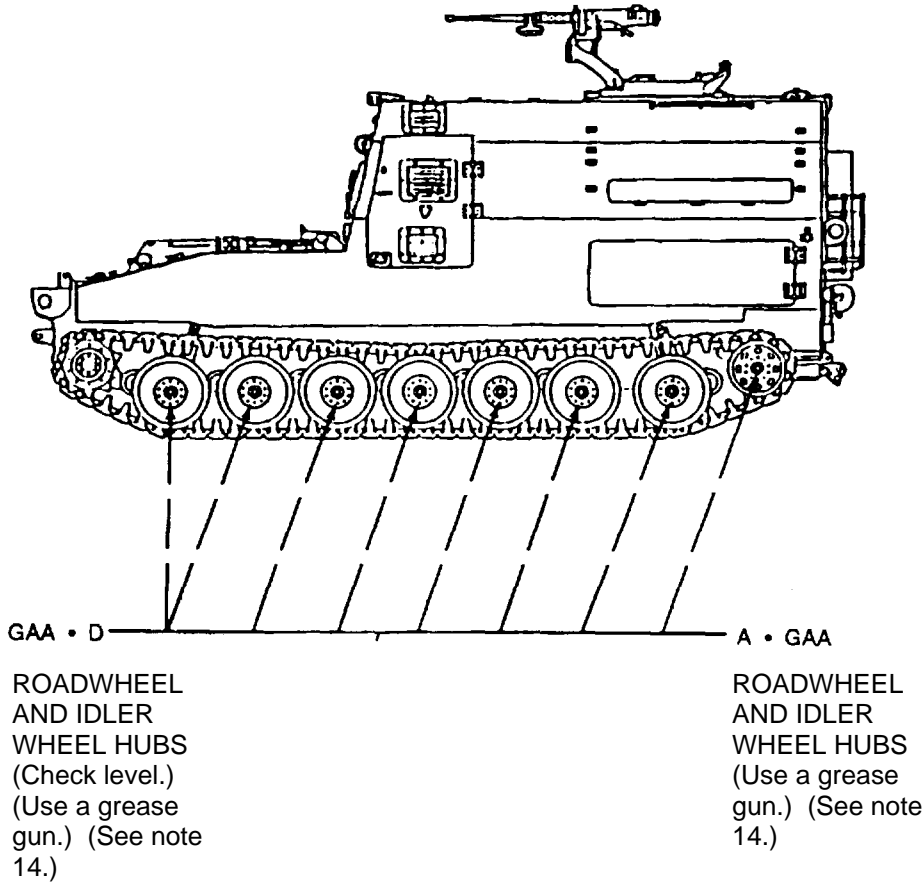
12. ROADWHEEL ARMS. Use a grease gun to inject GAA into the 14 roadwheel arm and pivot bearing housing grease fittings (24) until grease begins to seep from relief valve (23).

13. IDLER WHEEL HOUSING. Use a grease gun to inject GAA into the two idler wheel housing grease fittings (25) until grease begins to seep from around fittings (25).



LUBRICANT INTERVAL

INTERVAL LUBRICANT



NOTE

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

INTERVAL	MAN-HOURS *
D	1.0
A	1.9

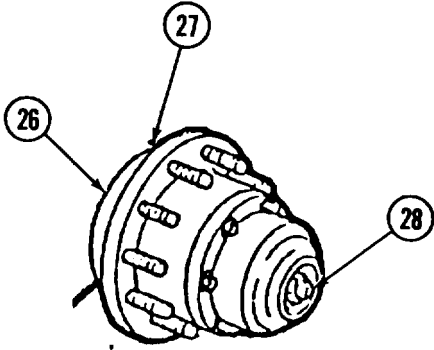
\* The man-hour time specified is the time you need to do all the services prescribed.

- KEY -

Lubricants	Capacities	Expected Temperatures			Intervals
		Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
<b>GAA (MIL-G-10924)</b> GREASE, Automot- ive and Artillery		All Temperatures			Intervals are as follows: D - Day; Daily A - Annually Intervals are based on normal hours of operation and moderate operating conditions.
Roadwheel and Idler Wheel Hubs					

