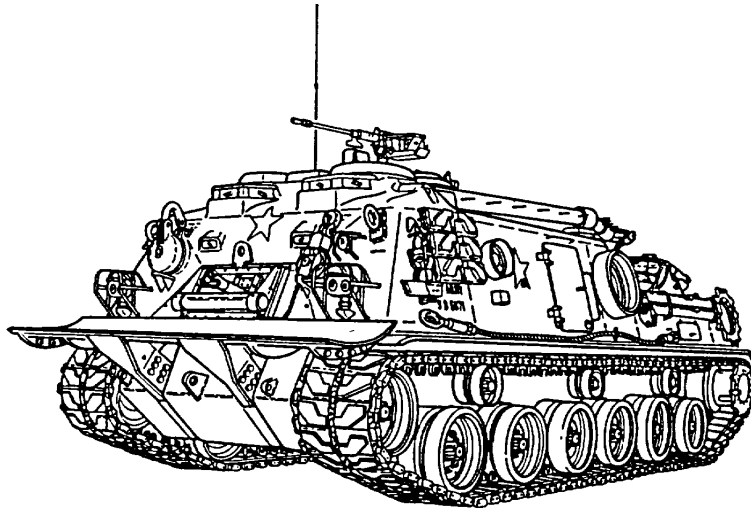


OPERATOR'S MANUAL



Recovery Vehicle,  
Full-Track:  
Medium, M 88A1  
(NSN 2350-00-122-6826)

EIC: AQA

DESCRIPTION AND USE OF  
OPERATOR'S CONTROLS  
AND INDICATORS  
Page 2-2

PREVENTIVE MAINTENANCE  
CHECKS AND SERVICES (PMCS)  
Page 2-44

OPERATION UNDER  
USUAL CONDITIONS  
Page 2-96

OPERATION UNDER  
USUAL CONDITIONS  
Page 2-195

TROUBLESHOOTING  
PROCEDURES  
Page 3-3

MAINTENANCE PROCEDURES  
Page 3-19

APPENDICES  
Page A-1

INDEX  
Page INDEX-1

**Distribution Statement A: Approved for public release; distribution is unlimited.**

HEADQUARTERS, DEPARTMENT OF THE ARMY  
31 MARCH 1998

**CHANGE  
NO. 1**

**HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 18 AUGUST 1998**

**OPERATOR'S MANUAL  
For  
Recovery Vehicle,  
Full-Tracked:  
Medium, M88A1  
(NSN 2350-00-122-6826)**

TM 9-2350-256-10, December 1997, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

*REMOVE PAGES*

3-55 and 3-56

*INSERT PAGES*

3-55 and 3-56

4. File this change sheet in front of the publication for reference purposes.

**Distribution Statement A:** Approved for public release; distribution is unlimited.

**By Order of the Secretary of the Army:**

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

Official:



JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*  
04947

**DISTRIBUTION:** To be distributed in accordance with the initial distribution number (IDN) 370944, requirements for TM 9-2350-256-10.

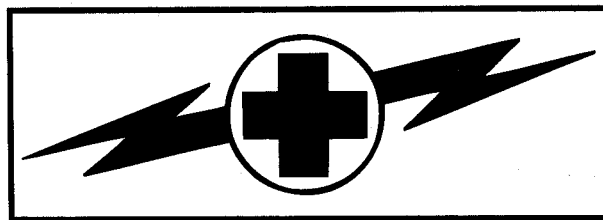
**WARNING****CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU**

Carbon monoxide is a colorless, odorless, deadly, poisonous gas, which, when breathed, deprives the body of oxygen and causes suffocation. Breathing air contaminated with carbon monoxide can produce headache, dizziness, loss of muscular control, drowsiness, and/or coma. Permanent brain damage or death can result from severe exposure.

Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure the safety of personnel whenever the personnel heater or main or auxiliary engine of any vehicle is operated for maintenance purposes or tactical use:

- Do not operate personnel heater or engine of vehicle in an enclosed area unless the area is adequately ventilated.
- Do not idle engine for long periods without maintaining adequate ventilation in personnel compartments.
- Do not drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
- Be alert at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, immediately ventilate personnel compartments. If symptoms persist, remove affected personnel from vehicle and expose to fresh air and keep warm. Do not permit physical exercise. If necessary, administer artificial respiration (refer to FM 21-11) and obtain medical treatment.

**The best defense against carbon monoxide poisoning is good ventilation.**

**WARNING****HIGH VOLTAGE**

High voltage is used in the operation of the M88A1.

**Death On Contact**

Death on contact may result if personnel fail to observe the following safety precautions:

- Never work on electronic equipment unless there is another person nearby. He or she should be familiar with the operation and hazards of the equipment. He or she should also be competent in giving first aid (refer to FM 21-11). Ask maintenance personnel about extremely hazardous areas of the vehicle prior to doing any maintenance.
- Whenever possible, the MASTER SWITCH should be OFF before performing any maintenance. Use extreme caution around any electronic components of the vehicle. Some components store energy that can injure personnel even when MASTER SWITCH is OFF.
- Do not touch high-voltage connections when installing or operating any equipment.
- Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.
- Check the immediate area for overhead obstructions before moving the vehicle. If you think you are going to have a problem, tie antennas down.
- Do not extend arms and legs over side of vehicle. If an antenna contacts a power line while your body brushes against metal or wet objects (such as wet foliage or trees), and you are grounded, death could result.
- Do not work on the vehicle during an electrical storm or when a storm is threatening.

- Remove rings, bracelets, wristwatches, neck chains, and any other jewelry before working around this or any other vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.
- Do not be misled by the term "low voltage." Voltages as low as 50 volts can cause death.

**WARNING**

**HAZARDOUS WASTE**

Fuel, coolant, and oil are all hazardous wastes and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.

**WARNING**

**EXPLOSION HAZARD**

Battery gases can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.

- When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.

**WARNING**

**DRY-CLEANING SOLVENT HAZARD**

Dry-cleaning solvent (Appx. D, item 16) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.

**WARNING****PAINT HAZARD**

Chemical Agent Resistant Coating (CARC) paint (Appx. D, item 35) contains isocyanate, a constituent that can cause respiratory effects during and after the application of the material. During the application of CARC paint, coughing, shortness of breath, pain in respiration, increased sputum, and chest tightness may occur. CARC paint also produces itching and reddening of the skin, a burning sensation of the throat and nose, and watering of the eyes. An allergic reaction may occur after initial exposure (ranging from a few days to a few months later), producing a shortness of breath. The following precautions must be observed to ensure the safety of personnel when CARC paint is applied:

- For spray, brush, or roller painting in confined spaces, an air line respirator is required unless an air sampling shows exposure to be below standards. If the air sampling is below standards, either chemical cartridge or air line respirator is required.
- Spot painters applying CARC paint by brush or roller must wear clothing and gloves that provide full coverage. Personnel using touchup spray kits should wear an air line respirator and protective clothing.
- Do not use water-, alcohol-, or amine-based solvents to thin or remove CARC paints. Use of these solvents with CARC paints can produce chemical reactions resulting in nausea, disease, burns, or severe illness to personnel.
- Do not use paint solvents to remove paint/coating from your skin.
- Mix paint or coating in a well-ventilated mixing room or spraying area away from open flames. Personnel mixing paint or coating should wear eye protection.
- Use paint or coating with adequate ventilation.
- Personnel grinding or sanding on painted equipment should use high-efficiency, air-purifying respirators.

- Do not weld, cut, or apply any form of heat to CARCcoated metal until the paint has been removed from a 4-inch (102-millimeter) area surrounding the rework site. Substances may be released that cause skin or respiratory irritation if this is not done. Sand or grind the paint down to the base metal in the surrounding area and also remove any paint from the other side of metal.
- When sanding any paint, use the wet sanding method. Older paints may contain lead, chromates, or other toxic material. When using wet or dry sandpaper, wet down the area before starting. Keep the sandpaper wet as you sand to keep down paint dust.

**WARNING**

**SPRING HAZARD**

Many springs on the M88A1 are under compression. May cause injury to personnel.

**WARNING**

**COMPRESSED AIR HAZARD**

Compressed air used for cleaning purposes must not exceed 30 pounds per square inch (207 kilopascals). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

**WARNING**

**SAFETY HAZARD**

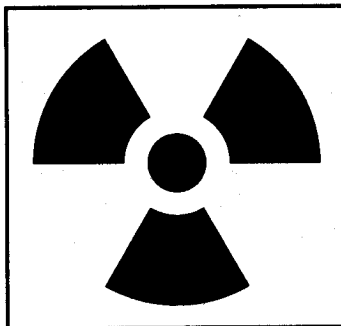
Ensure that seat belts are worn at all times when the vehicle is in motion, except when performing water operations.

**WARNING**

**CARBON MONOXIDE HAZARD**

The gas-particulate filter unit will not protect the crew against carbon monoxide poisoning.



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

Vehicles exposed to NBC must have all air filters replaced with extreme caution by experienced and trained personnel. Unprotected personnel may experience injury or death if residual toxic agents or radioactive materials are present. Servicing personnel must wear: protective mask, hood, protective overgarments, and chemical-protective gloves and boots.

**Disposal**

Damaged or unusable filters are considered hazardous waste. Do not dispose of them like common trash:

- Filters must be placed into double-lined plastic bags.
- Filters must be moved to a temporary segregation area away from the work site.
- Final disposal of contaminated air filters must be in accordance with (LAW) local Standard Operating Procedures (SOP).

**Nuclear Exposure**

The same procedure applies for radioactive dust contamination; however, the company NBC team should measure the radiation prior to filter removal to determine the extent of safety procedures required per the NBC Annex to the unit SOP. The segregation area in which the contaminated air filters are temporarily stored must be marked with appropriate NBC placards.

**OPERATOR'S MANUAL  
FOR  
RECOVERY VEHICLE, FULL-TRACKED:  
MEDIUM, M88A1  
(NSN 2350-00-122-6826)**

**REPORTING OF ERRORS**

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 direct to Commander, U.S. Army Tank-Automotive and Armaments Command, Attn. AMSTA-IM-OPIT, Warren, MI 48397-5000. You may also provide DA Form 2028-2 information to TACOM via datafax or e-mail:

- TACOM's fax number is DSN 786-6323
- TACOM's e-mail address is tacom-tech-pubs@cc.tacom.army.mil

**TABLE OF CONTENTS**

	<i>Page</i>
<b>CHAPTER 1. INTRODUCTION.....</b>	<b>1-1</b>
Section I. General Information.....	1-1
1-1. Scope.....	1-1
1-2. Maintenance Forms and Records.....	1-1
1-3. Corrosion Prevention and Control (CPC).....	1-1
1-4. Destruction of Army Materiel to Prevent Enemy Use.....	1-1
1-5. Reporting Equipment Improvement Recommendations (EIRs).....	1-1
1-6. Nomenclature Cross-Reference List.....	1-1
1-7. List of Abbreviations.....	1-2
1-8. Glossary.....	1-3
<b>Section II. Equipment Description.....</b>	<b>1-5</b>
1-9. Equipment Characteristics, Capabilities, and Features.....	1-5
1-10. Location and Description of Major Components.....	1-5
1-11. Equipment Data.....	1-11
<b>Section III. Principles of Operation.....</b>	<b>1-14</b>
1-12. General.....	1-14
1-13. Towing Operations.....	1-14
1-14. Auxiliary Power Unit (APU).....	1-15
1-15. Fire Extinguishers.....	1-16
1-16. Deep Water Fording.....	1-16
1-17. Miscellaneous Operations.....	1-16

**Distribution Statement A: Approved for public release; distribution is unlimited.**

**CHAPTER 2. OPERATING INSTRUCTIONS ..... 2-1**

**Section I. Description and Use of Operator's Controls and Indicators..... 2-2**

2-1. Driver's Controls and Instruments..... 2-2

2-2. Mechanic's (Assistant Operator's) Controls and Instruments ..... 2-20

2-3. Commander's Controls and Equipment ..... 2-22

2-4. Rigger's Controls and Indicators ..... 2-24

2-5. General Vehicle Controls ..... 2-26

2-6. Crew Compartment Floor Access Plates and Doors..... 2-42

**Section II. Preventive Maintenance Checks and Services (PMCS) ..... 2-44**

2-7. Introduction to PMCS Table ..... 2-44

**Section III. Operation Under Usual Conditions..... 2-96**

2-8. General..... 2-96

2-9. Assembly and Preparation for Use..... 2-96

2-10. Initial Adjustments, Checks, and Self-Test ..... 2-96

2-11. Operating Procedures ..... 2-118

2-12. Decals and Instruction Plates ..... 2-153

2-13. Operation of Auxiliary Equipment..... 2-156

2-14. Preparation for Movement..... 2-191

**Section IV. Operation Under Unusual Conditions..... 2-193**

2-15. General..... 2-193

2-16. Unusual Environment/Weather Conditions ..... 2-193

2-17. Fording and Swimming ..... 2-200

2-18. Emergency Procedures ..... 2-201

**CHAPTER 3. MAINTENANCE INSTRUCTIONS..... 3-1**

**Section I. Lubrication Instructions..... 3-2**

3-1. Lubrication Instructions ..... 3-2

**Section II. Troubleshooting Procedures..... 3-3**

3-2. Introduction..... 3-3

3-3. Malfunction Index ..... 3-3

3-4. Troubleshooting Procedures ..... 3-6

**Section III. Maintenance Procedures..... 3-19**

3-5. General..... 3-19

3-6. Suspension and Track ..... 3-19

3-7. Vision Devices ..... 3-35

3-8. Caliber .50 Machine Gun and Mount Maintenance..... 3-44

3-9. Lamp Replacement ..... 3-46

3-10. Main Engine Air Cleaner..... 3-48

3-11. APU Air Filter Maintenance..... 3-52

3-12. Oxygen Cylinder and Regulator Valve Replacement ..... 3-53

3-13. Acetylene Cylinder and Regulator Valve Replacement ..... 3-55

3-14. Maintenance Under Unusual Conditions ..... 3-57

**CHAPTER 4. MAINTENANCE OF AUXILIARY EQUIPMENT ..... 4-1**

**Section I. Communications Systems..... 4-1**

4-1. General..... 4-1

4-2. Inspection ..... 4-1

4-3. Removal and Installation..... 4-1

4-4. Cleaning..... 4-2

4-5. References ..... 4-2

**Section II. Deep Water Fording ..... 4-3**

4-6. Inspection of Deep Water Fording Kit Installation..... 4-3

4-7. After-Fording Maintenance..... 4-4

**Section III. M239 Smoke Grenade Launcher ..... 4-5**

4-8. Cleaning (Weekly)..... 4-5

4-9. Covers..... 4-5

**APPENDIX A. REFERENCES .....A-1**

A-1. Scope.....A-1

A-2. Army Regulations .....A-1

A-3. Common Table of Allowances .....A-1

A-4. Department of the Army Forms.....A-1

A-5. Department of the Army Pamphlet .....A-1

A-6. Field Manuals.....A-1

A-7. Standard Forms .....A-2

A-8. Supply Bulletin .....A-2

A-9. Technical Bulletin.....A-2

A-10. Technical Manuals .....A-2

**APPENDIX B. COMPONENTS OF END ITEMS (COEI) AND BASIC ISSUE ITEMS(BII) LISTS.....B-1**

**Section I. Introduction.....B-1**

B-1. Scope.....B-1

B-2. General.....B-1

B-3. Explanation of Columns .....B-1

B-4. Abbreviations .....B-2

**Section II. COEI .....B-3**

**Section III. BII.....B-13**

**APPENDIX C. ADDITIONAL AUTHORIZATION LIST (AAL) .....C-1**

**Section I. Introduction.....C-1**

C-1. Scope.....C-1

C-2. General.....C-1

C-3. Explanation of Listing.....C-1

**Section II. AAL.....C-2**

**APPENDIX D. EXPENDABLE AND DURABLE ITEMS LIST .....D-1**

**Section I. Introduction.....D-1**

    D-1. Scope.....D-1

    D-2. Explanation of Columns .....D-1

Section II. Expendable and Durable Items List .....D-2

**APPENDIX E. STOWAGE AND SIGN GUIDE.....E-1**

    E-1. Scope.....E-1

    E-2. Location of Exterior Stencils.....E-2

    E-3. Location and Description of Labels .....E-5

    E-4. Location of Stowed Items (Exterior) .....E-9

    E-5. Location of Stowed Items (Interior).....E-13

    E-6. Location of Stowage Straps (Exterior).....E-18

    E-7. Location of Stowage Straps (Interior).....E-19

**APPENDIX F. LUBRICATION INSTRUCTIONS .....F-1**

    F-1. General Statements.....F-1

    F-2. Oil Filter Statement .....F-2

    F-3. Lubrication Instructions .....F-3

**INDEX.....INDEX-1**

## HOW TO USE THIS MANUAL

- a. General.** This manual contains operation and maintenance information for the M88A1 Medium Full-Track Recovery Vehicle crew.

This manual is divided into 4 chapters and 6 appendices. Each chapter and appendix starts on a right-hand page with the page number of 1. Pages are numbered after the chapter number or appendix letter. For example, 1-14 means Chapter 1, page 14, and A-2 means Appendix A, page 2.

At the end of this manual are an alphabetical index and a DA Form 2028-2.

- b. Front Matter.** The front cover has an index for the major divisions in this manual. The first page of the associated major division has a black edge that lines up with the applicable cover boxed-in area.

There are general warnings that start on the first right-hand page immediately after the cover that should be read before operating or performing any maintenance on the M88A1.

The table of contents has the page where each chapter, appendix, and section starts.

**c. Chapters.**

- Chapter 1 provides general information, equipment descriptions, and principles of operation of the M88A1.
- Chapter 2 provides a description and usage instructions of the Operator's controls and indicators, PMCS, and operation instructions under usual and unusual conditions.
- Chapter 3 provides lubricating instructions, troubleshooting procedures, and maintenance procedures.
- Chapter 4 provides maintenance instructions for communication systems, deep water fording, and the M239 smoke grenade launcher.

**d. Appendices.**

- Appendix A provides titles of publications referenced in this manual.
- Appendix B provides the COEI and BII lists.
- Appendix C provides the AAL.

## HOW TO USE THIS MANUAL-Continued.

- Appendix D provides the expendable and durable items list.
  - Appendix E provides the stowage and sign guide.
  - Appendix F provides lubrication instructions.
- e. **Alphabetical Index.** The alphabetical index is located after the last appendix and provides an alphabetical listing of information contained in this manual.
- f. **DA Form 2028-2.** DA Form 2028-2 is used to report errors and to recommend improvements for the tasks in this manual.
- g. **Warnings, Cautions, and Notes.** Warnings, cautions, and notes are provided throughout this manual. A warning is provided where injury may occur to personnel on or near the vehicle. A caution is provided where equipment may be damaged, but no injuries to personnel should result. A note provides information, but no personnel injury or equipment damage should result.
- h. **Referencing.** In this manual, internal referencing is done by paragraph. For example, (see para. 2-3) refers you to Chapter 2, paragraph 3.

Referencing outside this manual is done by the military publication J number. For example, (refer to TM 9-2350-256-20) refers you to that manual.

i. **Locating Information.**

This manual provides five ways by which you can locate information quickly:

- The cover index lists the most frequently used major divisions by title and starting page number.
- The table of contents lists the chapters, sections, and paragraphs by name with their corresponding page number.
- The chapter and appendix indexes list the sections or paragraphs that are in those chapters/appendices.
- The malfunction index provides a quick guide to troubleshooting malfunctions.
- The index provides an alphabetical listing of information contained in this manual.

**CHAPTER 1  
INTRODUCTION**

**SECTION I. GENERAL INFORMATION**

**1-1. SCOPE.** This operator's manual contains instructions for your use in operating and maintaining the Recovery Vehicle, Full-Tracked: Medium, M88A1. The purpose of the M88A1 is to provide recovery of medium and light combat vehicles by towing, winching, and hoisting. This manual includes lists of components, Components Of End Items (COEI), Basic Issue Items (BII), Additional Authorized List (AAL), expendable and durable items list, a stowage and sign guide, and lubrication instructions.

**1-2. MAINTENANCE FORMS AND RECORDS.** Department of the Army forms and procedures used for equipment will be those prescribed by DA PAM 738-750 as contained in the Maintenance Management Update.

**1-3. CORROSION PREVENTION AND CONTROL (CPC).** Primary responsibility for CPC lies with unit maintenance and will be handled at depot level. Operators will notify unit maintenance of any excessive corrosion or wear that occurs with the M88A1.

**1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.** Instructions on destruction of the vehicle to prevent enemy use are contained in TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment To Prevent Enemy Use.

**1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).** If your M88A1 needs improvement, let us know. Send us an EIR You, the user, are the only one who can tell us what you do not like about the equipment. Let us know why you do not like the design or performance. Put it on an SF 368, Product Quality Deficiency Report. Mail it to us at: Commander, U.S. Army Tank-automotive and Armaments Command, Attn: AMSTA-IM-OPIT, Warren, MI 48397-5000. We will send you a reply.

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

- TACOM's fax number is DSN 786-6323
- TACOM's e-mail address is tacom-tech-pubs@cc.tacom.army.mil

**1-6. NOMENCLATURE CROSS-REFERENCE LIST.**

<b>Manual Nomenclature</b>	<b>Official Nomenclature</b>
Ammo .....	Ammunition
Dipstick.....	Gage rod
Lockwire .....	Safety wire, nonelectrical
M1A1 collimeter.....	Infinity aiming reference



1-7. LIST OF ABBREVIATIONS.

%.....	percent
AAL .....	Additional Authorization List
AOAP .....	Army Oil Analysis Program
APU.....	Auxiliary Power Unit
ammo.....	ammunition
B.O.....	blackout
BII.....	Basic Issue Item
CAGEC.....	Commercial and Government Entity Code
cal .....	caliber
CARC.....	Chemical Agent Resistant Coating
°C.....	degree Celsius
cm .....	centimeter
COEI.....	Component of End Item
CPC.....	Corrosion Prevention and Control
CTA .....	Common Table of Allowance
cu in.....	cubic inch
cu. ft .....	cubic foot
c. m .....	cubic meter
DA .....	Department of the Army
dc .....	direct current
dia .....	diameter
DOD .....	Department of Defense
ea .....	each
EIR .....	Equipment Improvement Report
fpm .....	foot per minute
ft.....	foot
gal .....	gallon
gen .....	generator
GPFU.....	Gas-Particulate Filter Unit
HD.....	heavy duty
IAW .....	In accordance with
ICE .....	Internal Combustion Engine
in.....	inch
IR.....	infrared
IR-B.O.....	infrared blackout
JTA.....	Joint Table of Allowance
kg.....	kilogram
km.....	kilometer
km /h .....	kilometers per hour
kPa.....	kilopascal
L.....	liter
LAW .....	Light Assault Weapon
lb.....	pound
lb-ft .....	pound-foot
lg.....	long
LSA .....	Lubricant, Small Arm s
lt.....	light

lube.....	lubrication or lubricate
m.....	meter
max.....	maximum
min.....	minimum
m.....	millimeter
mph.....	mile per hour
m/s.....	meter per second
MTOE.....	Modified Table of Organization and Equipment
N.....	neutral
NBC.....	Nuclear, Biological, and Chemical
NBC NCO.....	Nuclear, Biological, and Chemical Non-Commissioned Officer
No.....	number
NSN.....	National Stock Number
N•m.....	Newton-meter
P.....	park
pc.....	piece
PMCS.....	Preventive Maintenance Checks and Services
PN.....	part number
press.....	pressure
psi.....	pound per square inch
pt.....	pint
qt.....	quart
Qty. Recm.....	quantity recommended
R.....	reverse
rpm.....	revolutions per minute
SOP.....	Standard Operating Procedure
sq. dr.....	square drive
TACOM.....	U.S. Army Tank-automotive and Armaments Command
TAMMS.....	The Army Maintenance Management System
TDA.....	Table of Distribution and Allowance
TM.....	Technical Manual
temp.....	temperature
TOE.....	Table of Organization and Equipment
U/I.....	Unit of Issue
U/M.....	Unit of Measure
USAREUR.....	United States Army Europe
vent.....	ventilating
w.....	wide
w/.....	with
w/e.....	with equipment
w/o.....	without
w/oe.....	without equipment
x.....	by (as in 2 x 4)

**1-8. GLOSSARY.**

Acetylene.....A colorless gas used in metal cutting and welding.

**1-8. GLOSSARY-Continued.**

Amine .....	Any of a class of compounds derived from ammonia by replacement of one or more hydrogen atoms with organic groups.
Celsius .....	Pertaining to or noting a temperature scale in which 0° represents the ice point and 100° the steam point.
Chromate.....	A salt of chromic acid.
Collimation .....	To make parallel.
E-mail .....	Electronic mail.
Fahrenheit.....	Pertaining to or noting a temperature scale in which 32° represents the ice point and 212° the steam point.
Fax .....	Transmission and reproduction of documents over a telephone line.
Initialized.....	To set, prepare, or format.
Isocyanate.....	A salt or ester of an unstable acid, CHNO, tautomeric with cyanic acid.

## SECTION II. EQUIPMENT DESCRIPTION

### 1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

- a. **General.** The Recovery Vehicle, Full-Track: Medium, M88A1 is an armored, full-track-laying, low silhouette vehicle. It is used for hoisting, winching, and towing operations for tanks and other vehicles. It is equipped to assist in repairing disabled vehicles under general field conditions. The vehicle carries a crew of three: driver, mechanic, and commander.

#### NOTE

Refer to FM 20-22, Vehicle Recovery Operations for recovery methods.

b. **Major Vehicle Systems and Assemblies.**

- (1) The M88A1 is powered by a 12 cylinder, diesel engine. The vehicle transmission is a combined transmission, differential, steering and braking unit. Controls for these components are located in the driver's area.
- (2) The suspension system for each side consists of six pairs of roadwheels with support arms, three pairs of track support rollers, three shock absorbers, one track adjusting link, two bumper assemblies, track drive sprockets and hubs, compensating idler wheel, and track. Primary springing is done by individual torsion bars for each roadwheel arm.
- (3) The hull and cab assembly armor protects the crew and equipment against small arms fire, medium artillery, shell fragments, and 20-lb anti-tank mines. The vehicle is divided into three sections: crew compartment, hydraulics compartment, and engine compartment.
- (4) The vehicle is equipped with a main and an auxiliary hydraulic system used for recovery and maintenance operations. These systems power the spade, boom, main winch, hoist winch, refuel pump, and the hydraulic impact wrench. The primary purpose of the auxiliary system is to allow emergency retrieval of hydraulic systems in the event of main engine failure.
- (5) The vehicle is also equipped with a main and auxiliary generating system. The primary purpose of the auxiliary system is to charge the vehicle batteries when they are too low to start the main engine.

### 1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Refer to figures 1-1 thru 1-5 for location of major components.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS--

Continued.

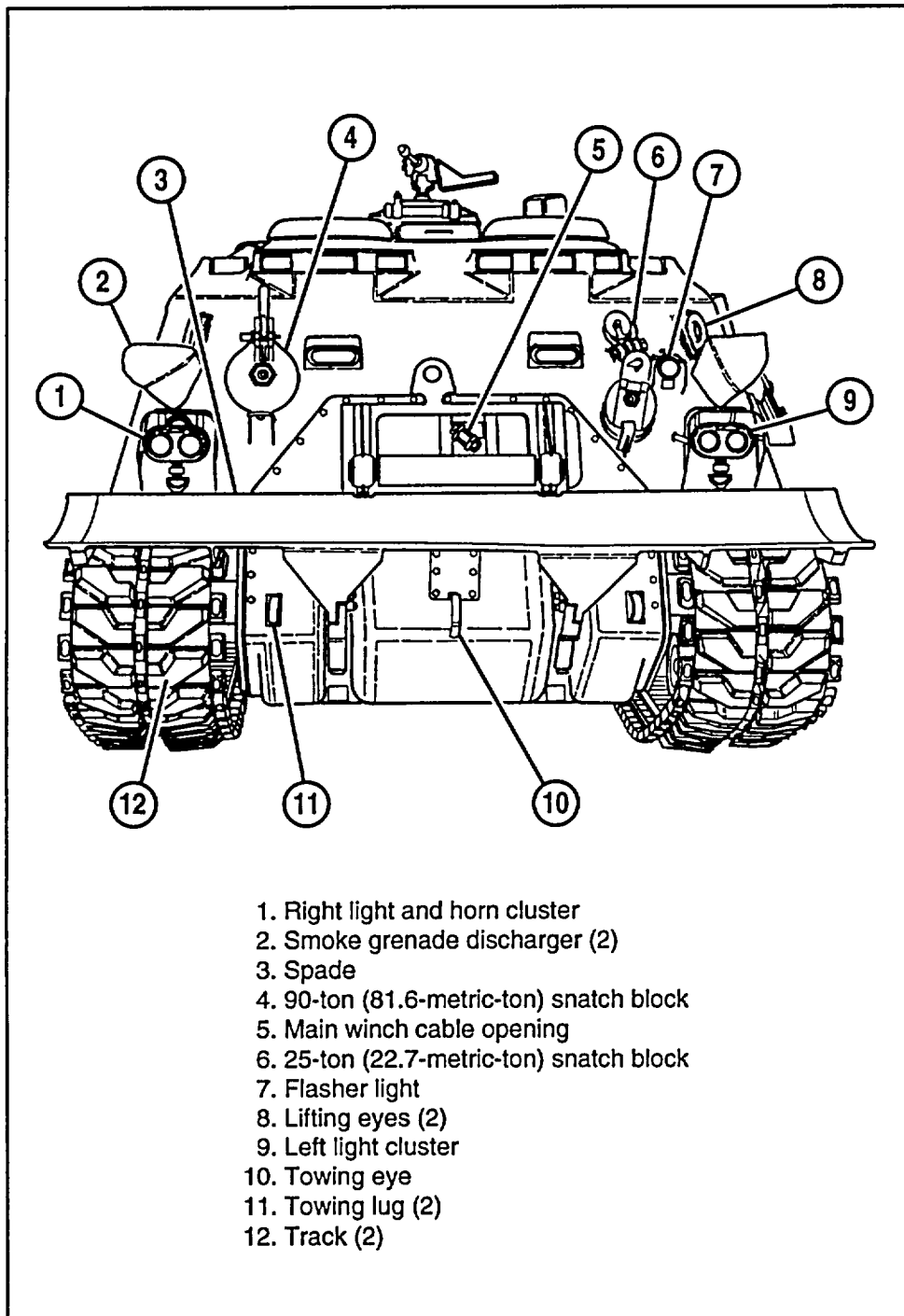
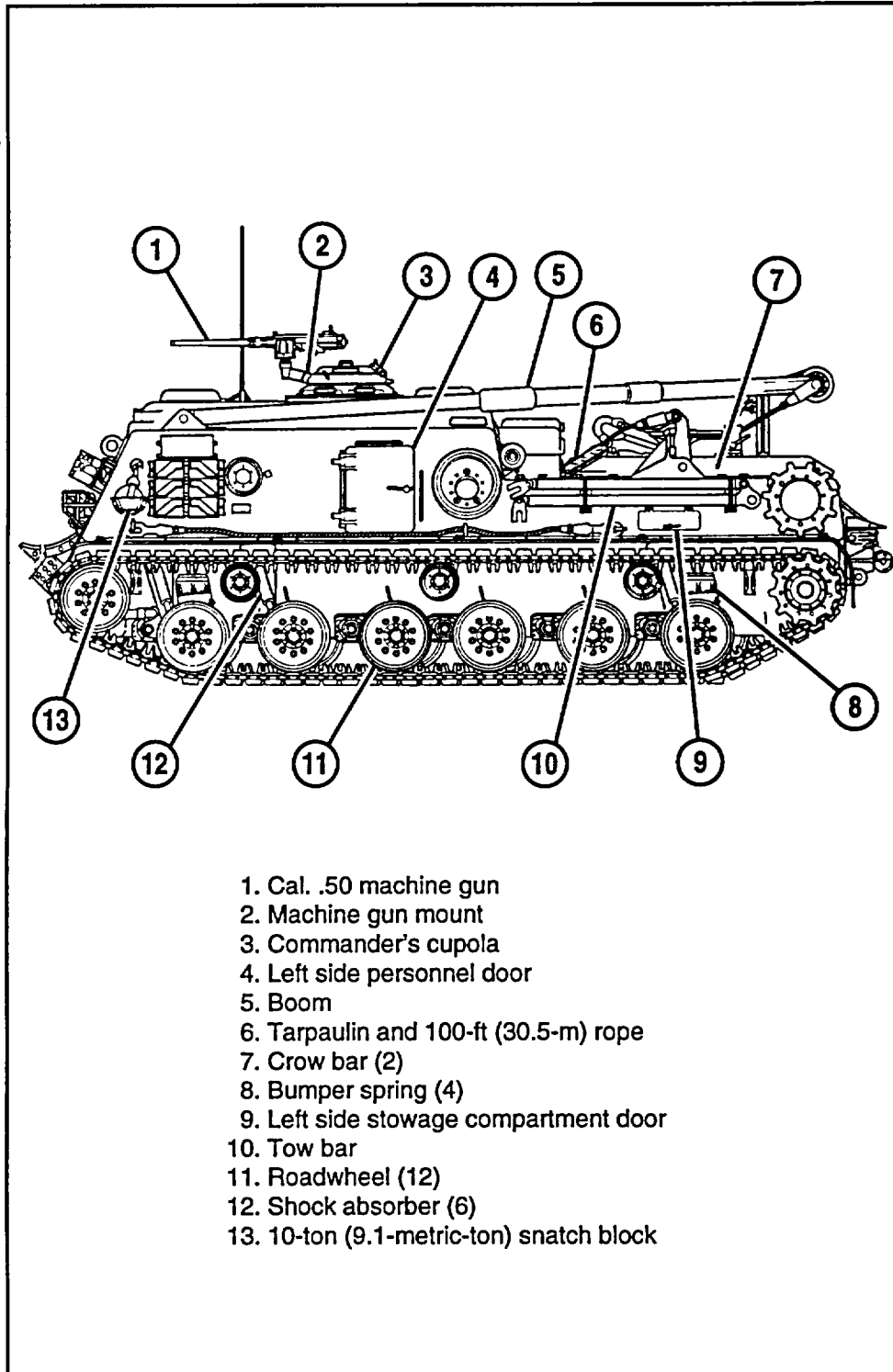


Figure 1-1. M88A1-Front View.



- 1. Cal. .50 machine gun
- 2. Machine gun mount
- 3. Commander's cupola
- 4. Left side personnel door
- 5. Boom
- 6. Tarpaulin and 100-ft (30.5-m) rope
- 7. Crow bar (2)
- 8. Bumper spring (4)
- 9. Left side stowage compartment door
- 10. Tow bar
- 11. Roadwheel (12)
- 12. Shock absorber (6)
- 13. 10-ton (9.1-metric-ton) snatch block

Figure 1-2. M88A1-Left Side View.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS-  
Continued.

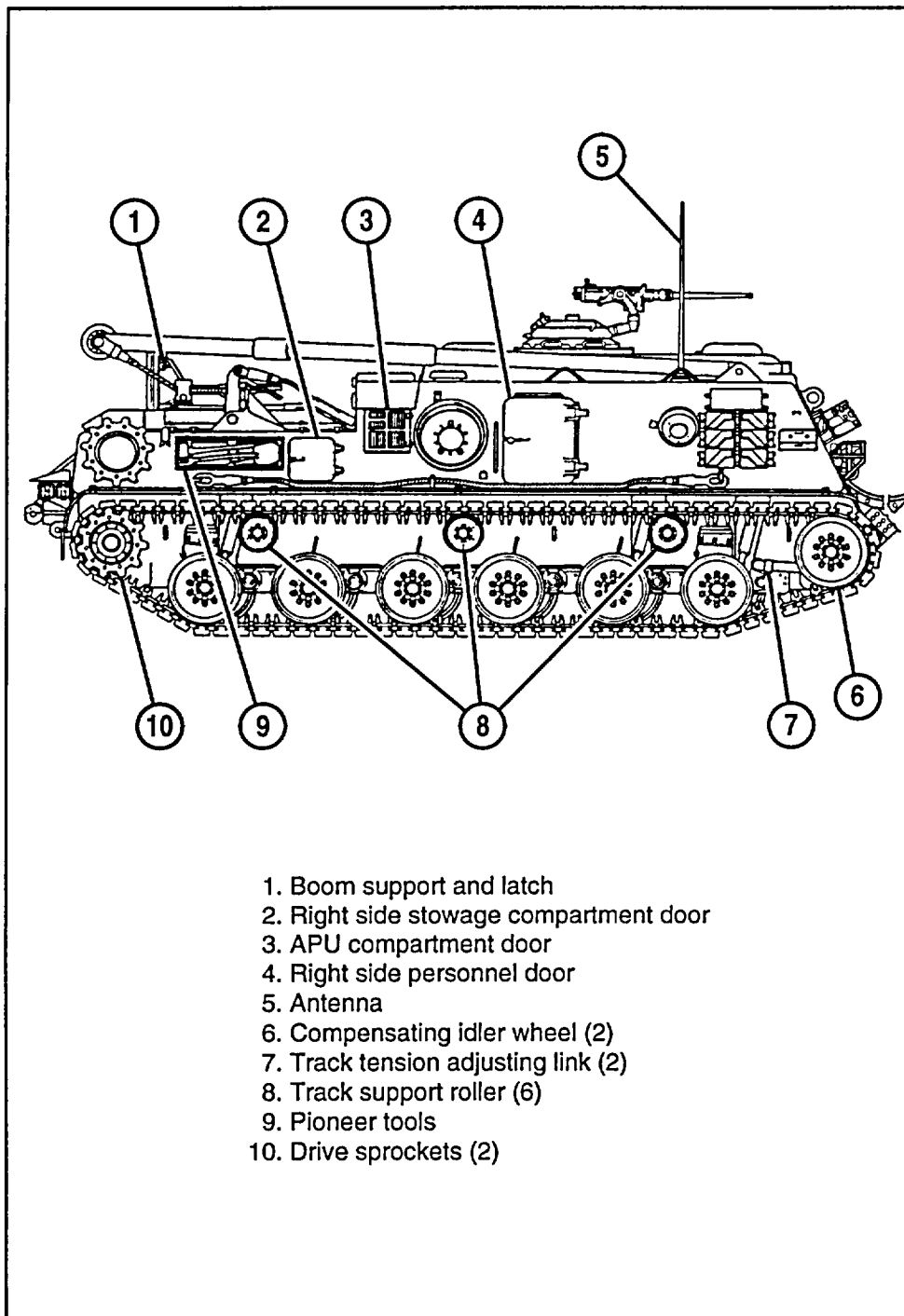


Figure 1-3. M88A1-Right Side View.

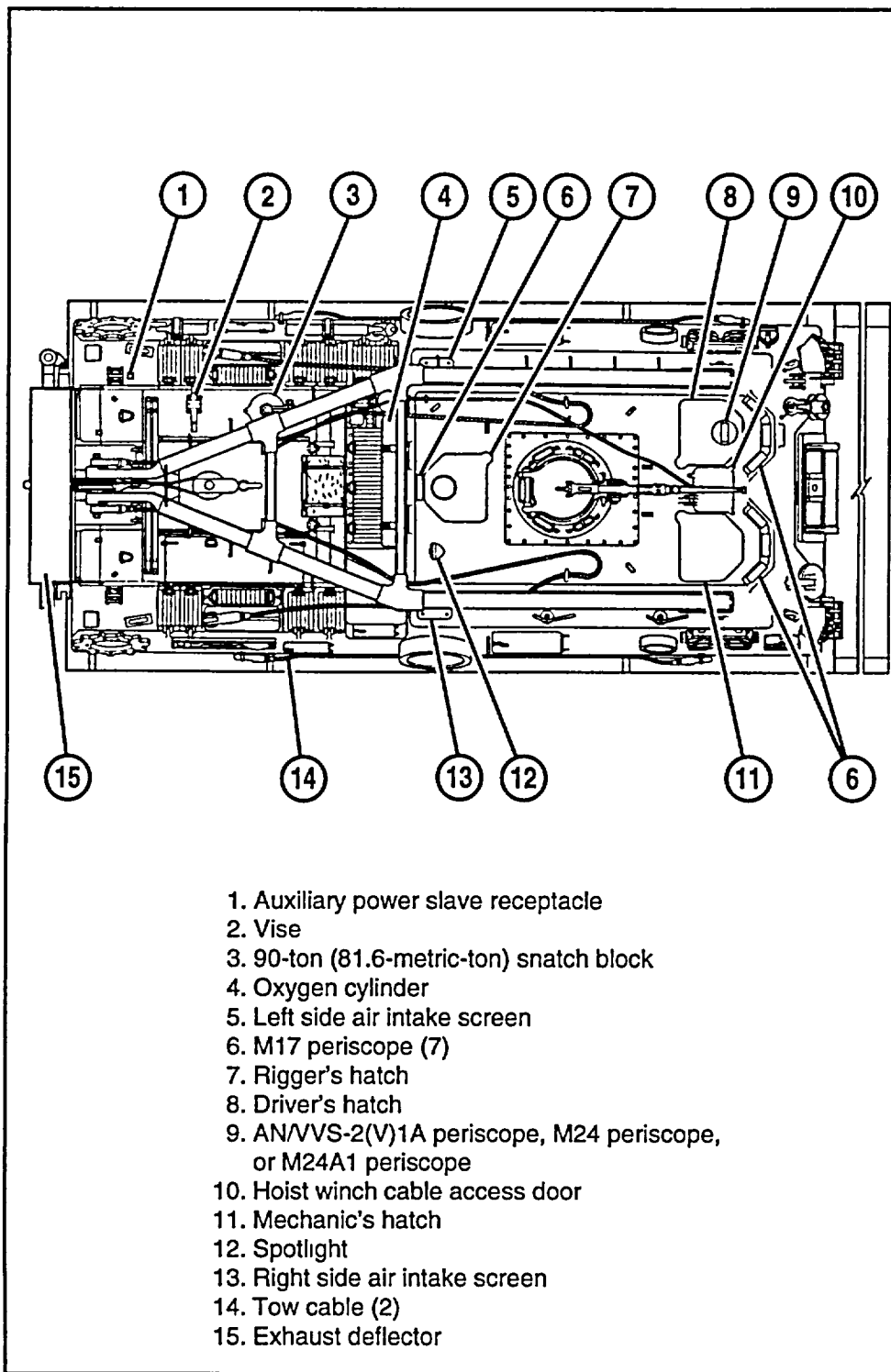


Figure 1-4. M88A1-Top View.



1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS-  
Continued.

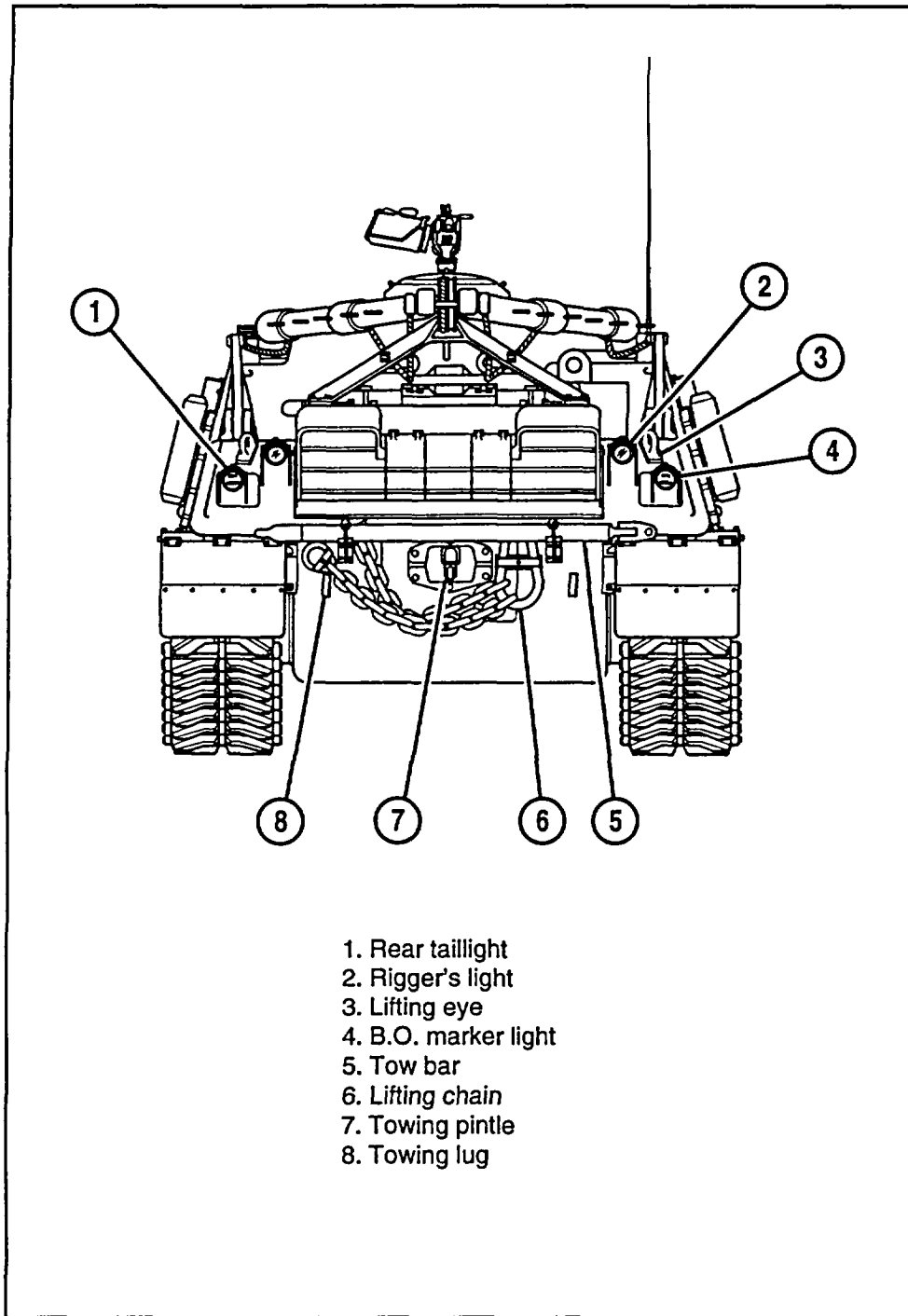


Figure 1-5. M88A1-Rear View.

**1-11. EQUIPMENT DATA.**

**a. General.**

Armament .....One caliber .50 Browning machine gun, M2, heavy barrel, flex; one machine gun mount A555ec38 or A88 two caliber 7.62 mm, M14 or 5.56 mm, M16; two caliber .45 submachine gun M3A1 with equipment; ten LAW rockets

Crew.....Three

Engine .....Diesel, V12, 4-cycle, air cooled model AVDS-1790-2DR

Transmission .....Model XT-1410-4; combination transmission, differential steer, and brake system: gears-three forward and one reverse

Weight:

Gross.....(Vehicle fully loaded with crew, passenger, and payload) 112,000 lb (50,803 kg)

Net.....(Vehicle with no crew or payload) 105,000 lb (47,628 kg)

Cargo.....(Crew and max. payload) 7000 lb (3175 kg)

**b. Vehicle.**

Dimensions:

Length.....27.125 ft (8.27 m)

Width.....11.25 ft (3.43 m)

Height .....10.25 ft (3.12 m)

Ground clearance .....17 in. (432 mm)

Ground pressure.....10.9 psi (75 kPa)

Electrical system:

Battery power .....24 volts dc

Generator power.....28 + 0.7 volts dc

Batteries.....six 12-volt

Capabilities (refill approximate):

Fuel tanks .....400 gal (1514 L)

Main engine crankcase (refill) .....16.5 gal (62.5 L)

Transmission .....17 gal (64 L)

Main winch.....11 gal (42 L)

**1-11. EQUIPMENT DATA-Continued.**

Hoist winch.....	3 gal (11 L)
APU.....	3.5 qt (3.3 L)
Hydraulic system.....	95 gal (360 L)
Mechanical transmission.....	1 gal (3.8 L)

**c. Performance.**

Vehicle speed.....(max.)	26 mph (42 km/h)
Cruising range.....	300 miles (483 km)
Fording depth (max. w/o kit).....	56 in. (1422 mm)
Fording depth (max. w/kit).....	102 in. (2591 mm)
Grade ascending ability (max.).....	60%
Grade descending ability (max.).....	60%
Vertical obstacle vehicle will climb (forward direction only).....	42 in. (1067 mm)
Max. trench crossing width.....	8.58 ft (2.62 m)
Turning circle (right or left).....	Pivot
Boom capacity.....	25 tons (22.7 metric tons)

Vehicle hoisting capacity:

Spade up.....	6 tons (5.4 metric tons)
Spade up (w/lockout blocks) —four-part line.....	20 tons (18.1 metric tons)
Spade down-four-part line.....	25 tons (22.7 metric tons)

Boom lift height:

8-ft reach.....	22.54 ft (6.87 m)
4-ft reach.....	25.125 ft (7.66 m)

Hoist winch:

Cable size.....	0.625 in. (15.9 mm) dia., 200 ft (61.1 m) lg.
-----------------	--

Line pull and speed, four-part line:

Bare drum.....	50,000 lb at 9 fpm (22,680 kg at 2.7 mps)
Full drum.....	30,000 lb at 13 fpm (13,680 kg at 4.0 mps)

Main winch:

Cable size.....	1.25 in. (31.8 mm) dia., 200 ft (61.1 m) lg.
-----------------	---

Line pull and speed:

Bare drum.....	90,000 lb at 20 fpm (40,824 kg at 6.1 m)
Full drum.....	51,400 lb at 42 fpm (23,315 kg at 12.8 m)

Draw bar pull.....	90,000 lb (40,824 kg)
Hydraulic impact wrench.....	Refer to TM 9-5130-338-15P

**d. Periscopes.**

- Periscope M17 (seven included):
  - Magnification..... 1X
  - Periscope offset..... Short
  - Field of view ..... 50° vertical, 150° horizontal
  
- Periscope M24 or M24A1 (two included):
  - Magnification..... 1X
  - Periscope offset..... 8.875 in. (225 mm)
  - Field of view ..... 25° vertical, 90° horizontal
  
- Periscope AN/W S-2(V)1A..... (one included):
  - Magnification..... 1X
  - Field of view ..... 38° vertical, 45° horizontal

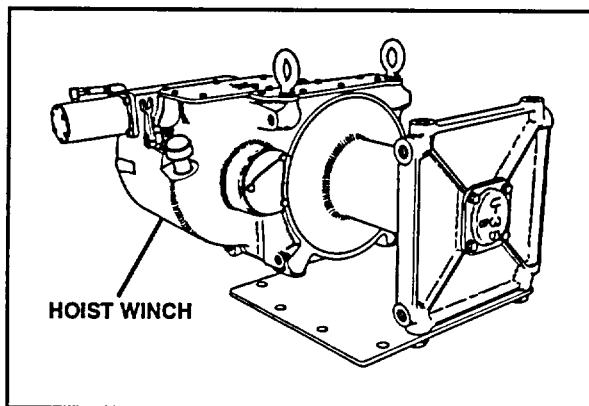
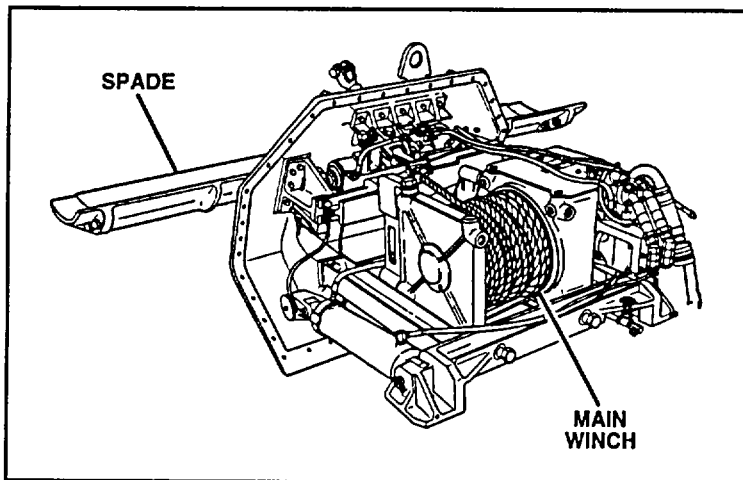
**e. Auxiliary Equipment.**

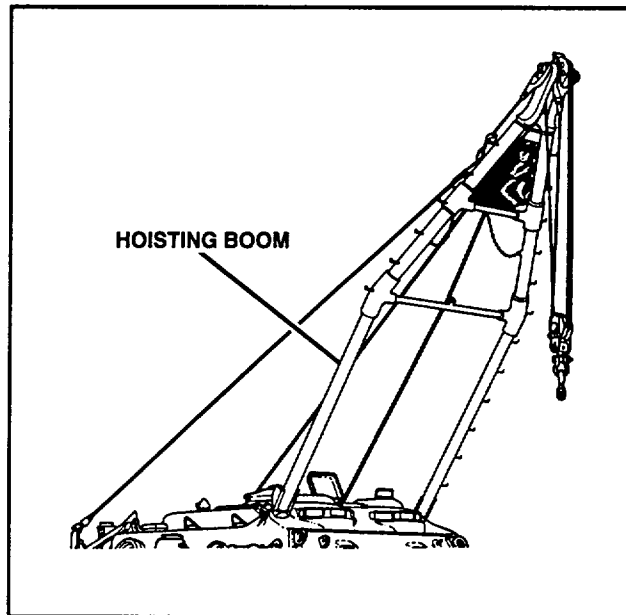
- APU:
  - Ordnance number..... 11671652
  - Type ..... 2-cylinder, 4-cycle, diesel
  - Power ..... 10.8 hp (8.1 kW)
  
- Fire extinguisher:
  - Portable (two included):
    - Type ..... Carbon dioxide
    - Capacity:
      - Volume..... 218 cu. in. (3.57 L) total
      - Weight ..... 5 lb (2.3 kg) ea.
      - Weight (fully charged) ..... 15.5 lb (7.03 kg) ea.
  - Fixed (two banks):
    - Type ..... Carbon dioxide
    - Capacity:
      - Volume..... 505 cu. in. (8.28 L) total
      - Weight ..... 10 lb (4.5 kg) ea.
      - Weight (fully charged) ..... 45 lb (20.4 kg) ea.
  
- Communication equipment:
  - Radio set and interphone, consisting of:
    - Radio sets-AN/VRC-44 or AN/VRC-46 or AN/VRC-64
    - Suppressor-MX-7778A
    - Intercommunications system-AN/VIX-1(V) (four controls)
  
- M239 smoke grenade equipment consisting of:
  - Grenade bin, canvas covers, push button unit, and dischargers
  
- Exhaust smoke generating system consisting of:
  - Modification kit 12275753 (engine)
    - (NSN 2815-01-077-7856)
  - Modification kit 1672388 (hull)
    - (NSN 2590-01-084-6051)

**SECTION III. PRINCIPLES OF OPERATION**

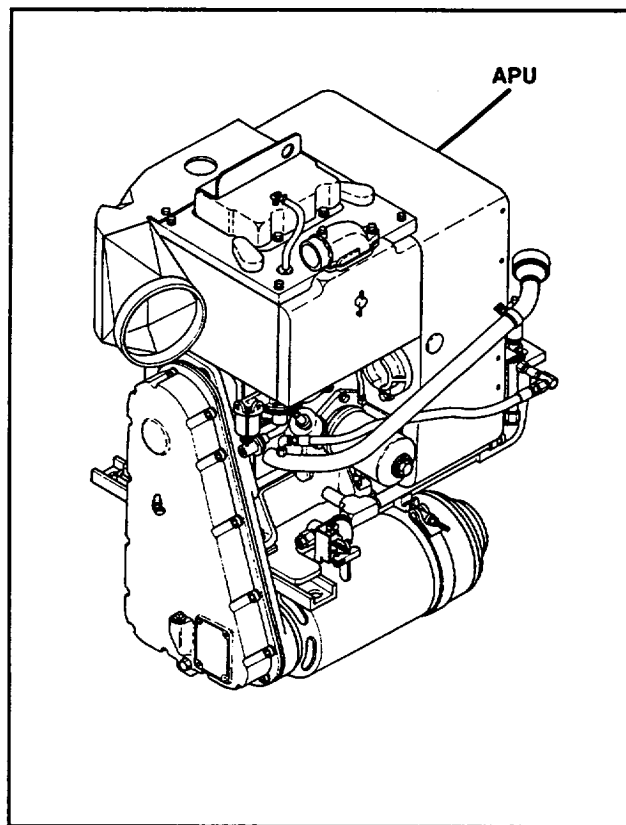
**1-12. GENERAL.** The M88A1, Full-Track, Medium, Recovery Vehicle is designed for towing, hoisting, and winching. It is equipped to assist in repairing disabled vehicles under general field conditions. Recovery of medium and light combat vehicles is the M88A1's main purpose.

**1-13. TOWING OPERATIONS.** The main hydraulic system supplies power for the spade, main winch, hoist winch, hoisting boom, and for releasing the mechanically applied main and hoist winch brakes. The spade is used during all winch operations and hoisting operations over 6 tons (5.4 metric tons) to help stabilize the vehicle. The main winch is located near the spade and is used to pull disabled vehicles during recovery operations. The hoisting boom works with the hoist winch which is used to lift disabled vehicles and heavy loads for recovery and maintenance operations. The maximum load the hoist winch is capable of handling is 50,000 lb (22,680 kg) using 200 ft (6 m) of steel cable. The hoisting boom is a modified A-frame located on the top of the vehicle. The lockout brakes are also used when lifting over 6 tons (5.4 metric tons) to prevent damage to the vehicle.





1-14. **APU.** The APU provides electrical power to recharge the batteries and emergency hydraulic system operations.



**1-15. FIRE EXTINGUISHERS.**

- a. **Portable Fire Extinguisher System.** There are two portable fire extinguishers to be used for the local fires inside and outside of the vehicle.
- b. **Fixed Fire Extinguisher System.** The fixed fire extinguisher system consists of eight 10-lb (4.5-kg) cylinders, a cylinder control valve, remote control connectors, two dual-pull mechanisms, extinguisher lines, seven nozzles, two exterior remote control handles with cables, two interior remote control pull handles with cables, and an engine shutoff switch. This fire extinguisher system is to be used for fires in the engine and winch compartments.

**1-16. DEEP WATER FORDING.** The M88A1 is able to ford up to 8.5 ft (2.6 m). The vehicle is completely operable in water or on land.

**1-17. MISCELLANEOUS OPERATIONS.** The flow regulator control allows for the operation of the fuel transfer pump and the hydraulic impact wrench. The personnel heater provides heated air for the crew compartment during cold weather operation. The caliber .50 machine gun is mounted on the cupola to aid the crew in case of an enemy attack by personnel, light vehicles, and aircraft. The commander's cupola mounts caliber .50 machine gun and allows 360° travel of gun. It also provides full vision for commander using six prism blocks mounted in the cupola. The GPFU provides filtered breathing air for CB masks used by the operator and crew. Power for this unit is supplied by the dome light power leads. There is a 12-ton (10.9-metric-ton) and a 30-ton (27.2-metric-ton) vehicle jack located behind the operator on the left side. The communication components provide equipment for internal and external station-to-station communication. The M239 smoke grenade kit provides a self-screening smoke capability for armored vehicles for concealing maneuvers or vehicle activities. The exhaust smoke generating system provides a self-screening smoke capability for vehicles with model AVDS-1790-2DR engine from diesel fuel in the vehicle fuel tanks and is used for concealing maneuvers or vehicle troops. The system is ineffective when JP-8 fuel is used.

**CHAPTER 2  
OPERATING INSTRUCTIONS**

<b>Section I.</b>	<b>Description and Use of Operator's Controls and Indicators.....</b>	<b>2-2</b>
2-1.	Driver's Controls and Instruments .....	2-2
2-2.	Mechanic's (Assistant Operator's) Controls and Instruments.....	2-20
2-3.	Commander's Controls and Equipment .....	2-22
2-4.	Rigger's Controls and Indicators .....	2-24
2-5.	General Vehicle Controls.....	2-26
2-6.	Crew Compartment Floor Access Plates and Doors .....	2-42
<b>Section II.</b>	<b>Preventive Maintenance Checks and Services (PMCS).....</b>	<b>2-44</b>
2-7.	Introduction to PMCS Table.....	2-44
<b>Section III.</b>	<b>Operation Under Usual Conditions.....</b>	<b>2-96</b>
2-8.	General .....	2-96
2-9.	Assembly and Preparation for Use.....	2-96
2-10.	Initial Adjustments, Checks, and Self-Test.....	2-96
2-11.	Operating Procedures .....	2-120
2-12.	Decals and Instruction Plates.....	2-155
2-13.	Operation of Auxiliary Equipment .....	2-158
2-14.	Preparation for Movement .....	2-193
<b>Section IV.</b>	<b>Operation Under Unusual Conditions.....</b>	<b>2-195</b>
2-15.	General .....	2-195
2-16.	Unusual Environment/Weather Conditions.....	2-195
2-17.	Fording and Swimming.....	2-202
2-18.	Emergency Procedures .....	2-203

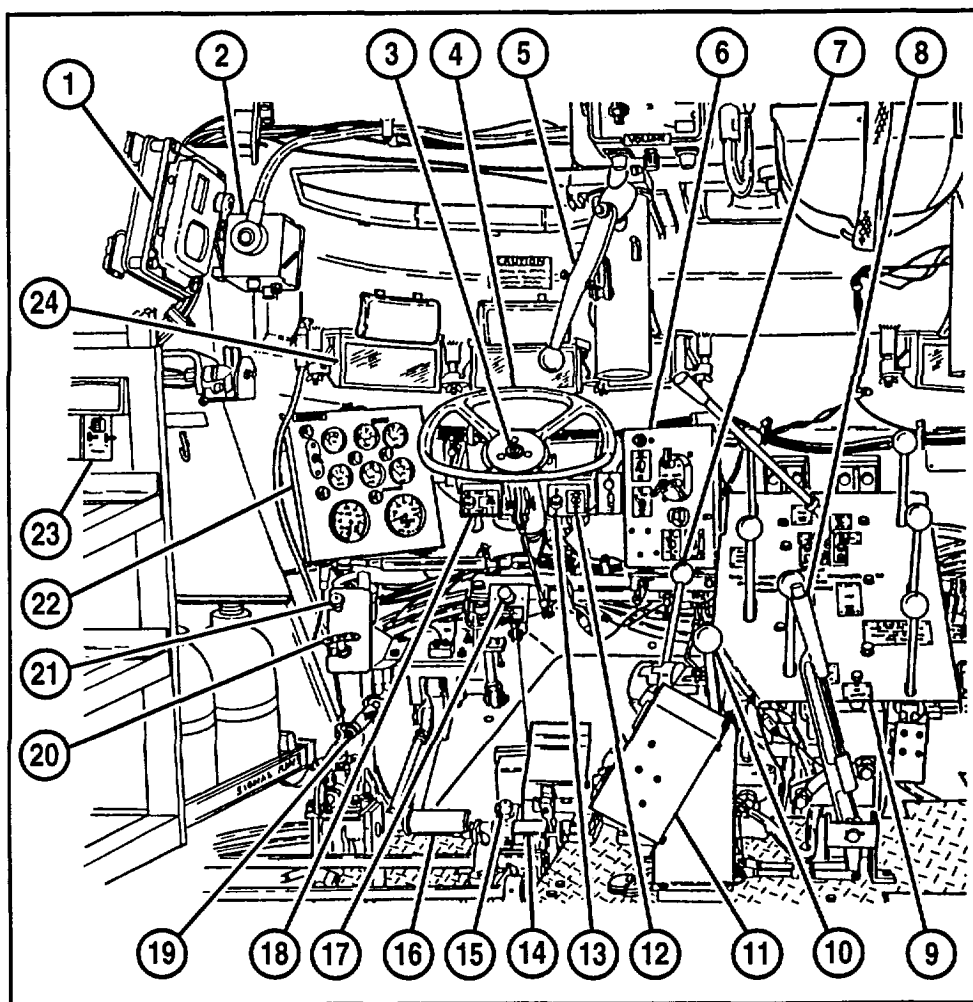


**Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS****2-1. DRIVER'S CONTROLS AND INSTRUMENTS.****a. Driver's Controls and Equipment.****NOTE**

- **In this manual, location description of left and right side always refers to the left and right side of the driver's position.**
- **Cable chute, seat, accessories control panel, and hoist winch shift lever removed for clarity.**

- (1) Dome light (1). See paragraph 2-1g.
- (2) Driver's interphone control box (2). See paragraph 2-1g.
- (3) Horn button (3). See paragraph 2-1g.
- (4) Steering wheel (4). See paragraph 2-1g.
- (5) Driver's hatch control (5). See paragraph 2-1g.
- (6) Switch panel (6). See paragraph 2-1e.
- (7) Transmission shift lever (7). See paragraph 2-1g.
- (8) Drain valve lever (8). See paragraph 2-1g.
- (9) Hydraulics control panel (9). See paragraph 2-1b.
- (10) MAIN WINCH SHIFT lever (10). See paragraph 2-1b.
- (11) AUXILIARY POWER UNIT (APU) CONTROL BOX (11). See paragraph 2-1c.
- (12) VEHICLE EXHAUST SMOKE system (12). See paragraph 2-1g.
- (13) NIGHT VIEWER receiver light system (13). See paragraph 2-1g.
- (14) Accelerator pedal (14). See paragraph 2-1g.
- (15) Dimmer switch (15). See paragraph 2-1g.
- (16) Brake pedal (16). See paragraph 2-1g.

- (17) Spade locking release handle (17). See paragraph 2-1g for manual and hydraulic handles.
- (18) HIGH BEAM indicator (18). See paragraph 2-1g.
- (19) Purge pump handle (19). See paragraph 2-1g.
- (20) Manual fuel shutoff handle (20). See paragraph 2-1g.
- (21) Engine hand throttle (21). See paragraph 2-1g.
- (22) Gage panel (22). See paragraph 2-1f.
- (23) PERSONNEL HEATER control box (23). See paragraph 2-1g.
- (24) M17 periscope (24). See paragraph 2-1g.

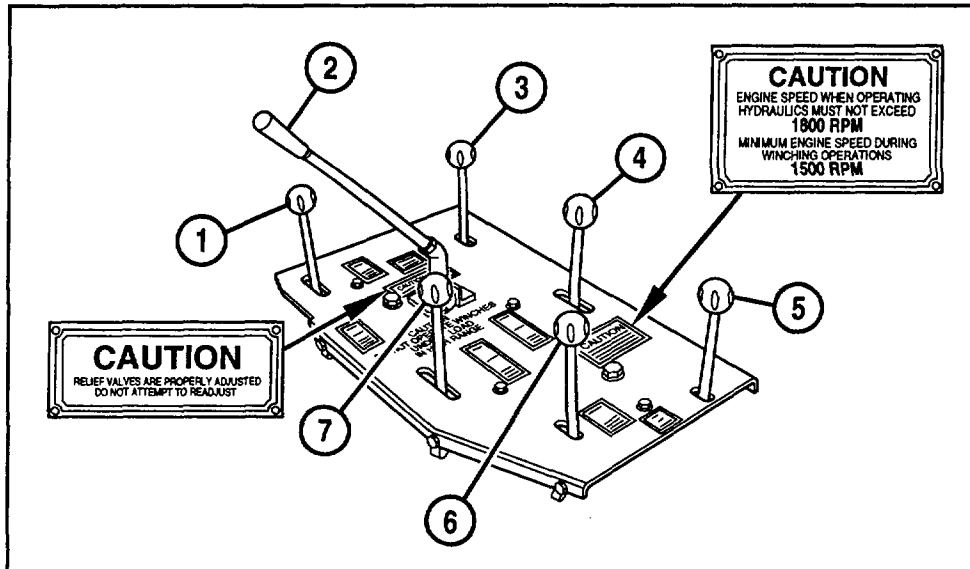


## 2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

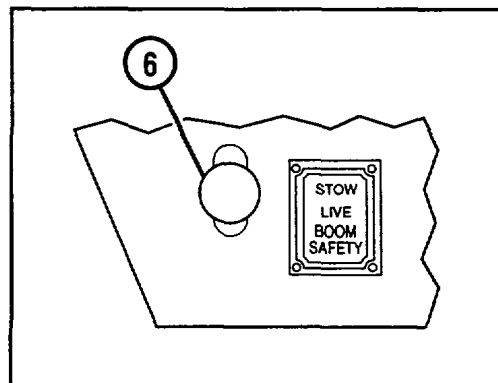
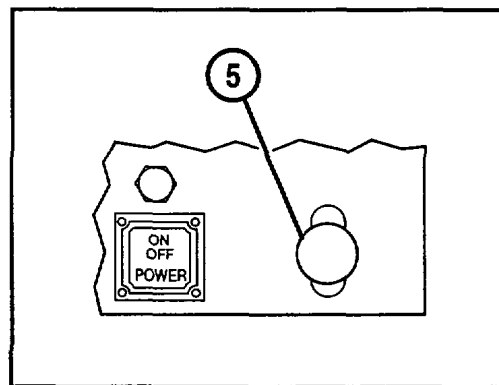
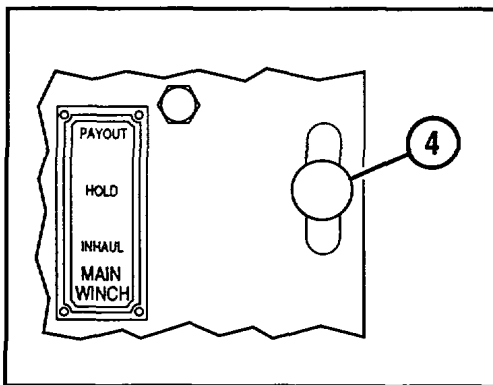
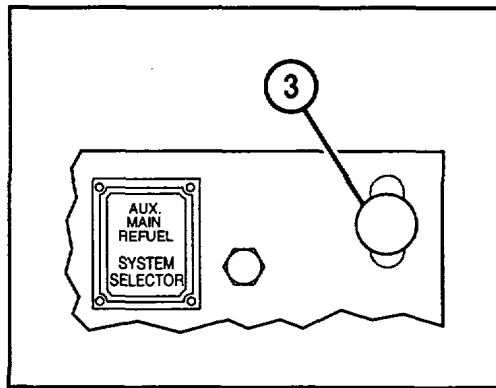
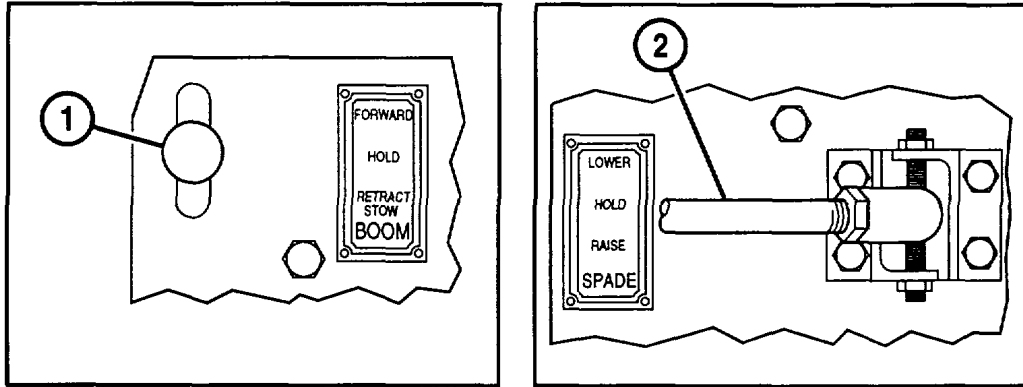
## b. Hydraulic Controls.

## NOTE

- Callout numbers (1) thru (7) in illustration below correspond with steps (1) thru (7).
- Refer to paragraph 2-1e for United States Army Europe (USAREUR) turn signal

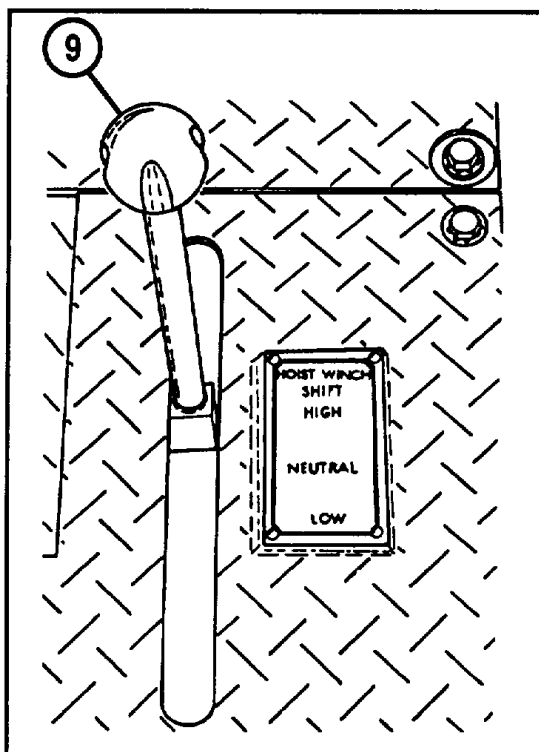
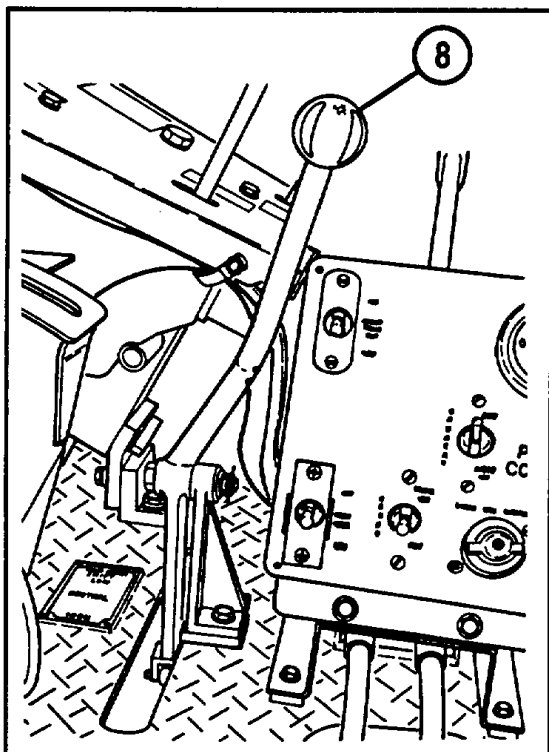
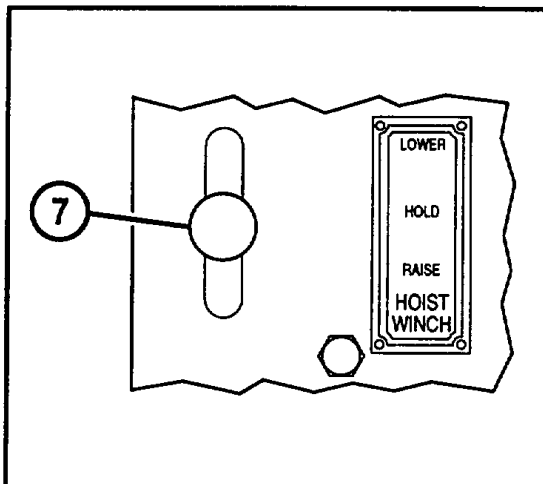


- (1) BOOM operating lever (1). Used to move boom up or FORWARD, HOLD, or RETRACT-STOW. Spring loaded to stay in HOLD.
- (2) SPADE operating lever (2). Used to RAISE, LOWER, and HOLD spade. Spring loaded to stay in HOLD position.
- (3) SYSTEM SELECTOR control lever (3). Selects auxiliary (AUX) and MAIN hydraulic systems. REFUEL position for refuel-defuel operations. It locks in desired position.
- (4) MAIN WINCH operating lever (4). Selects PAYOUT, HOLD, and INHAUL of main cable. Spring loaded to stay in HOLD position.
- (5) POWER control lever (5). To turn main hydraulic pump ON or OFF. It locks in desired position.
- (6) BOOM SAFETY control lever (6). Selects STOW or LIVE. Spring loaded to stay in LIVE position.



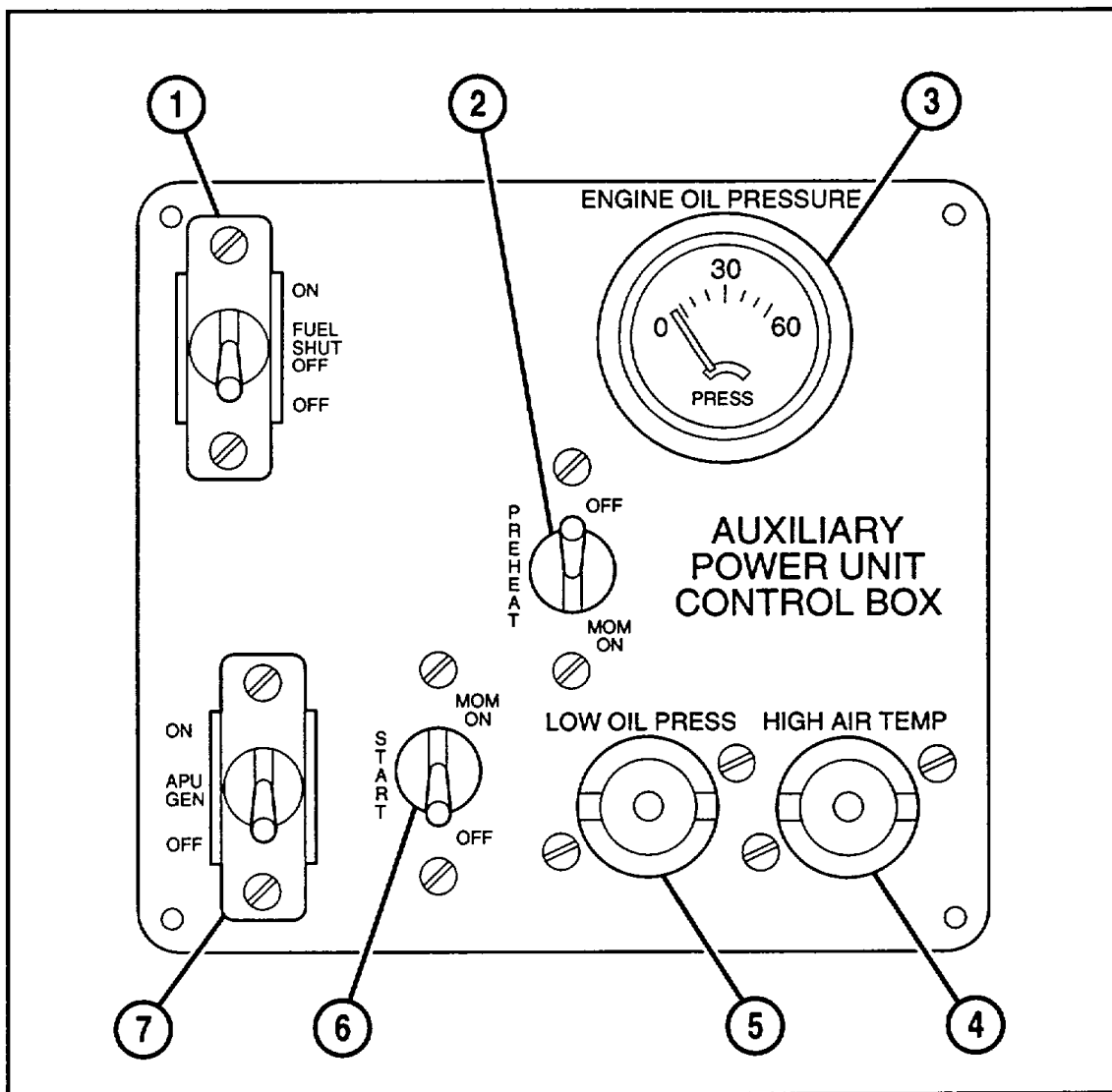
2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

- (7) HOIST WINCH operating lever (7). Selects LOWER, HOLD, and RAISE for hoist cable. It is spring loaded to stay in HOLD position.
- (8) MAIN WINCH SHIFT lever (8). Selects LOW, NEUTRAL, or HIGH main winching speeds and locks in desired position.
- (9) HOIST WINCH SHIFT lever (9). Selects LOW, NEUTRAL, or HIGH hoisting speeds. It locks in desired position. Located right rear of driver on floor.



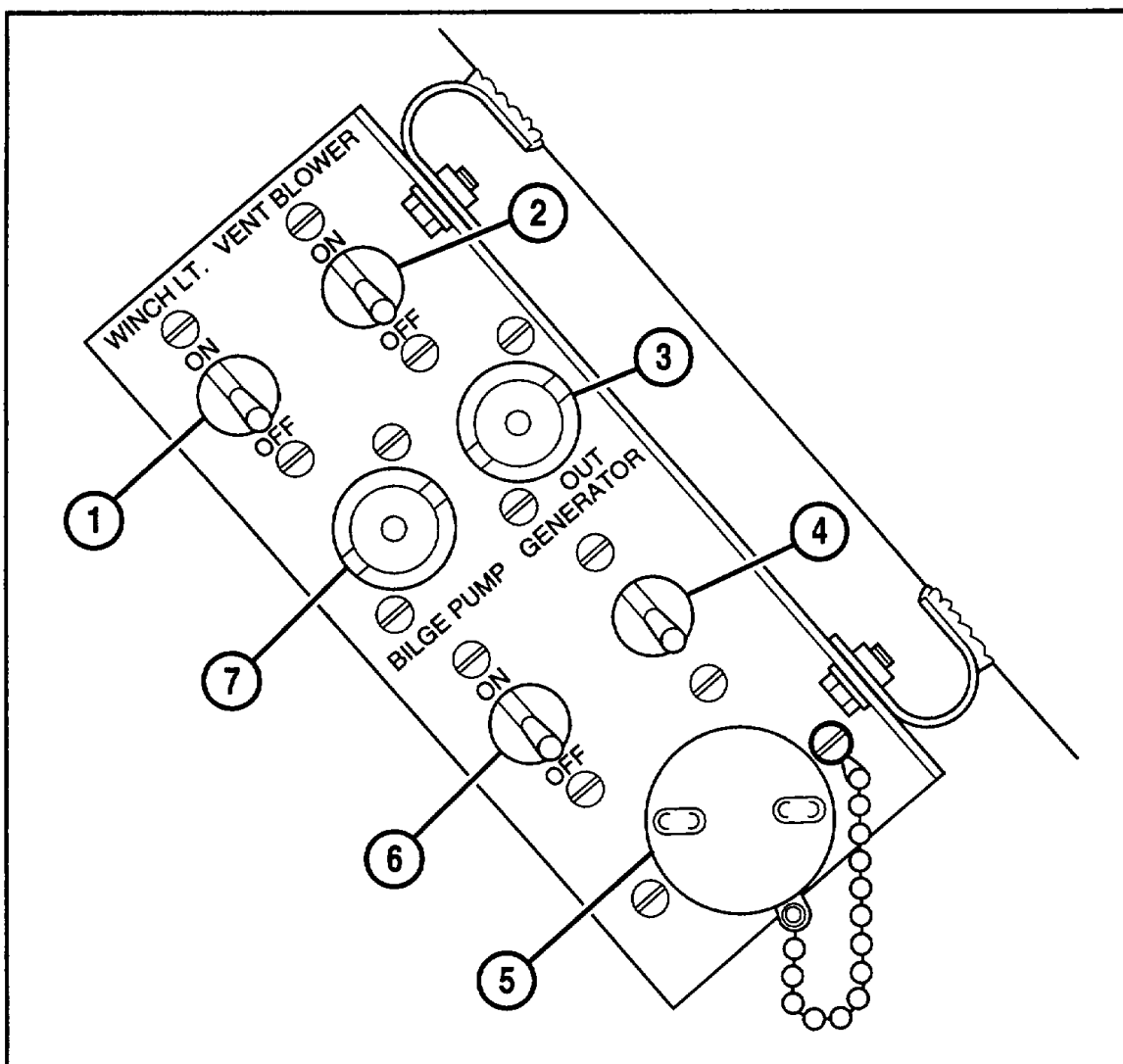
**c. APU CONTROL BOX.**

- (1) FUEL SHUTOFF switch (1). Shuts off fuel supply to APU.
- (2) PREHEAT switch (2). Turns on preheating units in APU and supplies power to start button.
- (3) ENGINE OIL PRESSURE gage (3). Indicates engine oil pressure in pounds per square inch (psi). Normal operating range is 25 to 36 psi (172 to 248 kilopascal [kPa]).
- (4) HIGH AIR TEMP light (4). Red lamp lights when APU overheats.
- (5) LOW OIL PRESS light (5). Lights when oil pressure is low.
- (6) APU START switch (6). Turns APU ON or OFF.
- (7) APU GEN switch (7). Turns APU generator ON or OFF.



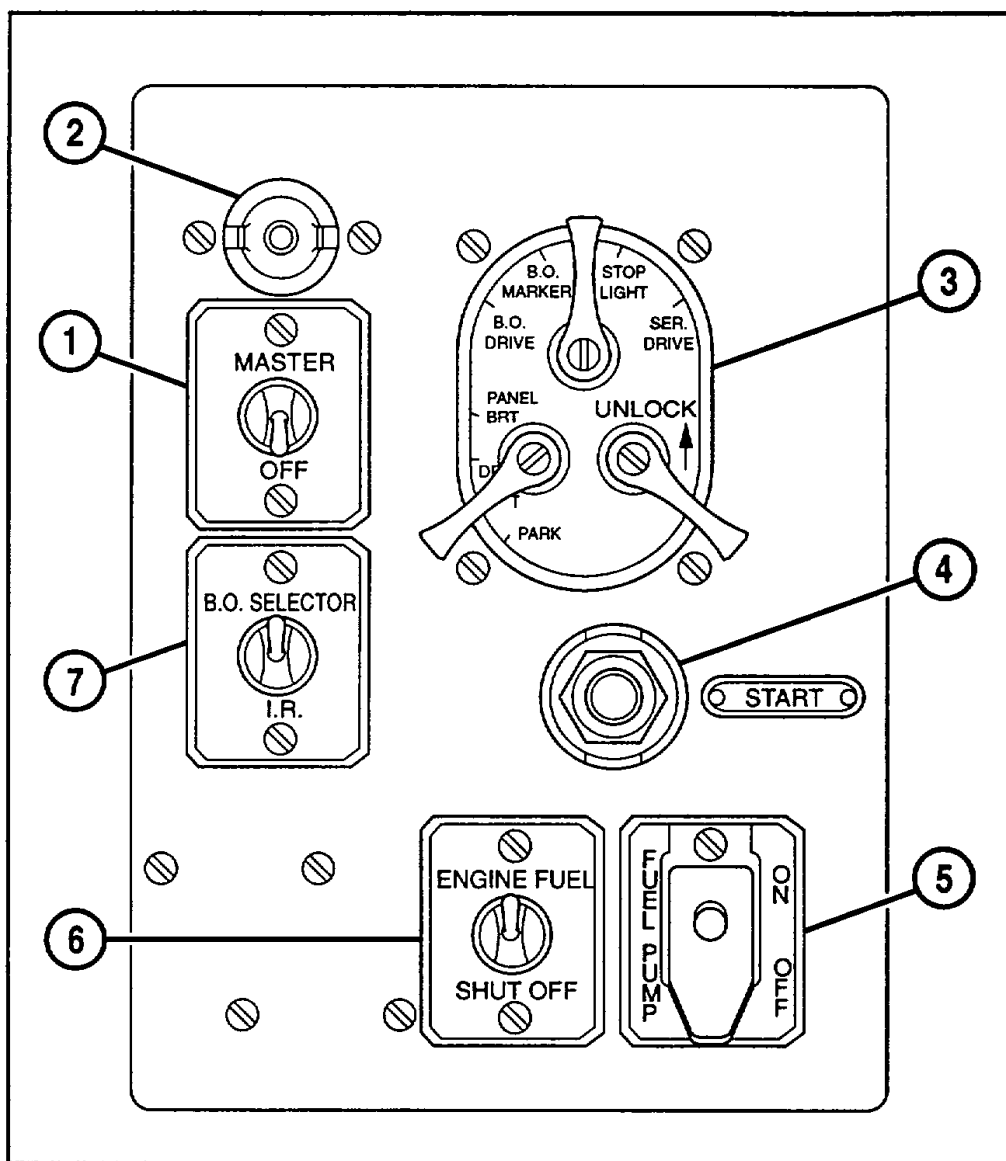
**2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.****d. Accessories Control Panel.**

- (1) WINCH LT switch (1). Turns winch compartment light ON/OFF.
- (2) VENT BLOWER switch (2). Turns ventilating blower ON/OFF.
- (3) Main engine OUT GENERATOR indicator light (3). OFF when GENERATOR switch (4) is down.
- (4) Main engine GENERATOR switch (4). Will always be left on (down).
- (5) Utility power receptacle (5). Provides power for auxiliary tools.
- (6) BILGE PUMP switch (6). Turns bilge pump ON/OFF.
- (7) BILGE PUMP indicator light (7). Lights when bilge pump is on.



e. **Switch Panel.**

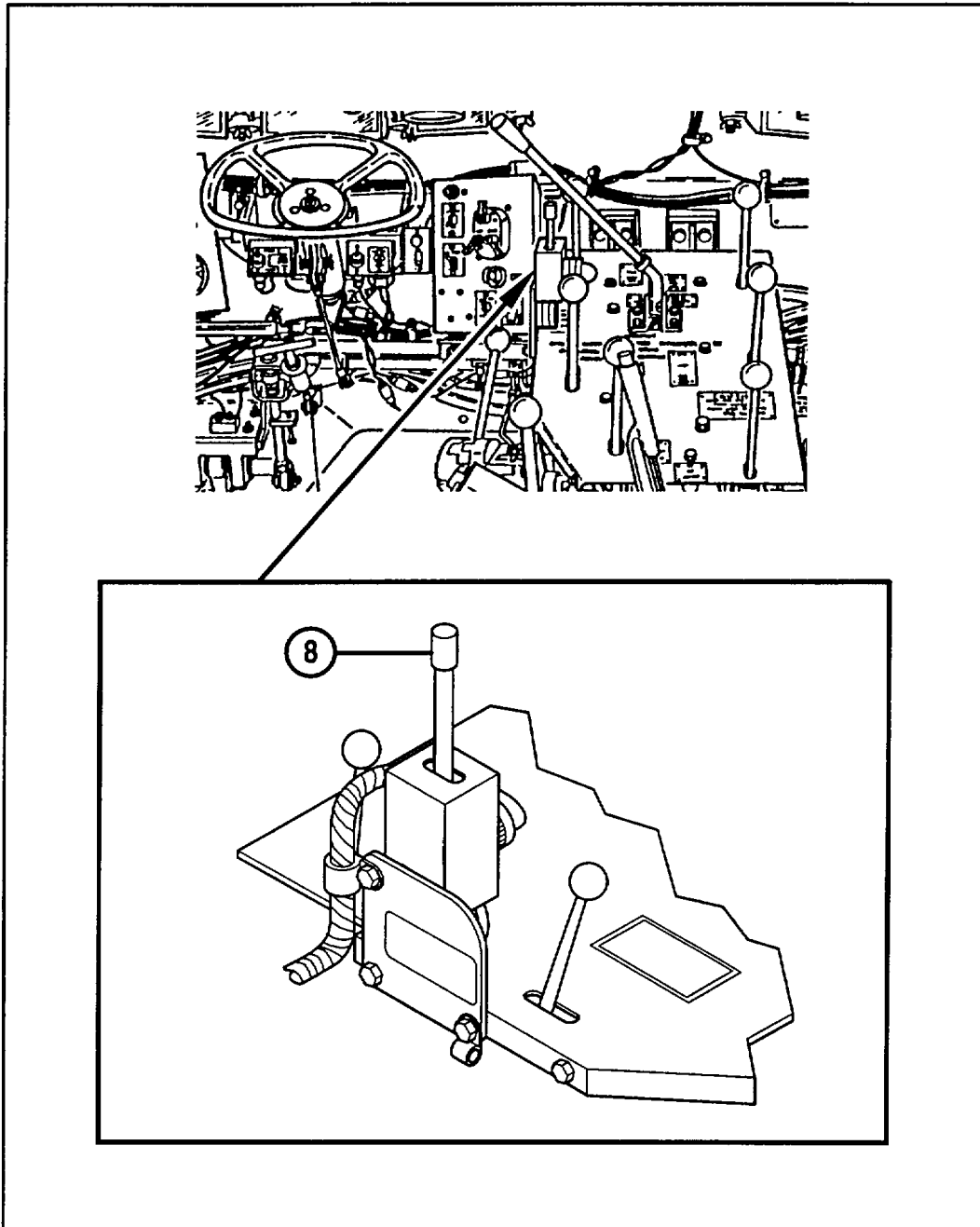
- (1) MASTER switch (1). Activates vehicle's electrical system.
- (2) Master switch indicator light (2). Lights when MASTER switch is on.
- (3) Vehicular lights switch (3). Controls driving lights.
- (4) START button (4). Starts vehicle for operation.
- (5) FUEL PUMP switch (5). Activates fuel pump to supply fuel to engine.
- (6) ENGINE FUEL SHUTOFF switch (6). Used to stop engine.
- (7) B.O. SELECTOR switch (7). Allows selection between blackout (B.O.) and infrared (IR) lights.





2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

- (8) USAREUR turn signal. Activates turn signals.



NOTE

Refer to figure 2-1 for vehicular light switch and figure 2-2 for USAREUR safety lighting.