**NOTES:**

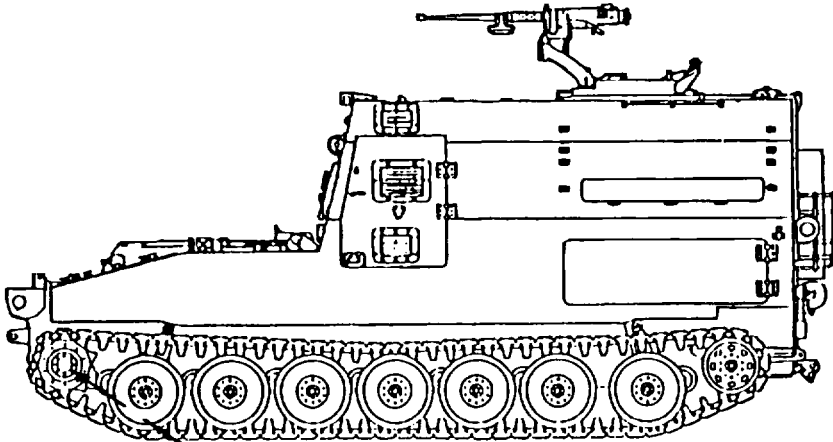
14. ROADWHEEL AND IDLER WHEEL HUBS. Check roadwheel and idler wheel hubs (26) daily after operations for overheating or Class III leaks. Ensure lubricant is at proper level by using grease gun to inject GAA into 16 grease fittings (28) on roadwheel and idler wheel hubs (26) until grease seeps from relief valves (27). Annually, use a grease gun to inject GAA into grease fittings (28) until clean grease seeps from relief valves (27).



E-17

LUBRICANT INTERVAL

INTERVAL LUBRICANT



OE/HDO • M

Final Drive Level and Fill Plug (Check level.) (See key and note 15.)

S • OE/HDO

Final Drive Drain Plug (Drain and re-fill.) (See note 16.)

NOTE

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

INTERVAL	MAN-HOURS *
M	0.2
S	0.3

\* The man-hour time specified is the time you need to do all the services prescribed.

- KEY -

Lubricants	Expected Temperatures			Intervals
	Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
<b>OE / HDO (MIL-L-2104D)</b> LUBRICATING OIL, Internal Combustion Engine Tactical Service  <b>OEA (MIL-L-46167)</b> LUBRICATING OIL, Internal Combustion Engine, Arctic				Intervals are as follows: M -Monthly S - Semiannually Intervals are based on normal hours of operation and moderate operating conditions.
Final Drive	<b>OE/HDO 15/W40</b>	<b>OE/HDO 151W40</b>	<b>OEA</b>	

**NOTES:**

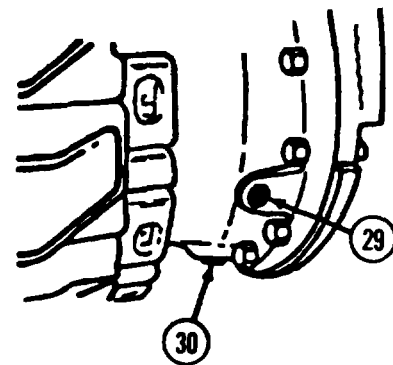
15. FINAL DRIVE LEVEL CHECK. Remove level check plug (29). Oil should be level with bottom of opening. If not, add oil until it flows from the plug opening (see key for required oil type). Clean and install level-check plug (29).

16. FINAL DRIVE DRAIN AND REFILL.

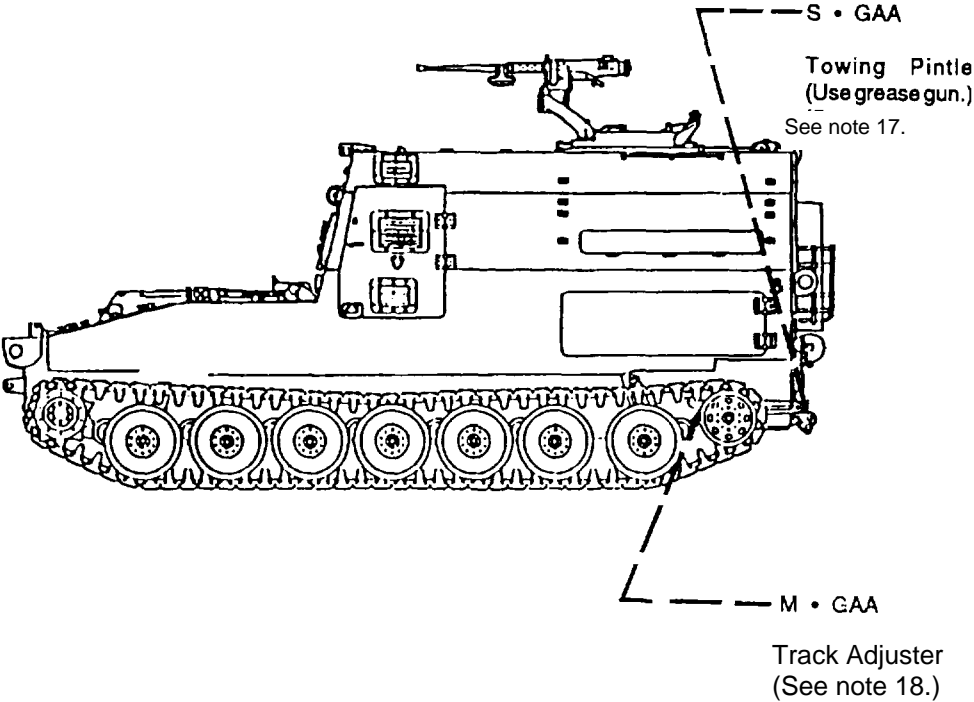
After operation, remove both level-check plugs (29) and both drain plugs (30). Clean drain plugs (30); apply teflon tape on drain plugs (30), and install drain plugs. Add oil at level-check plug opening (see key for required oil type). Clean, apply teflon tape, and install level-check plugs (29).