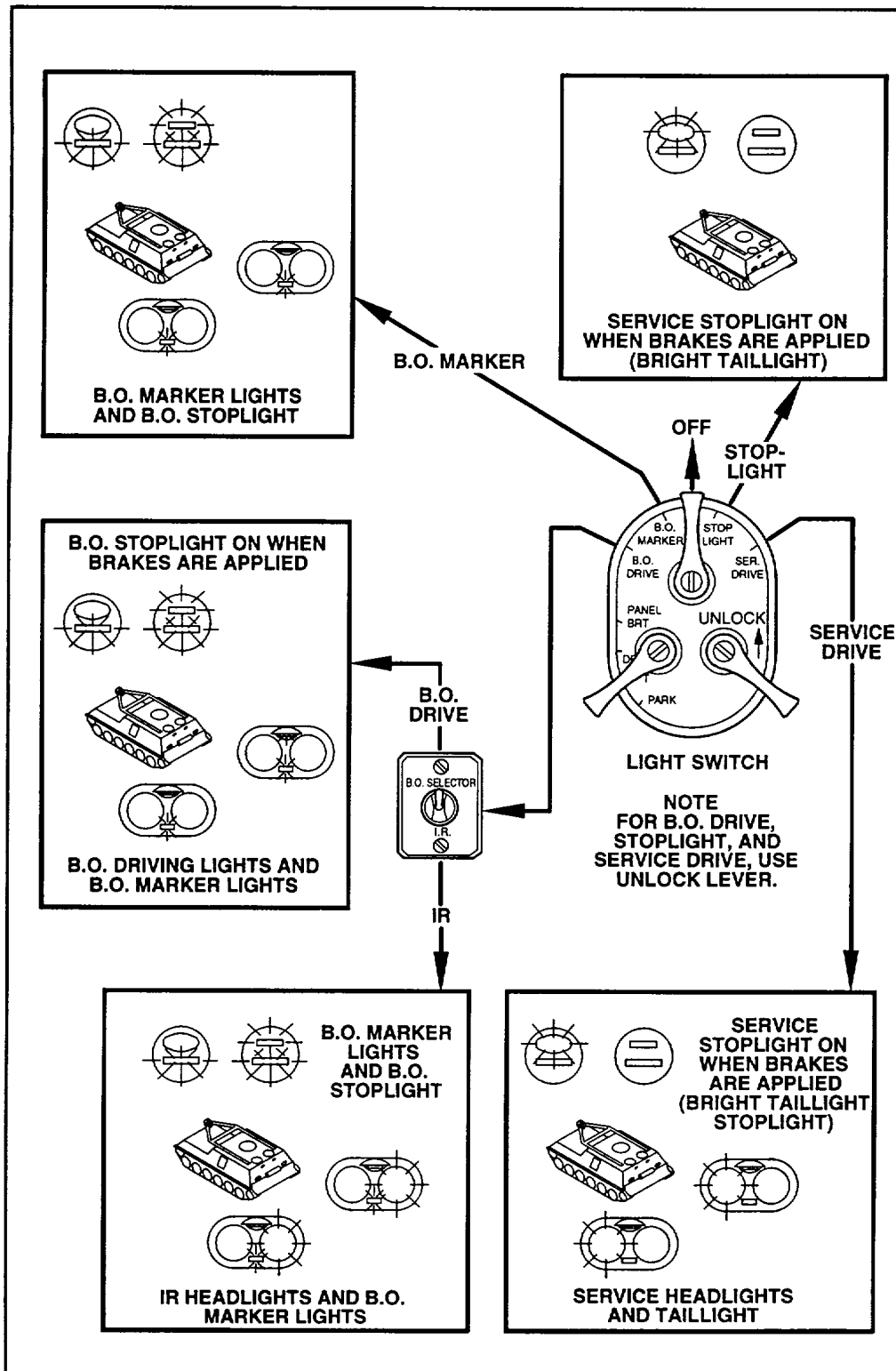


Figure 2-1. Vehicular Light Switch.

2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

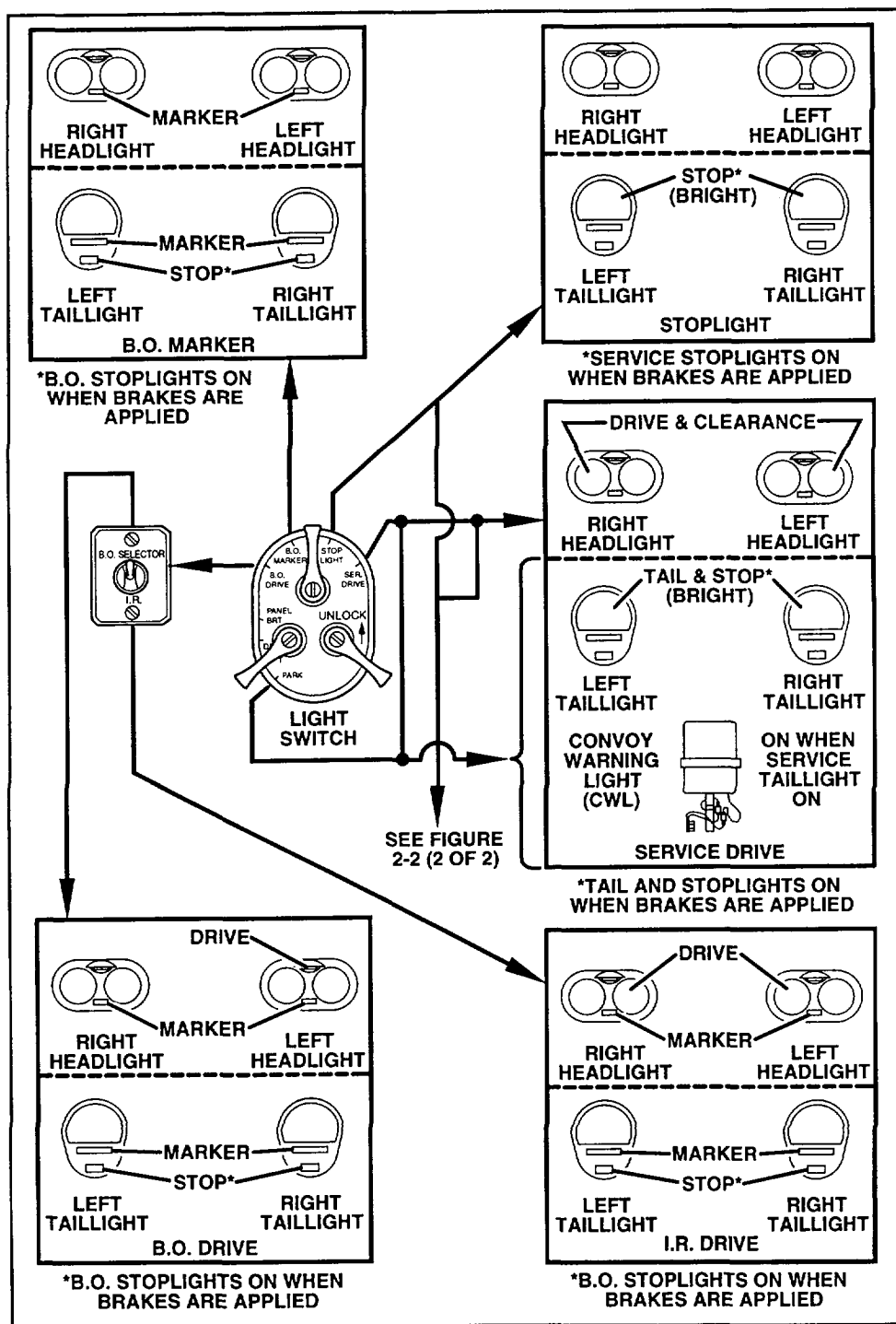


Figure 2-2. USAREUR Safety Lighting (1 of 2).

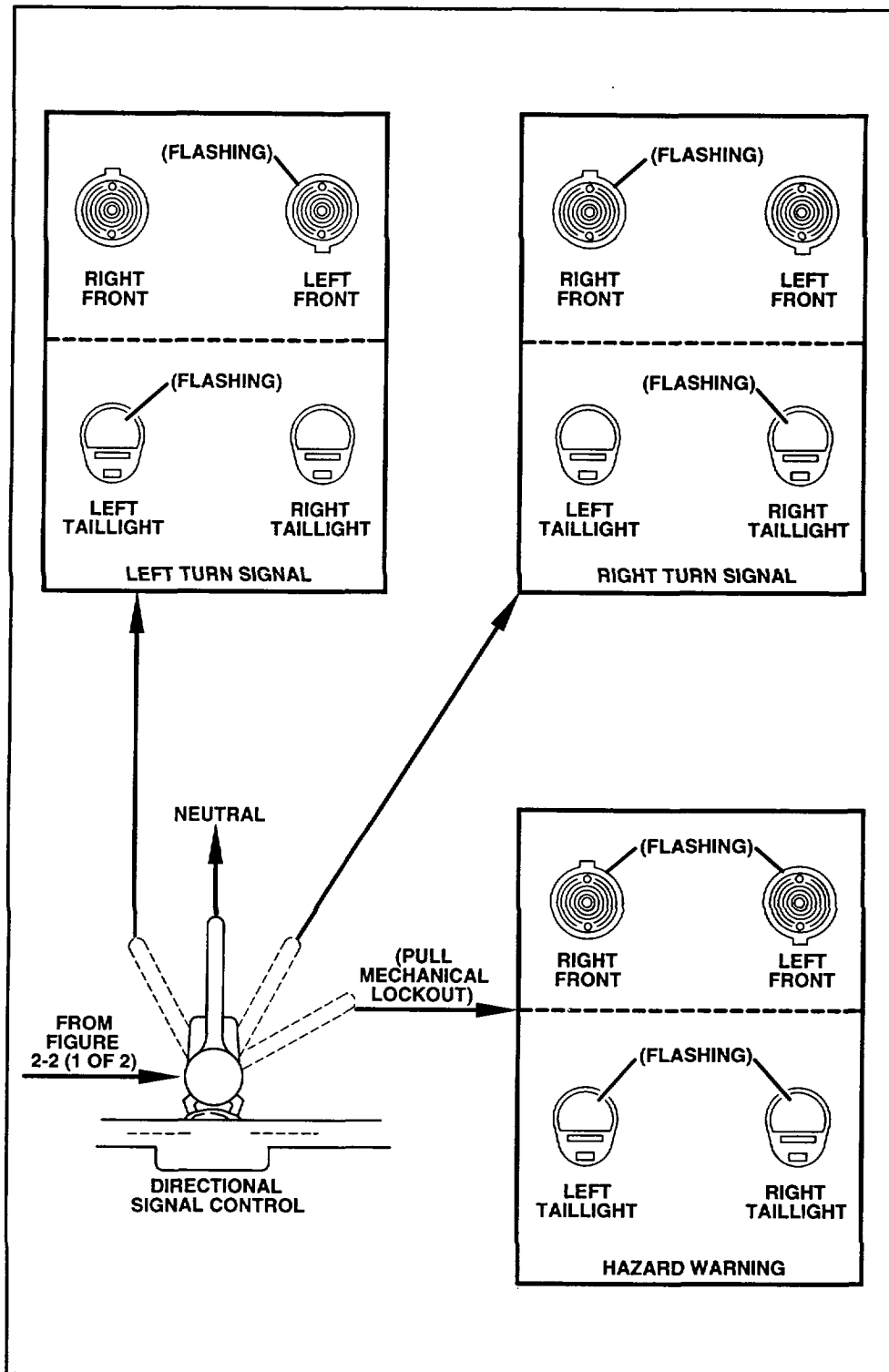


Figure 2-2. USAREUR Safety Lighting (2 of 2).

## 2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

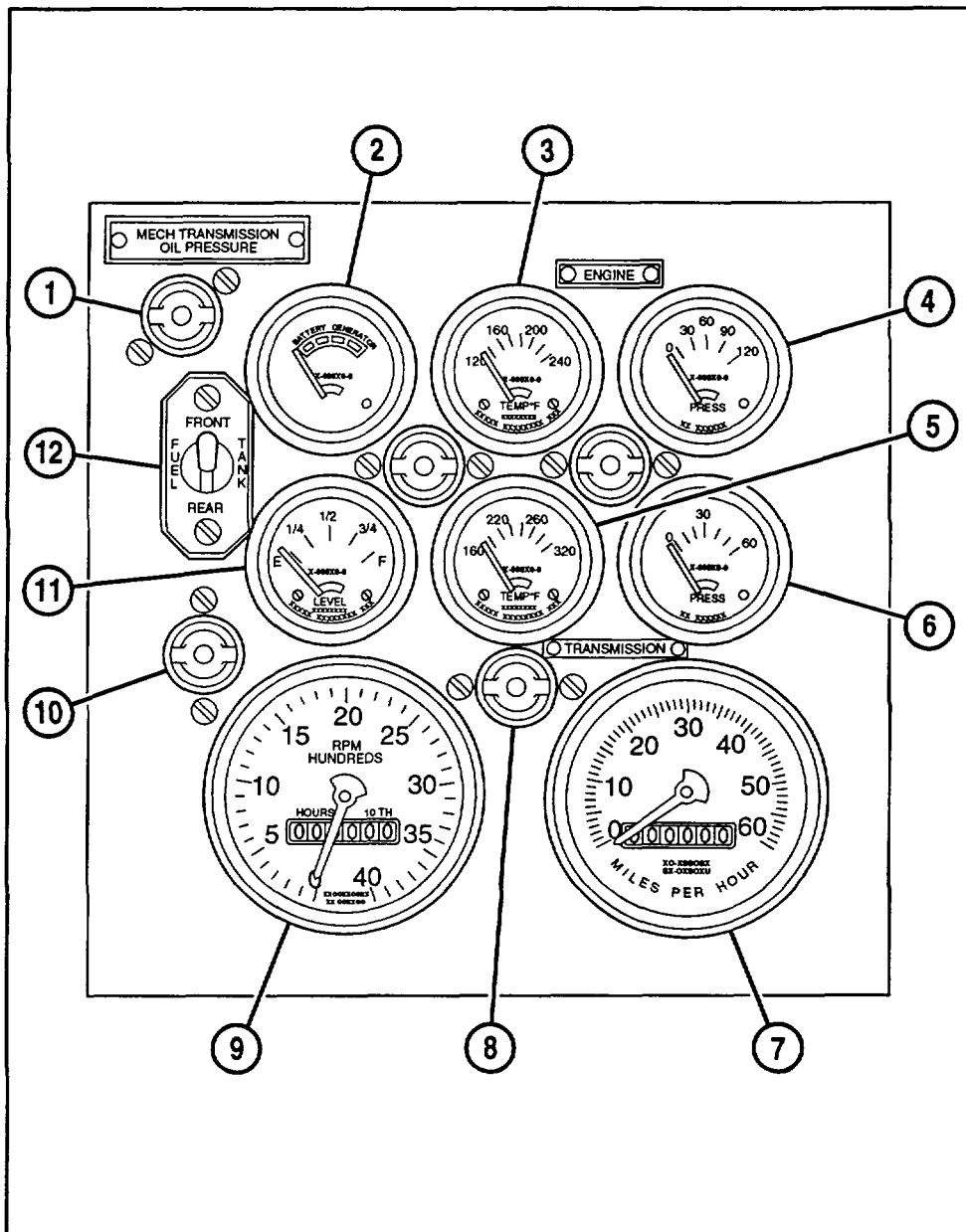
## f. Gage Panel.

- (1) MECH TRANSMISSION OIL PRESSURE warning light (1). Lights when mechanical transmission oil pressure is 4 psi (28 kPa) or less.
- (2) BATTERY GENERATOR indicator (2). Indicates battery when engine is off and generator when engine is running.
- (3) ENGINE oil temperature gage (3). Normal operating range-140 to 240 degrees Fahrenheit (°F) (60 to 115 degrees Celsius [°C]) Danger zone-245 ± 5°F (136 ± 3°C)
- (4) ENGINE oil pressure gage (4). Normal operation range- 0 to 70 psi (276 to 483 kPa) Idle-15 psi (103 kPa) Danger zone is less then 9 psi (62 kPa).
- (5) TRANSMISSION oil temperature gage (5). Normal operating range-160 to 280°F (71 to 138°C) Danger zone-285 ± 5°F (158 ± 3°C)
- (6) TRANSMISSION oil pressure gage (6). Normal operating range-17 ± 2 psi (117 ± 8 kPa) Idle-5 psi (35 kPa)
- (7) Speedometer (7).  
1st gear--0 to 5 miles per hour (mph) (0 to 8 kilometers per hour [km/h])  
2nd gear--5 to 12 mph (8 to 19 km/h)  
3rd gear--12 to 26 mph (19 to 42 km/h)
- (8) Panel lamp assembly (8). Lights gage panel.
- (9) Tachometer (9). Shows engine revolutions per minute (rpm) in divisions of 100.  
Low idle-675 to 725 rpm  
High idle-2400 to 2640 rpm  
Hydraulic settings: Turn on at low idle, operate at 1800 rpm.
- (10) Master warning light (10).  
Master light and horn come on when:
  - a. Engine oil temperature is 245 ± 5°F (136 ± 3°C).
  - b. Engine oil pressure is less than 13 psi (90 kPa) on start or less than 9 psi (62 kPa) when running.
  - c. Transmission oil temperature is 285 ± 5°F (158 ± 3°C).
  - d. Light only is on when MASTER switch is on with engine off.

- (11) Fuel level gage-for front and rear tanks (11). Shows selected fuel tank level.
- (12) FUEL TANK selector switch (12). Selects FRONT or REAR fuel tanks.

**CAUTION**

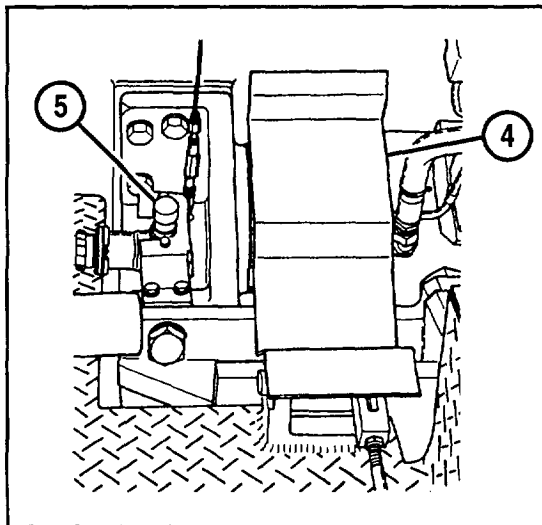
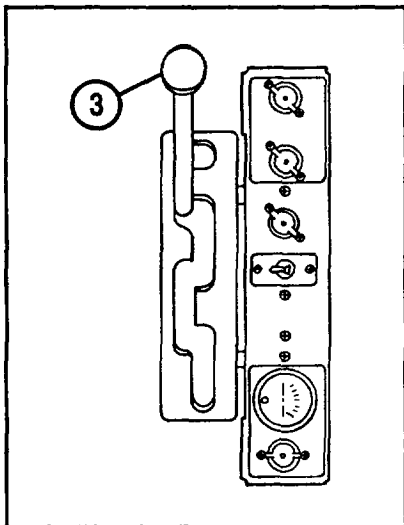
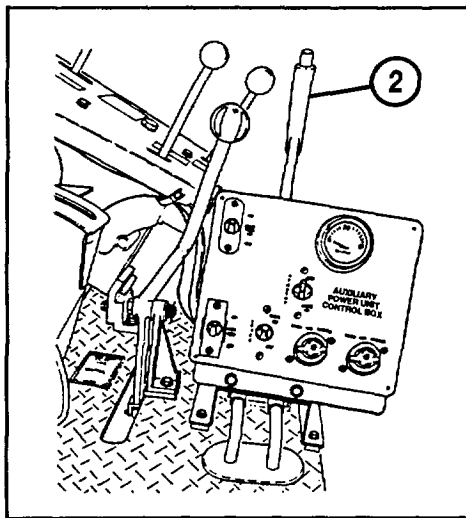
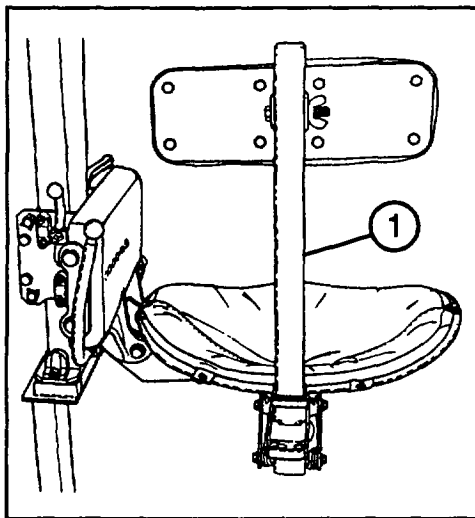
Do not allow engine to run above 2640 rpm for more than 2 to 3 seconds at high idle.



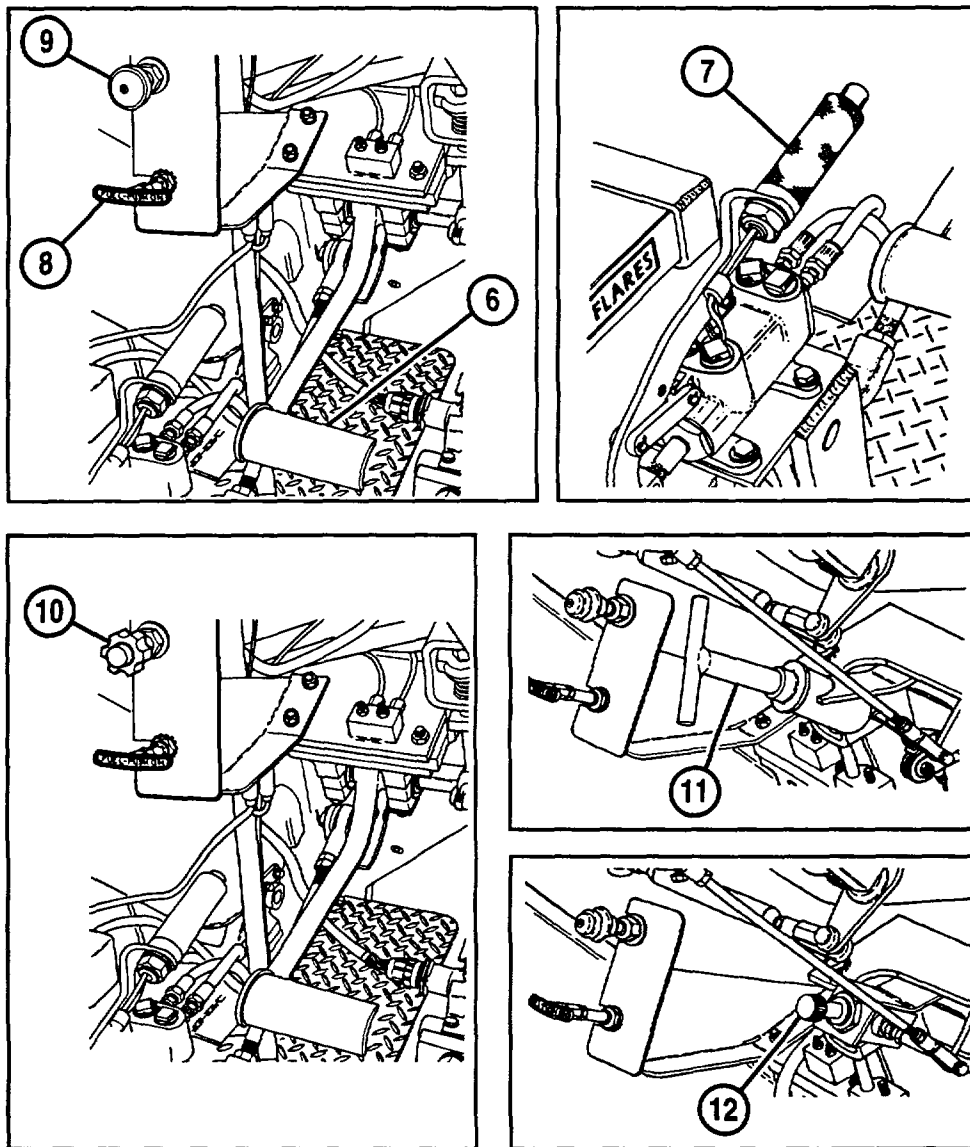
2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

g. Miscellaneous Driver's Controls and Indicators.

- (1) Driver's seat (1). Provides seating for driver.
- (2) Drain valve lever (2). Opens and closes drain valves.
- (3) Transmission shift lever (3). Selects driving range for forward and reverse operation.
- (4) Accelerator pedal (4). Controls engine speed.
- (5) Dimmer switch (5). Activates high beam of headlights.



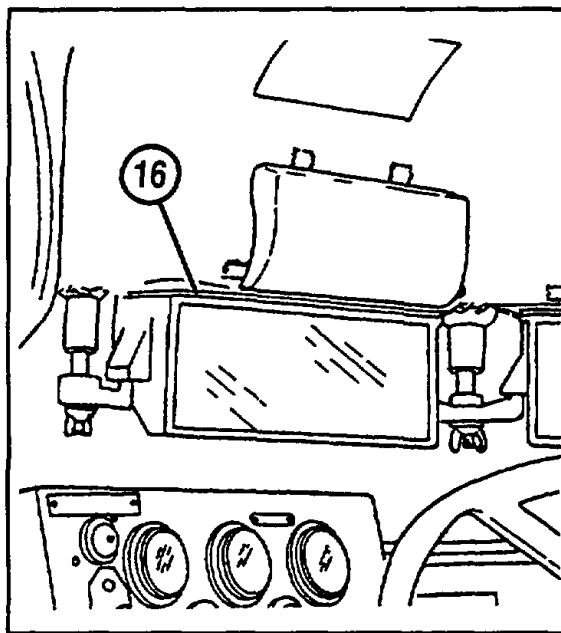
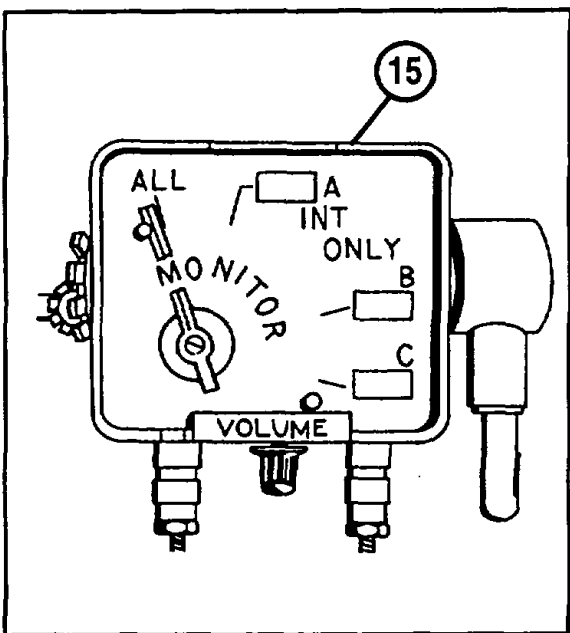
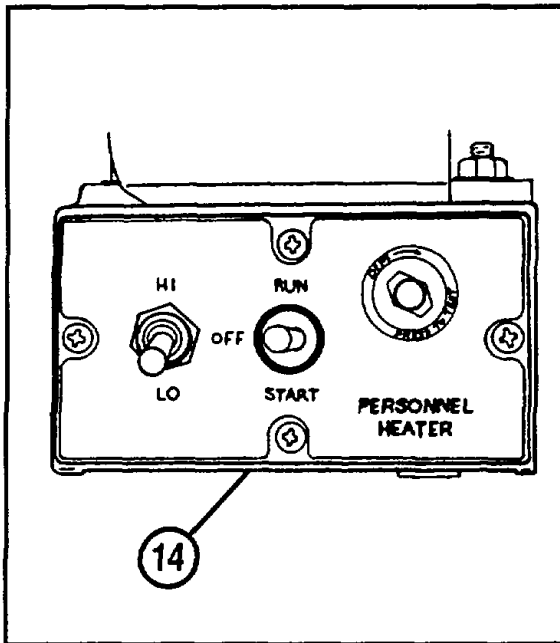
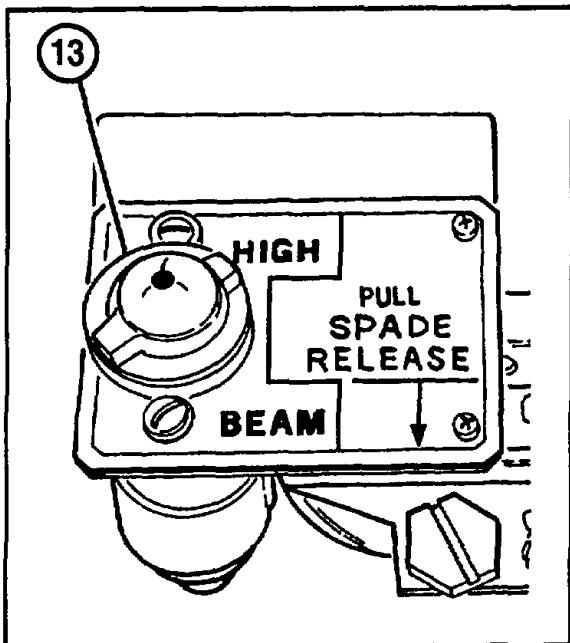
- (6) Brake pedal (6). Activates steering unit brakes to slow or stop vehicle.
- (7) Purge pump handle (7). Activates purge pump to remove excess water from hull.
- (8) Manual fuel shutoff handle (8). Stops fuel supply to the engine.
- (9) Push in style engine hand throttle (9) or turn style throttle (10). Controls engine speed.
- (10) Manual spade locking release handle (11) or hydraulic spade locking release button (12). Releases spade from locked position.



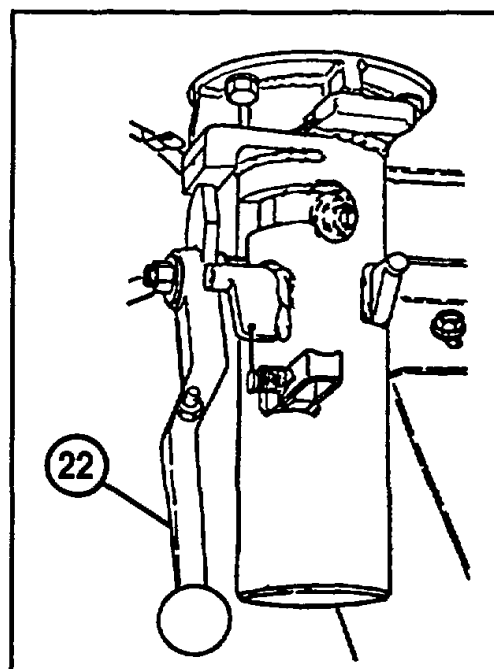
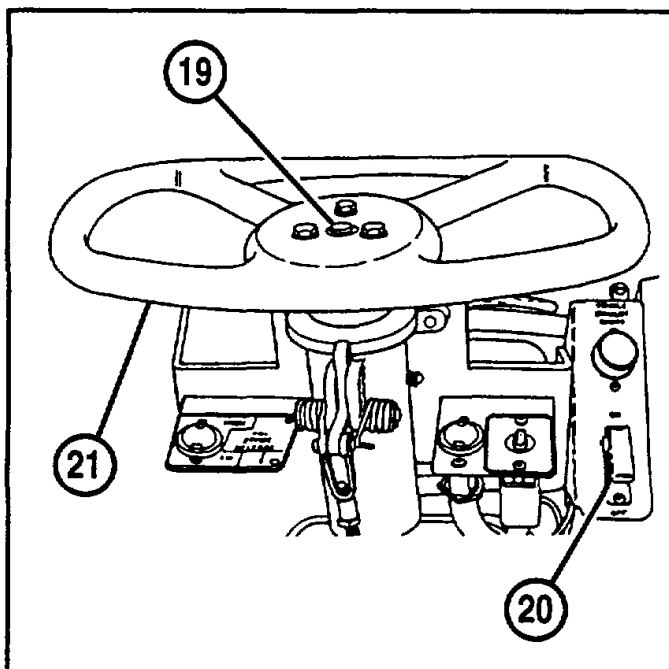
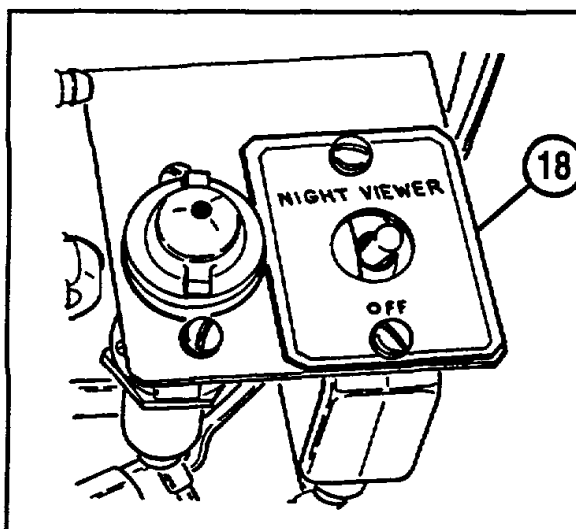
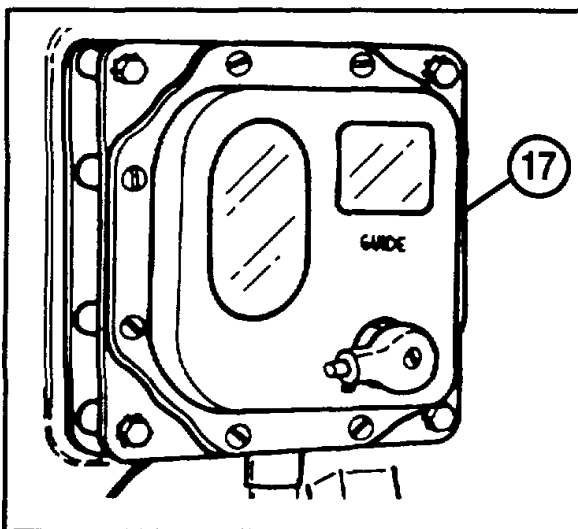


2-1. DRIVER'S CONTROLS AND INSTRUMENTS-Continued.

- (11) HIGH BEAM indicator (13). Indicates when headlights are on high beam.
- (12) PERSONNEL HEATER control box (14). Activates personnel heater.
- (13) Driver's interphone control box (15). Provides communication between crew during operations. Driver can also allow a person outside vehicle communication with crew.
- (14) M17 periscope (16). Provides vision to driver while operating vehicle.



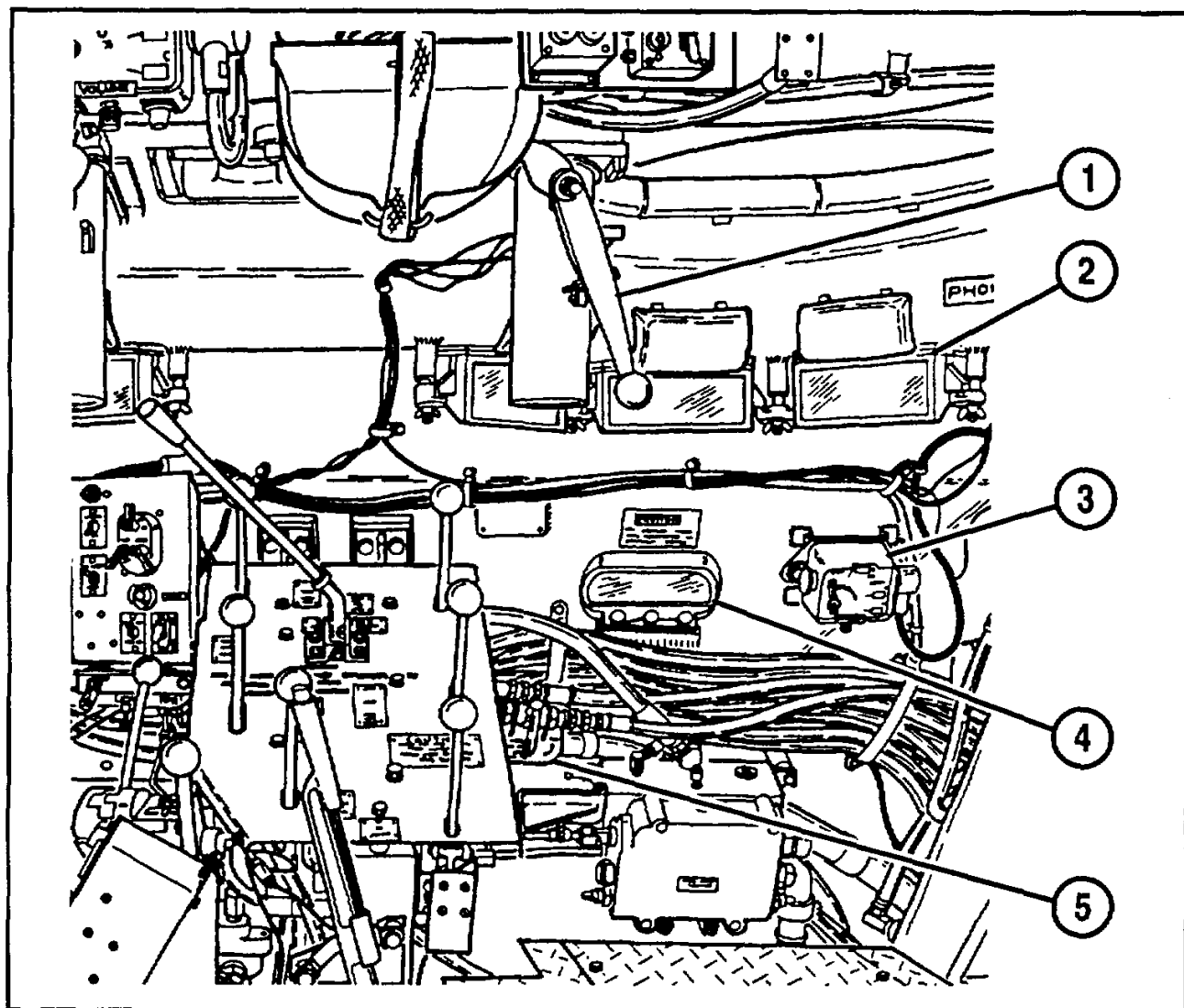
- (15) Dome light (17). Four dome lights provide lighting for interior of crew compartment.
- (16) NIGHT VIEWER receiver light system (18). Provides vision to operate vehicle during night operation.
- (17) Hornbutton (19). Activates horn.
- (18) VEHICLE EXHAUST SMOKE system (20). Provides a self-screening smoke capability.
- (19) Steering wheel (21). Allows driver to control direction of vehicle.
- (20) Driver's hatch control (22). Holds driver's hatch open for entry or exit.



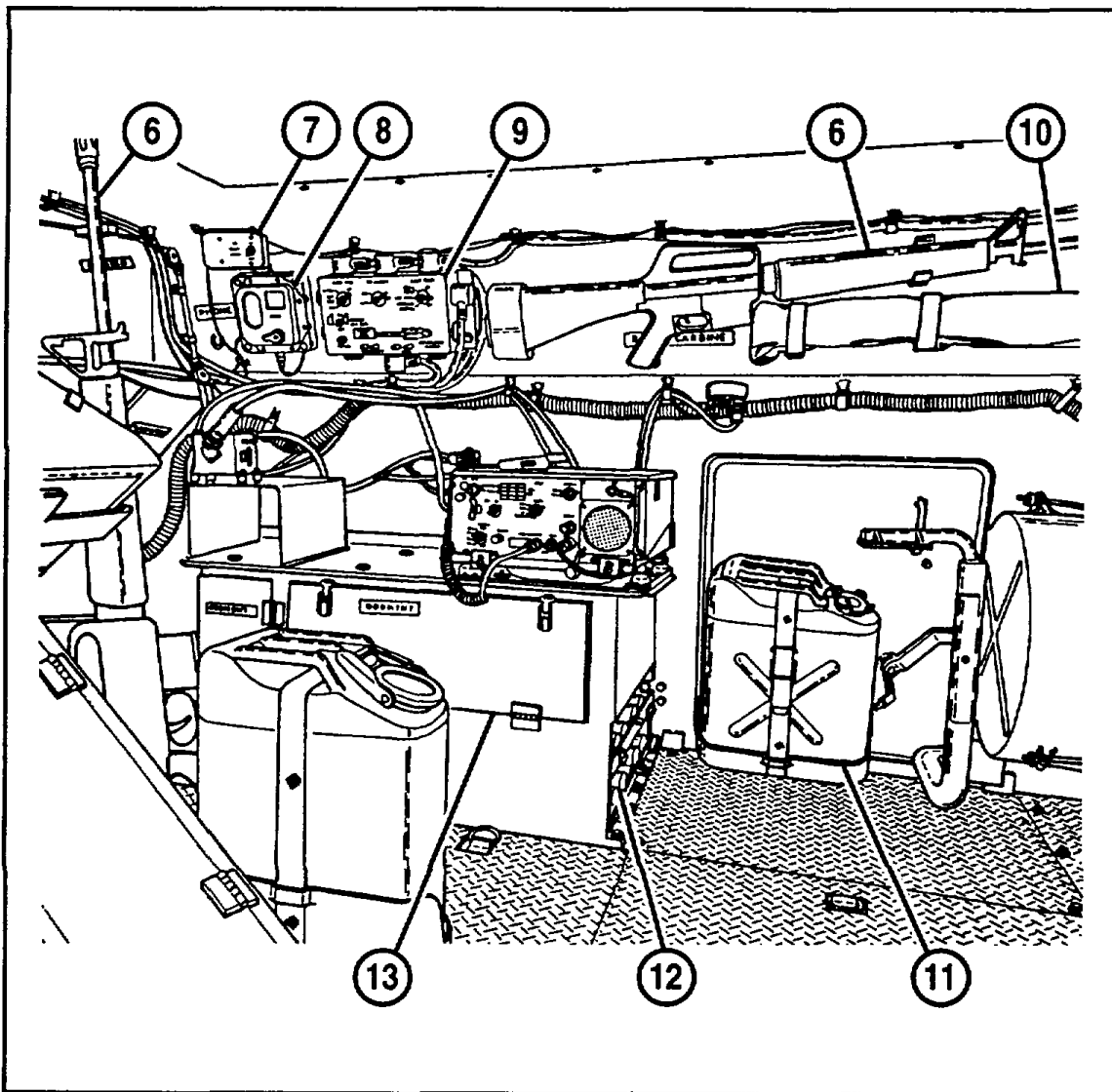
**2-2. MECHANIC'S (ASSISTANT OPERATOR'S) CONTROLS AND INSTRUMENTS.****NOTE**

The mechanic's (assistant operator's) seat controls, interphone control box, and hatch control are the same as the driver's.

- a. **Mechanic's Hatch Control (1).** Holds mechanic's hatch open for entry or exit.
- b. **M17 Periscope (2).** Provides vision to operate vehicle with hatch closed.
- c. **Mechanic's Interphone Control Box (3).** Provides communication between crew during operations.
- d. **Mechanic's Vision Blocks (4).** Provides vision while operating vehicle.
- e. **APU Emergency Winch Control Valve (5).** Controls winch in an emergency.

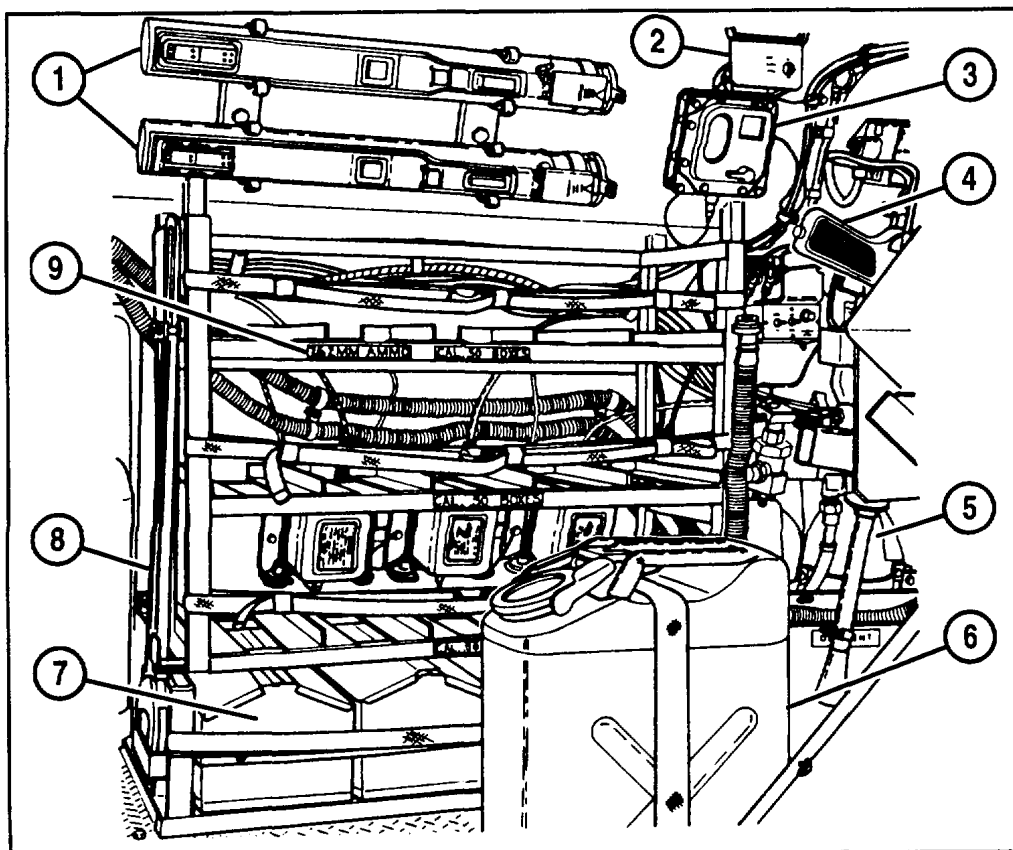


- f. **M16 Rifle (M14 Optional) (6).** Provides protection for the vehicle.
- g. **Mechanic's Air Purifier Control Switch (7).** Activates air purifier.
- h. **Dome Light (8).** Provides lighting for mechanic.
- i. **Communication Amplifier AM1780/VRC (9).** Provides power and voice switching circuitry for vehicular intercommunications system.
- j. **Spare Barrel for Caliber .50 Machine Gun (10).** Provides protection for vehicle.
- k. **Two Oil Cans (11).** Stowage area of oil to use in recovery situations.
- l. **Light Assault Weapon (LAW) Rocket (12).** Provides protection for vehicle.
- m. **Oddment Compartment (13).** Provides storage area.



### 2-3. COMMANDER'S CONTROLS AND EQUIPMENT.

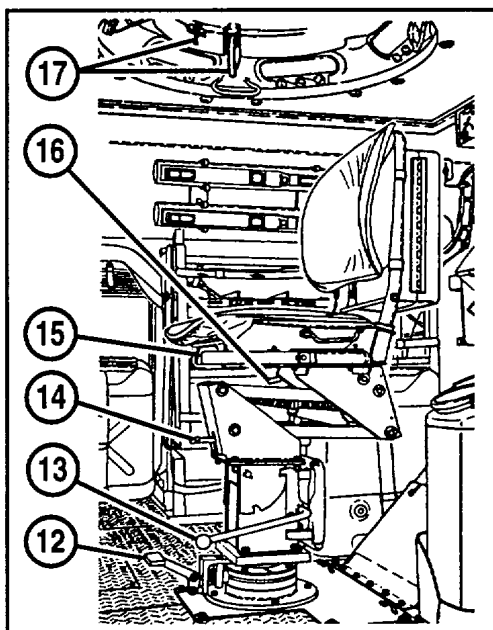
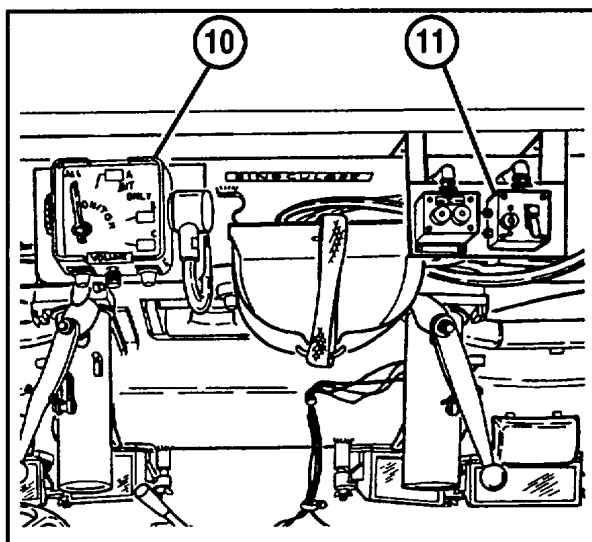
- a. **Two LAW Rockets (1).** Provides protection for crew and vehicle.
- b. **Commander's Air Purifier Control Switch (2).** Activates air purifier.
- c. **Dome Light (3).** Provides light for commander.
- d. **Caliber .45 Machine Gun (4).** Provides protection for vehicle.
- e. **Fixed Fire Extinguisher (5) (2 Banks, 4 Cylinders Each).** Allows for extinguishing of fire in engine compartment.
- f. **Two Water Cans (6).** Used to store water for recovery operations.
- g. **Tool Box (7).** Location of tools.
- h. **Track Link Adjusting Wrench (8).** Used to adjust the track.
- i. **Ammunition Stowage Rack (9).** Storage area for caliber .50 ammunition.
- j. **Commander's Interphone Control Box (10).** For crew communication.
- k. **M239 Smoke Grenade Arming Switch (11).** Switch that provides a self-screening smoke capability.



NOTE

Callouts (12) thru (16) adjust commander's seat.

- l. Seat Rotating Foot Pedal (12).
- m. Dumping Handle (13).
- n. Tilt Handle (14).
- o. Seat Horizontal Adjustment (15).
- p. Seat Height Control (16).
- q. Commander's Cupola Controls (17). Operates cupola for entry or exit.

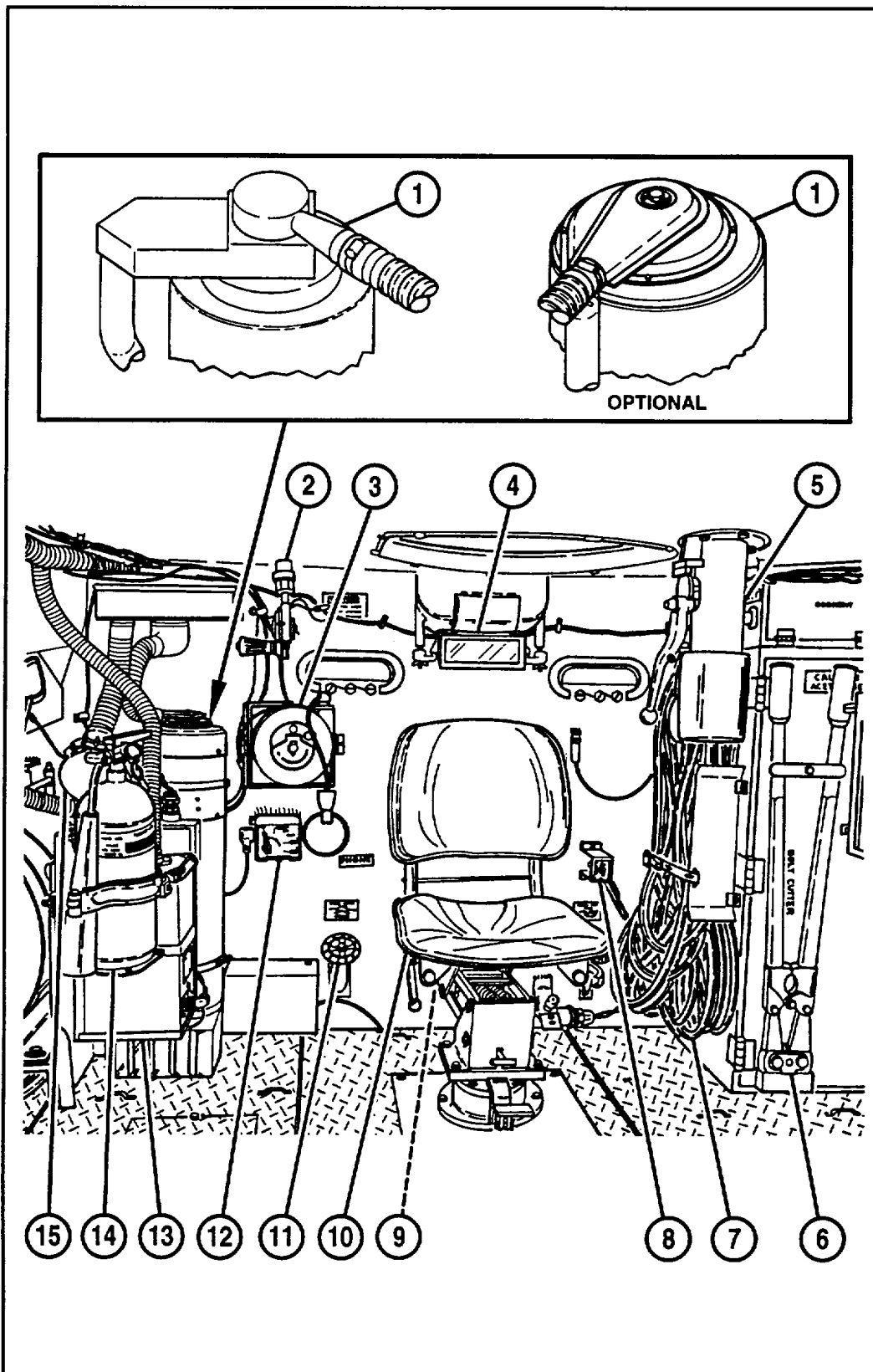


**2-4. RIGGER'S CONTROLS AND INDICATORS.**

- a. **Personnel Heater (1).** Provides heated air to crew compartment.
- b. **Rigger's Spotlight Remote Control (2).** Used in night rigging operations when extra light is needed.
- c. **Rigger's Troublelight (3).** Used in night rigging operations when extra light is needed.
- d. **M17 Periscope (4).** Provides vision while operating vehicle.
- e. **Rigger's Hatch Control (5).** Holds rigger's hatch open for entry or exit.
- f. **Bolt Cutter (6).** Used in recovery operations.
- g. **Oxygen and Acetylene Hoses (7).** Used in recovery operations in cutting and welding.
- h. **Rigger's Lights (8).** Activates stoplight.
- i. **Generator Blower Air Intake Grille (9) (On Bottom of Wall, Behind Rigger's Seat-Hidden).** Extracts air out of crew compartment when engine is running.
- j. **Rigger's Seat (10).** Provides seating for rigger.
- k. **FUEL CONTROL VALVE (11).** Opens or closes fuel control valve.
- l. **Rigger's Intercom Control Box (12).** Provides communication between crew members during operations.
- m. **Gas-Particulate Filter Unit (GPFU) (13).** Provides filtered breathing air for CB masks used by driver and crew.
- n. **Portable Fire Extinguisher (14).** Used to extinguish fires inside vehicle.
- o. **APU Air Filter Housing (15).** Location of air filter for APU.

**NOTE**

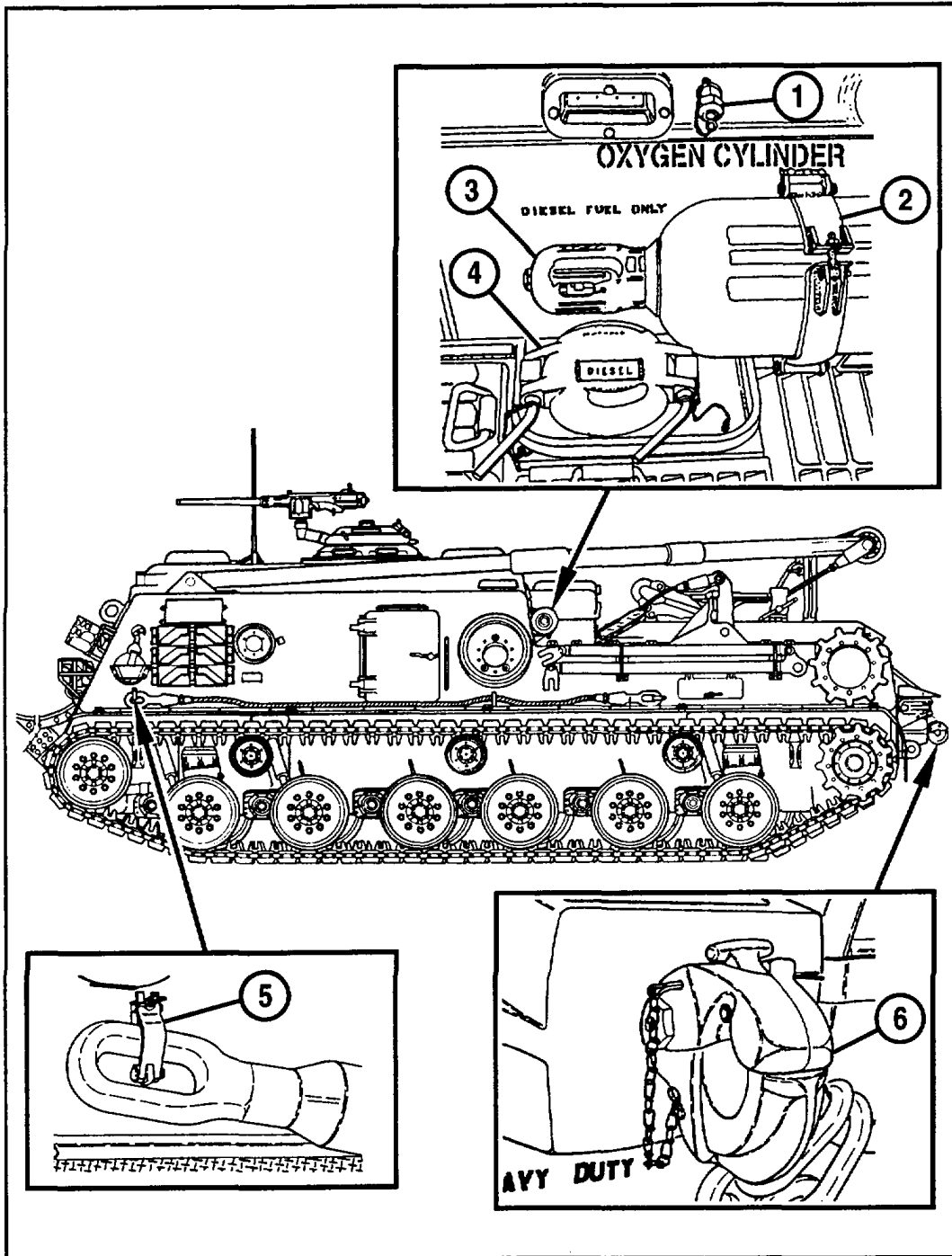
**Rigger's hatch control operates like driver's (see para. 2-1g). The seat controls operate like the commander's (see para. 2-3).**



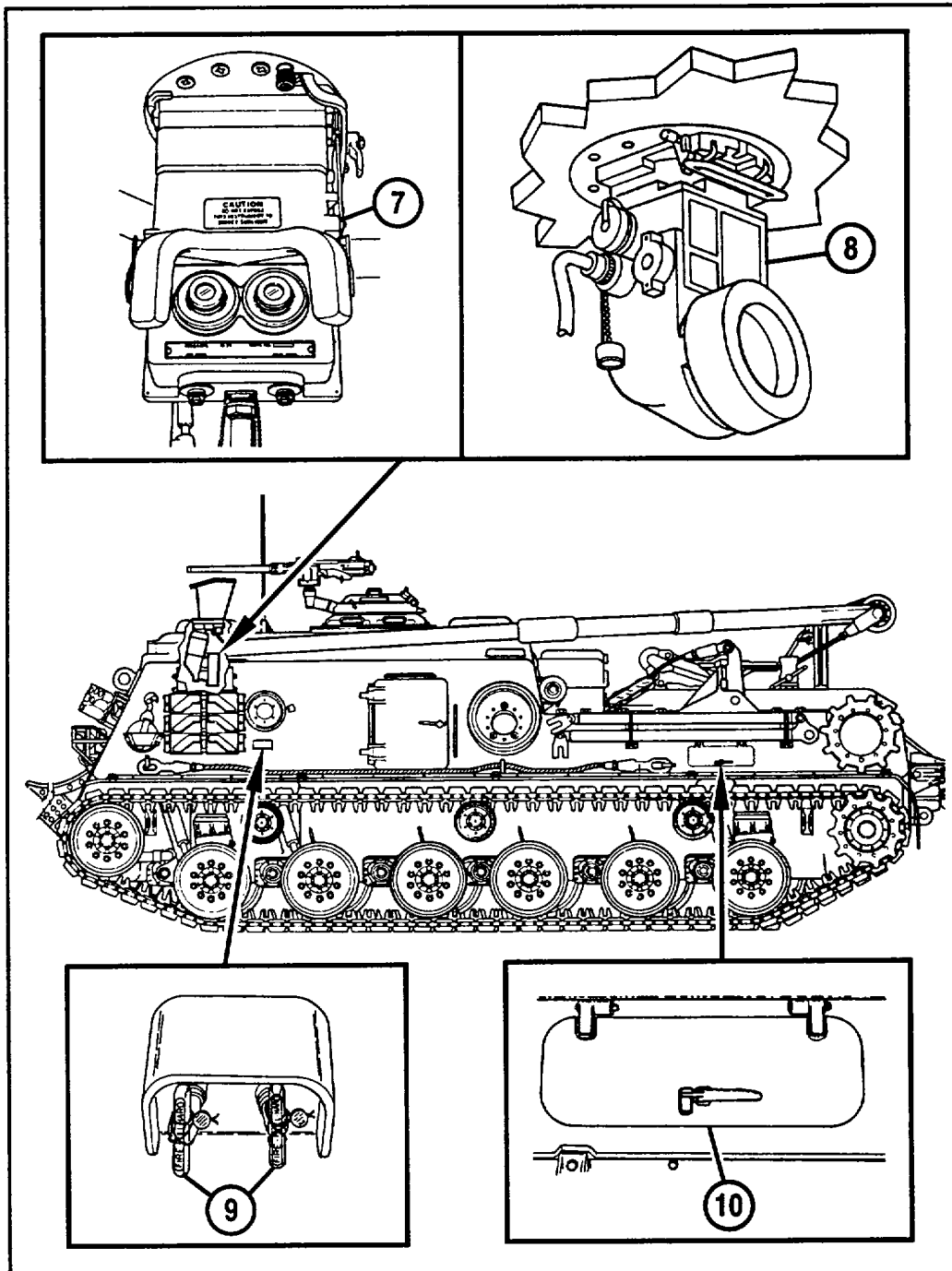


**2-5. GENERAL VEHICLE CONTROLS.**

- a. Acetylene plug (1), oxygen cylinder strap (2), safety cap (3), and fuel tank fill cover (4).
- b. Towing cable stowage attachment (5).
- c. Towing pintle (6).

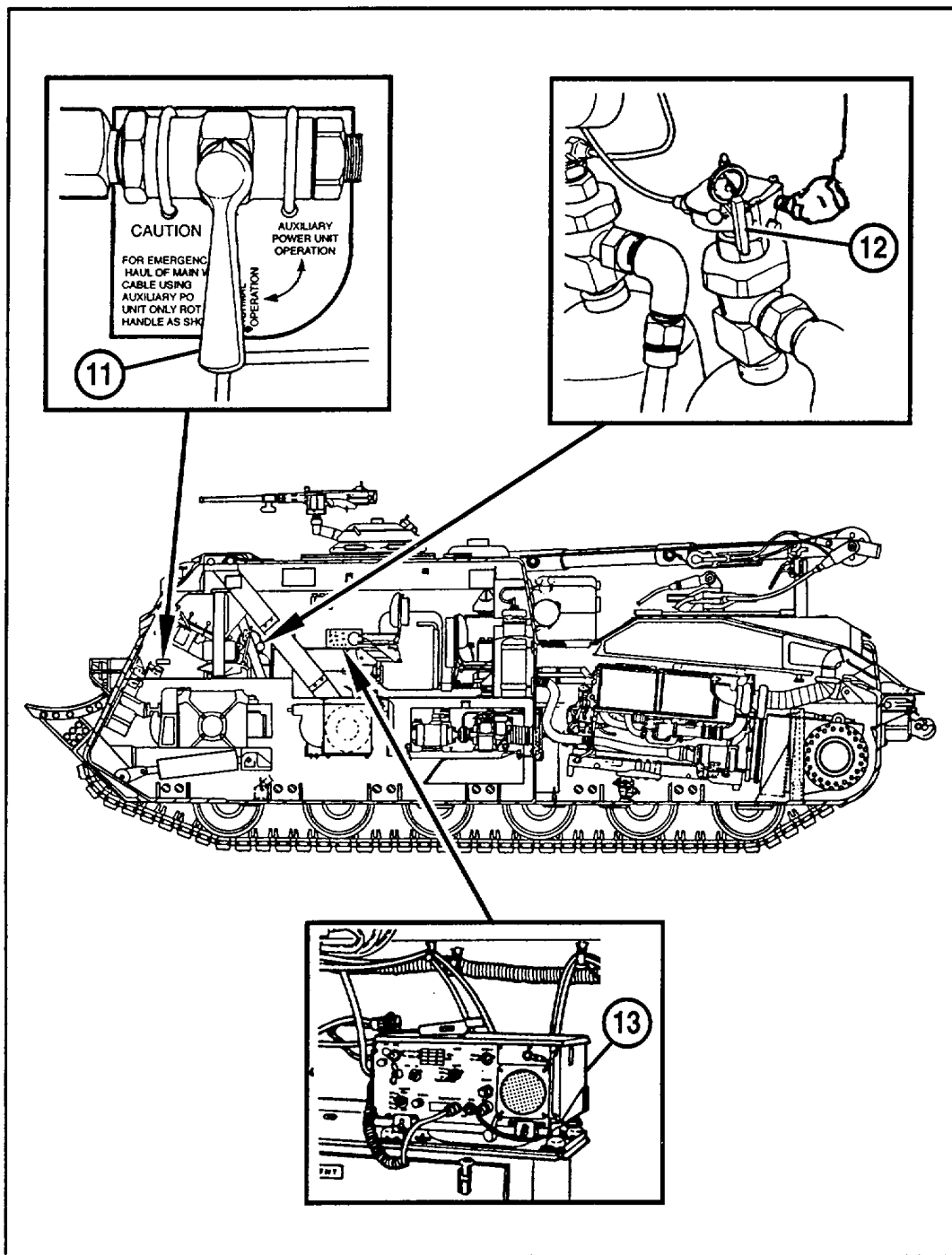


- d. M24 or M24A1 periscope (7).
- e. AN/VVS-2(V)1A (8).
- f. Fixed fire extinguisher outside pull handles (9).
- g. Left side stowage compartment door (10).

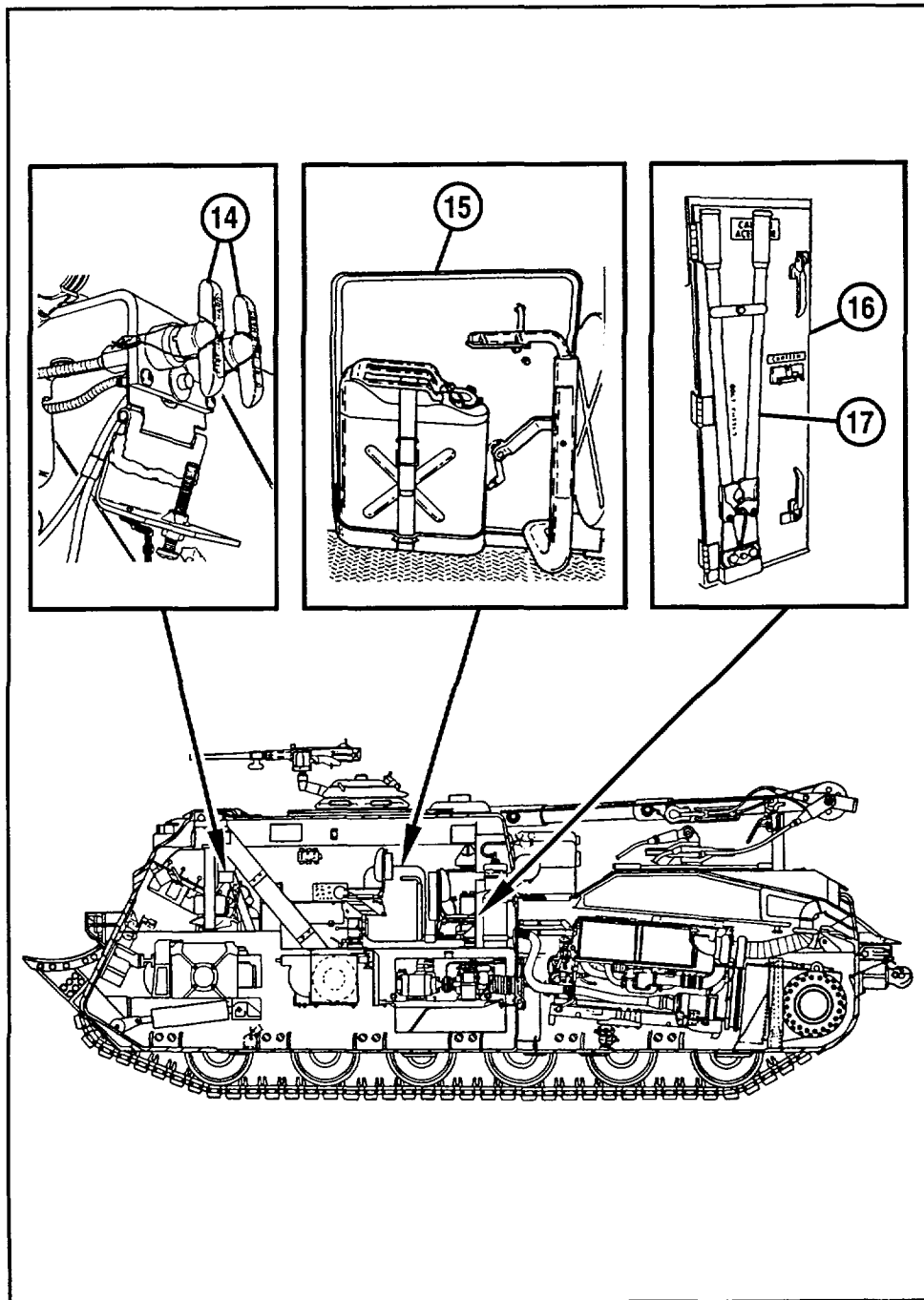


2-5. GENERAL VEHICLE CONTROLS-Continued.

- h. APU emergency winch control valve (11).
- i. Fixed fire extinguisher cylinder control lever (12) (one on rear cylinder of each bank).
- j. Radio communications set (13).

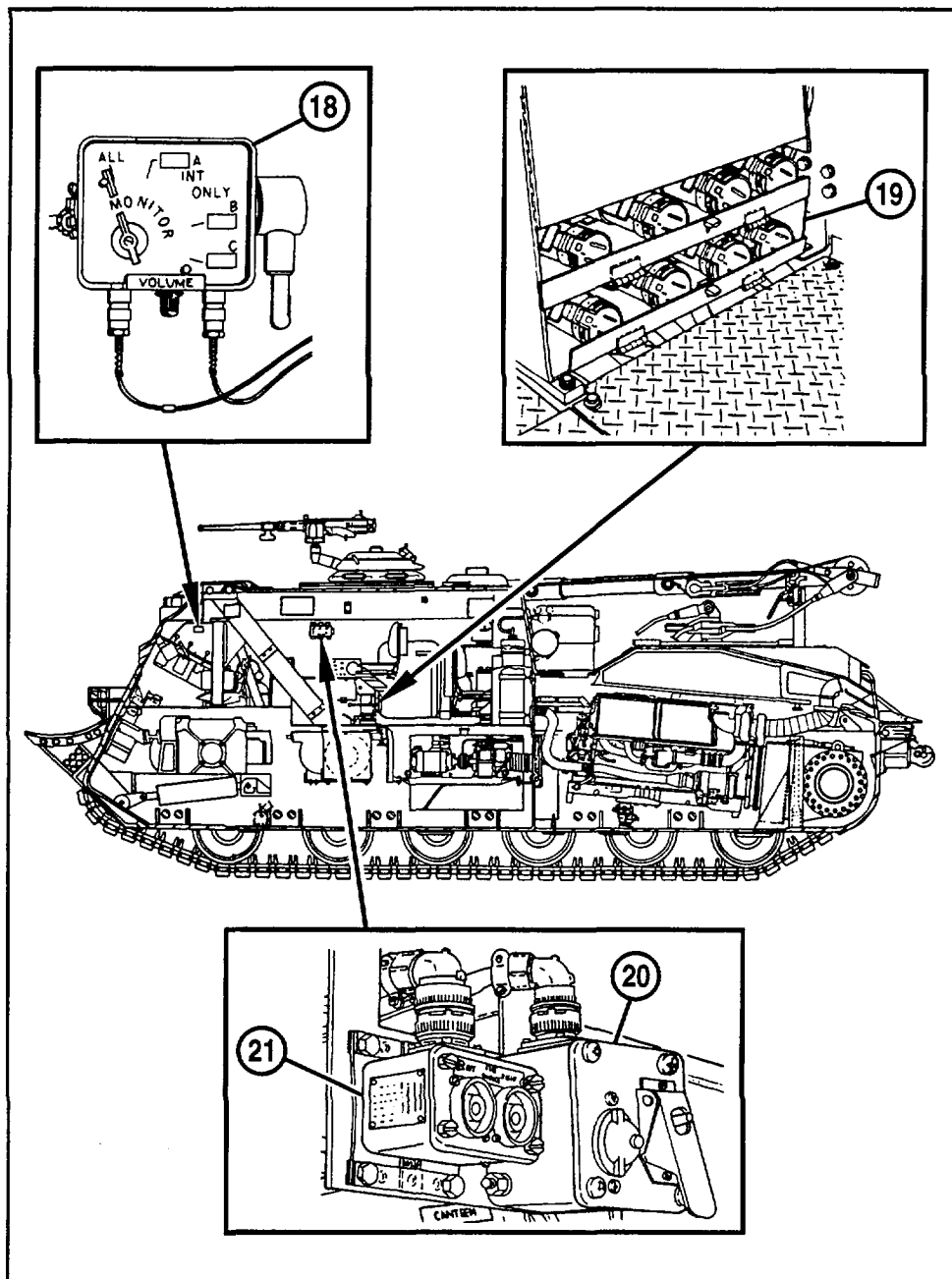


- k. Left wall fixed fire extinguisher pull handles (14).
- l. Right side personnel door (15).
- m. Acetylene compartment door (16) and bolt cutter (17).



2-5. GENERAL VEHICLE CONTROLS-Continued.

- n. Interphone control box (18) (four in crew compartment).
- o. LAW rocket stowage trays (19).
- p. M239 smoke grenade arming box (20) and push button unit (21).

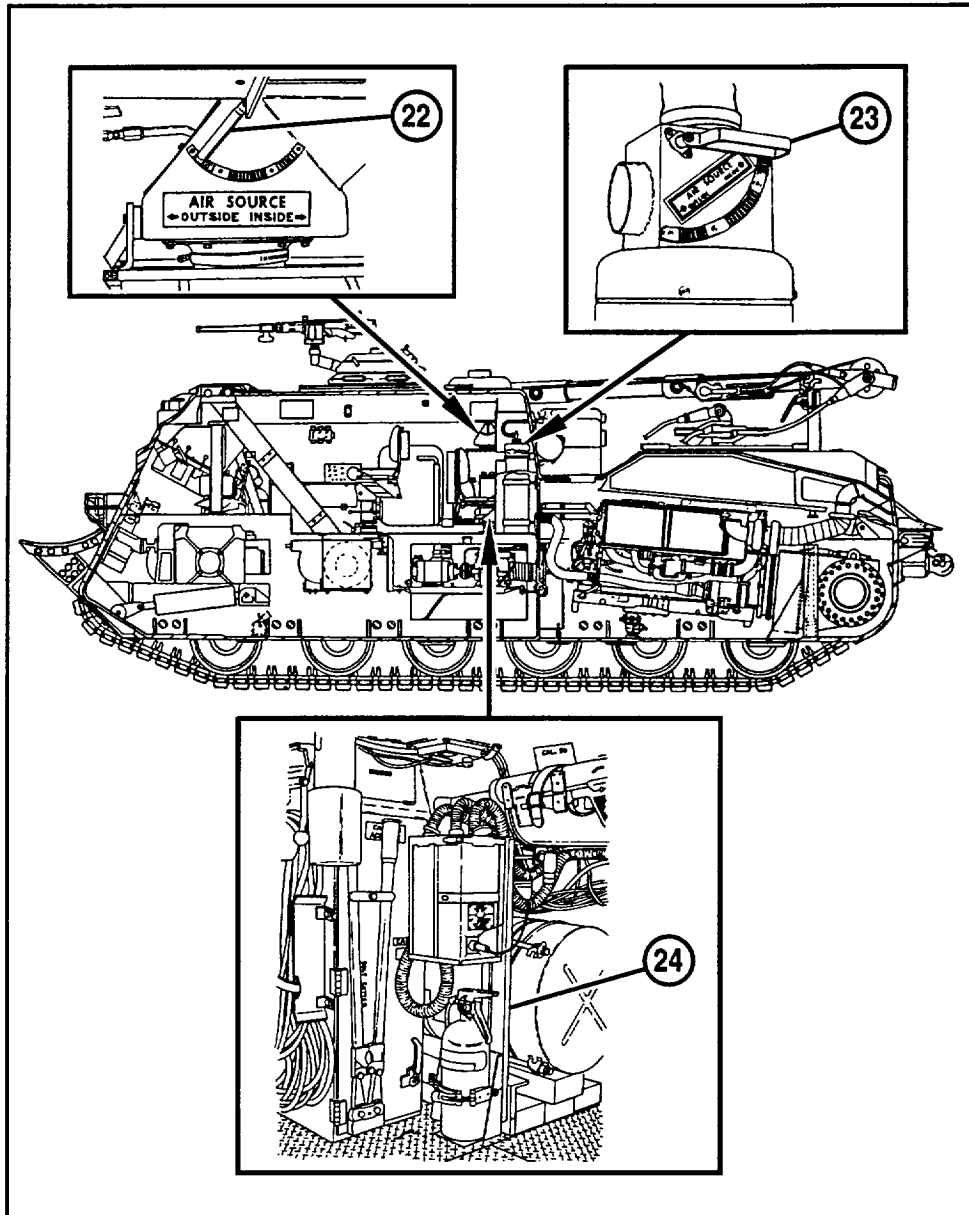


- q. Air cleaner air control handle (22).

**NOTE**

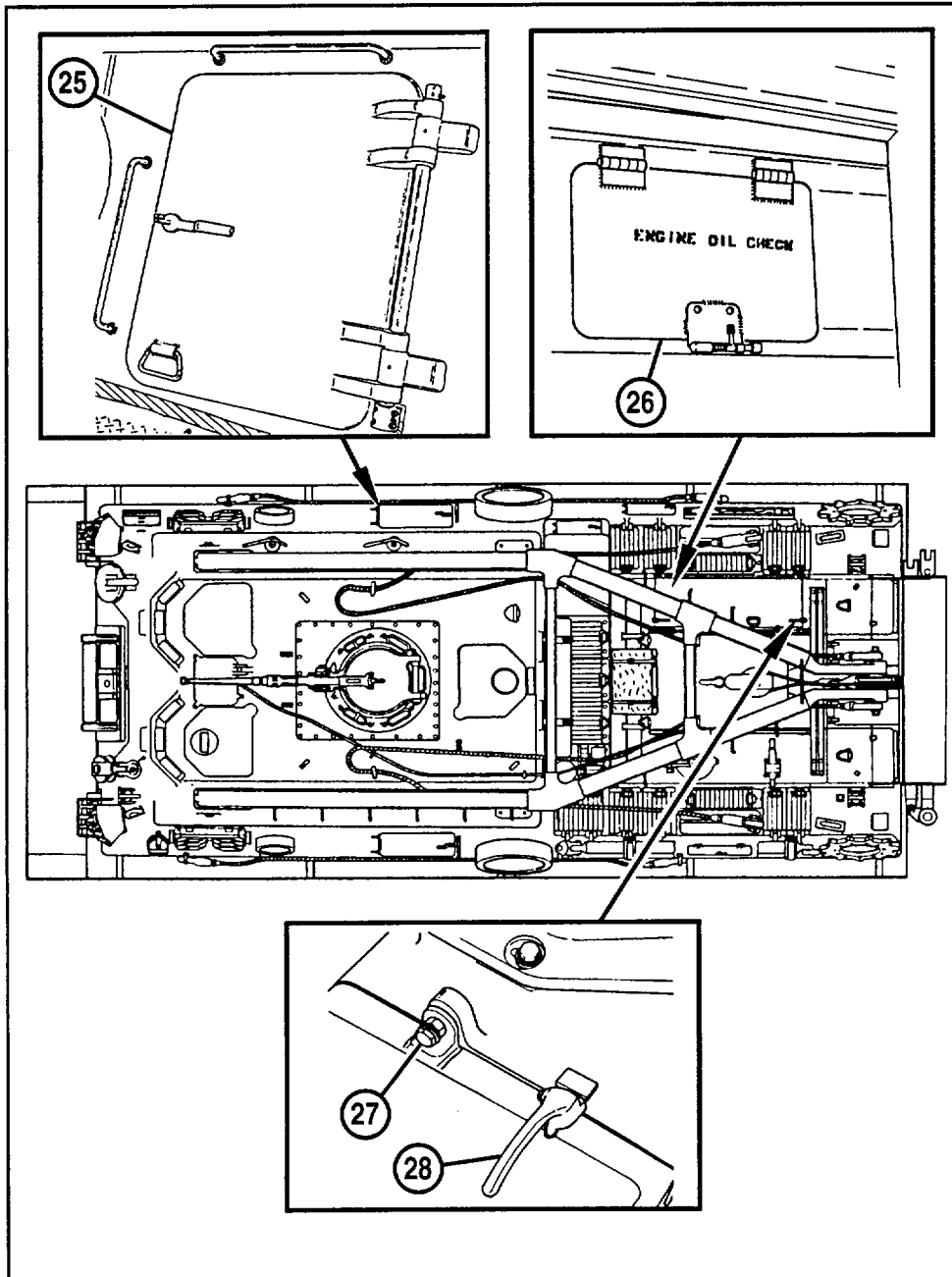
**Later optional heater design does not include an air control handle assembly.**

- r. Personnel heater air control handle (23).
- s. Hinge and bracket assembly for portable fire extinguisher and GPFU (24).

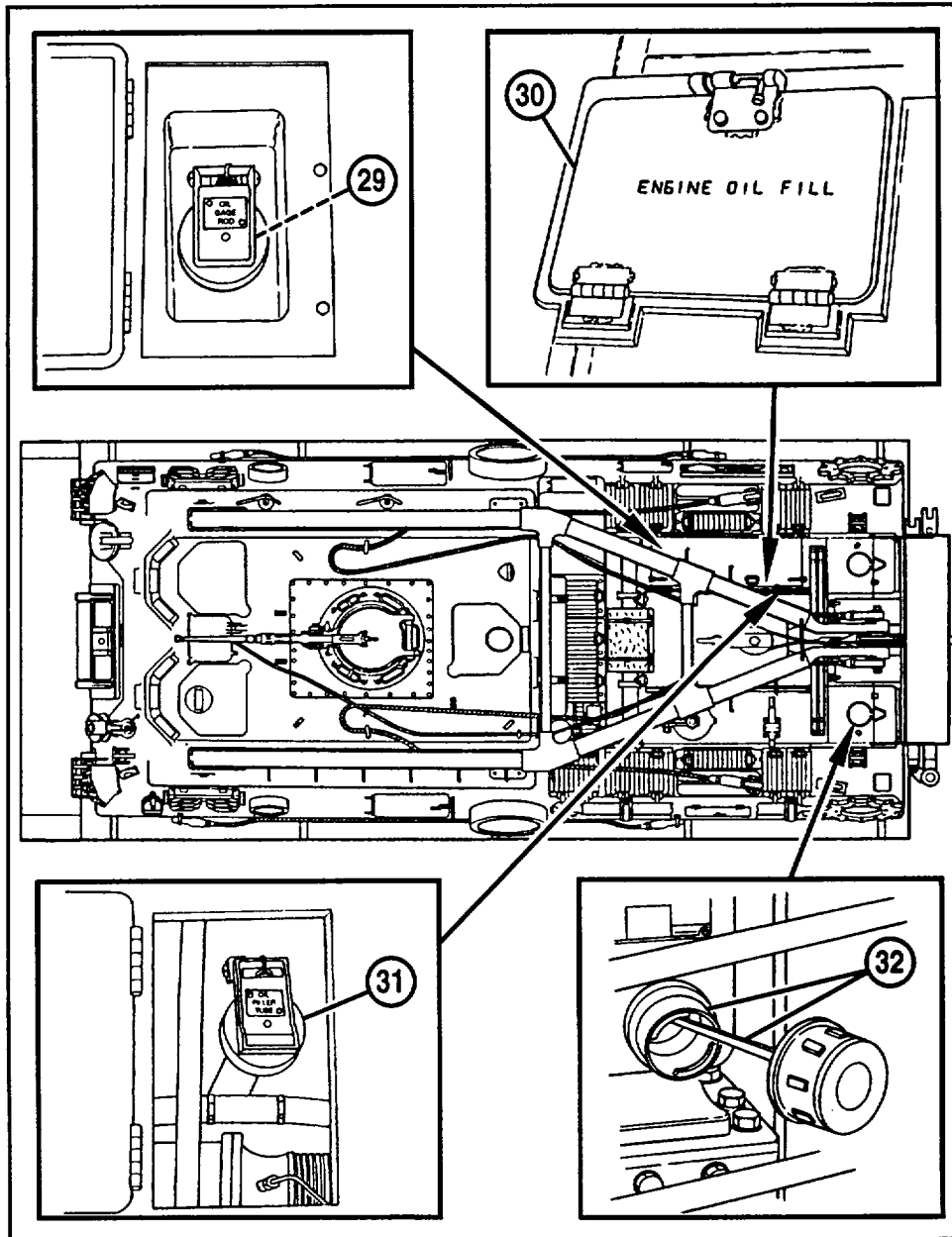


2-5. GENERAL VEHICLE CONTROLS-Continued.

- t. Right side personnel door (25).
- u. ENGINE OIL CHECK access door (26) (under engine deck door).
- v. Engine deck door secure bolt (27) and latch (28).



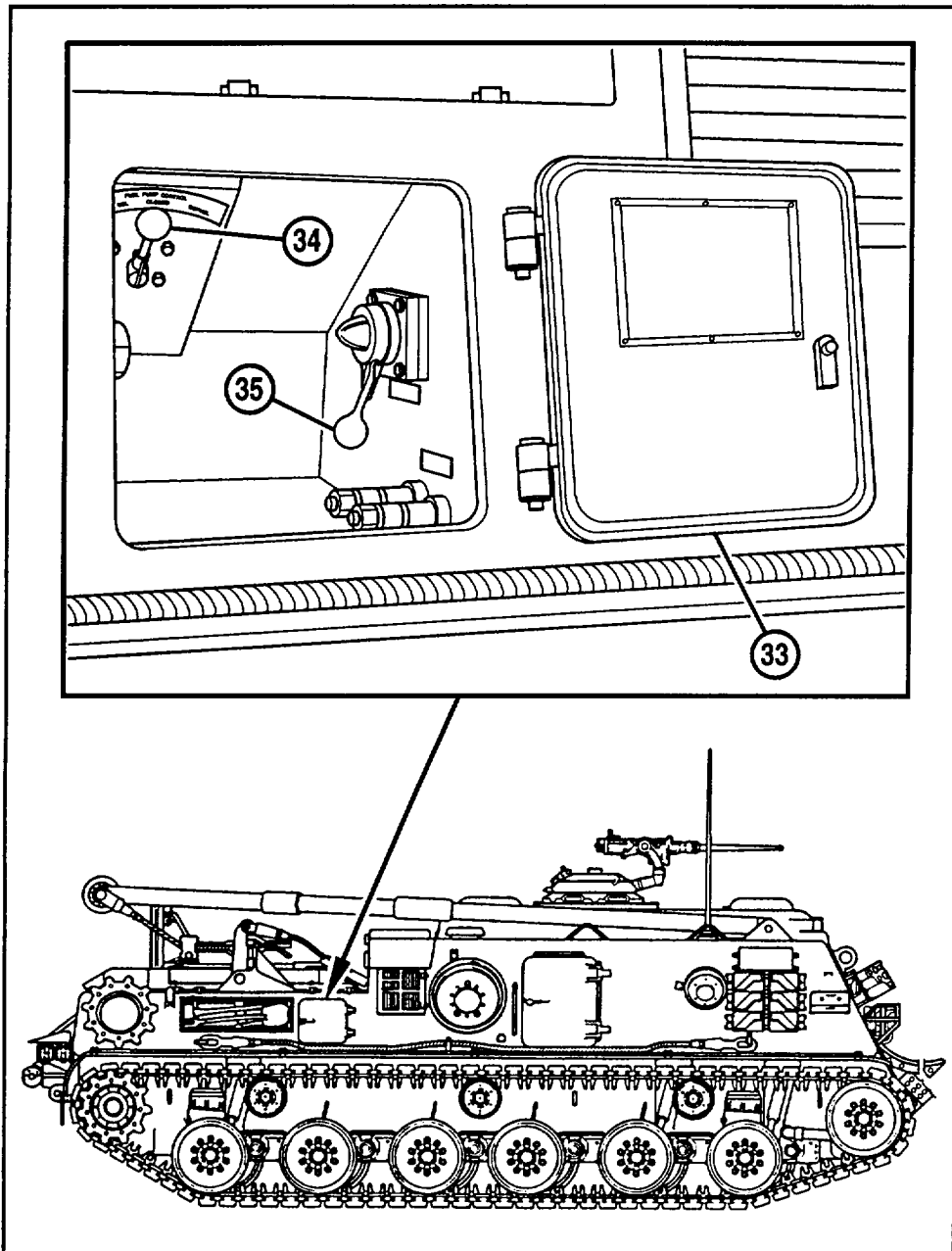
- w. Engine OIL GAGE ROD (29) (under ENGINE OIL CHECK access door).
- x. ENGINE OIL FILL access door (30) (under engine deck door).
- y. Engine OIL FILLER TUBE (31) (under ENGINE OIL FILL access door).
- z. Transmission oil fill and level (32) (under rear engine deck grille exhaust deflector and grille).



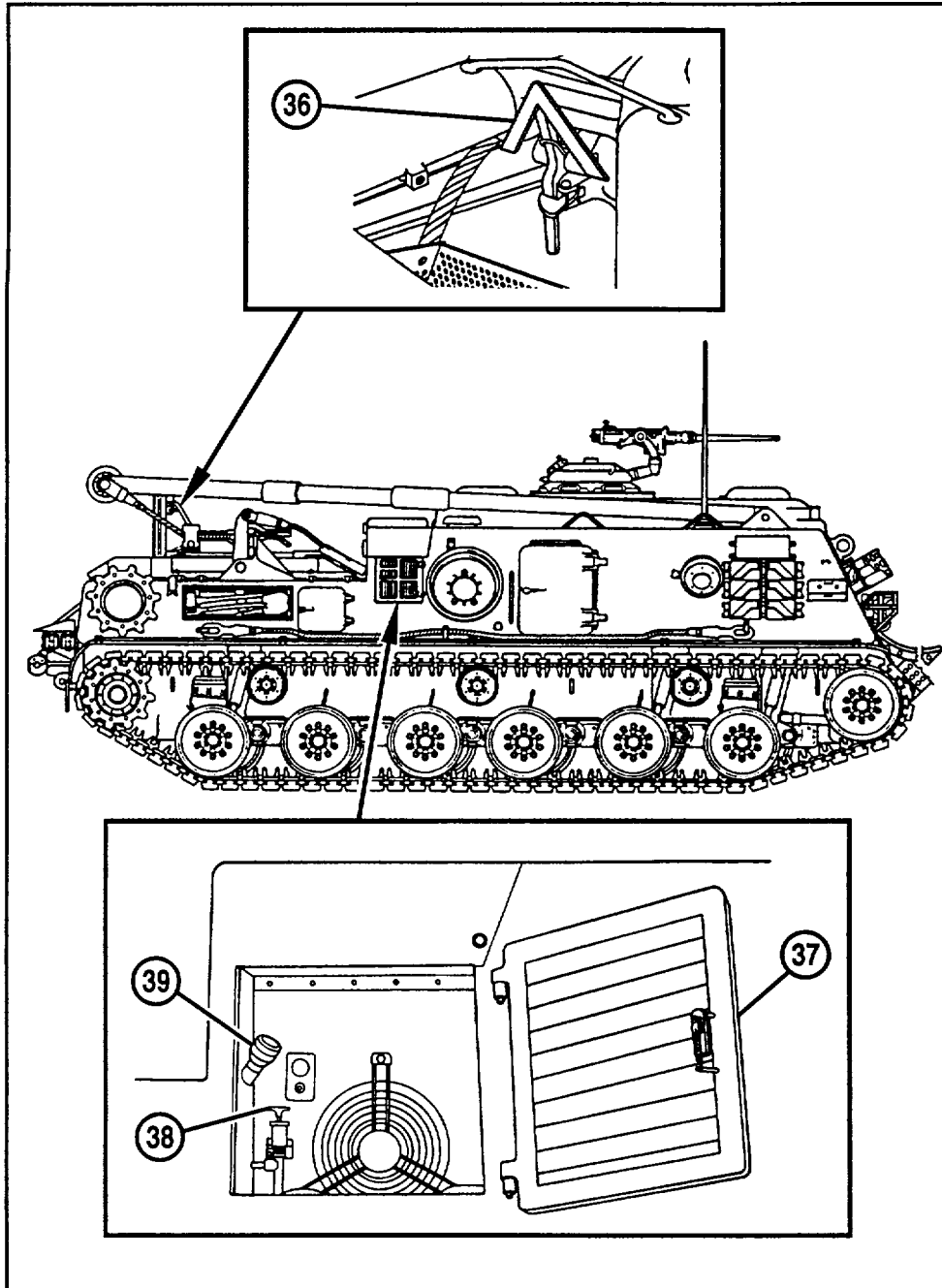


2-5. GENERAL VEHICLE CONTROLS-Continued.

- aa. Right side stowage compartment door (33) (control and regulator valves, hydraulic impact wrench, fuel transfer hose).
- ab. FUEL PUMP CONTROL handle (34).
- ac. Flow regulator handle (35).