**NOTE**

Notify Unit maintenance if you find pieces of metal stuck to the magnetic drain plugs.



**INTERVAL LUBRICANT**



**NOTE**

Dotted leader lines on the illustration indicate that lubrication is required on both sides of the equipment.

INTERVAL	MAN-HOURS *
M	0.8
S	0.3

\* The man-hour time specified is the time you need to do all the services prescribed.

- KEY -

Lubricants	Expected Temperatures			Intervals
	Above 15° F (Above -9°C)	+40°F to -10°F (+4°C to -26°C)	+40°F to -65°F (+40°C to -54°C)	
<b>GAA (MIL-G-10924)</b> GREASE, Auto- motive and Artillery	All Temperatures			Intervals are as follows: M - Monthly S - Semiannually Intervals are based on normal hours of operation and moderate operating conditions.
Towing Pintle Track Adjuster				

NOTES:

17. TOWING PINTLE. Lubricate three fittings (31) with GAA.

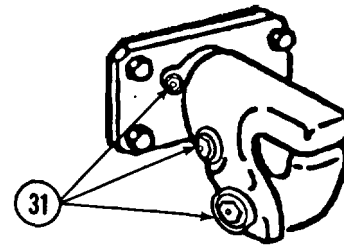
18. TRACK ADJUSTER.

**WARNING**

Lubricant is under high pressure. Loosen bleed plug slowly to avoid injury.

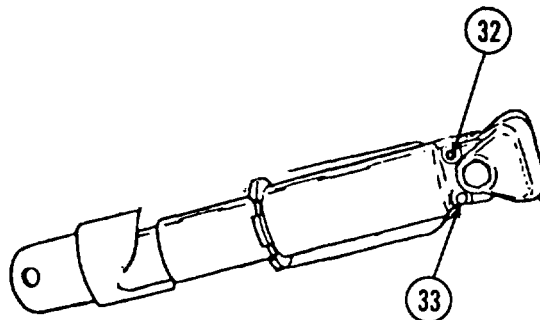
**CAUTION**

When increasing track tension, do not let adjuster extend beyond 3 1/2 inches. Adjuster will bind in extended position and will require force to collapse.



Check track adjuster. Pump GAA into fitting (33) to increase tension.

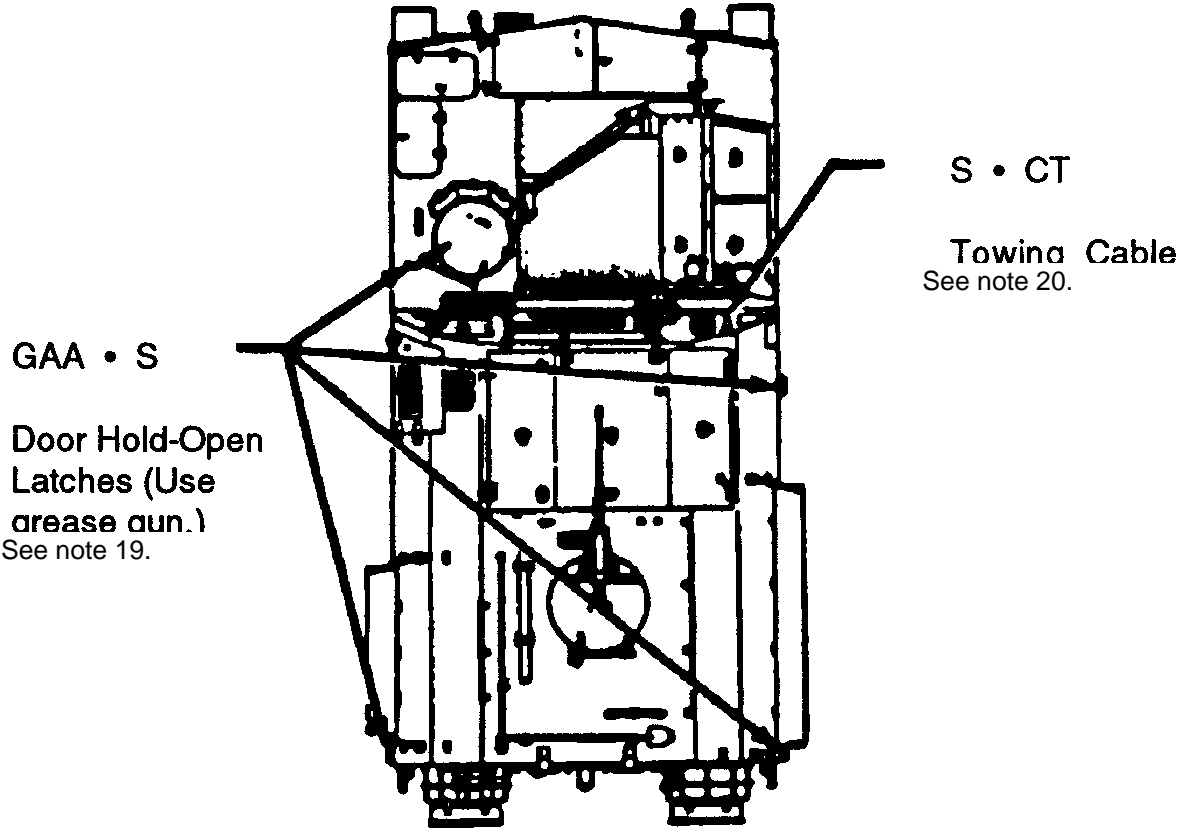
Slowly open pressure bleed plug (32) to decrease track tension.





LUBRICANT INTERVAL

INTERVAL LUBRICANT



INTERVAL	MAN-HOURS *
S	1.2

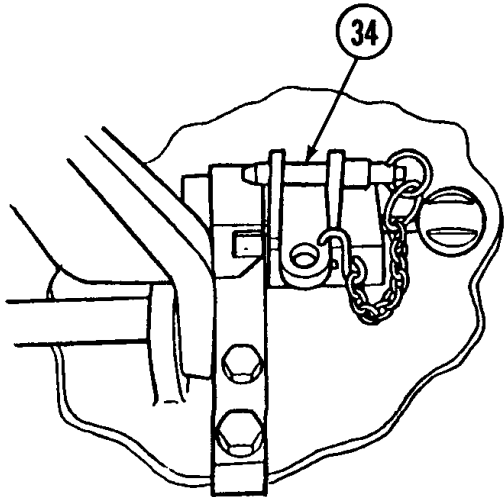
\* The man-hour time specified is the time you need to do all the services prescribed.

- KEY -

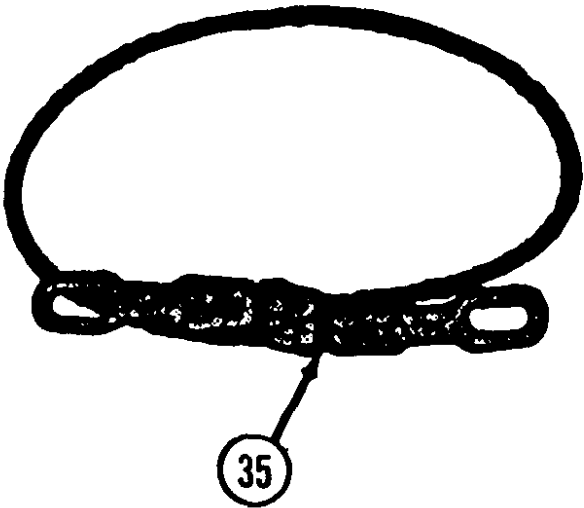
Lubricants	Expected Temperatures			Intervals
	Above 15° F (Above -9°C)	+40°Fto-10°F (+4°C to -260C)	+40°Fto-65°F (+40C to -54°C)	
GAA (MIL-G-10924) GREASE, Automot- ive and Artillery	All Temperatures			Intervals are as follows: S - Semiannually Intervals are based on normal hours of operation and moderate operating conditions.
Door Hold-Open Latches				
CT (MII-C-81706) CORROSION PREVENTIVE COMPOUND	All Temperatures			
Towing Cable				

NOTES:

19. DOOR HOLD-OPEN LATCHES. Lubricate one fitting9340 on each hold-open latch with a hand grease gun until grease seeps out around pin. Latches are located at driver's hatch, personnel side door, left canister door, and right canister door.

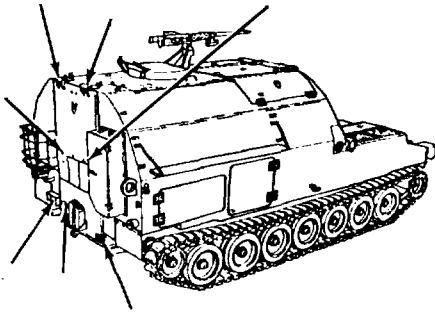


20. TOWING CABLE. Clean towing cable (35) with dry cleaning solvent and coat with CT.

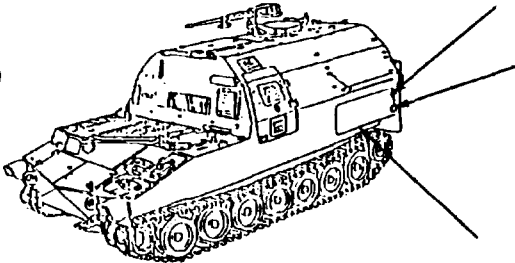


OIL CAN POINTS

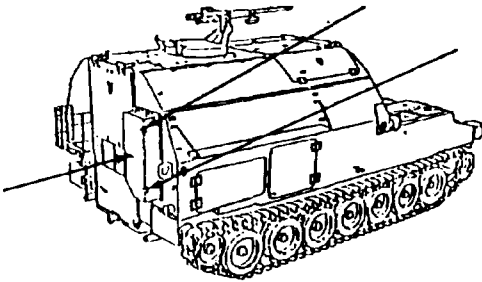
Lubricate semiannually with seasonal grade oil, OE/HDO (MIL-L-2104D) or OEA (MIL-L-46167).  
Clean lubrication points and wipe off excess lubricant