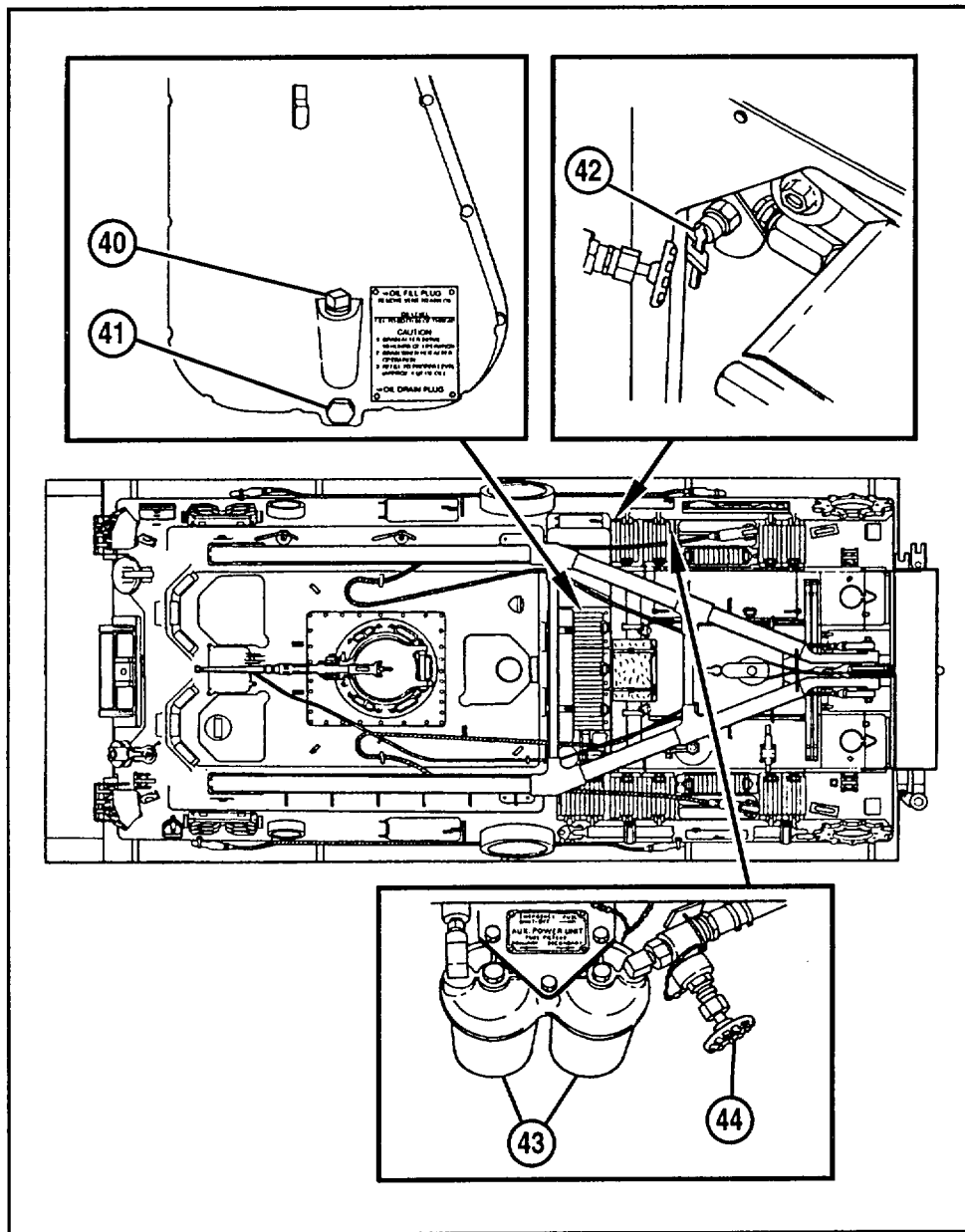


- ad. Boom latch (36).
- ae. APU compartment door (37).
- af. APU oil level gage (38) and filler tube (39).

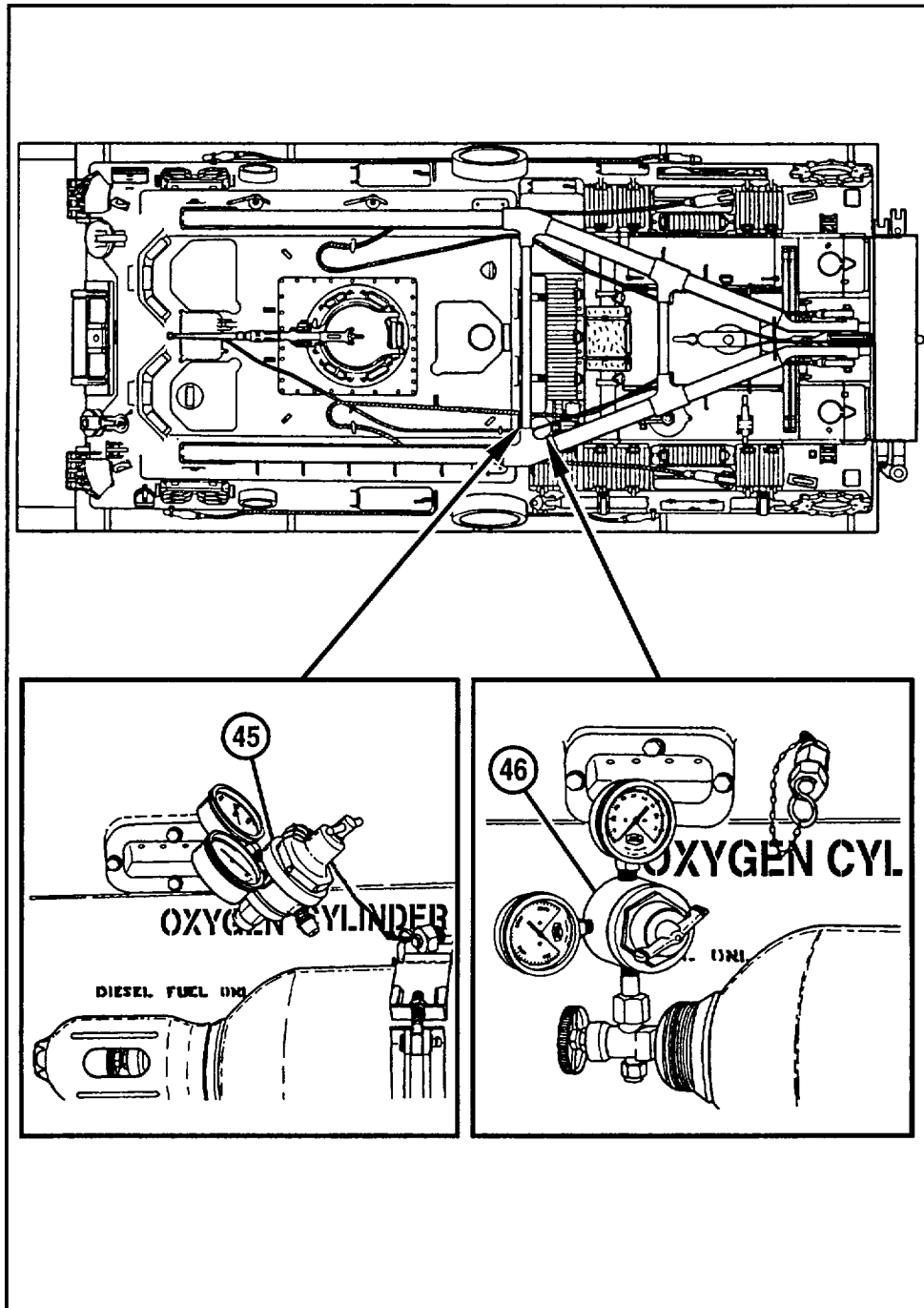


2-5. GENERAL VEHICLE CONTROLS-Continued.

- ag. APU chain case oil fill (40) and drain plug (41) (under front engine grille deck).
- ah. APU crankcase oil drain valve (42) (under engine deck grille).
- ai. APU fuel filters (43) and emergency fuel shutoff valve (44) (under engine deck grille).

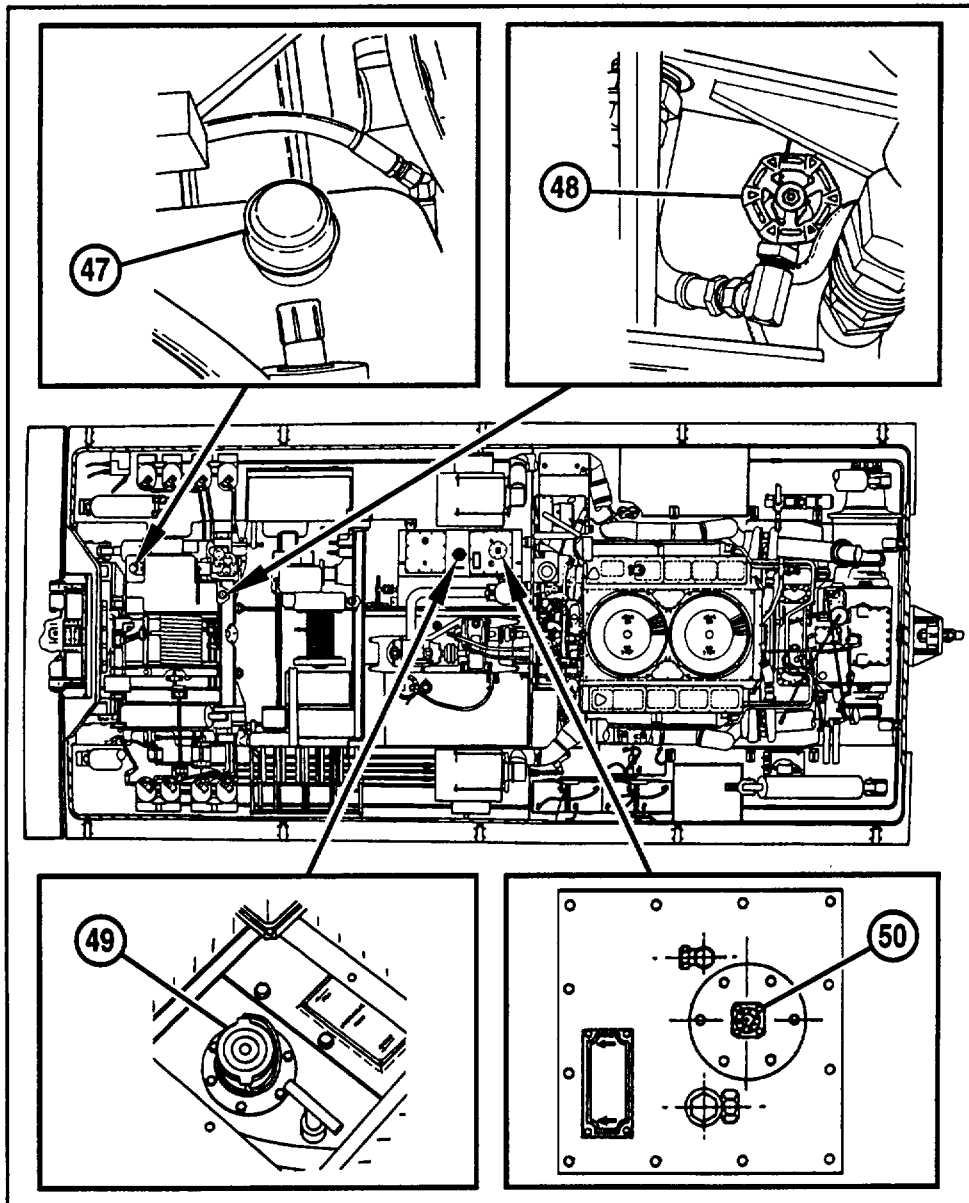


- aj. Acetylene regulator valve and gages (45) (stowed in compartment above acetylene cylinder).
- ak. Oxygen regulator valve and gages (46) (stowed in compartment above acetylene cylinder).

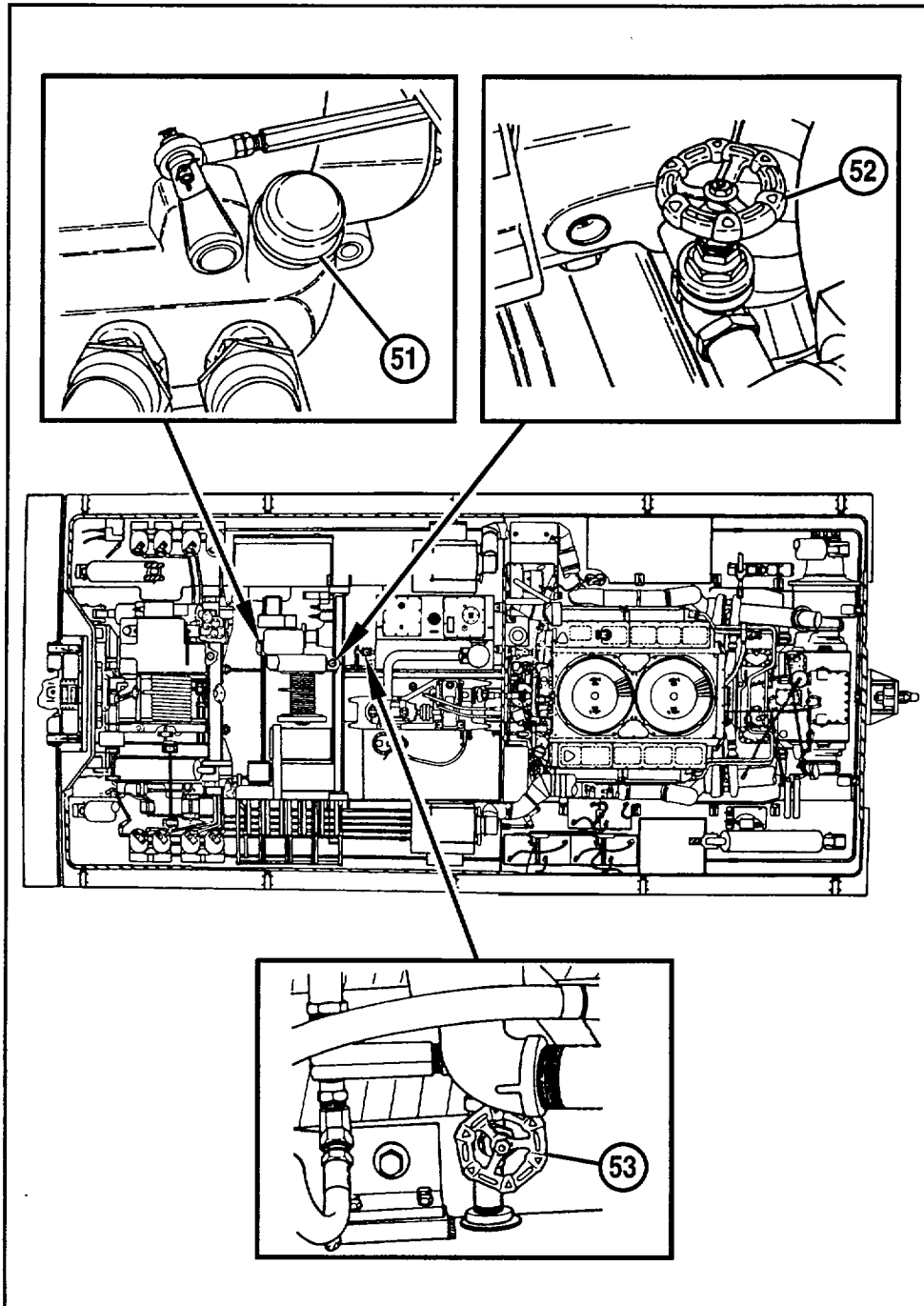


2-5. GENERAL VEHICLE CONTROLS-Continued.

- a. Main winch oil level indicator (47).
- am. Main winch oil drain valve (48).
- an. Hydraulic oil tank oil level indicator and fill (49).
- ao. Hydraulic oil high temperature switch and oil temperature transmitter (50).

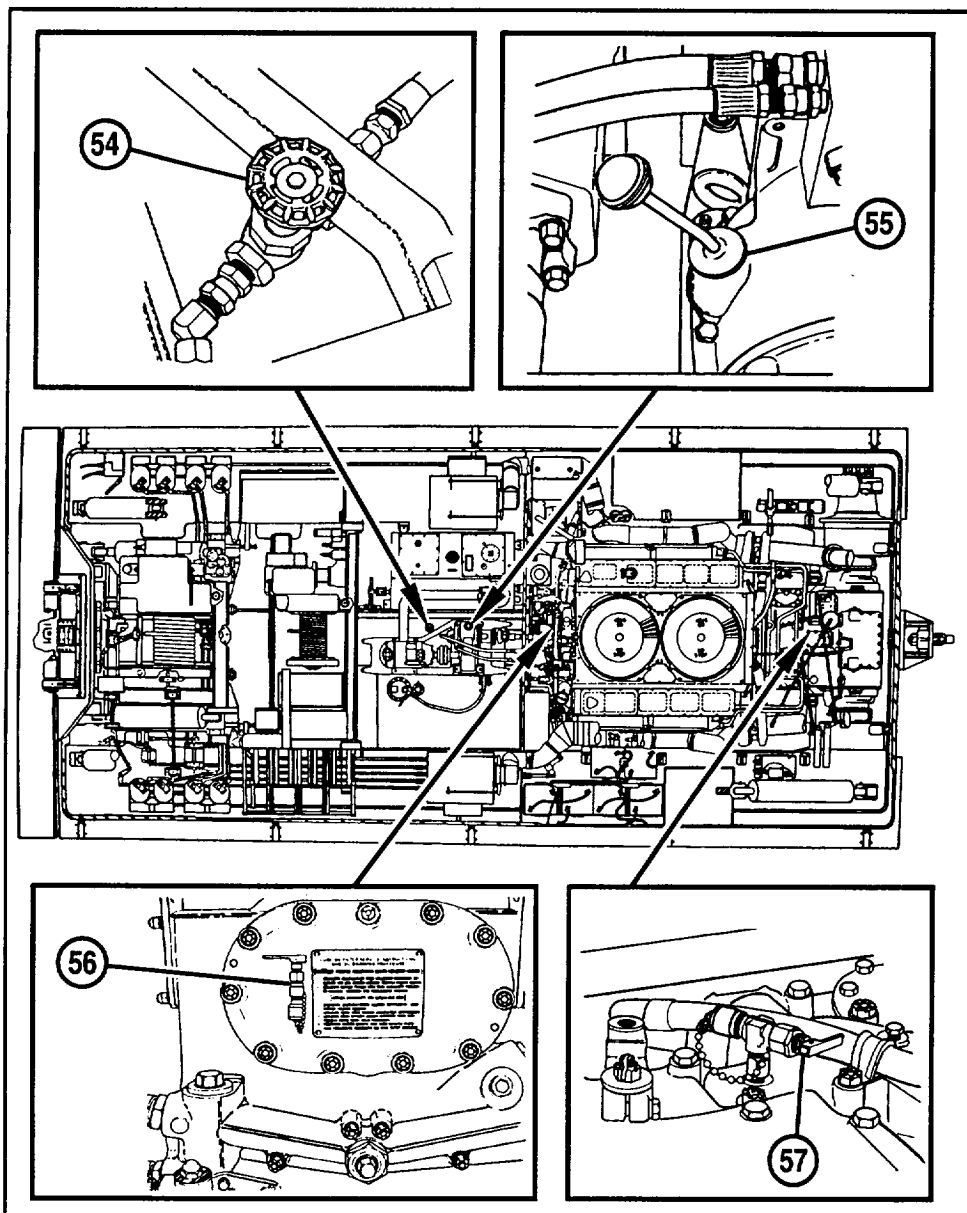


- ap. Hoist winch oil level indicator (51).
- aq. Hoist winch oil drain valve (52).
- ar. Hydraulic oil tank drain valve (53).



2-5. GENERAL VEHICLE CONTROLS-Continued.

- as. Mechanical transmission oil drain valve (54).
- at. Mechanical transmission oil level indicator and fill (55).
- au. Engine oil sampling valve (56) (on main engine oil filter cover).
- av. Transmission oil sampling valve (57) (on transmission converter-in pressure port).

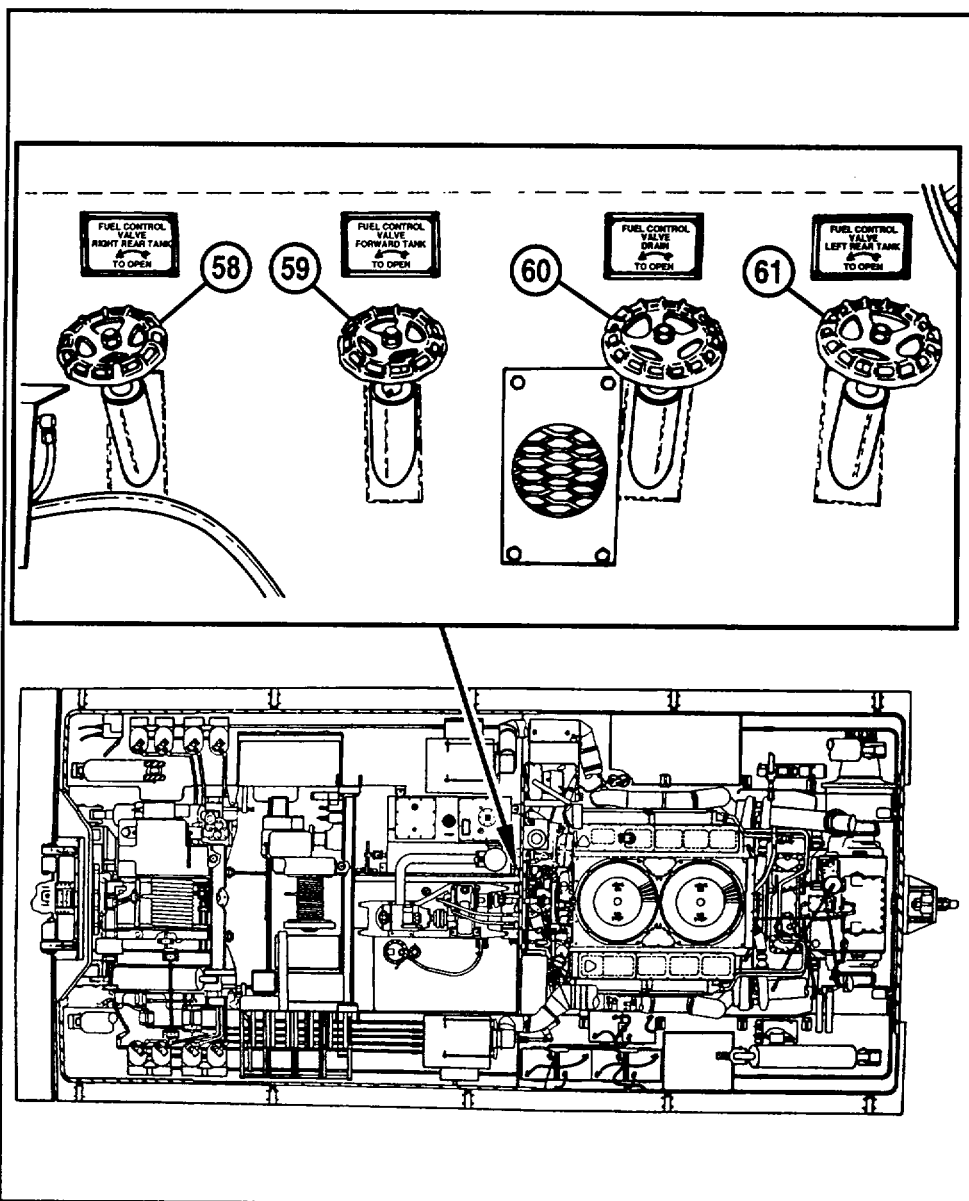


- aw. FUEL CONTROL VALVE, RIGHT REAR TANK (58).
- ax. FUEL CONTROL VALVE, FORWARD TANK (59).
- ay. FUEL CONTROL VALVE, DRAIN (60).

**CAUTION**

Before operating vehicle FUEL CONTROL VALVE, FORWARD TANK must be closed.

- az. FUEL CONTROL VALVE, LEFT REAR TANK (61).

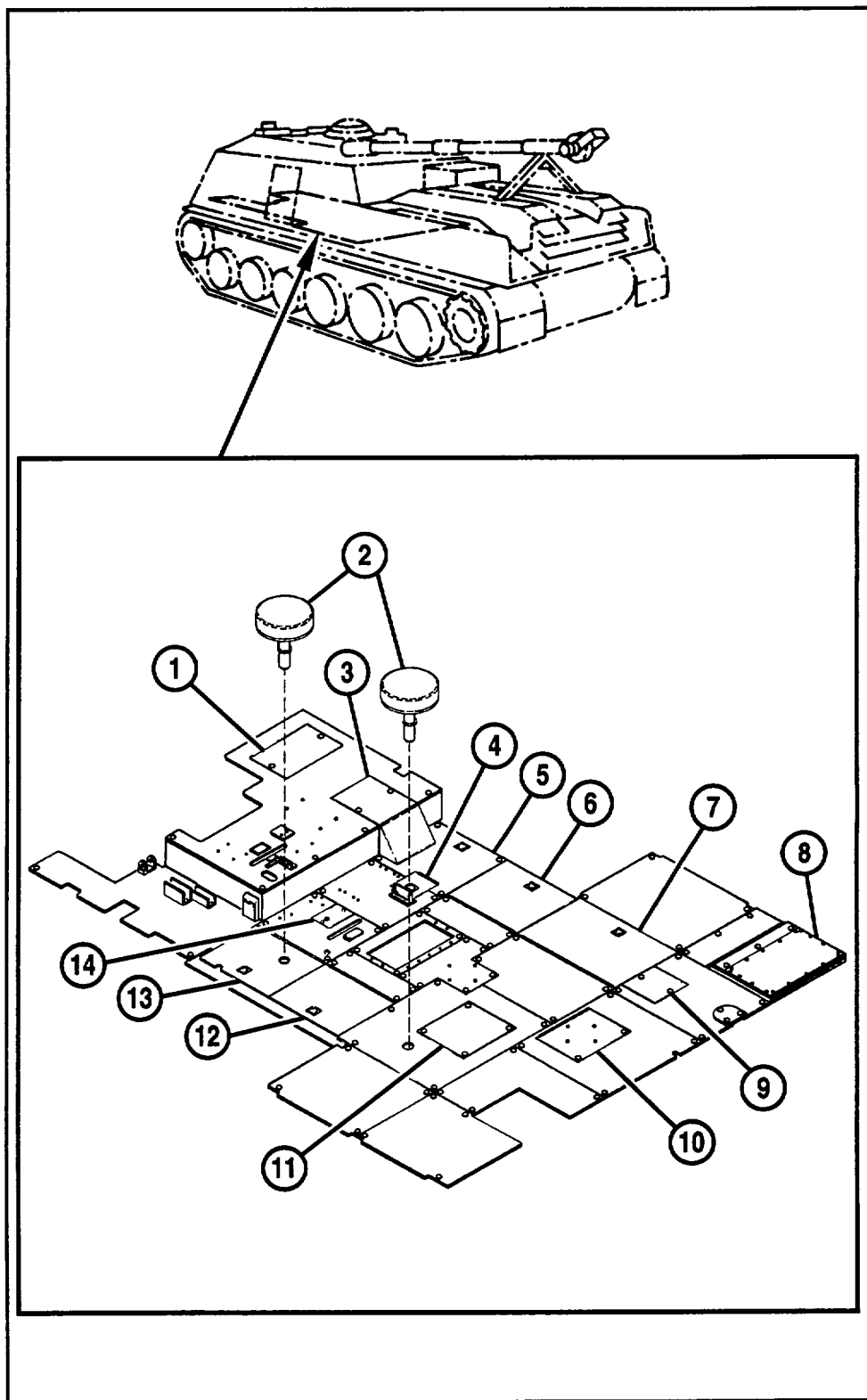




**2-6. CREW COMPARTMENT FLOOR ACCESS PLATES AND DOORS.****NOTE**

**The floor of the crew compartment is made up of separate plates and doors. They may be removed for access to the equipment and controls located below them.**

- a. Main winch fill and level access plate (1).
- b. Two personnel seats (2).
- c. Hydraulic hose connection access plates (3).
- d. Hoist winch fill and level, main winch drain valve access door (4).
- e. Hydraulic hose connection access plate (5).
- f. Hoist winch drain valve access door (6).
- g. Hydraulic oil tank drain access door (7).
- h. Hydraulic connections access door (8).
- i. Hydraulic oil tank fill and oil level indicator access plate (9).
- j. Hydraulic filter gage, mechanical fill level indicator, and drain valve access door (10).
- k. Fuel level sending unit and fuel pump access door (11).
- l. Vehicle jack and utility chain storage access door (12).
- m. Track fixtures, track components, and bilge pump stowage access door (13).
- n. Winch compartment light mount plate (14).



## Section II. PMCS

### 2-7. INTRODUCTION TO PMCS TABLE.

- a. **Maintenance Forms and Records.** Every mission begins and ends with the paperwork. There is not much of it, but it must be kept up. The forms and records filled out have several uses. They are a permanent record of the services, repairs, and modifications made on the vehicle. They are reports to unit maintenance and to your commander. And they are a checklist to determine what is wrong with the vehicle after its last use, and whether those faults have been fixed. For the information needed on forms and records, see DA PAM 738-750.
- b. **General.** Table 2-1 has been provided to assist in keeping the equipment in good operating condition.
- c. **PMCS Procedures.**
  - (1) Item No. Column. Numbers in this column are for reference. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the check or service indicating a fault. Item numbers also appear in the order that the checks and services must be done for the intervals listed.
  - (2) Interval Column. This column tells when to do a certain check or service. BEFORE procedures must be done before operating or using the equipment for its intended mission. DURING procedures must be done during the time of operation or using the equipment for its intended mission. AFTER procedures must be done immediately after operating or using the equipment.
  - (3) Location, Item to Check/Service Column. This column provides the location and the item to be checked or serviced.
  - (4) Crewmember/Procedure Column. This column provides the procedure that must be performed to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or operation. The procedure must be done at the time stated in the Interval column.
  - (5) Not Fully Mission Capable If: Column. Information in this column tells what faults will keep the equipment from being capable of performing its primary mission. If you make check/service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

d. **Other Table Entries.** Observe all special information, warnings, cautions, and notes that appear in the table.

e. **Guidelines to Keep in Mind While Performing PMCS.**

- (1) If something does not work, troubleshoot it with the instructions in this manual and notify your supervisor.
- (2) Always do the PMCS in the same order so it gets to be a habit. Once you have had some practice, you will spot anything wrong in a hurry.
- (3) If anything looks wrong and you cannot fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to unit maintenance right now.
- (4) When doing the PMCS, take along the tools needed for the checks and a rag or two (Appx. D, item 40).

**WARNING**

**P-D-680 type II dry-cleaning solvent is hazardous to health. Wear protective clothing and eye protection when using. Do not expose to high temperatures over 130°F (55°C). Use only in a well-ventilated area.**

- (5) Keep it clean-Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean while working and as needed. Use dry-cleaning solvent (SD-2) (Appx. D, item 16) on all metal surfaces. Use soap and water when you clean rubber or plastic material.
- (6) Bolts, nuts, and screws-Check them all for obvious looseness, missing, bent, or broken condition. You cannot try them all with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose tighten it, or report to unit maintenance if you cannot tighten it.
- (7) Welds-Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to unit maintenance.
- (8) Electric wires and connectors-Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure the wires are in good shape.

**2-7. INTRODUCTION TO PMCS TABLE-Continued.**

(9) Hoses and fluid lines-Look for wear, damage, and leaks and ensure clamps and fittings are tight. Wet spots show leaks, of course. But a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to unit maintenance.

- f. **Classification of Fluid Leaks.** It is necessary for you to know how fluid leakage affects the status of your vehicle. The following definitions of the types or classes of leaks you need to know to be able to determine the status of your vehicle. Learn, then be familiar with them and remember-when in doubt, notify your supervisor!

**CAUTION**

- **Equipment operation is allowable with minor leakages (class I or II). Of course, consideration must be given to the fluid capacity in the item or system being checked or inspected. When In doubt, notify your supervisor.**
- **When operating with class I or II leaks, continue to check fluid levels as required in PMCS.**
- **Class III leaks should be reported to your supervisor or to unit maintenance for corrective action.**

Class I	Seepage of fluid (as indicted 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 or inspected.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked or inspected.

Table 2-1. PMCS

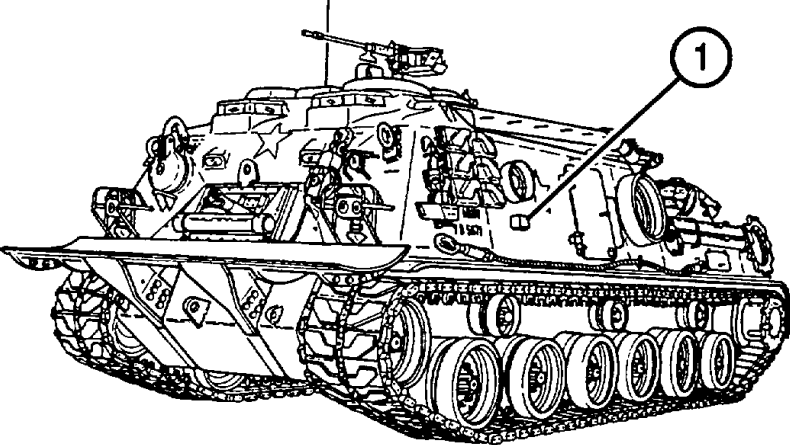
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
1	Before	Vehicle Exterior	<p><u>Driver</u></p> <p>Check under and around vehicle for leaks, damage, tampering, missing parts and components that would prevent vehicle and recovery operations.</p> <p><b>NOTE</b>  <b>Ensure drain valves are open (to remove water), then close.</b></p>	Any class III leak of fuel, oil, or hydraulic fluid. Any damage that would prevent operation.
2	Before	External Fire Extinguisher Handle	<p><u>Driver</u></p> <p>Visually inspect fire extinguisher (1) for lead seals and lockwires.</p>	Missing or broken seals or lockwires.
				
3	Before	Fixed Fire Extinguishers	<p><u>Driver</u></p> <p>a. Inspect pins, heads, connecting tubes, and controls for broken seals, tightness, and for serviceable condition.</p>	<p>a. Any seal broken or missing. Any fixed fire extinguisher cylinder missing or empty.</p>

Table 2-1. PMCS - Continued

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service		
3 Cont.	Before	Fixed Fire Extinguishers	<p><b>b.</b> Check that internal pull handles (1), lead seals (2), and lockwires (3) are not broken or missing.</p>	<p><b>b.</b> Any seal or lockwire broken or missing.</p>
4	Before	Portable Fire Extinguishers	<p><u>Commander</u></p> <p><b>WARNING</b> A fire can break out any time. Personnel could be killed or injured. Equipment could be damaged. Ensure both fire extinguishers are ready to use before operating vehicle.</p>	

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<ul style="list-style-type: none"> <li>a. Check portable fire extinguisher's control seals (1). Ensure seals or lockwires (2) are not broken.</li> <li>b. Check fire extinguishers for security of mounting hardware and missing hardware.</li> <li>c. Check for full charge.</li> </ul>	<ul style="list-style-type: none"> <li>a. Any fire extinguisher missing. Seal or lockwire missing or broken.</li> <li>c. Pressure gage indicates discharge or seal is broken. Extinguisher feels light or seal is broken, if no gage.</li> </ul>

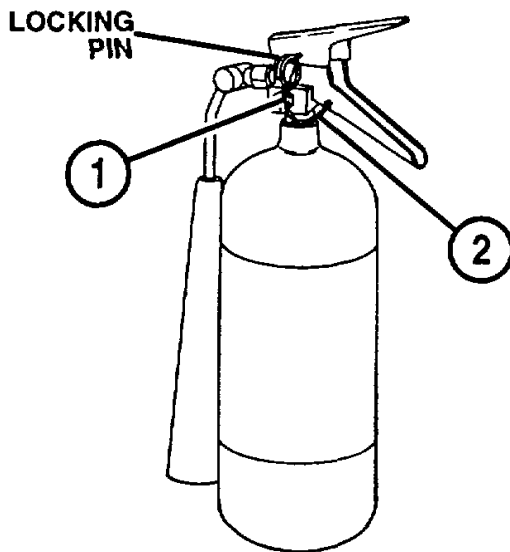




Table 2-1. PMCS-Continued.

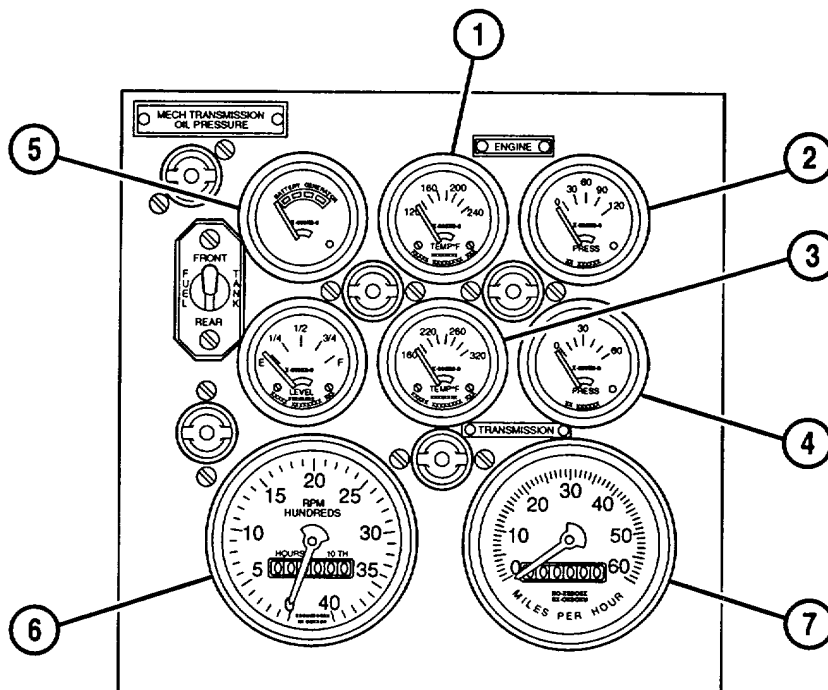
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
5	Before	Caliber .50 M2 Machine Gun	<p><u>Commander</u></p> <p><b>WARNING</b> Ensure machine gun is clear of ammo and barrel is free of obstructions.</p> <p>a. Check mounting of machine gun in mount.</p> <p>b. Check headspace and timing. For further PMCS refer to TM 9-1005-213-10.</p>	<p>a. Machine gun or mount missing or unserviceable.</p> <p>b. Fault listed in "Not Fully Mission Capable If" column of machine gun TM.</p>
6	Before	Carrier Communi- cations Equipment Radio	<p><u>Driver/Commander</u></p> <p>a. Check radio equipment for proper condition. Refer to TM 11-5820-498-12 and/or TM 11-5820-401-10-2, as needed. Refer to TM 11-5965-286-14 for headset microphone.</p> <p>b. Check intercom system for proper operation.</p>	<p>a. Fault listed in "Not Fully Mission Capable If" column of radio TM. Radio will not transmit and receive.</p> <p>b. No intercom between commander and driver.</p>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
7	Before	Driver's Instrument Panel	<p><u>Driver</u></p> <p><b>NOTE</b> Master warning light and horn come on when:</p> <ul style="list-style-type: none"> <li>· Engine oil temperature reaches 245 ± 5°F (118 ± 3°C).</li> <li>· Engine oil pressure is less than 13 psi (90 kPa) at start and less than 9 psi (62 kPa) when running.</li> <li>· Transmission oil temperature reaches 285°F (140°C).</li> <li>· Mechanical transmission warning light comes on when oil pressure is 4 psi (28 kPa) or less.</li> </ul> <p>a. Start engine. Observe tachometer, ENGINE oil pressure, ENGINE oil temperature, TRANSMISSION oil pressure, and TRANSMISSION oil temperature gages.</p>	<p>a. Any gage missing or tachometer gage excessively fluctuates. ENGINE oil pressure gage, ENGINE oil temperature gage, TRANSMISSION oil pressure gage, or TRANSMISSION oil Temperature gage inoperative.</p>

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
7 Cont.	Before	Driver's Instrument Panel	<p><b>b.</b> Observe normal readings and operation of gages and warning lights.</p> <p><b>c.</b> Check ENGINE oil temperature gage (1). Normal temperature range 140 to 240°F (60 to 115°C).</p> <p><b>d.</b> Check ENGINE oil pressure gage (2). Normal pressure 40 to 70 psi (276 to 483 kPa) at 2400 rpm, 180°F (82°C) oil temperature.</p> <p><b>e.</b> Check TRANSMISSION oil temperature gage (3). Normal operating range 160 to 280°F (71 to 138°C).</p> <p><b>f.</b> Check TRANSMISSION oil pressure gage (4). Normal pressure 15 to 19 psi (103 to 131 kPa).</p> <p><b>g.</b> Check battery-generator indicator (5). Normal reading green zone for generator; yellow for battery.</p> <p><b>h.</b> Check tachometer (6) and speedometer (7). Both should operate normally without excessive fluctuations or unusual noise.</p>	<p><b>c.</b> Operating above 240°F (115°C).</p> <p><b>d.</b> Pressure reads below 40 psi (276 kPa) or above 70 psi (483 kPa).</p> <p><b>e.</b> Indicator remains in red with the main engine running.</p> <p><b>f.</b> Pressure reads below 15 psi (103 kPa) or above 19 psi (131 kPa).</p> <p><b>g.</b> Indicator remains in red with main engine running.</p> <p><b>h.</b> Tachometer not operating.</p>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	



8

Before

Generator Blower

Commander

With engine running, hold a hand up to generator blower air intake grille. Feel for suction.

No suction can be felt.

9

Before

Brake

Driver

- a. Check brakes for ability to hold vehicle on inclines.
- b. With vehicle in park (P), move steering wheel back and forth and ensure parking brake does not release.

- a. Brakes are inoperative.
- b. Parking brake releases.

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
9 Cont	Before	Brake	<p>c. With vehicle in P, visually check that steering column collar recesses properly.</p> <p>d. Shift vehicle out of P and ensure steering lock releases.</p>	<p>c. Parking brake does not engage</p> <p>d. Steering lock does not release.</p>
10	During	Controls, Steershift, Accelerator and Brake	<p><u>Driver</u></p> <p><b>CAUTION</b>  <b>Vehicle must be brought to a complete stop before shifting from driving gears (1st, 2nd, or 3rd) range to reverse (R).</b></p> <p>Inspect and operate controls. Note any binding or excessive play in linkage during vehicle operation.</p>	<p>Performance or function results in abnormal operation.</p>
11	During	Main Hydraulic System, Boom, Hoist Winch, and Main Winch	<p><u>Driver</u></p> <p>During operation check for any unusual noise or vibration. Check for jerking (chatter) of hoist winch during pay-out of line.</p>	<p>Hydraulic system inoperative. Improper performance or function, class III oil leaks, winch or boom inoperative. Any item missing or unserviceable.</p>

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
12	During	Air Cleaners	<p><u>Commander</u></p> <p><b>WARNING</b> If Nuclear, Biological, and Chemical (NBC) exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC Non-Commissioned Officer (NCO) for appropriate handling or disposal instructions.</p> <p>Observe restriction gage (1). When color changes to red, clean or replace filter element. Reset restriction gage.</p>	Restriction gage remains in red after being reset or unserviceable.

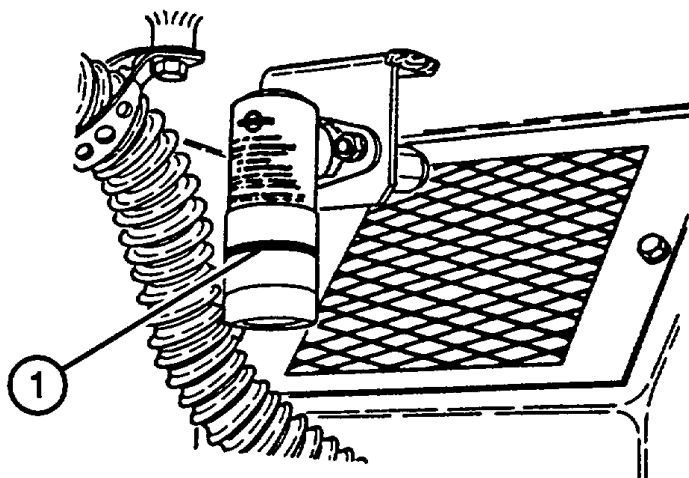
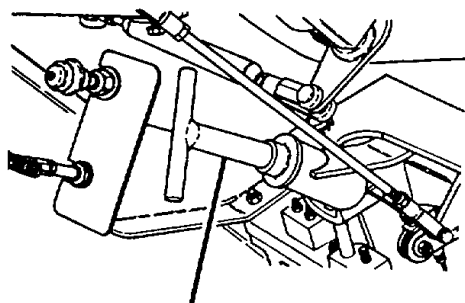
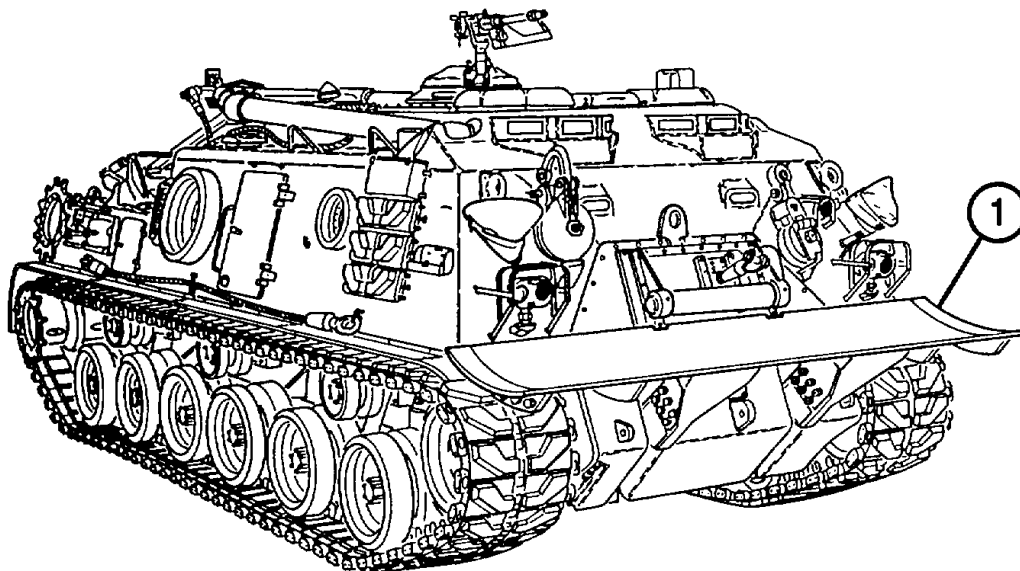
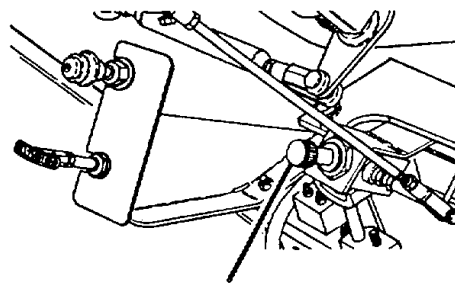


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service		
13	After	Spade	<p><u>Driver</u></p> <p>a. Raise and lower spade (1) to determine function and to detect binding at pivot points.</p> <p>b. Operate spade release handle to determine locking function.</p>	<p>a. Will not raise or lower.</p> <p>b. Spade does not operate or will not lock in raised position.</p>



**MANUAL SPADE  
RELEASE HANDLE**



**HYDRAULIC SPADE  
RELEASE BUTTON**

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
14	After	Main Hydraulic System, Boom, Hoist Winch, and Main Winch	<p><u>Driver/Crewmember</u></p> <p><b>WARNING</b></p> <ul style="list-style-type: none"> <li>· To avoid injury, do not stand on top of vehicle while boom is being raised or lowered.</li> <li>· To avoid injury, do not stand on engine deck while operating boom. Boom support latch will guide hoist winch cable out of the path of retracting boom.</li> <li>· To avoid damage to the boom and hydraulic system, always keep boom in stowed (travel lock) position when not in use.</li> </ul> <p>a. Engage main hydraulic system to determine operation of controls, pumps, and hydraulic governor.</p>	<p>a. Hydraulic system inoperative. Improper performance or function, class III oil leaks; winch or boom damaged or inoperative. Any hydraulic components or lines missing or unserviceable.</p>



Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
14 Cont.	After	Main Hydraulic System, Boom, Hoist Winch, and Main Winch	<p><b>b.</b> Inspect all hoses and connections for leaks, ruptures, or other damaged conditions.</p> <p><b>c.</b> Visually inspect boom travel support for operation and condition.</p> <p><b>d.</b> Visually inspect boom, A-frame, stayline cables, rollers, cylinders, boom control levers, and sheaves for presence and condition.</p>	<p><b>b.</b> Any class III leak.</p> <p><b>d.</b> Boom A-frame bent or cracked.</p>
15	After	Air Cleaners	<p><u>Driver</u></p> <p><b>CAUTION</b> Do not drop or rap filter element to clean. Seals may be damaged.</p> <p><b>NOTE</b> For desert or extremely dusty operation, clean dust cover frequently and check restriction gage often for RED mark.</p> <p><b>a.</b> Empty dust cover (1) daily after operations.</p>	

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<p>b. Check for damaged and unserviceable components of air cleaner system.</p> <p>c. Check rubber gasket with cover.</p>	<p>b. Any holes or tears in air Induction tubes. Any missing hose or hose clamps. Air cleaner unserviceable.</p> <p>c. Rubber gasket ripped, tom, or missing.</p>
16	After	Engine Compartment	<p><u>Driver</u></p> <p>Check engine and transmission oil coolers for obstruction of airflow. Check area for leaks.</p>	Any class III oil leak.