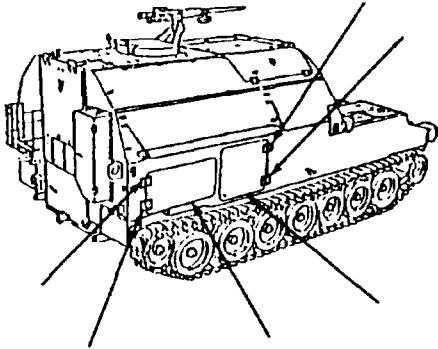
BACK DOOR LATCH AND HINGES, AND INTERVEHICULAR CABLE RECEPTACLE



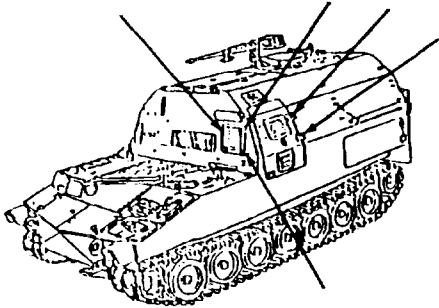
PERSONNEL SIDE DOOR LATCHES (INSIDE ONLY) AND HINGES



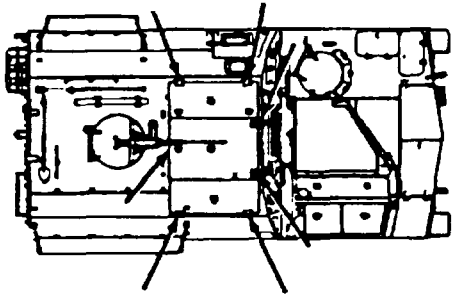
FIRE EXTINGUISHER BOX DOOR LATCH AND HINGES



PERSONNEL AND CANISTER SIDE DOOR LATCHES (INSIDE ONLY) AND HINGES



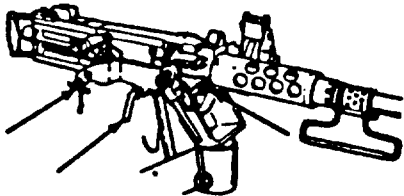
APU FRONT AND SIDE DOOR LATCHES AND HINGES



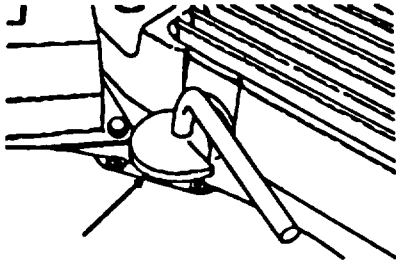
TOP MIDDLE DOOR LATCH (INSIDE ONLY) AND TOP DOOR HINGES

OIL CAN POINTS (continued)

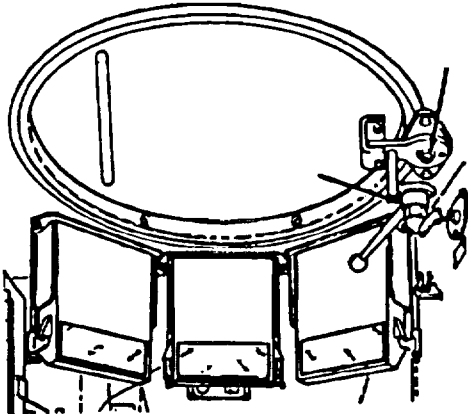
Lubricate semiannually with seasonal grade oil, OE / HDO (MIL-L-2104D) or OEA (MIL-L-46167).  
Clean lubrication points and wipe off excess lubricant.



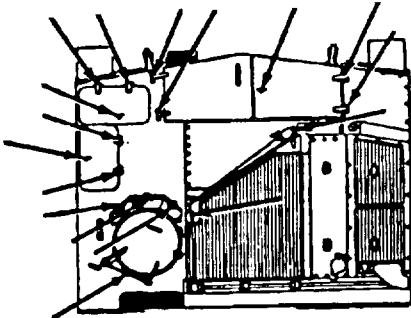
MACHINE GUN CRADLE LOCKING PINS



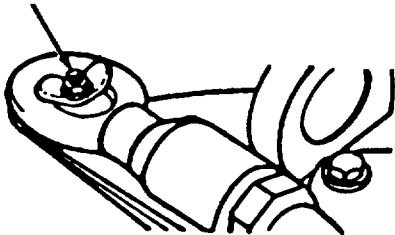
SECURITY LATCH FOR DRIVER'S HATCH



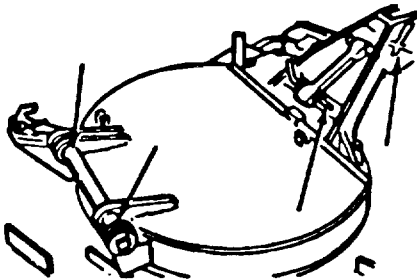
DRIVER'S HATCH COVER OPERATING  
LEVER AND SECURITY LATCH



HINGES AND LATCHES FOR  
GRILLES AND COVERS



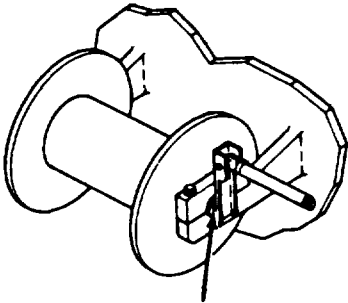
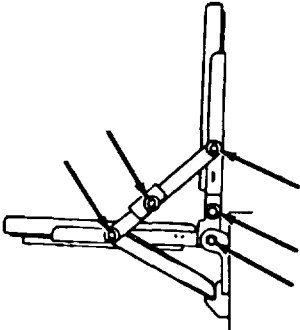
TOW CABLE MOUNTING BRACKETS



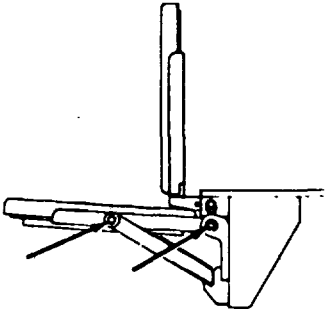
COMMANDER'S CUPOLA HATCH COVER  
HINGE, PERISCOPE COVER HINGE, AND  
MACHINE GUN PINTLE SUPPORT

OIL CAN POINTS (continued)

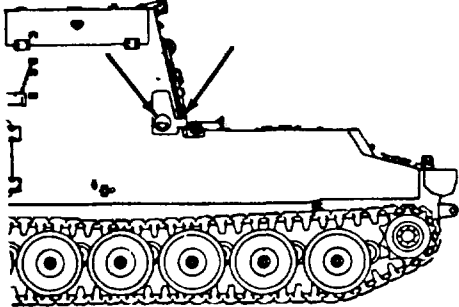
Lubricate semiannually with seasonal grade oil, OE/HDO (MIL-L-2104D) or OEA (MIL-L-46167).  
Clean lubrication points and wipe off excess lubricant



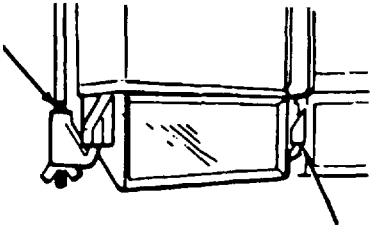
TELEPHONE CABLE REEL



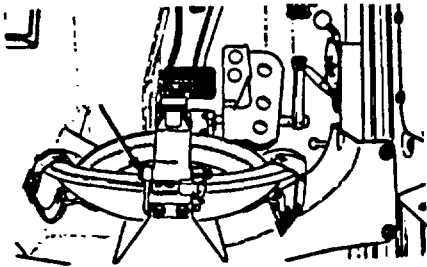
CREW SEAT HINGES (NOTE: NOT ALL SEATS ARE SHOWN; HOWEVER, ALL MUST BE LUBRICATED.)



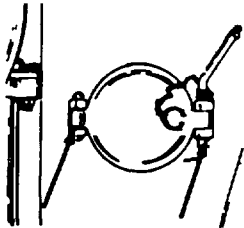
FUEL FILLER ACCESS COVER AND LATCH (INSIDE ONLY)



DRIVER'S PERISCOPE RETAINING LATCHES



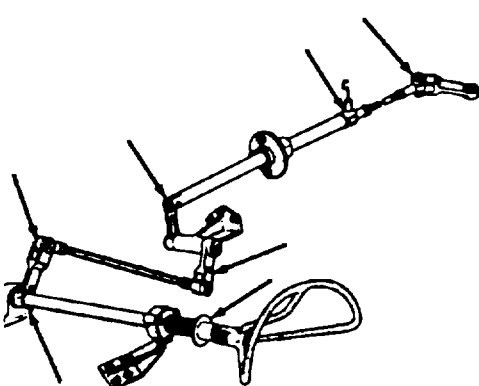
DRIVER'S SEAT MOVING PARTS



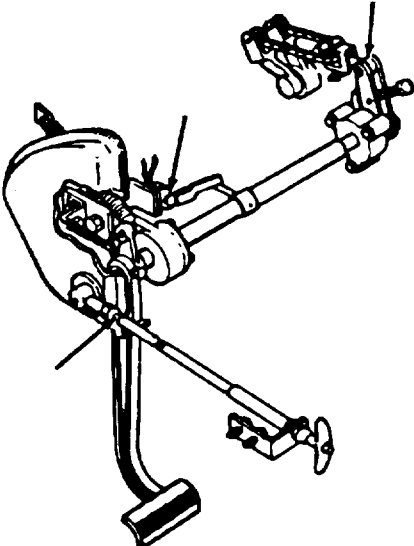
RADIATOR FILLER ACCESS COVER

OIL CAN POINTS (continued)