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
17	After	Engine Oil Level (Engine Running)	<p><u>Driver</u></p> <p>a. Set parking brake and shift lever in P position. Start engine. Run engine at 1000 to 1200 rpm until engine temperature gage reads 140 to 240°F (60 to 116°C). Reduce engine idle to 675 to 725 rpm.</p> <p>b. Remove gage rod (dipstick) from tube. Wipe rod. Reinsert dipstick and remove. Add oil (Appx. D, item 27 or 28) as required to bring level up to FULL mark on rod.</p>	<p>a. Vehicle will start in gears other than P.</p> <p>b. Any class III oil leak.</p>
18	After	Transmission Oil Level (Engine Running)	<p><u>Driver</u></p> <p><b>WARNING</b> Transmission may be hot after operation. Use caution when reaching into engine/transmission compartments.</p> <p><b>NOTE</b> If vehicle has been operating for a period of time sufficient to warm oil to 180 to 200°F (82 to 93°C), oil level should be at or slightly above FULL mark due to the expansion of the oil.</p>	

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
19	After	Fuel Shut-Off Cable	<p>Stop engine. Wait 3 to 5 minutes then check oil level again. Add or drain oil (Appx. D, item 27 or 28) until oil level measures between ADD and FULL marks.</p> <p><u>Driver</u></p> <p>Check for proper operation.</p>	Fuel shutoff cable is broken or unserviceable.
20	After	Driver's Seat	<p><u>Driver</u></p> <p>Adjust driver's seat up and down using lever (1). Adjust seat forward and backward using lever (2). Ensure that seat moves smoothly and locks in desired position.</p>	Seat missing or will not adjust.

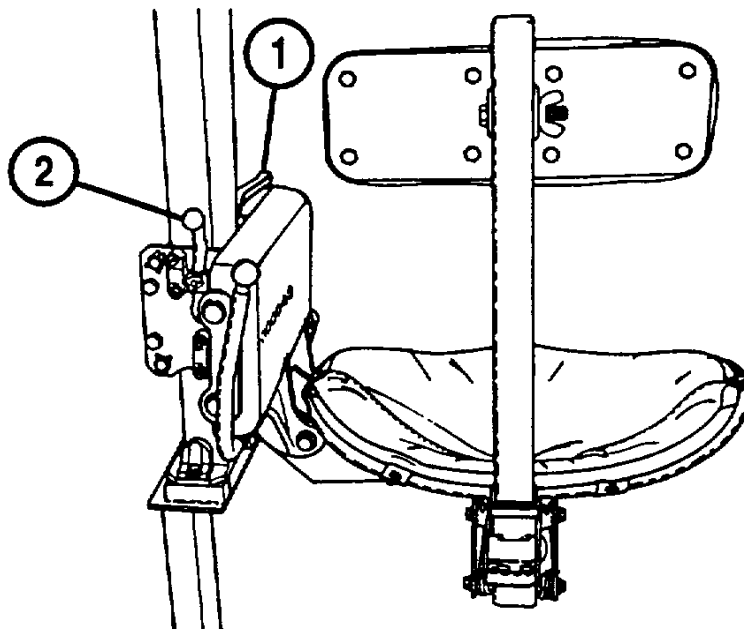
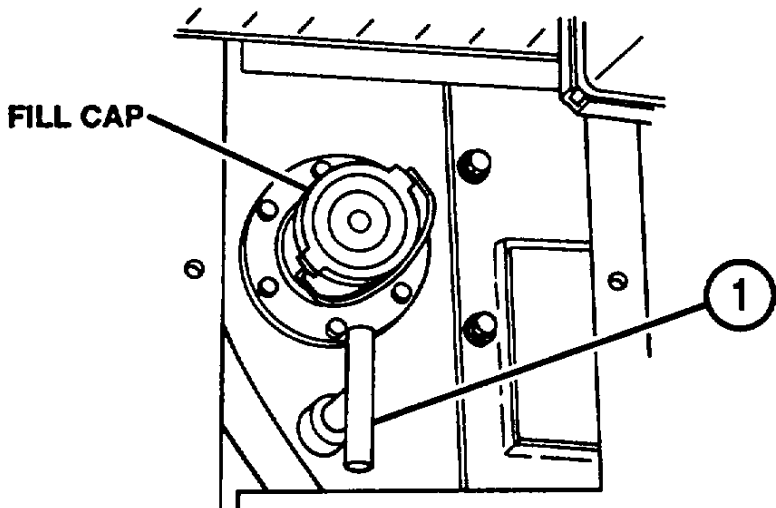
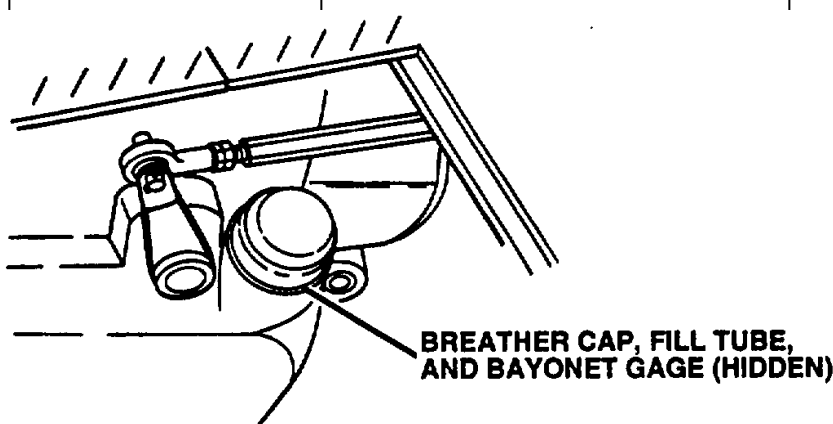


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
21	After	Hydraulic Reservoir Oil Level	<p><u>Commander</u></p> <p>Remove bayonet gage (1) and check that oil level in the reservoir is to the FULL mark.</p>	Any class III oil leak.
				
22	After	Hoist Winch Oil Level	<p><u>Commander</u></p> <p>Remove bayonet gage and check that oil level is to the FULL mark on gage.</p>	Any class III oil leak.
				

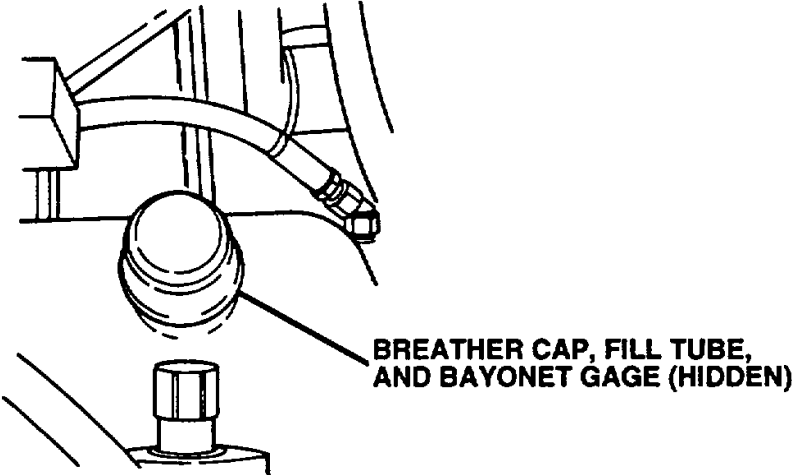
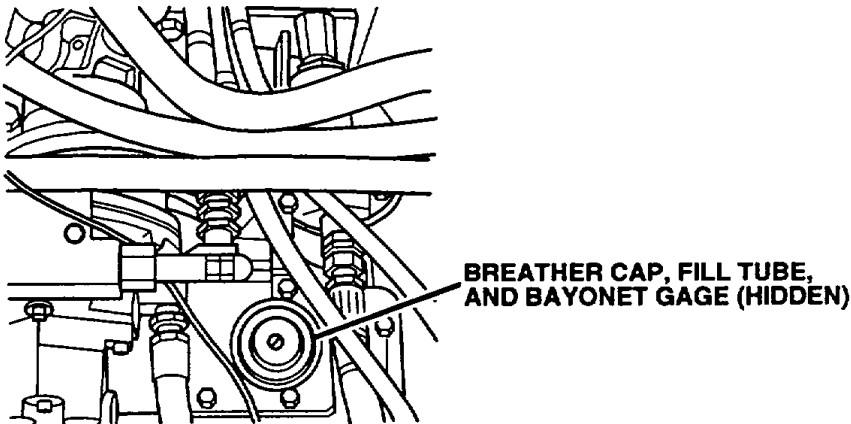
Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
23	After	Main Winch Oil Level	<p><u>Commander</u></p> <p>Remove breather cap and bayonet gage. Check that oil level is to the FULL mark on gage.</p>	Any class III oil leak.
				
24	After	Mechanical Transmission Oil Level	<p><u>Commander</u></p> <p>Remove fill cap and bayonet gage. Check that oil level is to the FULL mark on gage.</p>	Any class III oil leak.
				

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
25	After	Smoke Grenade Launcher Controls	<p><u>Commander</u></p> <p>a. Indicator light (1) comes on when arming switch (2) is set to ON.</p>	
		<p>b. Check electrical connector to launcher control for bent pins, frayed wires, tears, and any damage rendering cable unserviceable.</p> <p>c. Clean smoke grenade launcher tubes (3).</p>		

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
26	After	Cupola	<p><b>d.</b> Inspect launcher tubes. Ensure drain hole is free of obstruction.</p> <p><b>e.</b> During continued firing, clean tubes with cleaning compound (RBC) (Appx. D, item 8). Do not wipe dry or lubricate. Immediately after firing and on 2 consecutive days, thoroughly clean tubes with cleaning compound. Ensure all surfaces are well coated. Do not wipe dry. On third day after firing, clean tubes with cleaning compound. Wipe dry with clean cloth (Appx. D, item 40).</p> <p><u>Commander</u></p> <p><b>a.</b> Check that cupola lock restricts movement of the cupola. Release lock and test cupola for ease of movement.</p> <p><b>b.</b> Check operation of retard lock (brake drag).</p>	
27	After	Machine Gun Mount	<p><u>Commander</u></p> <p><b>WARNING</b>  <b>Ensure machine gun is clear of ammo and that barrel is free of obstructions.</b></p>	

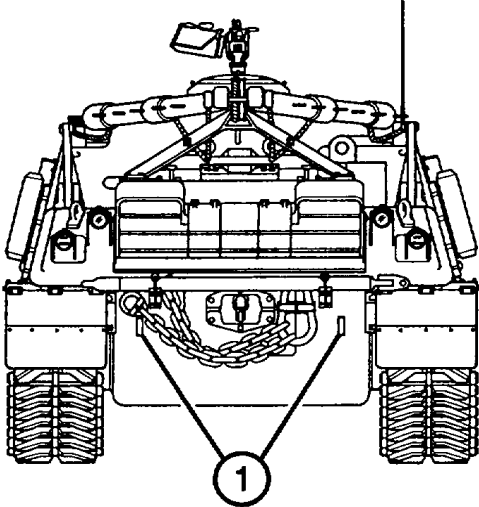
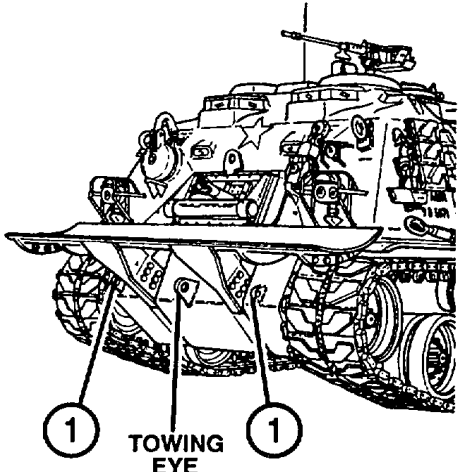
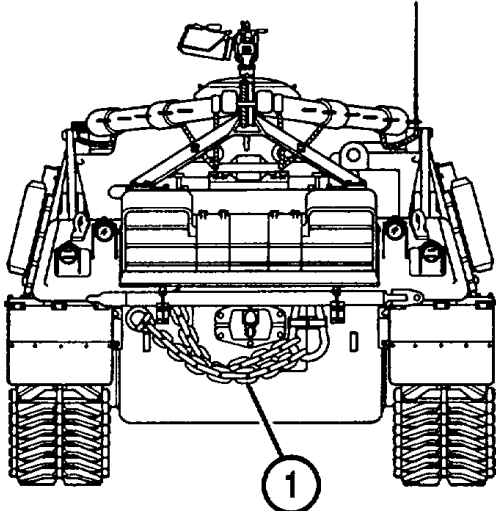


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
27 Cont.	After	Machine Gun Mount	<p>Check gun mount for missing pins. Check for tightness of all fasteners and operating parts. Operate ammo box locking latch. When locked, ammo box must be sturdy and secure.</p>	Damaged, binding, or missing parts or pin.
28	After	Caliber .50 Machine Gun	<p><u>Commander</u></p> <p><b>WARNING</b> Ensure machine gun is clear of ammo and barrel is free of obstructions.</p> <p>a. Disassemble, clean, and lightly lube per TM 9-1005-213-10.</p> <p><b>CAUTION</b> Never pull back bolt assembly with the safety on "S": the safety assembly will be damaged.</p> <p>b. Reassemble and check for ease of operation.</p>	<p>a. Any damaged parts found. Fault listed in "Not Fully Mission Capable If" column of machine gun TM.</p> <p>b. Weapon does not function properly.</p>
29	After	Snatch Block Assemblies	<p><u>Crewmember</u></p> <p>a. Visually inspect two 90-ton (81.7-metric-ton) (1), one 25-ton (22.7-metric-ton) (2), and one 10-ton (9.1-metric-ton) (3) blocks for presence.</p>	<p>a. Any snatch block assembly missing.</p>

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
			<p>b. Inspect all snatch block housings for cracks or defects. Inspect pulley for chips, dents, and cracks. Inspect locking mechanisms for locking capabilities. Inspect hooks for cracks and straightness.</p>	<p>b. Blocks are cracked and/or do not lock. Safety screw (4) missing from 25-ton (22.7-metric-ton) block (2). Hooks on block are bent. Pulleys deformed and prevent proper cable lay in pulley groove or housing.</p>
		<p>The diagrams illustrate the inspection points for snatch blocks. The top-left diagram shows a close-up of a snatch block with callouts: (2) points to the upper housing, and (4) points to a safety screw. The top-right diagram shows a side view of a vehicle with callouts: (1) points to a snatch block on the front suspension, and (3) points to another snatch block on the rear suspension. The bottom diagram is a top-down view of the vehicle's chassis, with callout (1) pointing to a snatch block on the rear axle.</p>		
			<p>c. Inspect pulley for proper rotation.</p>	<p>c. Pulley does not rotate freely.</p>

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
30	After	Pintle Tow Lugs (Rear and Front)	<u>Crewmember</u> Visually inspect tow lugs (1) for presence and condition.	Tow lugs missing or broken.
		 <p style="text-align: center;"><b>Rear View</b></p>  <p style="text-align: center;"><b>Front View</b></p>		
31	After	Tow Chain (Rear)	<u>Crewmember</u> Visually inspect tow chain (1) for presence, missing.	Tow chain
		 <p style="text-align: center;"><b>Rear View</b></p>		

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
32	After	Tow Bars (Two Each), Two Cables (Two Each) (Back and Side Mounted)	<p><u>Crewmember</u></p> <p>a. Visually inspect tow bars (1) for presence. unserviceable.</p> <p>b. Inspect tow bar legs for bends and cracks. Inspect lunette for cracks and bends. Inspect for tow bar pins, clevis's, and locking pins.or cracked.</p> <p>c. Inspect tow cables (2) for kinks, broken, or frayed wires. Inspect eyelets for cracks.</p>	<p>a. Both tow bars missing or</p> <p>b. Any bends, cracks, missing tow bar pins or locking pins. Lunette bent</p> <p>c. Missing, kinks, bends, broken, or frayed wires. Eyelet cracked.</p>

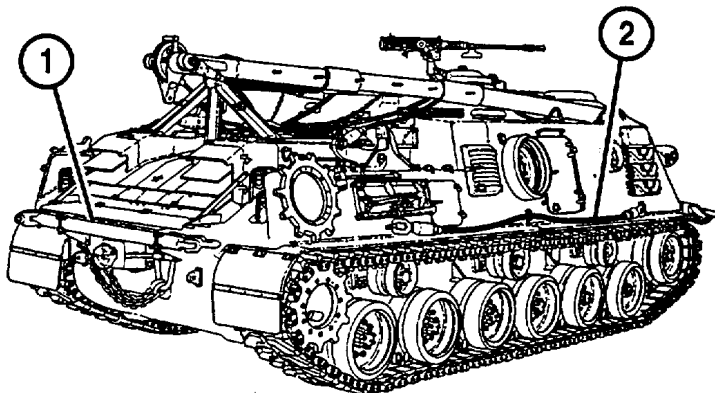
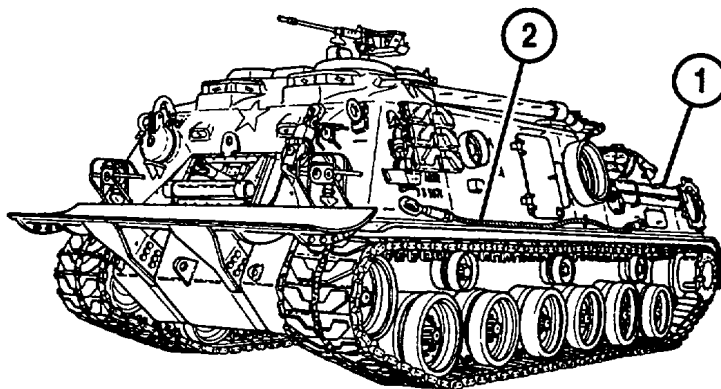


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
33	After	Temperatures of Roadwheel Idler and Support Roller Hubs and Shock Absorbers	<p><u>Crewmember</u></p> <p>At halts other than tactical operations and immediately after vehicle operation, feel these components cautiously for noticeable variation in temperature between like components. An overheated hub indicates maladjustment's, inadequate lubrication, or bearings. If shock absorbers are defective, they will be colder than the hull.</p>	Any hub found to be overheated and temperature cannot be corrected by lubrication.
34	After	Final Drive (Right and Left Side)	<p><u>Driver</u></p> <p>a. Check for Class III oil leakage between final drive (1) and bottom of sprocket (2).</p> <p>b. Check for sheared mounting studs (3). Ensure that final drive hub stud nuts (4) are tight. If evidence of looseness is present, report to unit maintenance.</p> <p style="text-align: center;"><b>WARNING</b> Final drive hubs (5) may be very hot.</p> <p>c. Cautiously check for final drive hubs for overheating.</p>	<p>a. Any class III leak.</p> <p>b. More than two final drive hub studs sheared off on any one final drive.</p> <p>c. Any final drive hub overheating.</p>

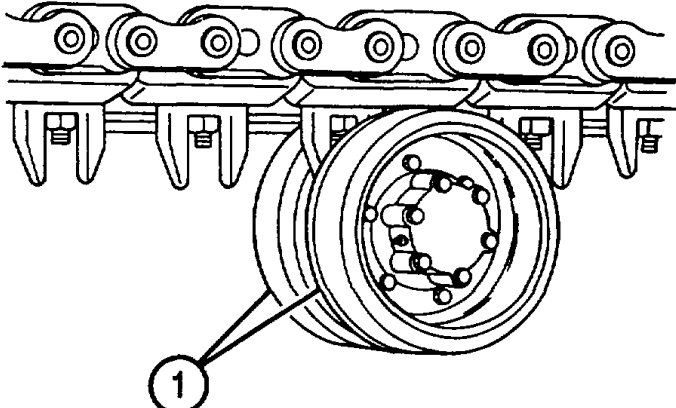
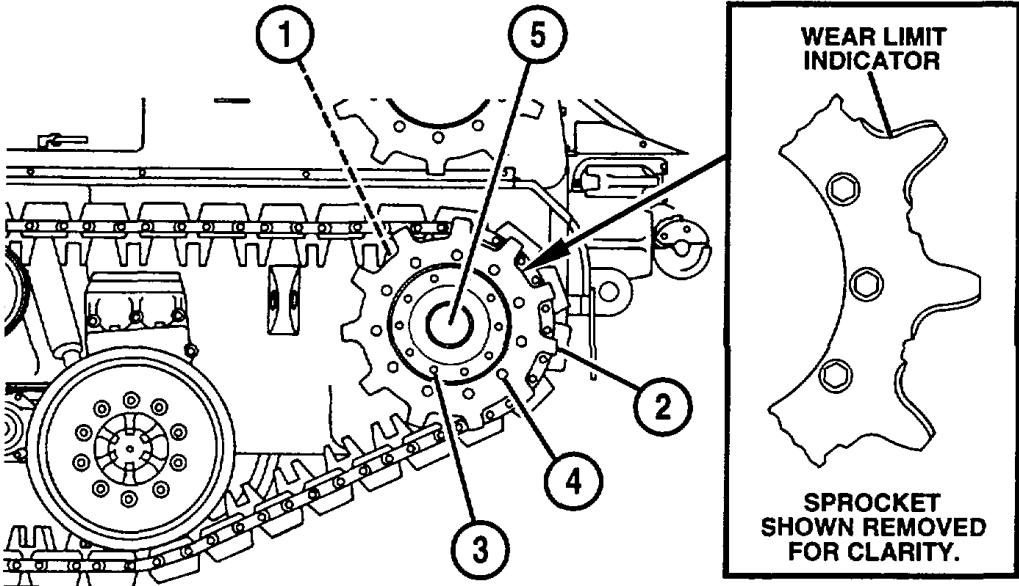
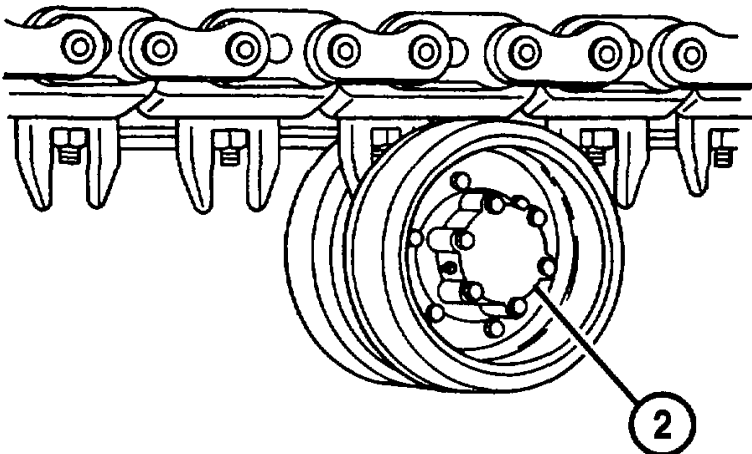
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
35	After	Track Support Rollers and Hubs (Right and Left Side)	Driver	
			<p>a. Check for missing or loose track support rollers (1). missing or loose.</p>	a. Any track support roller
			<p>d. Check drive sprocket (reversible).</p>	<p>d. Wear limit indicator no longer visible on both sides.</p>

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
35 Cont.	After	Track Support Rollers and Hubs (Right and Left Side)	<p>b. Check rollers for separation of rubber from metal and chunking.</p> <p><b>WARNING</b> Track support roller hubs (2) may be very hot.</p> <p>c. Cautiously feel support roller hubs for high temperature differences between other hubs.</p>	c. Any hub is overheated.
				
36	After	Roadwheel Assemblies (Right and Left Side)	<p><u>Crewmember</u></p> <p>a. Check for bent, broken, or missing roadwheel.</p>	a. Two roadwheels on same arm, either side, cracked, dented, warped, missing, or unserviceable.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
		Roadwheel Arms	<p>b. Check for any loose or missing mounting bolts or nuts.</p> <p>c. Check for cracked, missing, or gouged wearplates.</p> <p>d. Check roadwheels for chunking or separation.</p> <p>e. Visually inspect roadwheel alignment, all sets should be in a row.</p> <p style="text-align: center;"><b>WARNING</b> Roadwheel hubs may be extremely hot.</p>	<p>b. Three or more mounting nuts missing on same oadwheel hub.</p> <p>c. Wearplate is worn out.</p> <p>d. Separation of 1 inch (in.) (25 millimeter [mm]) of rubber contact from metal surface around 75 percent (%) of roadwheel and/or chunking that exposes metal extending 3 x 4 in. (76 x 102 mm) on wheel surface exists.</p> <p>e. Out of alignment.</p>



Table 2-1. PMCS-Continued.

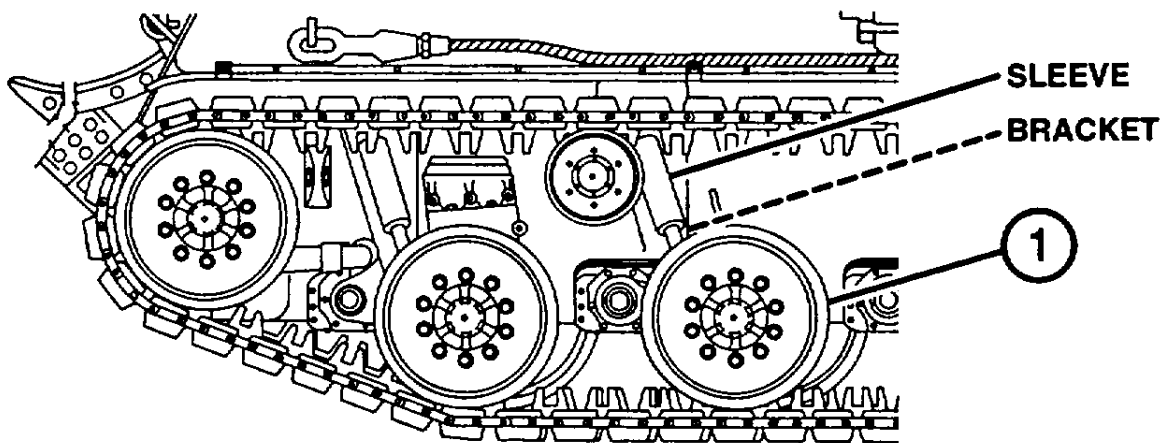
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
36 Cont.	After	Roadwheel Assemblies (Right and Left Side)	<p>f. Inspect inner and outer roadwheel hub for leaks and temperature.</p> <p><b>NOTE</b> Splattered grease indicates defective seal.</p>	
37	After	Compensating Idler Wheel Assembly, Nos. 1 and 2 Roadwheel Assembly (Right and Left Side)	<p><u>Crewmember</u></p> <p>a. Check for bent, broken, or missing roadwheels and compensating idler wheel.</p> <p>b. Check for any loose or missing mounting bolts or nuts.</p>	<p>a. Any idler wheel or No. 1 or 6 arm roadwheel to two roadwheels on same arm for Nos. 2 thru 5, either side, is cracked, dented, missing, or unserviceable. Any compensating idler wheel or roadwheel warped.</p> <p>b. Two or more mounting nuts missing on the same idler wheel hub. Three or more mounting nuts missing on same roadwheel hub.</p>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<p>c. Check for cracked, missing, or gouged wearplates.</p> <p>d. Check roadwheels for chunking or separation.</p> <p style="text-align: center;"><b>WARNING</b> Idler wheel hub may be very hot.</p> <p>e. Inspect inner and outer roadwheel hub and compensating idler wheel hub for high temperature.</p>	<p>Two or more lug nuts that cannot be torqued to proper standard of 320-350 pound-feet (lb-ft) (434-475 Newton-meters [N•m]) on any wheel.</p> <p>c. Wearplate worn or cracked.</p> <p>d. Separation of 1 in. (25 mm) of rubber contact from metal surface around 75% of roadwheel and/or chunking that exposes metal extending 3 x 4 in. (76 x 102 mm) on wheel surface exists.</p> <p>e. Any hub overheated or throwing grease.</p>

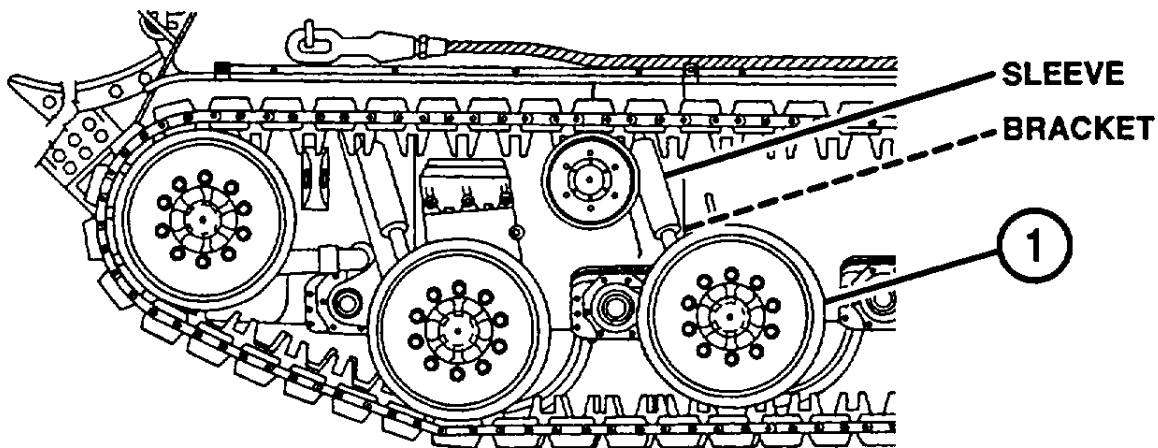
Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
38	After	Track Adjusting Links (Right and Left Side)	<p><u>Driver</u></p> <ul style="list-style-type: none"> <li>a. Check that link assembly (1) is not missing or broken.</li> <li>b. Check that cotter pin (2) is not missing or broken.</li> <li>c. Check connector pin (3) and retainer bolt (4).</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjuster broken, missing, or damaged.</li> <li>c. Connector pin broken, missing, or retainer bolt missing.</li> </ul>
39	After	Torsion Bars for Roadwheel (Right and Left Side)	<p><u>Driver</u></p> <ul style="list-style-type: none"> <li>a. Look at roadwheel (1) No. 1 and No. 6 to see if torsion bars are broken or missing.</li> </ul>	<ul style="list-style-type: none"> <li>a. Torsion bars at roadwheels No. 1 and/or No. 6 broken or missing.</li> </ul>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<p>b. Check for broken torsion bars by attempting to pry up roadwheels using crowbar on Nos. 2 thru 5.</p>	<p>b. Any two in row at roadwheels Nos. 2 thru 5.</p>



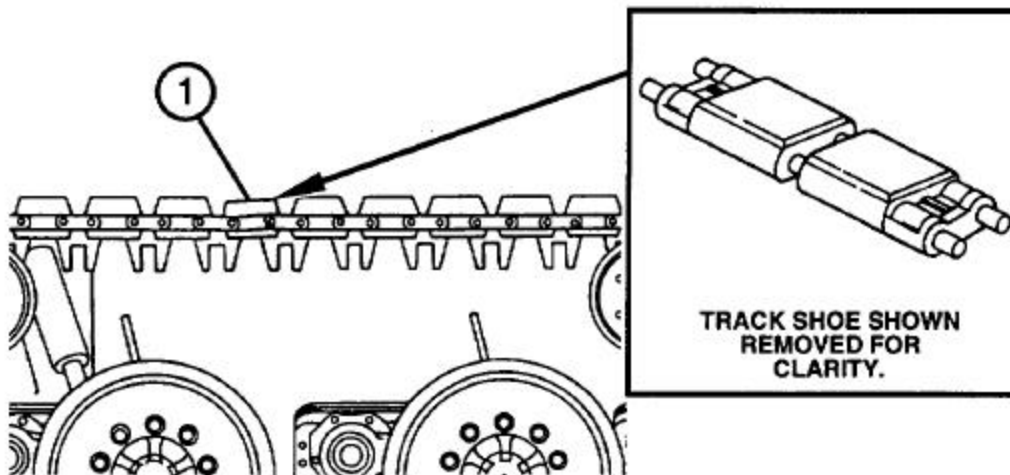
**View with Good Torsion Bar**



**View with Bad Torsion Bar**

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
40	After	Track Shoes (Right and Left)	<p><u>Crew</u></p> <p><b>NOTE</b> When track shoe (1) appears out of line, it indicates a dead shoe or damaged track pin bushing.</p> <p>a. Check for dead shoes between track support rollers. more dead track shoes or any broken pin.</p> <p>b. Check track shoes for breaks, cracks, or broken pin.</p> <p><b>NOTE</b> When replacing individual track shoes, the rubber pads should be approximately same height as adjacent pads. This may require removing new pads and installing used pads of equal height.</p>	<p>a. On one side of vehicle three or</p>



Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service		
41	After	Track Tension (Right and Left Side)	<p><u>Crew</u></p> <p>Mechanical Track Link Adjustment Link Only</p> <p>Adjust track tension after all other track inspection faults have been corrected.</p> <p>Move vehicle forward on hard level surface and coast to stop without using brakes or steering.</p> <p>Remove dirt and mud from outboard end connectors (1) between first and second support rollers (2 and 3).</p> <p>Place string (4), with weight on both ends over first end connector before No. 1 support roller, and extend string past No. 2 support roller to next end connector.</p>	

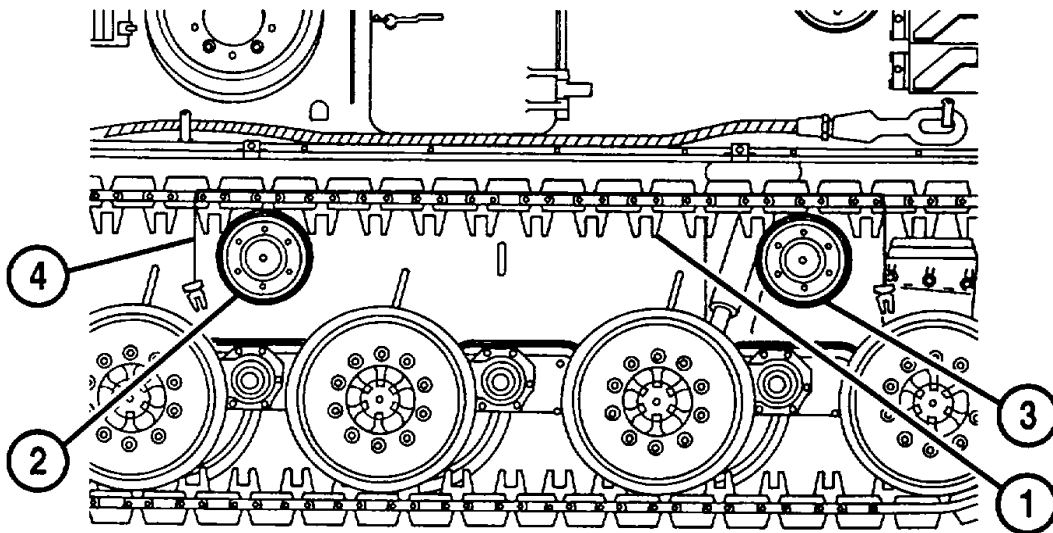


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
41 Cont.	After	Track Tension (Right and Left Side)	<p>Locate string in center of end connector. Measure distance between string and end connector midway between first and second support roller. Ensure distance is 0.375 to 0.5625 in. (9.5 to 14.3 mm).</p>	
42	After	Hull Access Plates/ Drain Valve Operations	<p><u>Driver</u></p> <p><b>WARNING</b> Be careful when you feel roadwheel, idler track support roller hubs, and shock absorbers. They can heat up enough to burn you.</p> <p>Ensure all hull access plates are present and secure using 9/16 in.-socket, 7-in. extension, and hinge handle.</p>	

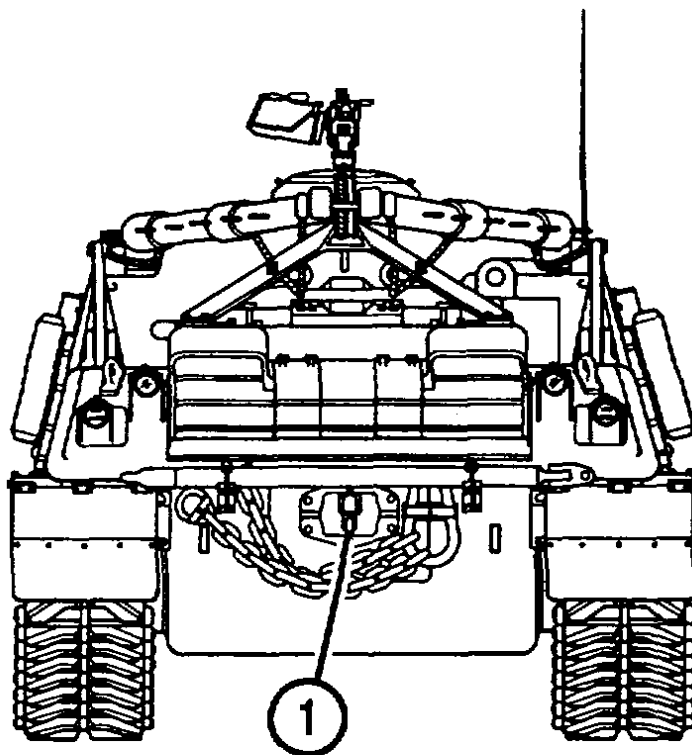
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
43	Weekly	Lights	<p>a. Check driving lights by turning driving lights switch on. Depress high beam switch to make sure lights operate properly on high and low beams.</p> <p>b. Check HIGH BEAM indicator light, MASTER switch on indicator light.</p> <p style="text-align: center;"><b>NOTE</b> Driver will turn on lights and commander will check for operation.</p> <p>c. Check stop light and taillights to see that they operate properly. Ensure lights brighten during braking.</p> <p>d. Check B.O. drive-lights. Set main light switch lever to B.O. DRIVE. Set IR-B.O. SELECT switch to B.O.</p> <p style="text-align: center;"><b>WARNING</b></p> <ul style="list-style-type: none"> <li>· Do not look directly into IR lights. You may damage your eyes.</li> <li>· Do not touch lens. You may burn your fingers.</li> </ul>	



Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
43 Cont.	Weekly	Lights	<p>e. Check IR lights on both high and low beam. Do this by HOLDING YOUR HANDS OVER LENS, but do not touch lens. If light is operating properly, heat will be felt.</p>	
44	Weekly	Batteries	<p><b>WARNING</b></p> <ul style="list-style-type: none"> <li>• <b>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.</b></li> <li>• <b>Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short will result in instant heating of tools, injury to personnel, and damage to equipment.</b></li> </ul> <p>Check electrolyte level. Check all connections for corrosion and ensure connections are tight. Refill batteries with distilled water (Appx. D, item 15) to bottom of split ring. After adding water, run engine for 15 minutes.</p>	<p>A battery is missing or unserviceable or engine will not crank. Any loose cable or terminal. Any broken or cracked battery.</p>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
45	Weekly	Slave Cable	Check slave cable receptacle and cap for damage, burnt-out condition, and corrosion.	
46	Weekly	Rear Grille Doors	<ul style="list-style-type: none"> <li>a. Ensure grille doors are secure.</li> <li>b. Check for loose or missing hardware.</li> <li>c. Ensure doors are not damaged or missing.</li> </ul>	<ul style="list-style-type: none"> <li>a. Grille doors cannot be secured or closed.</li> <li>c. Grille doors are missing.</li> </ul>
47	Weekly	Tow Pintle	Visually inspect tow pintle (1) for presence, condition, and operation.	Tow pintle missing, broken, or unserviceable.



**Rear View**

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
48	Weekly	Personnel Side Doors	<p>a. Inspect personnel side doors (1) for presence and operation.</p> <p>b. Check for loose or damaged crash pads and door seals.</p>	<p>a. Any door missing or inoperable. Will not lock in closed position.</p>
49	Weekly	Top Hatches	<p>a. Inspect for presence and operation.</p> <p>b. Check for loose or damaged crash pads and door seals.</p>	<p>a. Any hatch missing or inoperable. Will not lock in open or closed position.</p>

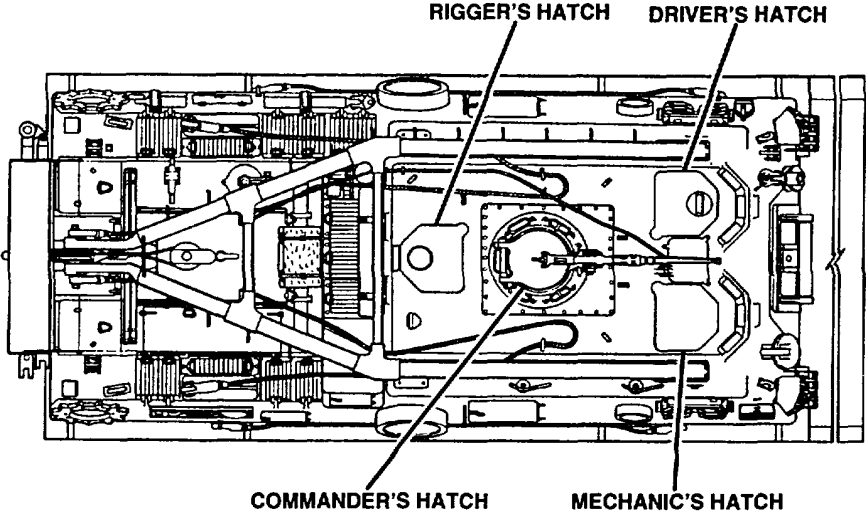
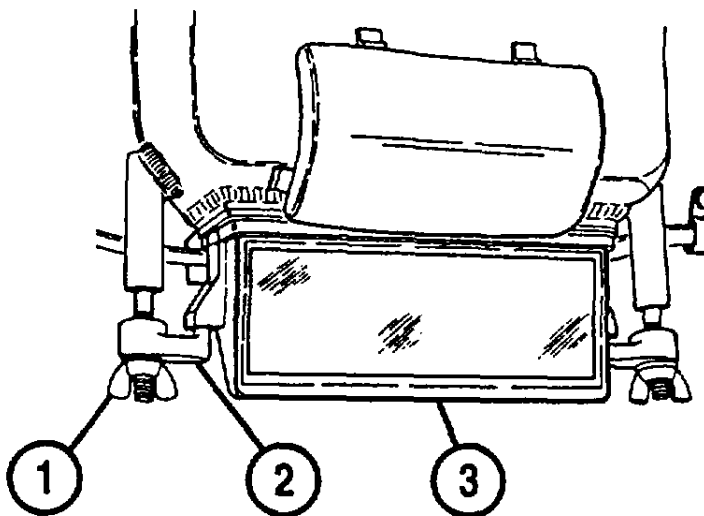
Item No.	Interval	Location Item to Check/ Service	Crewmember Procedure	Not Fully Mission Capable if:
50	Weekly	APU	<div style="text-align: center;">  </div> <p style="text-align: center;"><b>CAUTION</b> Severe engine damage can result if contaminated air is permitted to enter combustion chamber. Dirt and grit in the air mixing with oil or fuel will act the same as sandpaper, creating excessive wear on machined surfaces.</p> <p>Check APU oil level as follows:</p> <ol style="list-style-type: none"> <li>a. Remove bayonet gage and wipe it with a clean rag (Appx. D, item 40). Insert bayonet gage and remove it again. Observe the oil level indicated on the bayonet gage. If oil level reads below full (F) mark, remove oil filler cap and add oil (Appx. D, item 30, 31, or 33) until level rises to F.</li> </ol>	<ol style="list-style-type: none"> <li>a. Any class III leak.</li> </ol>

Table 2-1. PMCS-Continued.