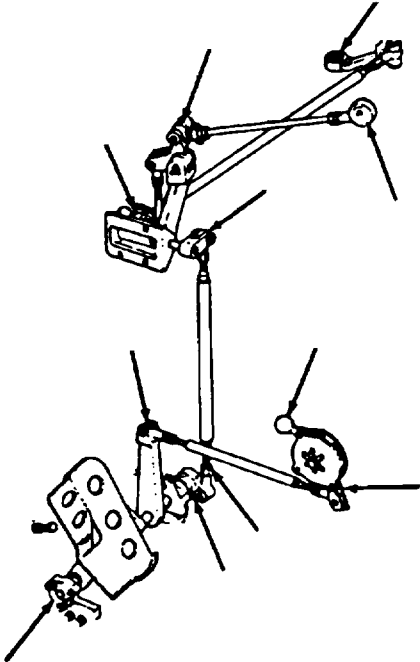
Lubricate semiannually with a few drops of preservative lubricant cleaner (CLP-MIL-L-63460) on rod and bearing; wipe off excess lubrication.



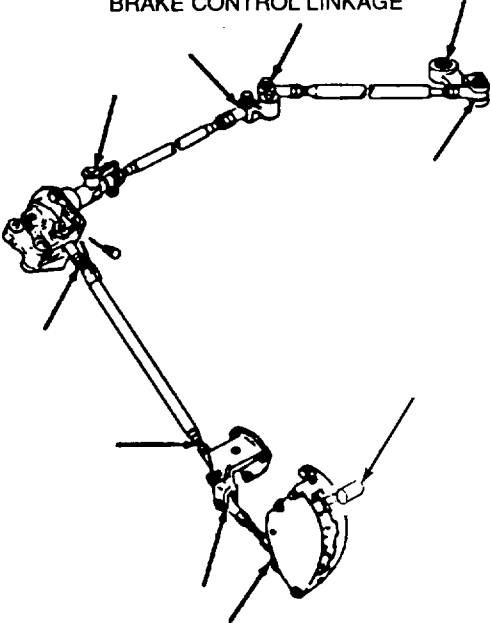
STEERING SHAFT BUSHING AND STEERING CONTROL LINKAGE



BRAKE CONTROL LINKAGE



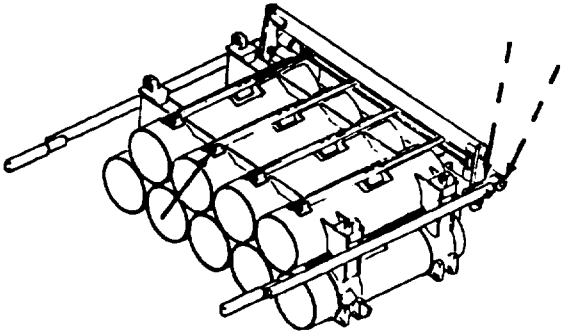
ACCELERATOR AND THROTTLE CONTROLS



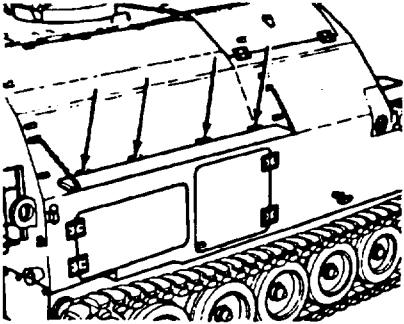
TRANSMISSION SHIFTING CONTROL LINKAGE

OIL CAN POINTS (continued)

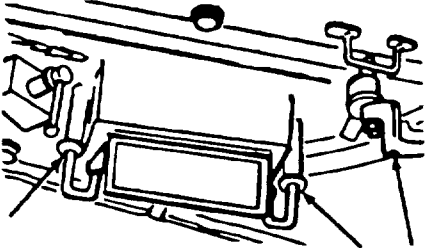
Lubricate semiannually with seasonal grade oil, OE / HDO (MIL-L-2104D) or OEA (MIL-L-46167).  
Clean lubrication points and wipe off excess lubricant.