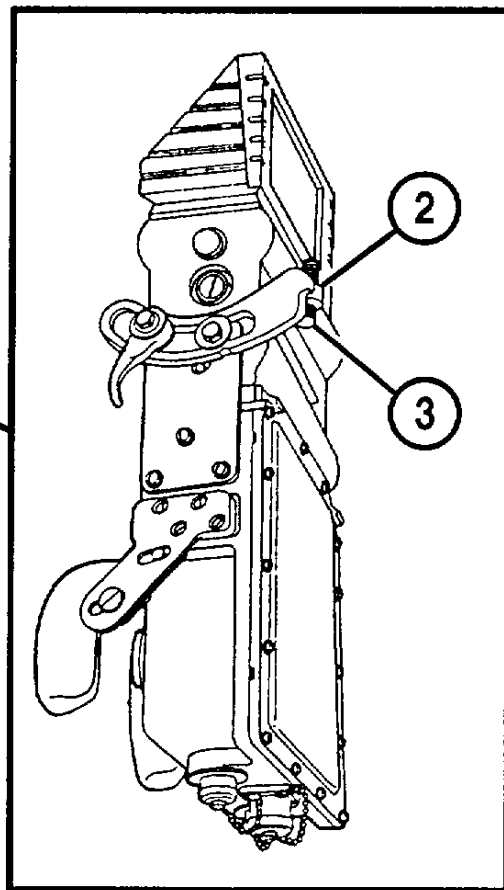
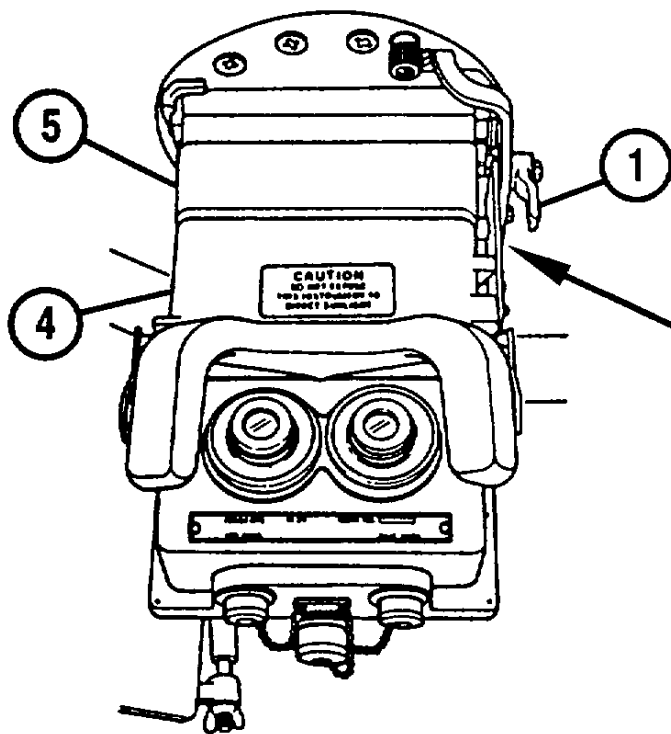
Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
50 Cont.	Weekly	APU	<p><b>b.</b> Drain condensation from fuel filters.</p> <p><b>c.</b> Check APU air filter for rips, tears, or dirt. If any of these conditions exist, clean filter (see para. 3-11b(4) thru 3-11b(9)) or replace filter element.</p> <p><b>d.</b> Check for hydraulic leaks (lift grilles). Check chain drive gear base oil level.</p>	<p><b>d.</b> Any class III leak.</p>
51	Weekly	Exhaust Smoke Generating System	Check for security of exhaust smoke generating components.	Mounting hardware loose or stripped. Any Class III leak.
52	Weekly	M17 Periscope	<p><b>a.</b> Ensure wingnuts (1) on clamp assemblies (2) are tight and hold M17 periscopes (3) in place. Clean windows and check for overall damage.</p>	<p><b>a.</b> Vision is over 50% blocked.</p>



Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
53	Weekly	M24/ M24A1 IR Periscope Night Check	<p>b. Be alert to any moisture entering through M17 periscope mounting (defective seal on periscope).</p> <p><b>WARNING</b> IR powerpack is high voltage item. Injury to personnel or damage to M24 periscope could occur if MASTER BATTERY and IR POWER switches are in ON position when vehicle power cable is being connected to or disconnected from periscope.</p> <p><b>CAUTION</b> Perform M24 IR periscope check during darkness only. Do not expose IR periscope to direct sunlight.</p> <p><b>NOTE</b> Perform WEEKLY and BEFORE NIGHT operations.</p> <p>Lower center periscope. Pull down on periscope lid handle. Push up on latch to unlock lid. Push lid open.</p>	

Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
53 Cont.	Weekly	M24/ M24A1 IR Periscope Night Check	<p>Release elevation adjustment lever (1) allowing clamp to pivot. Loosen jamnut (2) and thumbscrew (3). Position periscope (4) in hatch holder (5) and push up to lock. Ensure periscope is locked before releasing it. Tighten thumbscrew until clamp is firmly in detent. Tighten jamnut.</p> <p>Pull elevation adjustment lever forward to lock periscope.</p>	



Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<p><b>WARNING</b>                      IR powerpack is high voltage item. Injury to personnel or damage to M24 periscope could occur if MASTER BATTERY and IR POWER switches are in ON position when vehicle power cable is being connected to or disconnected from periscope.</p> <p>Ensure MASTER BATTERY switch is OFF. Unscrew dustcap from power receptacle. Remove power cable from stowage receptacle. Connect power cable to power receptacle.</p> <p>Set MASTER BATTERY switch to ON. Set B.O. SELECTOR switch to IR. Raise UNLOCK lever and set LIGHTING CONTROL lever to B.O. DRIVE. Set IR POWER switch to ON. IR indicator will glow.</p> <p>Release elevation adjustment lever. Adjust periscope to elevation angle desired. Pull lever forward to lock periscope in position. If necessary, adjust headrest by loosening clamp screws.</p>	<p>Power cable missing, damaged, or will not connect to M24 periscope.</p>



Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
53 Cont.	Weekly	M24/ M24A1 IR Periscope Night Check	<p>Tighten screws after adjustment. Bend headrest to fit head. Allow 5-minute warmup for periscope before adjusting focus.</p> <p>Remove dust caps from left and right focus controls. Loosen lock-nuts on focus controls.</p> <p>Using a screwdriver, turn focus controls and ensure view through eyepiece is sharp and clear.</p> <p>Tighten locknuts. Put dust caps on left and right focus controls.</p> <p>Set IR POWER switch to OFF. Set MASTER BATTERY switch to OFF. Set B.O. SELECTOR switch to B.O. DRIVE. Set LIGHTING CONTROL level to center (up) position.</p> <p><b>WARNING</b> Wait at least 2 minutes after IR POWER switch is turned off before disconnecting power cable. (High voltage is present at power cable for several minutes after IR POWER switch is OFF).</p>	<p>View is not clear or is obstructed.</p> <p>M24 IR periscope inoperative or missing.</p>

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
54	Weekly	ANNVS-2(V)1A Periscope	<p>Disconnect power cable from periscope and connect to dummy receptacle. Install receptacle dustcover on power receptacle.</p> <p>While supporting periscope with one hand, pull release bar toward rear and remove periscope.</p> <p style="text-align: center;"><b>CAUTION</b> Do not expose objective lens to direct sunlight or bright light.</p> <p style="text-align: center;"><b>NOTE</b> Perform WEEKLY and BEFORE NIGHT OPERATION.</p> <p>Close and lock driver's hatch. Remove snap-on lens cover (1) and stow in periscope stowage box.</p>	

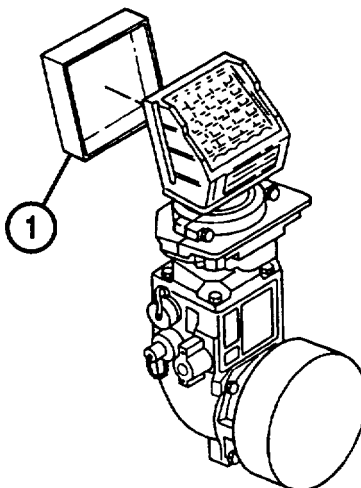


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
54 Cont.	Weekly	ANNVS-2 (V)1A Periscope	<p>Remove battery cap (2) and ensure battery has been removed. Reinstall cap.</p> <p>Check that OFF-BRIGHT knob is set to OFF and not broken.</p> <p>Turn mount (3) to position detent and aline sides of mount with sides of periscope (4).</p> <p>Press and hold lever (5) and raise periscope through hatch and lock into place by releasing lever.</p> <p>Remove snap-on eyepiece cover (6) from periscope and stow in periscope storage box.</p> <p>Ensure NIGHT VIEWER switch is set to OFF. Remove cap (7) from receptacle (8). Disconnect power cable (9) from dummy receptacle (10) and connect power cable to receptacle. Turn MASTER switch on. Set NIGHT VIEWER switch to on.</p> <p>Turn operator's control (11) to full brightness. View through eyepiece.</p>	<p>View is obstructed or unclear.</p> <p>View is obstructed or unclear.</p>

Item No.	Interval	Location	Crewmember Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
			<p>Check that image display is brightly lighted. Turn operator's control slowly off.</p> <p>Check that image display goes from bright to dim to off.</p>	<p>Inoperative in both battery and vehicle power mode.</p> <p>Night vision viewer ANNVIS-2(V)1A inoperative.</p>

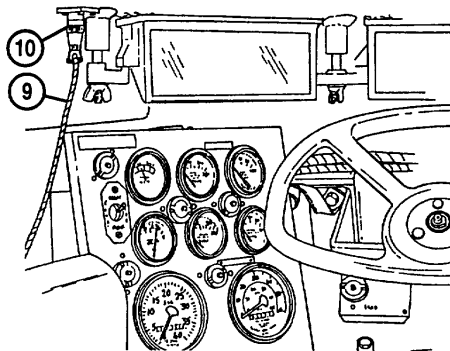
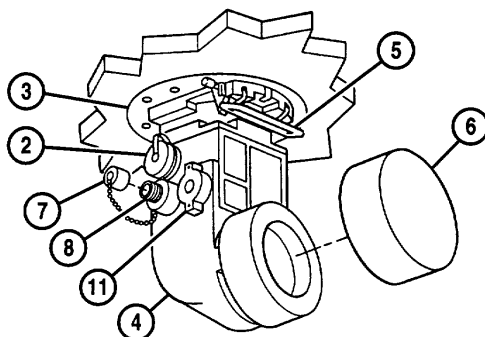


Table 2-1. PMCS-Continued.

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
54 Cont.	Weekly	ANNVS-2(V)1A Periscope	<p>Set NIGHT VIEWER to OFF. Disconnect power cable from receptacle. Connect power cable to dummy receptacle.</p> <p>Install cap on receptacle. Install snap-on eyepiece cover to periscope. Press lever and remove periscope from mount.</p> <p>Remove battery cap and ensure battery has been removed. Reinstall battery cap.</p> <p>Install snap-on lens cover. Turn MASTER switch to OFF.</p>	
55	Weekly	Personnel Heater	<p>a. Check for proper operation.</p> <p>b. Inspect for fuel and exhaust leaks.</p>	<p>b. Any fuel or exhaust leaks.</p>
56	Monthly	Hoist Winch and Main Winch Assembly	Unwind cable and inspect for kinks, breaks, frayed condition, and proper wind on drum.	Any cable with kinks, breaks, frayed condition, or is missing.
57	Monthly	GPFU	<p>a. Turn switch to ON, check motor for smooth operation and check outlets for air flow (refer to unit maintenance).</p>	

Item No.	Interval	Location	Crewmember	Not Fully Mission Capable if:
		Item to Check/Service	Procedure	
			<ul style="list-style-type: none"> <li><b>b.</b> Check cable assembly for worn or cracked insulation and loose connections.</li> <li><b>c.</b> Check all hoses for wear, damage, or deterioration.</li> <li><b>d.</b> Check entire filter unit assembly for dents, cracks, or missing parts.</li> <li><b>e.</b> Check tank protective mask for holes, loose eyepiece, and separation of mask from tank.</li> </ul>	

**SECTION III. OPERATION UNDER USUAL CONDITIONS****2-8. GENERAL.**

- a. This section contains instructions for operating vehicle under normal weather conditions. Operations under unusual weather are covered in Chapter 2, Section IV.
- b. Before starting main engine and driving vehicle, perform all Before-operation PMCS. These are found in Chapter 2, table 2-1. Take the vehicle for a short test of one mile and see that it operates the way it should.

**2-9. ASSEMBLY AND PREPARATION FOR USE.**

- a. When your unit receives a new vehicle, it must be thoroughly checked out. If anything is wrong with the M88A1, record it on DA Form 2404.
- b. Check the vehicle for completeness of assembly. Ensure all equipment and controls are present and in good shape.
- c. Check the components and support items supplied with the vehicle against the Components Of End Item (COEI) and Basic Issue Items (BII) lists provided in Appendix B.

**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST.****a. Prestarting Instructions.**

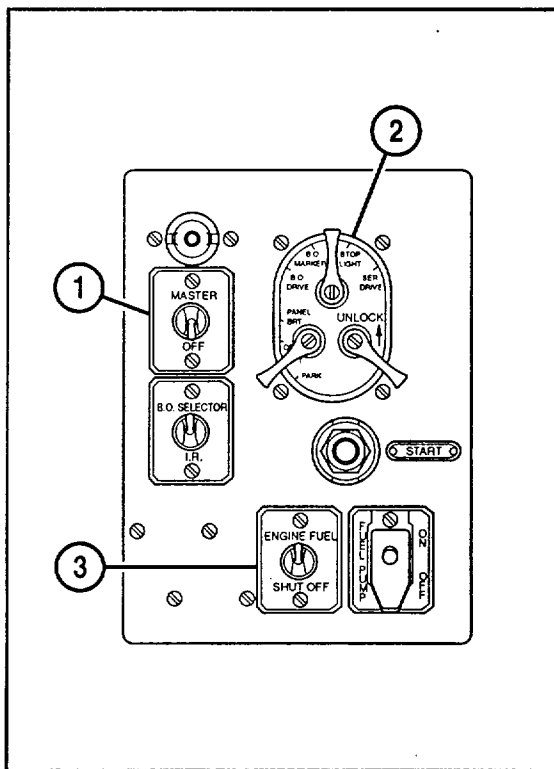
- (1) Before operating the vehicle, you must be familiar with controls and instruments described in Chapter 2, Section I.
- (2) If engine is new or reconditioned, perform general and break-in services described in paragraphs 2-8 and 2-9.
- (3) Ensure all controls on M88A1 are properly positioned. Be certain that hatches and doors are secured and equipment is properly stowed. This will help ensure effective operation and safe conditions for you and crew. Never take anything for granted check everything yourself.
- (4) Adjust seats now so that you will not have to when driving.

- (5) Check controls before starting vehicle:

**CAUTION**

**Before operating vehicle, FUEL CONTROL VALVE FORWARD TANK must be closed.**

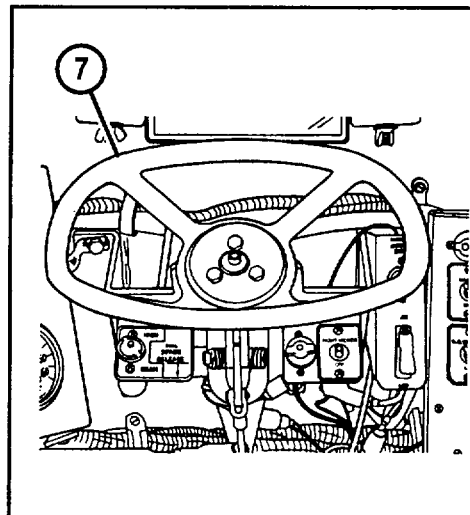
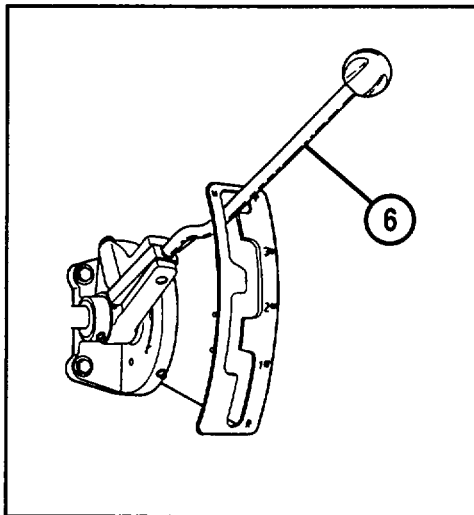
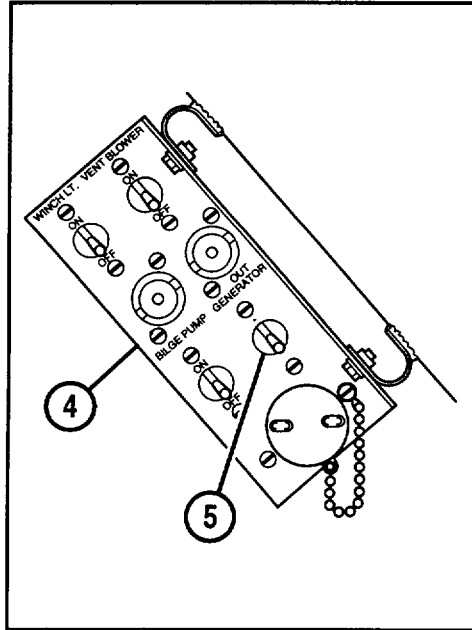
- (a) Ensure MASTER switch (1) and vehicle light switch (2) are OFF. FUEL PUMP switch (3) is generally left ON. Cover over FUEL PUMP switch ensures this. Turn switch OFF if MASTER switch is on and main engine is not going to be run.





2-9. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

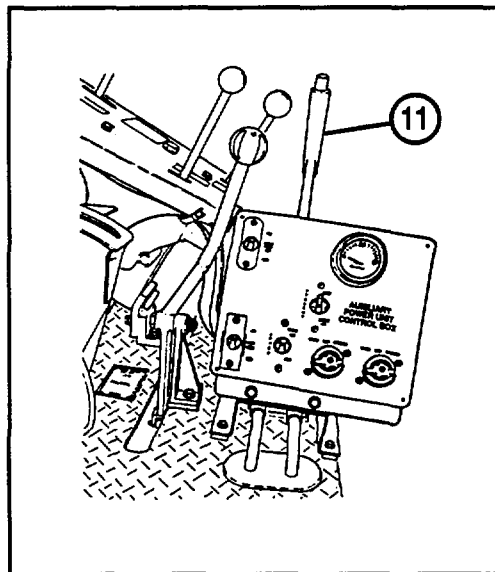
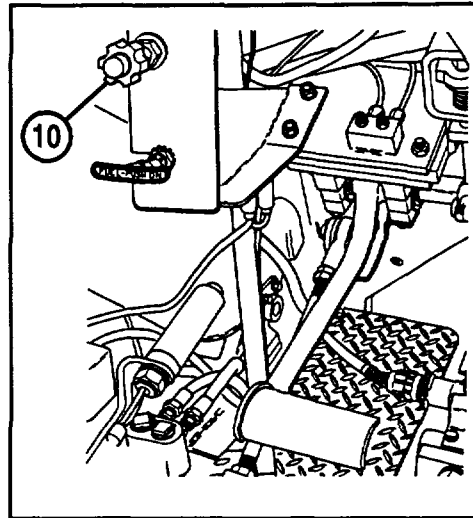
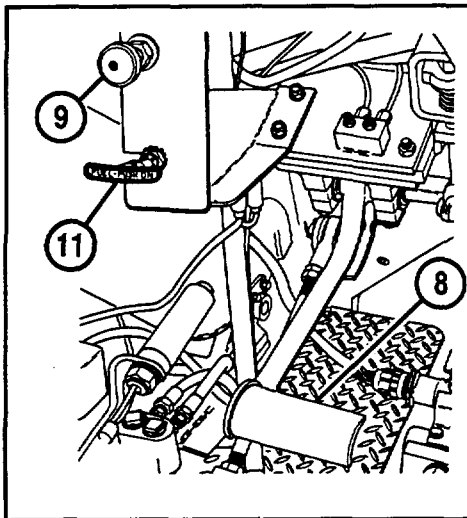
- (b) Ensure all switches on accessory control panel (4) are OFF and generator switch (5) is down.
- (c) Ensure transmission shift selector (6) is in P. Ensure steering wheel (7) is centered and locked.



**NOTE**

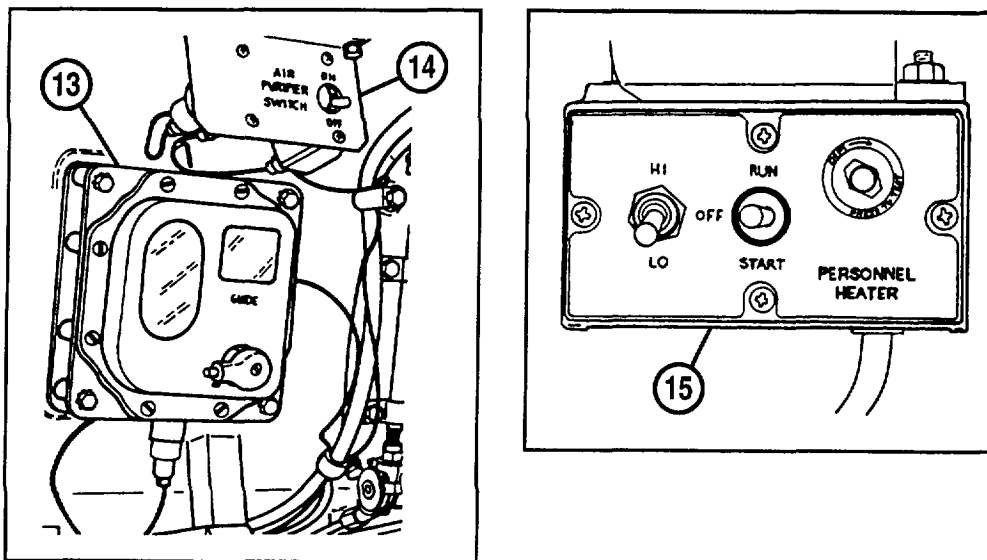
**Vehicle is equipped with either a push in or turn style throttle.**

- (d) Ensure brake (8) is depressed and locked. Transmission must be in P. Push in throttle (9) or turn off throttle (10). Push in fuel shutoff handle (11).
- (e) Ensure drain valve lever (12) is CLOSED.



2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

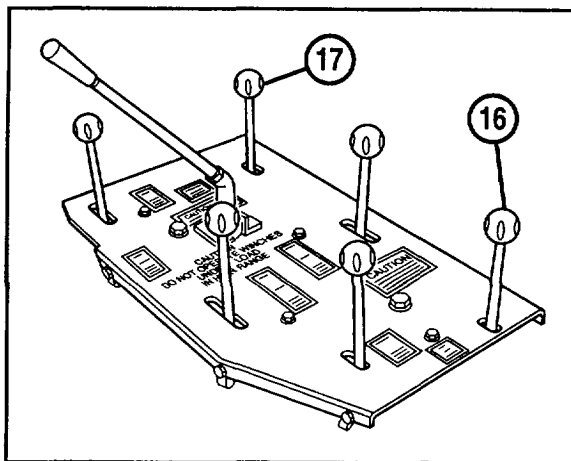
- (f) Ensure dome lights (13), air purifier switches (14), and personnel heater (15) are OFF.



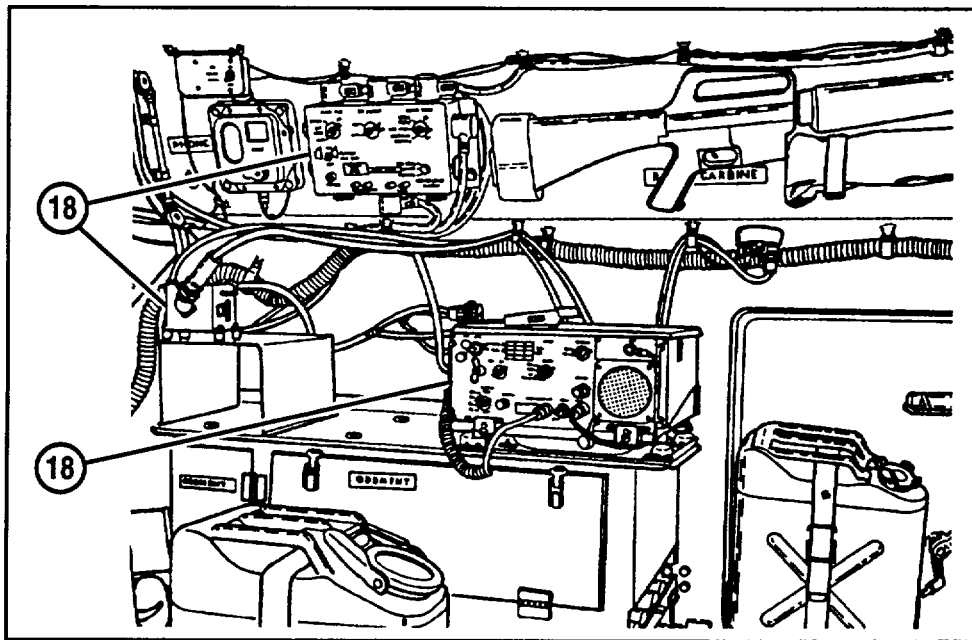
**CAUTION**

Always check to be certain **POWER** control lever (16) is in the **OFF** position during normal vehicle driving operations to prevent throttle linkage solenoid failure.

- (g) Ensure hydraulic controls-SYSTEM SELECTOR control lever (17) and **POWER** control lever (16) are **OFF**, all others automatically neutral (N) or **OFF**. Ensure **MAIN WINCH** and **HOIST WINCH SHIFT** levers are **NEUTRAL**.



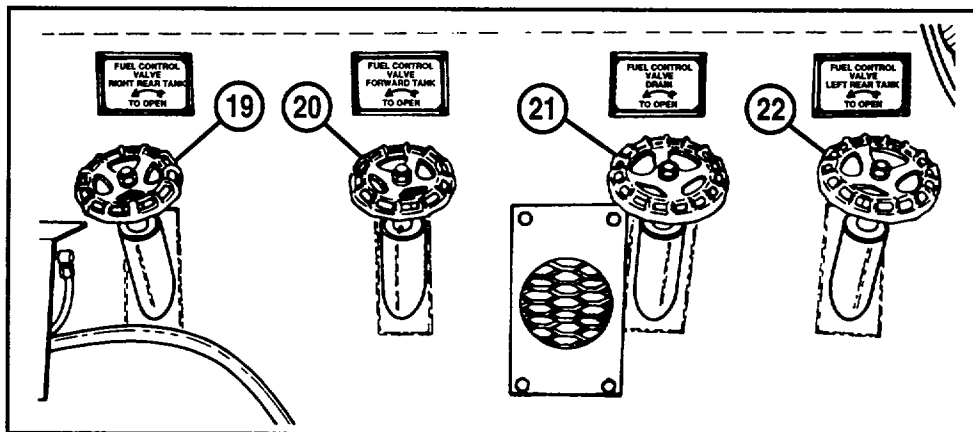
- (h) Ensure radio communications equipment (18) is off.



- (i) Check all inside and outside fire extinguisher controls for broken seals.
- (j) Ensure FUEL CONTROL VALVES are properly set.

When operating vehicle under normal conditions, set fuel control valves as follows:

- RIGHT REAR TANK (19)-open
- FORWARD TANK (20)-closed
- DRAIN (21)-closed
- LEFT REAR TANK (22)-open



**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.****b. Starting Main Engine (Normal Conditions).****WARNING**

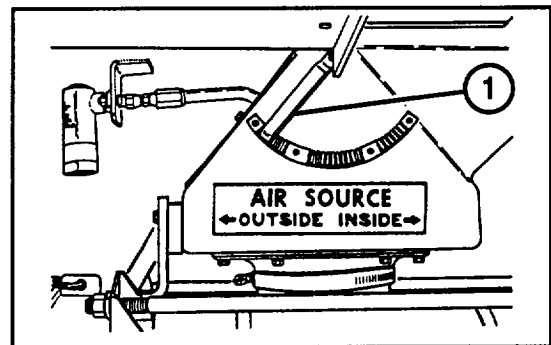
- Ear protection must be worn by personnel in vehicle because of high vehicle noise.
- Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear area of all personnel and keep vehicle downwind of installation during test.

**CAUTION**

Turn off radio and electrical switches before starting engine.

**NOTE**

If crew compartment is closed up, ensure air cleaner air control housing handles (1) are set on OUTSIDE air source before starting engine.



- (1) Ensure transmission shift selector (2) is in P. Depress brake (3) to lock it in position. Ensure steering wheel (4) is centered and locked.

**NOTE**

Ensure fuel tank FUEL CONTROL VALVES are properly positioned (see para. 2-11i).

- (2) Turn MASTER switch (5) on. Check FUEL PUMP switch (6) is ON.

**NOTE**

When MASTER switch is on, the master and mechanical transmission warning lights will stay on until engine is running. If lights do not come on, troubleshoot (see tab. 3-1).

- (3) Move FUEL TANK selector switch (7) up and down to check fuel levels.

- (4) Operate purge pump (8) until back pressure is felt. Three or four strokes should do it. This will help get air out of lines. Do not press preheat button.

**CAUTION**

**Do not hold START button (9) in for longer than 15 seconds. If engine cranks but fails to start, turn off MASTER switch and wait 3 to 5 minutes. Repeat starting procedures. If it does not start after third try, troubleshoot (see tab. 3-1).**

- (5) Depress accelerator pedal (10) to its fullest travel. Push and hold START button until engine runs. Release button and pedal.

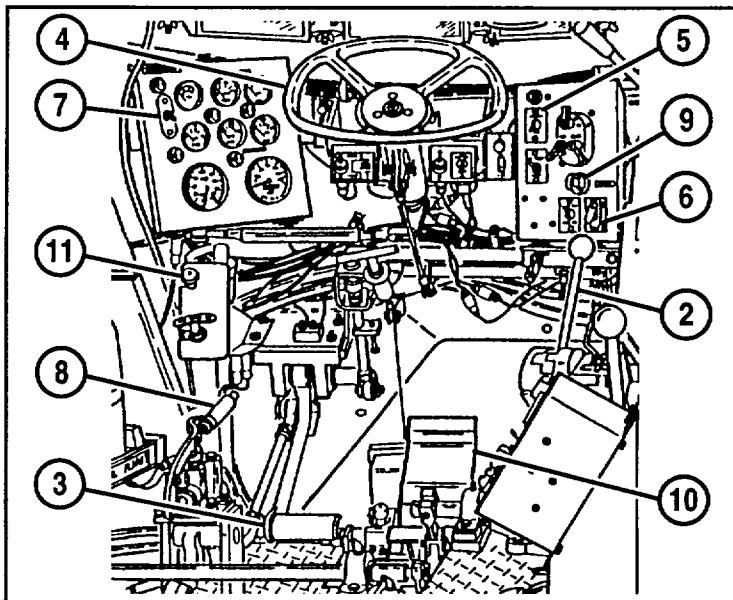
**CAUTION**

**If master warning light does not go out in 20 seconds after engine starts, stop engine and notify unit maintenance.**

**NOTE**

**If battery charge is too low to start engine, start APU (see para. 2-13e) and charge batteries for 20 minutes or slave start vehicle (see para. 2-10d).**

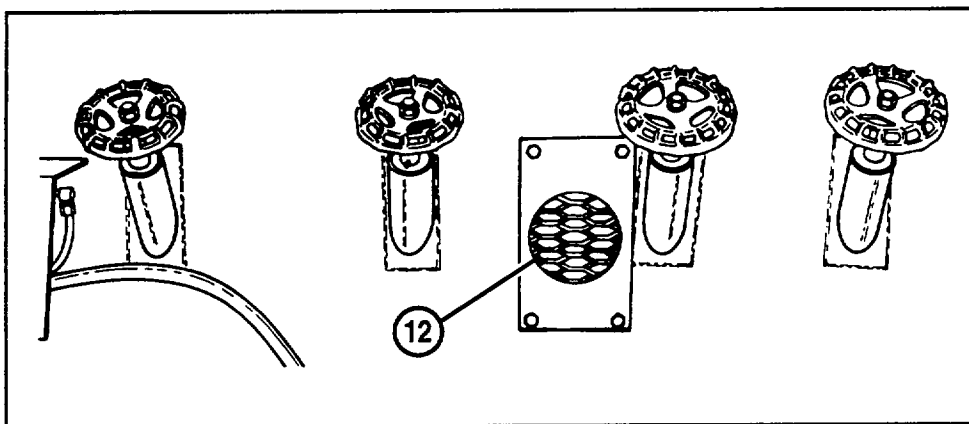
- (6) Adjust hand throttle (11) for 1000 to 1200 rpm and let engine warm up for 3 minutes. After 3 minutes return engine to low idle (675 to 725 rpm) or depress accelerator pedal keeping engine speed at 1000 to 1200 rpm until engine runs smoothly.



**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.****CAUTION**

**Ensure generator blower is operating when engine is running.**

- (7) Hold piece of paper up to generator grille (12). If paper is drawn to grille, it is OK. If it is not, stop engine (see para. 2-10k) and call unit maintenance.



- (8) Check engine for normal operation (see para. 2-10b).

**WARNING**

**Do not leave operator's seat while engine is running.**

**NOTE**

**During long standstill periods with engine running, hold engine speed at 1000 to 1200 rpm to keep it running smoothly.**

- (9) For cold weather start, see paragraph 2-16b.

**c. Checking Engine Operation.****NOTE**

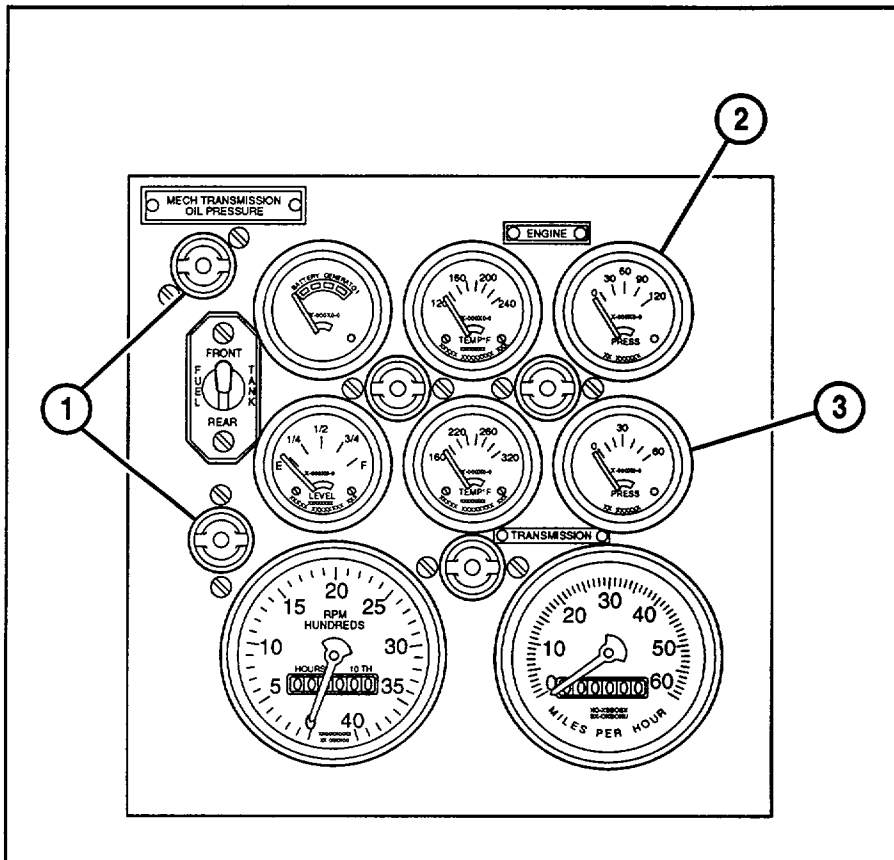
**When MASTER switch is on, warning lights will be on until engine is started and oil pressure builds up.**

- (1) Warning lights (1) should go out after engine has run for 20 seconds.

**CAUTION**

If warning lights come on while operating vehicle, stop engine and call unit maintenance.

- (2) Engine oil pressure (2) should be:
  - 15 psi (103 kPa) at low idle (675 to 725 rpm)
  - 40 to 70 psi (276 to 483 kPa) at 2400 rpm.
- (3) Transmission oil pressure (3) should be:
  - 5 psi (35 kPa) at low idle
  - 15 to 19 psi (103 to 131 kPa) at 2400 rpm.
- (4) There should be no unusual noises from engine.



**d. Slave Starting Main Engine.**

- (1) If main engine does not start due to low or discharged batteries, it can be started with help of another vehicle. Before slave starting, check battery electrolyte and cables.



## 2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

**CAUTION**

Turn off radio and electrical switches before starting engine.

**NOTE**

- M88A1 is equipped with NATO slave start receptacle and requires an adapter for slave starting.
  - These instructions are for starting any dead M88A1.
  - There are two types of slave receptacles-Part Number (PN) 1168235 (1) and PN 7321299 (2).
  - They are not interchangeable.
- (2) Turn MASTER switch to OFF in dead vehicle. (Dead vehicle-vehicle with low batteries. Live vehicle-vehicle doing slaving.)

**WARNING**

**Do not allow personnel to get between two vehicles. Lock brakes on vehicles and reduce engine to low idle (675 to 725 rpm).**

- (3) Position a vehicle with six batteries having a 24-volt system near dead vehicle so slave receptacles are close together.

**NOTE**

**If live vehicle is M60 series, M88A1, M728, AVLB, M48A3, or M48A5 keep engine running.**

- (4) Turn MASTER switch to OFF on both vehicles.

**NOTE**

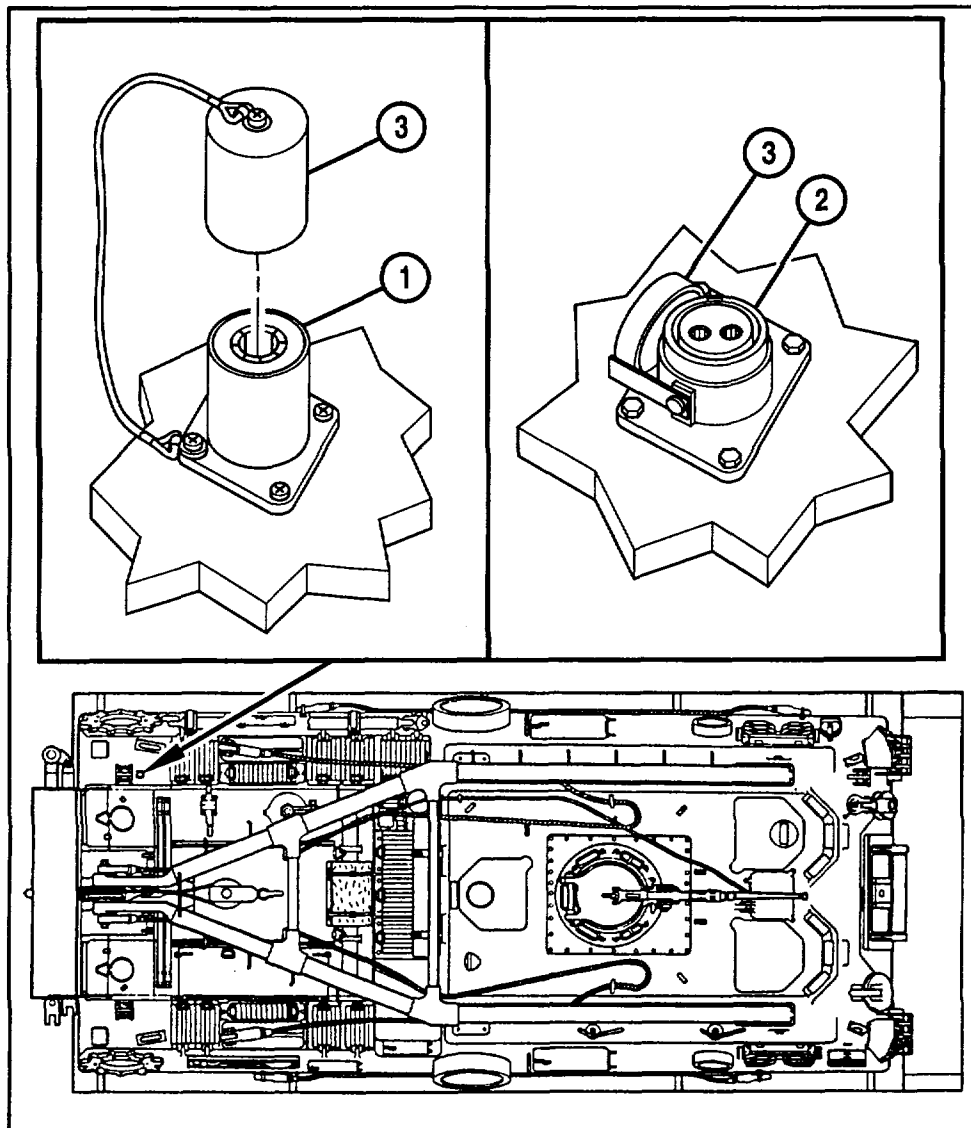
**Live M60 series, M88A1, M728, AVLB, M48A3, or M48A5 vehicle engines will keep running with MASTER switch to OFF.**

- (5) Remove cap (3) and connect slave cables to slave receptacle (1 or 2) of both vehicles.
- (6) Live vehicle must have MASTER switch on for charging if time and situation permits. Charge dead vehicle's batteries for 15 minutes before trying to start engine.

**CAUTION**

**If M60 series, M728, M88A1, AVLB, or M48A3 vehicle is used, turn MASTER switch to OFF in live vehicle with engine running to prevent damaging generator and electrical systems.**

- (7) Turn MASTER switch on in dead vehicle after charging period.



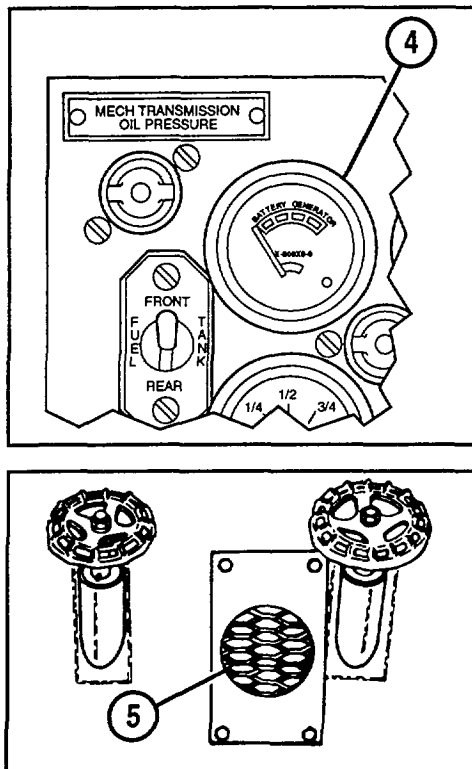
**CAUTION**

If dead vehicle does not start in 15 seconds, release START button and accelerator pedal. Turn MASTER switch to OFF and wait 3 to 5 minutes. Repeat starting procedures. If engine does not start on third try, troubleshoot (see tab. 3-1).

- (8) Start engine of dead vehicle (see para. 2-10b).
- (9) Disconnect slave cable from both vehicles and install cap (3) on slave receptacle (1 or 2).

**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.**

- (10) Check BATTERY-GENERATOR indicator (4) and generator grille (5) operation. If the generator grille does not operate, stop engine (see para. 2-10k) and notify unit maintenance.



- (11) If vehicle is not going to be driven for a long period, idle engine at 1000 to 1200 rpm for 30 minutes to recharge batteries.

**e. Starting Main Engine by Towing.**

**NOTE**

- Under normal conditions and on level terrain, engine may be started by towing vehicle.
- Tow start vehicle if it cannot be slave started or if starter trouble exists and vehicle must be operated.

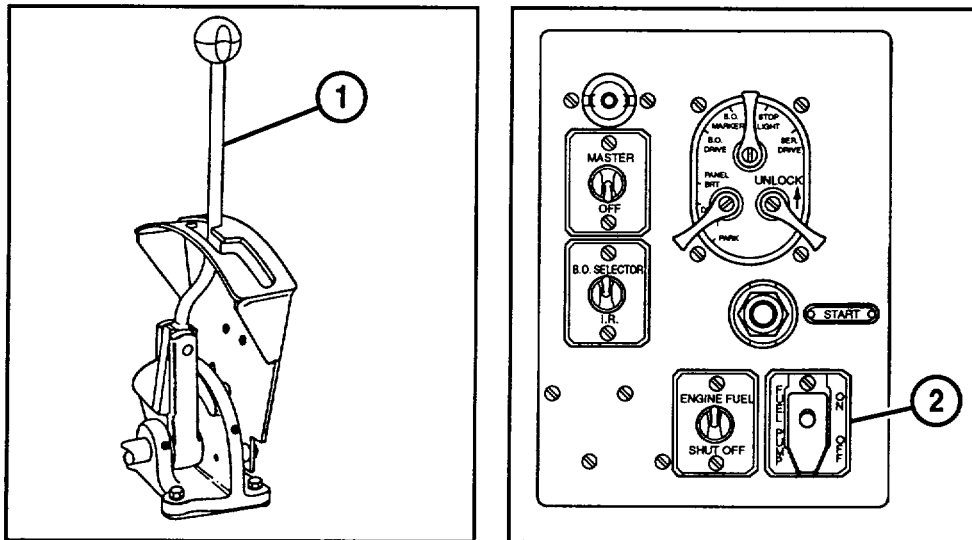
- (1) Prepare vehicle for towing with tow bar. See paragraph 2-11a.

**NOTE**

**Station observer in clear view of both operators to direct towing operation.**

- (2) Shift transmission (1) in dead vehicle to 2nd gear.

- (3) Check FUEL PUMP switch (2) for ON.



- (4) Turn MASTER switch on.

**NOTE**

**When MASTER switch is on, the master and mechanical transmission warning lights will stay on until engine is running. If lights do not come on, troubleshoot. (see tab. 3-1).**

- (5) Depress accelerator pedal about 0.5 in. (13 mm).  
 (6) Start towing in a straight line or a wide sweeping turn at about 8 mph (13 km/h).

**CAUTION**

**If master warning light does not go out in about 20 seconds after engine starts, stop engine (see para. 2-10k) and notify unit maintenance.**

- (7) If engine fails to start in about 3 to 5 minutes, stop towing and troubleshoot (see tab. 3-1).  
 (8) Stop vehicle before shifting.  
 (9) When engine starts, halt vehicles, and disconnect and stow tow bar. Check generator blower. If it does not operate, stop engine (see para. 2-10k) and notify unit maintenance.

## 2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

## f. Putting Vehicle in Motion.

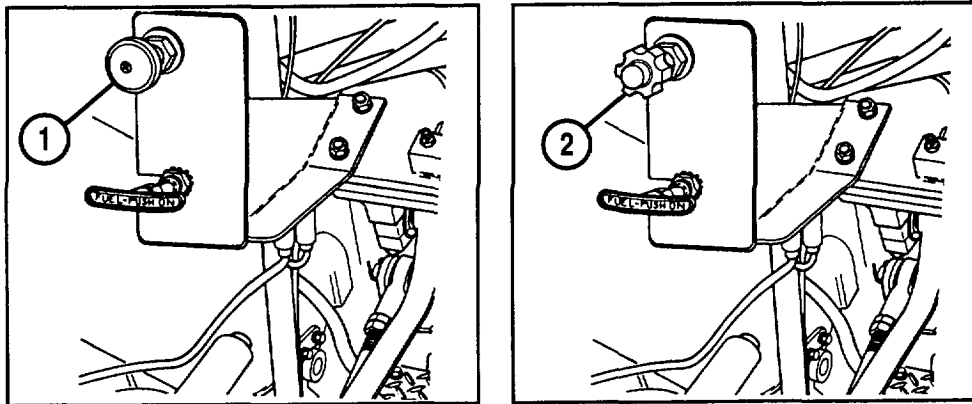
**WARNING**

- Secure covers, hatches, and doors before moving vehicle to avoid injuring personnel.
- Before moving out:
  - Ensure boom and spade are properly secured.
  - Check area around vehicle to avoid injuring personnel or damaging nearby equipment.

**NOTE**

Vehicle is equipped with either a push in or a turn style throttle.

- (1) Push throttle (1) or turn hand throttle (2) all the way in so engine is at low idle (675 to 725 rpm).
- (2) Hold brake down and shift to desired gear.
- (3) Release brake and accelerate to desired speed.

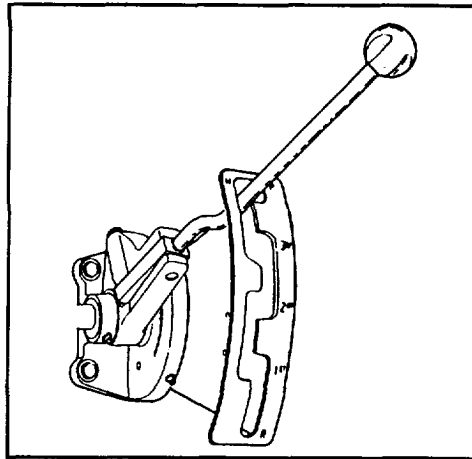
**CAUTION**

- Do not use hand throttle in place of accelerator for speed control except in an emergency.
- If track is thrown while driving, do not use the brake. Let off accelerator and coast to a stop.

## g. Transmission Shift Selection.

- (1) P. Use when:
  - (a) Starting engine.

- (b) Locking brakes (brake pedal must be depressed).
- (c) Vehicle is parked.
- (d) Using boom and winches when vehicle is stationary.
- (e) At halt for long periods or equipment nearby.

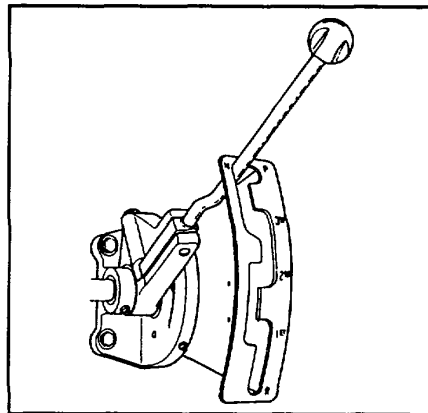


(2) N. Use when:

- (a) Vehicle is at halt for short periods.
- (b) Making pivot turns.
- (c) Vehicle is being towed.