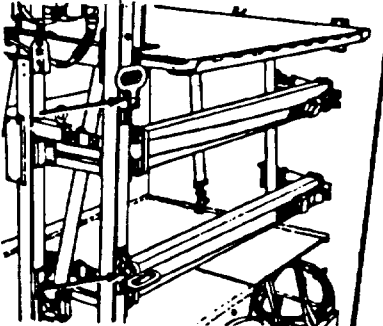
PROJECTILE RACK PIVOT POINTS



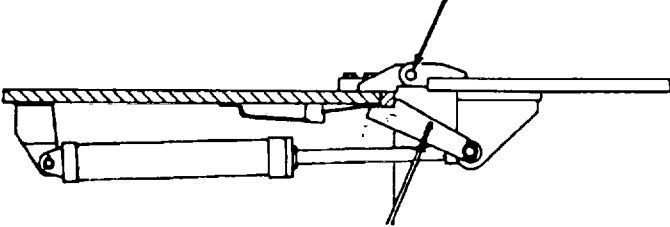
DUFFLE BAG SHELF HINGES (3 ON LEFT, 4 ON RIGHT)



COMMANDER'S CUPOLA HATCH COVER LOCK AND PERISCOPE RETAINING LATCHES



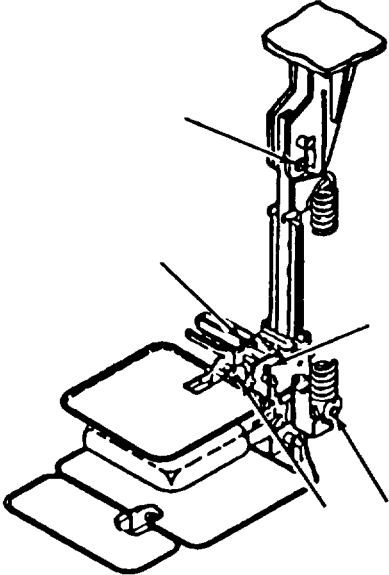
COMMANDER'S FOOTSTEPS



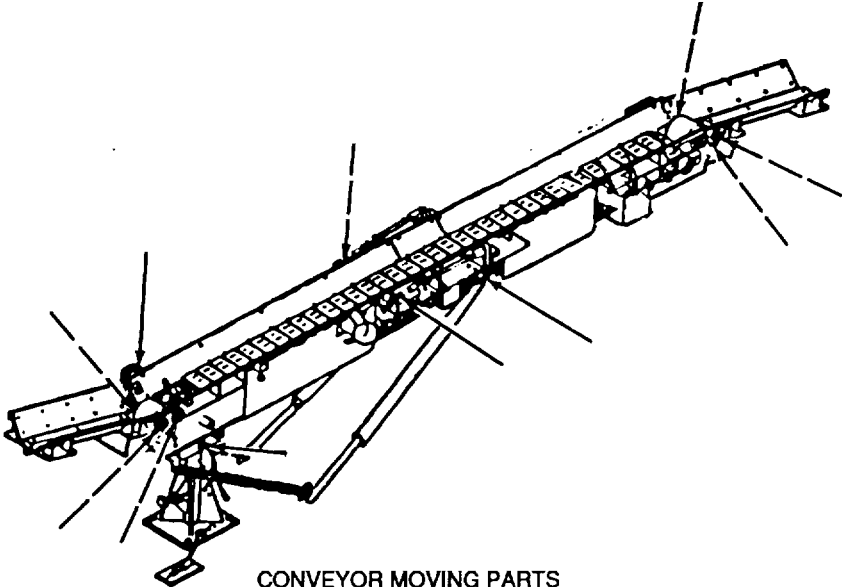
UPPER REAR DOOR PIVOT POINTS

OIL CAN POINTS (continued)

Lubricate semiannually with seasonal grade oil, OE / HDO (MIL-L-2104D) or OEA (MIL-L-46167).  
Clean lubrication points and wipe off excess lubricant.



COMMANDER'S SEAT MOVING PARTS



CONVEYOR MOVING PARTS



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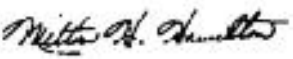
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## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter	10 Millimeters	0.01 Meters	0.3937 Inches
1 Meter	100 Centimeters	1000 Millimeters	39.37 Inches
1 Kilometer	1000 Meters	0.621 Miles	

### SQUARE MEASURE

1 Sq Centimeter	100 Sq Millimeters	0.155 Sq Inches
1 Sq Meter	10,000 Sq Centimeters	10.76 Sq Feet
1 Sq Kilometer	1,000,000 Sq Meters	0.386 Sq Miles

### WEIGHTS

1 Gram	0.001 Kilograms	1000 Milligrams	0.035 Ounces
1 Kilogram	1000 Grams	2.2 Lb	
1 Metric Ton	1000 Kilograms	1 Megagram	1.1 Short Tons

### CUBIC MEASURE

1 Cu Centimeter	1000 Cu Millimeters	0.06 Cu Inches
1 Cu Meter	1,000,000 Cu Centimeters	35.31 Cu Feet

### LIQUID MEASURE

1 Milliliter	0.001 Liters	0.0338 Fluid Ounces
1 Liter	1000 Milliliters	33.82 Fluid Ounces

### TEMPERATURE

5/9 ( F - 32 )	C
212 Fahrenheit	is equivalent to 100 Celsius
90 Fahrenheit	is equivalent to 32.2 Celsius
32 Fahrenheit	is equivalent to 0 Celsius
9/5 C + 32	F

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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