**CAUTION**

**Vehicle must be completely stopped before shifting to N.**

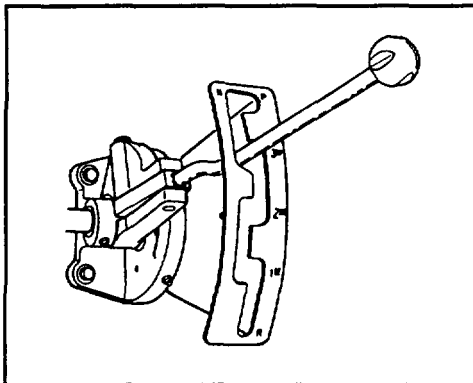


**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.**

- (3) 3rd. Use when driving under normal conditions on hard surface road. Top speed is 26 mph (42 km/h).

**CAUTION**

**Do not downshift from 3rd to 2nd above 12 mph (19 km/h).**

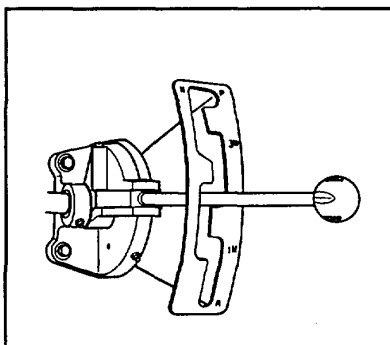


- (4) 2nd. Use when:

- (a) Towing heavy load.
- (b) Going up or down low slopes.
- (c) Starting vehicle in motion (normally).
- (d) Starting vehicle by towing.
- (e) Vehicle operation in deep or loose sand.

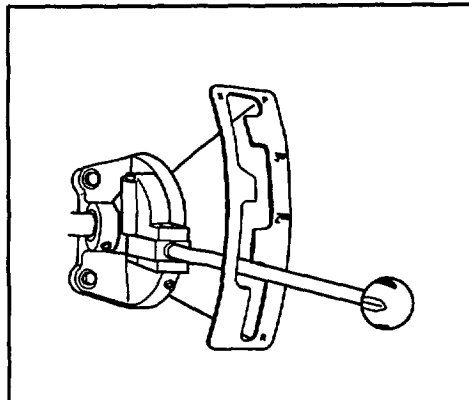
**CAUTION**

**Do not downshift from 2nd to 1st above 5 mph (8 km/h).**



(5) 1st. Use when:

- (a) Going up or down steep slopes.
- (b) Soft, muddy, or very rough ground.
- (c) Crossing a ditch, shell hole, or obstacle.
- (d) Start of towing operation.
- (e) When backing down steep hill.



- (f) In an emergency when going forward down a very steep slope, 50 to 60%. Brake vehicle by shifting to R on slope of hill. Stop before shifting into or out of reverse. When you go down, speed up engine to increase braking and to keep engine from stalling.

**NOTE**

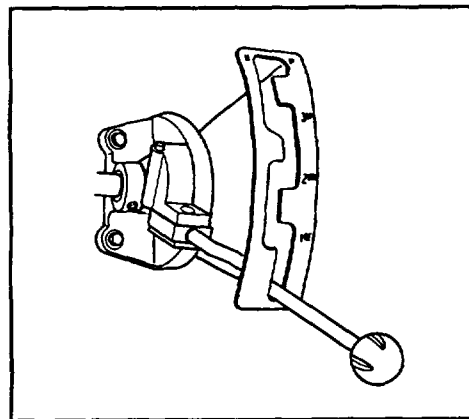
**Shift from 1st to 2nd gear when going above 5 mph (8 km/h).**

(6) R. Use when:

Backing up.

**CAUTION**

**Steers opposite when shifted to R. Turn wheel right-move left. Turn wheel left-move right.**



**h. Steering Instructions.**

**WARNING**

**Be careful when steering vehicle. It does not handle like a car. Do not make short, jerky turns or stops. Injury to personnel and damage to equipment can result if these instructions are not followed.**

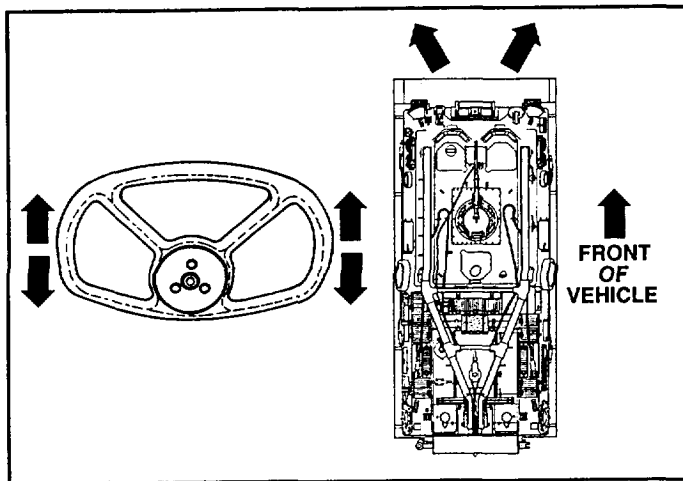


2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

- (1) Normal steering-forward. Transmission shift selection: 1st, 2nd, or 3rd.

**NOTE**

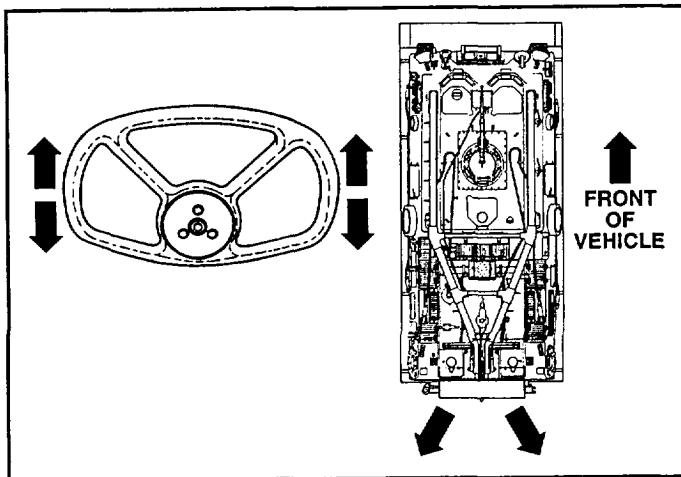
For larger wide, turns turn steering wheel slightly in desired direction in 2nd or 3rd gear. Turns in 1st gear are sharper.



- (2) Normal steering-reverse. Transmission shift selection: R.

**CAUTION**

Steer opposite way a car does. Turn wheel right-move left. Turn wheel left-move right.



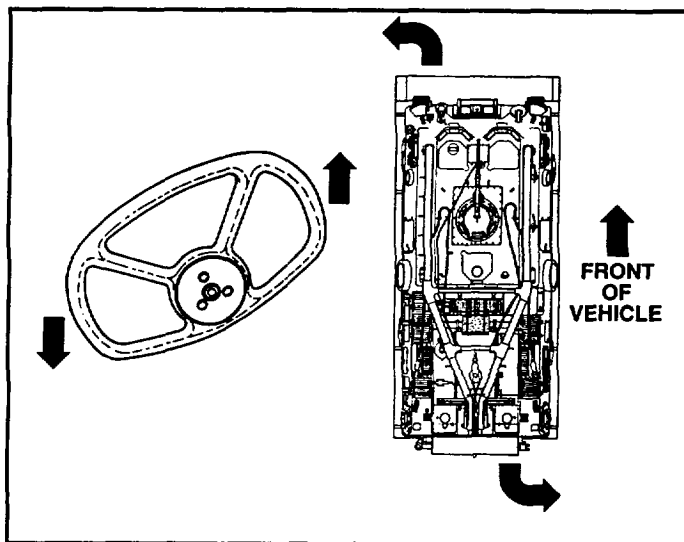
- (3) Pivot steering. Transmission shift selection: N.

**CAUTION**

Sudden turn can throw track. Turn on smooth level ground.

**NOTE**

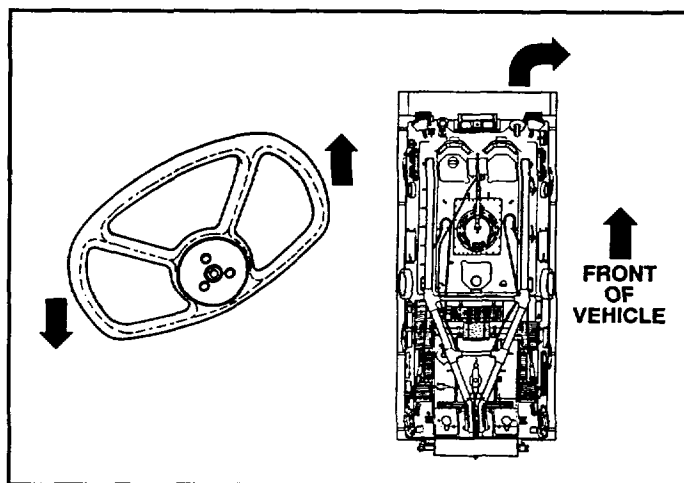
- Stop vehicle before shifting to N.
- Turn steering wheel full turn to desired direction and accelerate engine slowly.



(4) Forward downhill steering-in reverse gear. Transmission shift selection: R.

**CAUTION**

Moving in one direction with opposite gear selected for braking is used **ONLY** in extreme conditions. Vehicle must be **STOPPED** before shifting.

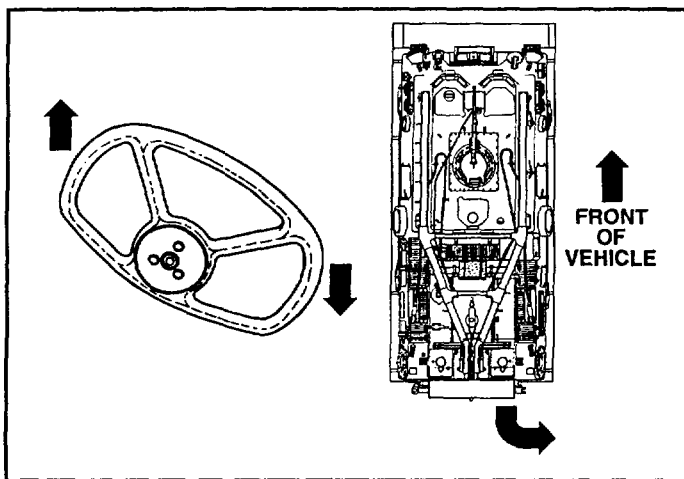


2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.

- (5) Backward downhill steering-in forward (1st) gear. Transmission shift selection: 1st.

**CAUTION**

As stated above, use reverse gear for braking **ONLY** in extreme conditions. Vehicle must be **STOPPED** before shifting to R.



- (6) Turning in sand.

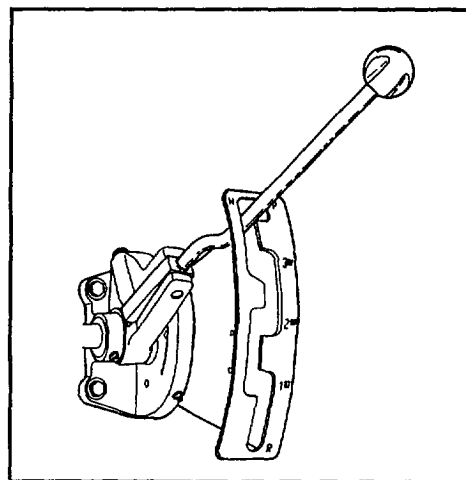
- (a) When turning in sand, shift to 2nd or 3rd gear and make gradual turns.
- (b) If sharp turns are made in 1st gear, track can be thrown. This is because of sand buildup on track.

**i. Stopping Vehicle.**

- (1) Release accelerator pedal and depress brake pedal.
- (2) Come to a complete stop, shift to P, and lock brake.

**NOTE**

Increase engine idle to 1000 to 2000 rpm for long halts.



**j. Driving Precautions.**

- (1) General. Be careful. You know the vehicle and how it handles. Do not allow the vehicle to get out of control.

**WARNING**

**Careless driving can result in loss of control causing serious injury and damage.**

- (2) Hard pavement. Care must be taken when driving on hard surfaces.
- (3) Crossing a ditch, shell hole, or trench.

**WARNING**

**Adjust vehicle speed and squarely approach an object or an obstacle. Warn crew members to brace themselves. Secure hatches and doors.**

- (a) When approaching ditch, shell hole, or trench, slow down by releasing accelerator. Use brake if necessary.
- (b) Put transmission selector into low (1st) gear.
- (c) As soon as vehicle reaches bottom and starts to climb, depress accelerator for power needed to climb out of ditch.
- (4) Going over an obstacle.

**WARNING**

**Approach obstacle squarely. Warn crew members to brace themselves.**

- (a) When approaching an obstacle (3.5 ft [1.1 m]) max. height, release accelerator, apply brake, and shift to low (1st) gear.
- (b) Apply full power when starting over obstacle, release accelerator pedal on reaching crest and permit vehicle to settle. Balance vehicle forward of crest so it begins to go down.
- (c) When front of track touches ground, add power and move on.
- (5) Starting vehicle on an upgrade. When vehicle is headed uphill, apply power before releasing brake to avoid rolling backward.

**CAUTION**

- **Do not use transmission as a braking source for a long period of time: transmission will overheat.**
- **Using service brakes too long will burn them out. Release and apply brakes occasionally to cool them off.**

**2-10. INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST-Continued.**

- (6) Going down steep grades. When going down a steep hill, shift transmission to 1st. Apply brake now and then to help slow down. In an emergency on a long descent:
- (a) Stop vehicle.
  - (b) Shift into R when headed down grade.
  - (c) Open throttle enough to brake vehicle and keep engine from stalling.

**CAUTION**

**Steering direction is reversed when in reverse gear, so be careful. See paragraph 2-10h.**

- (7) Driving down a steep hill backwards. In an emergency:
- (a) Stop vehicle.
  - (b) Shift into 1st when headed downhill.
  - (c) Use engine as brake. This prevents service brakes from burning out. Brake only when necessary.

**WARNING**

**Secure covers, doors, and hatches before moving vehicle to avoid injuring personnel**

- (8) Climbing steep grades on uphill recovery operations. Ensure FORWARD TANK FUEL VALVE (see para. 2-11i) is closed. This prevents fuel from draining into rear tanks and starving fuel pump.

**k. Stopping Main Engine.****WARNING**

**Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear area of all personnel and keep vehicle downwind of installation during test.**

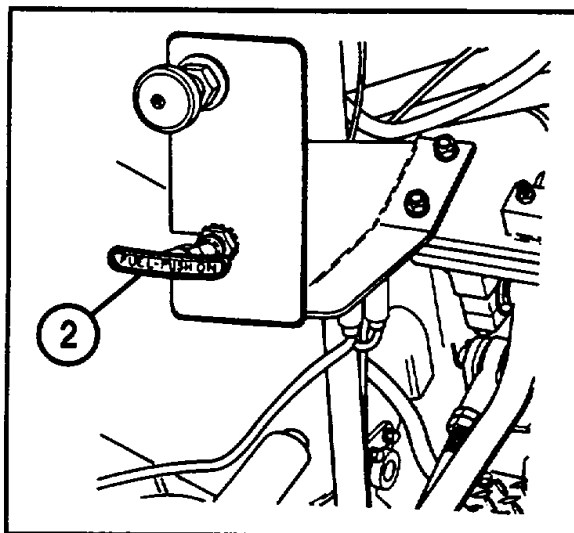
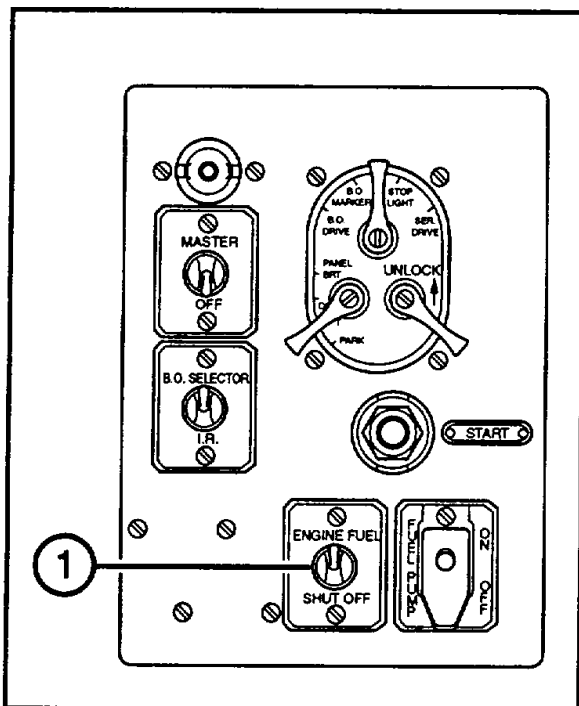
**NOTE**

**Fill fuel tanks when finished with daily operations to prevent condensation. Use diesel fuel only.**

- (1) Stop vehicle (see para. 2-10i).
- (2) Idle engine at 1000 to 1200 rpm for 3 to 5 minutes to cool it off. Bring idle down to 675 to 725 rpm after cooling period.
- (3) Hold ENGINE FUEL SHUTOFF switch (1) down until engine stops.

**NOTE**

If engine fails to shut off, pull manual fuel shutoff handle (2) until engine stops. Notify unit maintenance.



- (4) Turn off all radio and electrical switches.

- (5) Turn MASTERS switch to OFF.

**1. Crossing Class 60 Bridge, Armored Vehicle Launched (NSN 5420-00-522-9599).**

**WARNING**

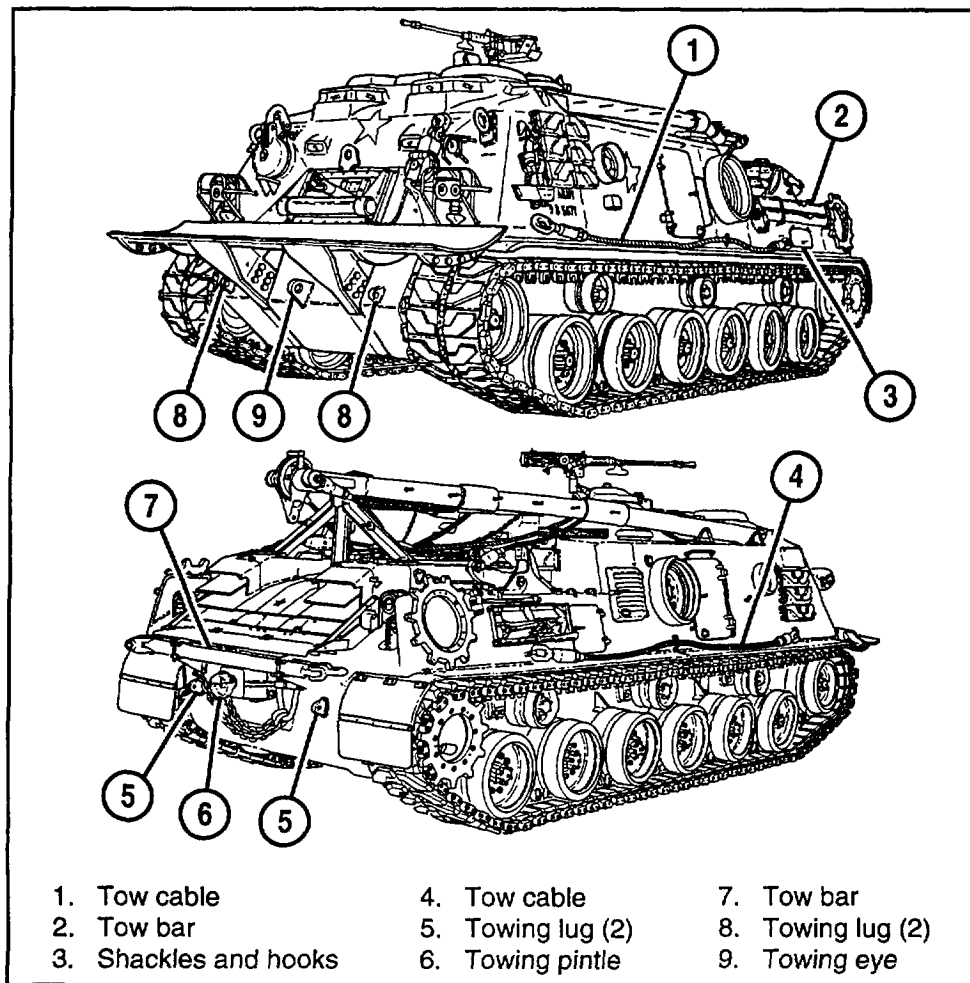
Failure to observe following precautions when crossing the Class 60 Bridge, Armored Vehicle Launched, may cause injury to personnel or structural damage to bridge.

- (1) Center vehicle on bridge.
- (2) Cross bridge at speeds no higher than 8 mph (13 km/h).
- (3) Do not stop, accelerate, or shift gears while crossing bridge.

2-11. OPERATING PROCEDURES.

a. Towing Operations.

- (1) Equipment. All equipment needed for towing operations is stored on vehicle. Refer to illustration below for equipment location.



**NOTE**

**Six people are needed to connect tow bar.**

- (2) Towing precautions. The following precautions should be followed to ensure safety to personnel and equipment:
- (a) Vehicle engines should be turned off and brakes applied while tow cables are being connected or disconnected.
  - (b) Main guns on towed vehicles must be pointed away from M88A1 to prevent impact in case of collision.

- (c) Place exhaust deflector in center position on both sides during towing operation.
- (d) An observer must be used to assist driver when rigging vehicle and during towing operations.
- (e) Personnel must not ride on or in an M1MBT while it is being towed.
- (f) Avoid sudden stops or turns. Make a wide gradual turn in 1st gear.
- (g) During normal M1MBT towing operations, use same procedures used for cross-country towing. Use of third vehicle as a holdback vehicle is required even when using tow bar for extended hauling. This helps prevent heavier M1MBT from pushing M88A1 to side or jackknifing when stopped.

**WARNING**

**These speeds are for good conditions. Go slow if ground is unsafe.**

**NOTE**

**The M88A1 is authorized to tow only one vehicle at a time.**

- (3) Towing speeds. When towing another vehicle, following speeds should be maintained:

<b>Speed</b>	<b>Surface/Condition</b>
10 to 13 mph (16 to 21 km/h)	Hard, level surface (tow bar used)
5 mph (8 km/h)	Hard, level, smooth road (tow bar and braking vehicle used) towing M1MBT
2 mph (3 km/h)	Hilly or level cross-country (tow cables used)

These figures are only averages. You might have to go slower for safe traveling. Check with operator's manual of vehicle being towed.

- (4) Connecting tow bar. Use tow bar when traveling over level ground. Tow cables must be used when towing over rough ground or cross-country.



2-11. OPERATING PROCEDURES-Continued.

**WARNING**

Tow bar assembly (1) is extremely heavy-two persons are required for removal and installation.

**CAUTION**

Do not use tow bar for cross-country towing. Tow cables are supplied for this.

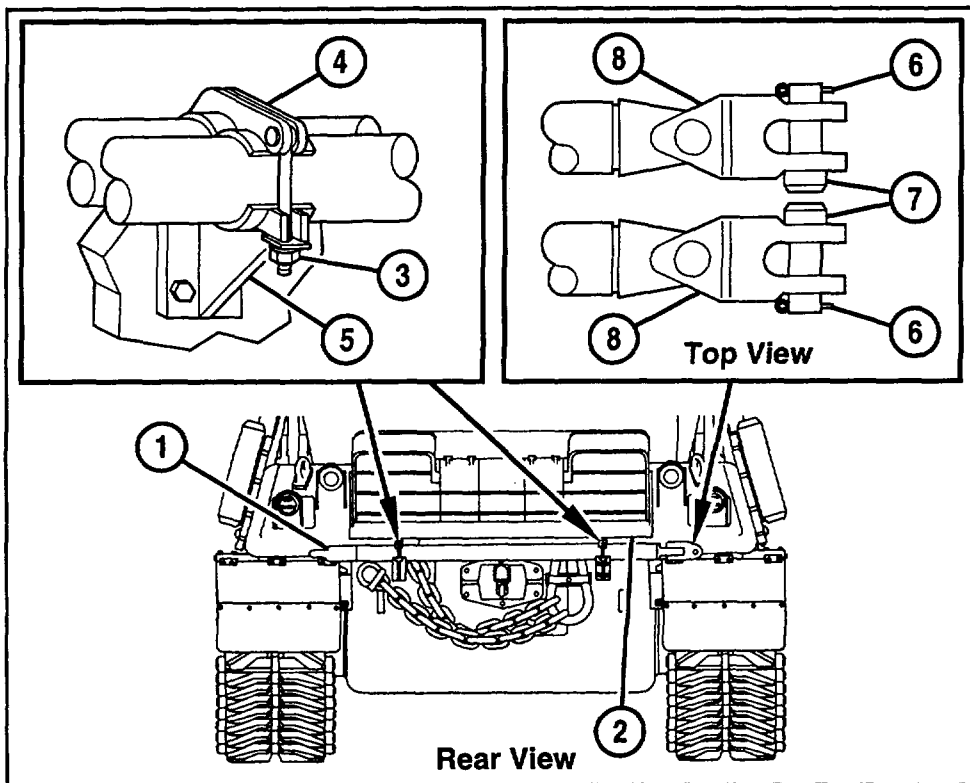
**NOTE**

Exhaust deflector (2) positions:

- Full down for normal travel.
- Half up while towing.
- Full up when hooking up or stowing towing equipment.

(a) Loosen two nuts (3) to open clamp assembly (4) and remove tow bar from bracket (5).

(b) Remove two locking pins (6) and two clevis pins (7) from clevis ends (8) of tow bar.

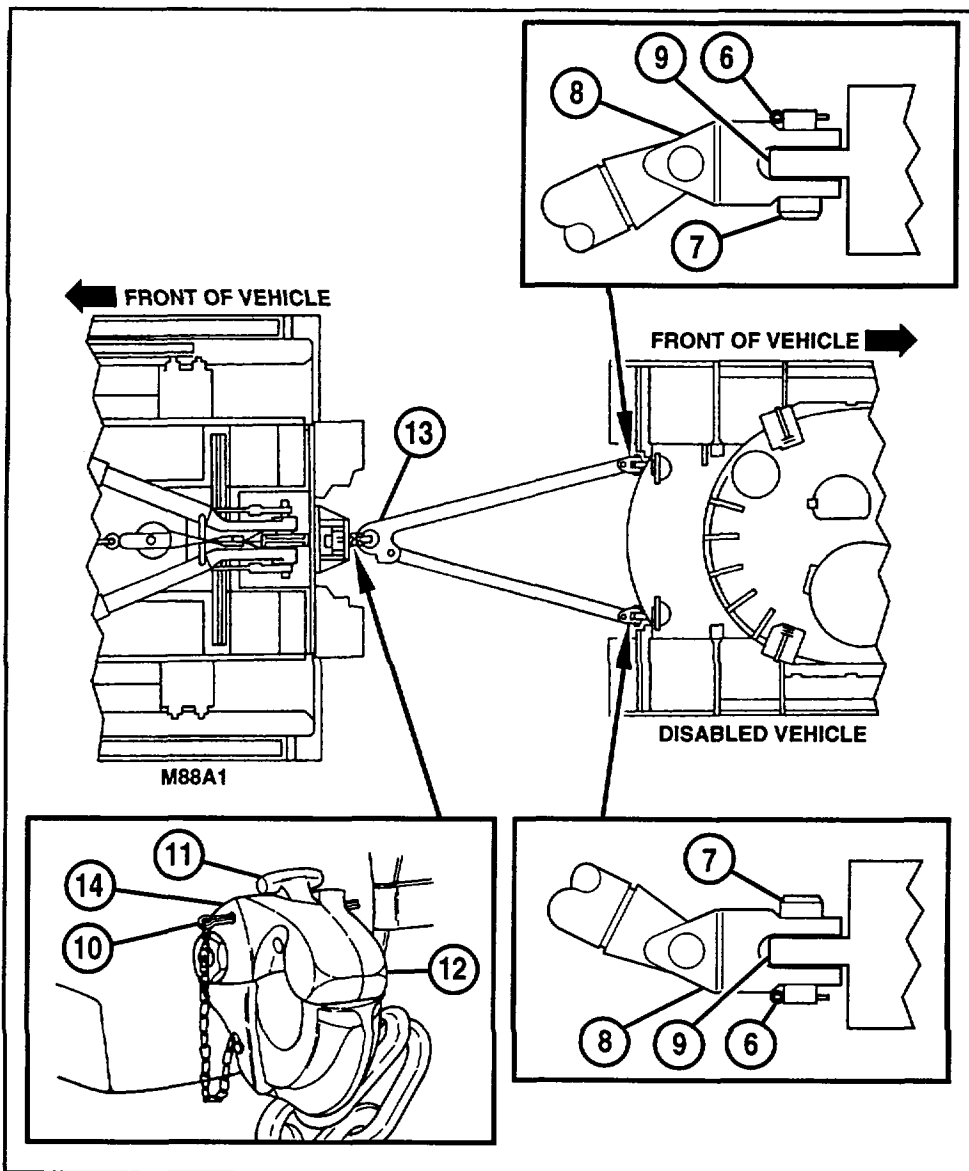


- (c) Place clevis ends (8) over towing lugs (9) of disabled vehicle and insert two clevis pins (7) and two locking pins (6).
- (d) Remove cotter pin (10) and lift latch (11) and lift lock (12).

**WARNING**

**Use extreme caution to prevent injury to personnel.**

- (e) Connect lunette end (13) of tow bar to towing pintle (14) of M88A1 by carefully moving vehicle into position. Secure lock and insert cotter pin (10).

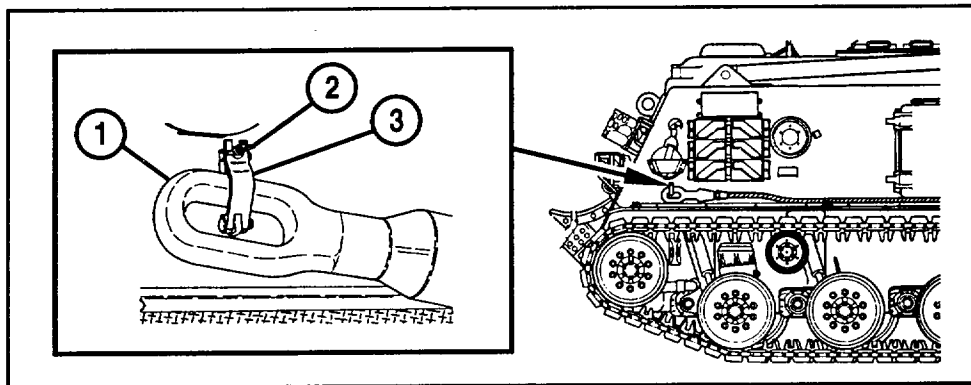


## 2-11. OPERATING PROCEDURES-Continued.

- (f) Check operator's manual of disabled vehicle before start of towing. Special services might have to be done. Maintain proper speed (see para. 2-11a(3)).

(5) Connecting tow cables.**NOTE**

- Tow cables (1) are used when towing over rough, uneven ground (cross-country).
  - There is one tow cable located on right side of vehicle and one located on left side.
- (a) Position rear of M88A1 in front of disabled vehicle. Loosen wingnut (2) on each clamp (3) and pull three clamps off each cable.

**WARNING**

Before hooking cables, turn engine off and set brakes in both vehicles.

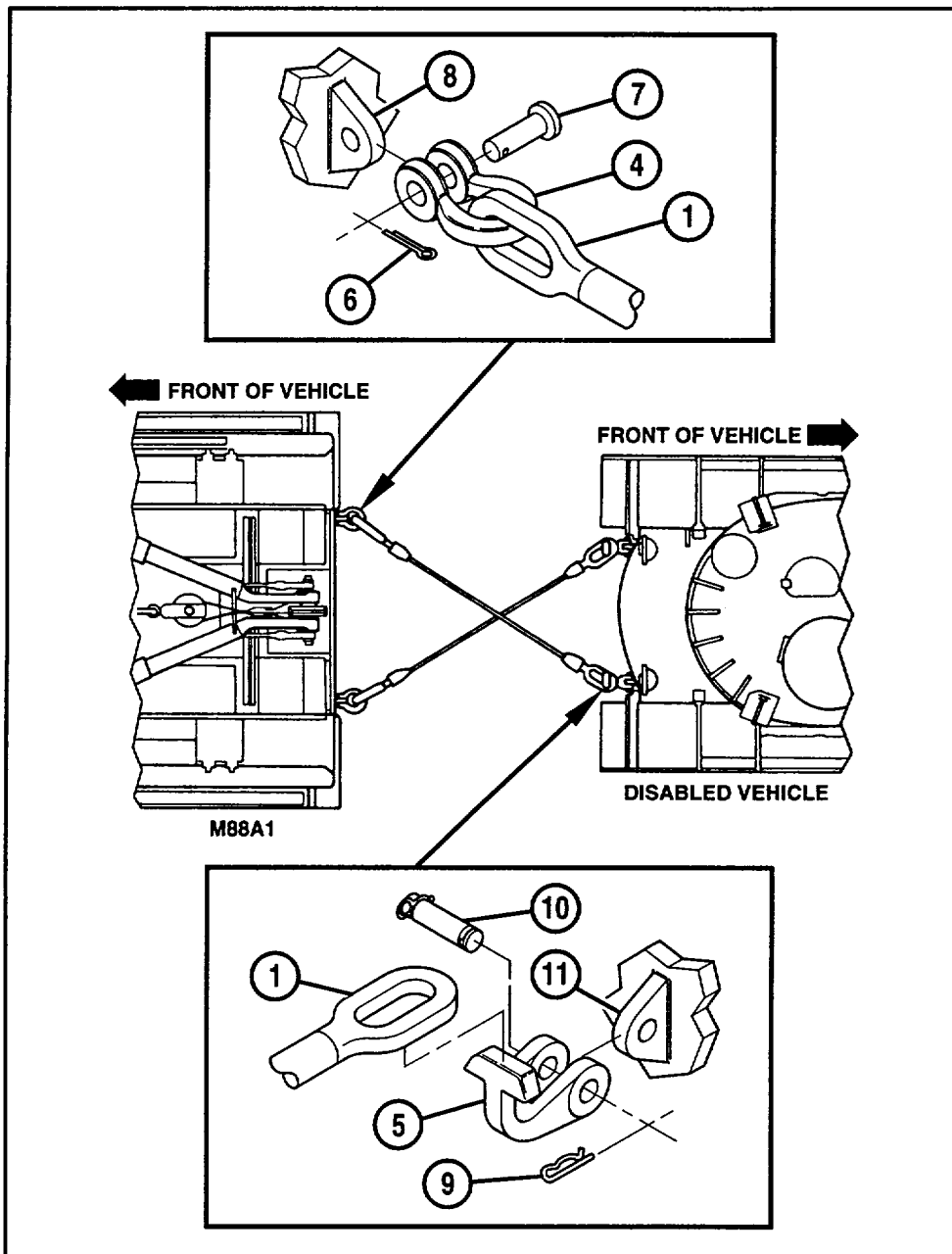
**CAUTION**

Do not bend or loop cables when rigging vehicles for towing. This will weaken cables and cause rigging to break. Cross cables as shown on illustration below.

**NOTE**

- Tow cable shackles (4) and tow cable hooks (5) are located in left side storage compartment.
- Steps (b), (c), and (d) must be repeated for both tow cables.

- (b) Remove locking pin (6) and clevis pin (7) from tow cable shackle (4). Put tow cable shackle through end of tow cable (1) and towing eye (8). Insert clevis pin and locking pin.
- (c) Remove cotter pin (9) and pin (10) from tow cable hook (5). Attach tow cable hook to towing lug (11) of disabled vehicle by inserting pin and cotter pin.
- (d) Put free end of tow cable (1) over tow cable hook (5).



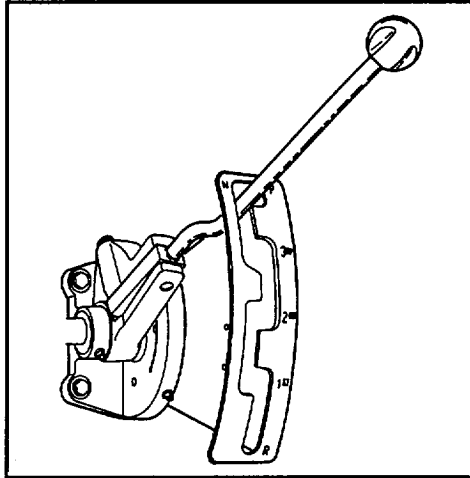
**2-11. OPERATING PROCEDURES-Continued.**

- (e) Keep speed around 2.5 to 3 mph (4.0 to 4.8 km/h) when towing cross-country. When using cables for towing, a third vehicle must be used. This is to hold back disabled vehicle if final drives have been disconnected. Refer to FM 20-22 for procedures. Check operator's manual of disabled vehicle for towing.
  - (f) Final drives on tracked vehicles, other than M88A1, will be disconnected on disabled vehicle if it is to be towed more than 0.25 mile (0.42 km). Disconnect as instructed in that vehicle's manual.
- (6) Towing the M88A1.

**CAUTION**

- **Do not use M88A1 brakes continuously: they will burn out.**
- **If tow cables are used to tow M88A1, a driver must be stationed on M88A1 to operate brakes.**
- **When a vehicle other than an M88A1 is used for towing be sure its towing pintle is strong enough to take the load.**
- **These speeds are for good ground conditions. Go slower if ground is unsafe.**
- **Do not disconnect final drives unless transmission problems are suspected. If transmission problems are suspected, disconnect final drives to prevent further damage to transmission. If M88A1 is going to be towed with cables more than 0.25 mile (0.42 km), have a third vehicle hookup with a cable behind vehicle to act as braking unit. Refer to FM 20-22 for procedures.**
- **Do not tow the M88A1 backwards with final drives connected. Always disconnect final drives before towing vehicle backwards.**
- **Do not tow M88A1 faster than 12 mph (19.3 km/h) with tow bar on level ground or 2.5 mph (4.0 km/h) with tow cables.**

- (a) Connect tow bar or tow cables (see para. 2-11a).
- (b) Shift transmission to N.



(7) Towing a disabled vehicle.

- (a) Position M88A1 in front or behind disabled vehicle.
- (b) Connect tow bar or cables (see para. 2-11a).
- (c) Refer to operator's manual of disabled vehicle for gear position and speed for towing.
- (d) Shift transmission to 1st gear to get rolling and then to 2nd if ground conditions permit.

**b. Operation of Caliber .50 Machine Gun.** Refer to FM 23-65 and TM 91005-213-10 for instructions on how to operate and maintain caliber .50 machine gun.

**c. Preparing Hydraulic System for Operation.**

- (1) Main hydraulic system.

**CAUTION**

**Do not operate hydraulic system with hoses disconnected.**

- (a) Depress brake and shift transmission to P.
- (b) Start engine (see para. 2-10b) and run it at low idle (675 to 725 rpm).

## 2-11. OPERATING PROCEDURES-Continued.

- (c) Shift SYSTEM SELECTOR control lever (1) to MAIN. Shift POWER control lever (2) to ON. Place rest of hydraulic control levers in N. Check APU emergency winch control valve (3) for NORMAL OPERATION.

**CAUTION**

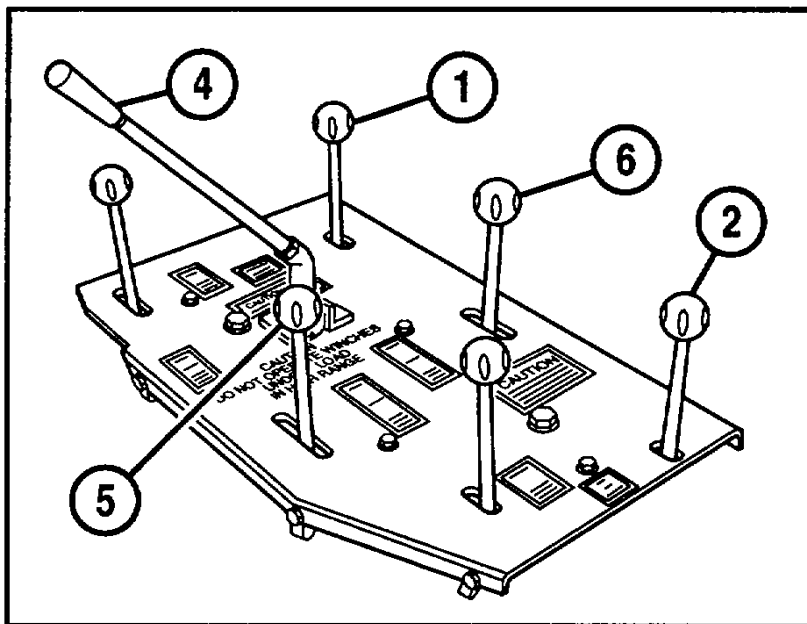
**Hydraulic operation above 170°F (77°C) not recommended. High oil temperature may cause abnormal system performance.**

- (d) Speed up engine to 1000 rpm and wait 5 to 10 minutes to let oil circulate and warm up.

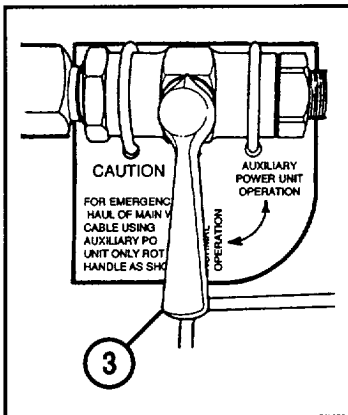
**NOTE**

**For cold weather operation-increase engine to 1800 rpm. Be sure spade is locked and move SPADE operating lever (4) to RAISE for 3 to 4 minutes. This will cause oil to spill over relief valve for faster warm up.**

- (e) Return engine to low idle. Ensure MAIN WINCH and HOIST WINCH SHIFT levers are in NEUTRAL (see para. 2-1b). With systems in a no-load condition, circulate oil through main and hoist winch systems. Move HOIST WINCH operating lever (5) to RAISE and LOWER. Move MAIN WINCH operating lever (6) to INHAUL and PAYOUT. Do this 3 or 4 times.



- (f) Slowly increase engine speed to 1800 rpm by using hand throttle.
- (g) The hydraulic system is now ready for operation or draining.



**NOTE**

Refer to paragraph 2-11d for spade operation, paragraph 2-11e for boom operation, paragraph 2-11f for hoist winch operation, and paragraph 2-11h for main winch operation.

(2) Auxiliary hydraulic system.

**CAUTION**

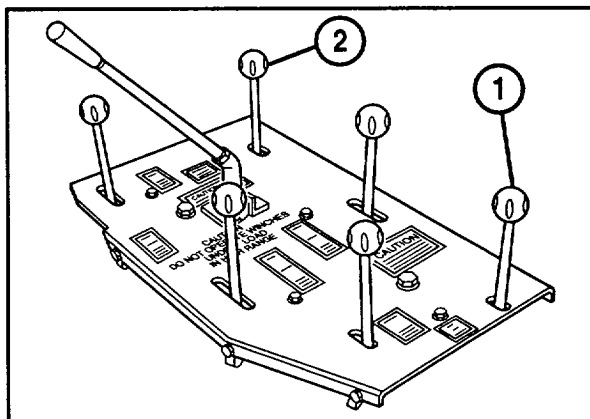
The auxiliary hydraulic system is used for winches, boom, and spade under no-load conditions.

- (a) Check and keep POWER control lever (1) to OFF.

**CAUTION**

Do not operate hydraulic systems with hoses disconnected.

- (b) SYSTEM SELECTOR control lever (2) must be in MAIN when starting APU. Start APU (see para. 2-13e) and let system warm up for 5 minutes.

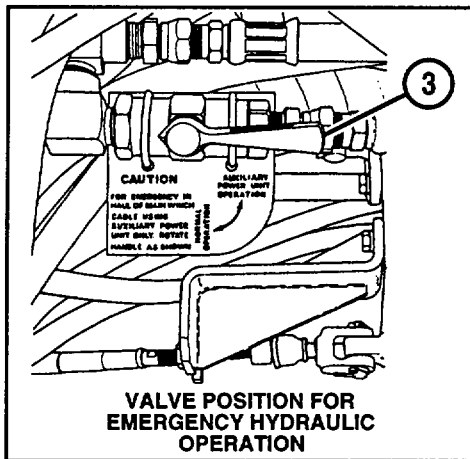




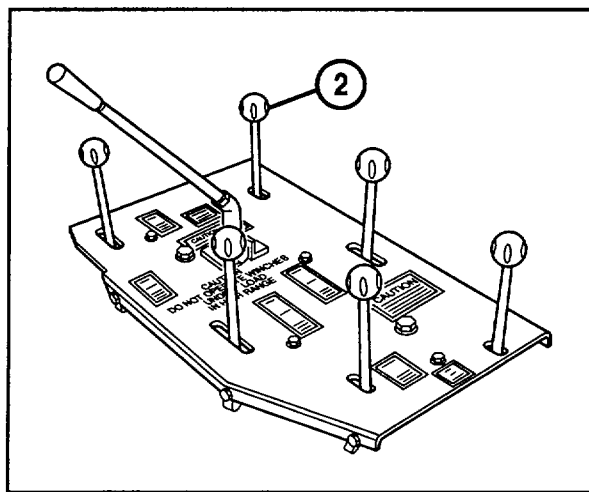
2-11. OPERATING PROCEDURES-Continued.

(c) To operate hoist and main winches under no-load condition:

1. Ensure APU emergency winch control valve (3) is in AUXILIARY POWER UNIT OPERATION position.



2. Move SYSTEM SELECTOR control lever (2) to AUX.



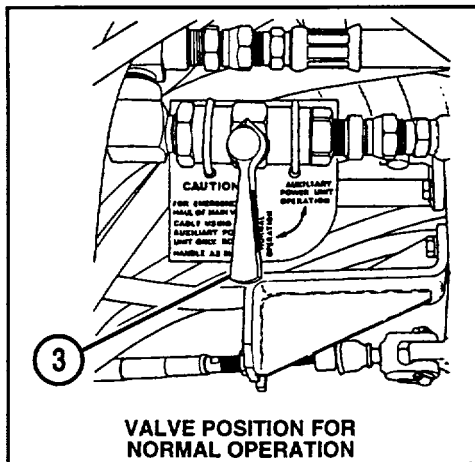
3. Shift MAIN or HOIST WINCH SHIFT lever to HIGH only (see para. 2-1b).
4. Operate MAIN WINCH operating lever (see para. 2-1b) or HOIST WINCH operating lever.

**NOTE**

- Located In mechanic's area on left side.
- Valve position is for emergency hydraulic operations.

(d) To operate boom or spade under no-load condition:

1. Move APU emergency winch control valve to NORMAL OPERATING position.
2. Move SYSTEM SELECTOR control lever (2) to AUX position.



3. Operate BOOM or SPADE operating levers. See paragraph 2-11e for boom operation or paragraph 2-11d for spade operation.

**NOTE**

**Valve position is for normal operations.**

(e) To operate hydraulic impact wrench of refuel-defuel system:

1. Check APU emergency winch control valve for NORMAL OPERATION position.
2. Move SYSTEM SELECTOR control lever (2) to REFUEL.
3. See paragraph 2-13e for refuel-defuel operation or paragraph 2-13f for hydraulic impact wrench operation.

**d. Spade Operation.**

(1) Controls. Spade is controlled by main or auxiliary hydraulic system. Controls are located in driver's area.

(a) Prepare main hydraulic system for operation (see para. 2-11c).

**NOTE**

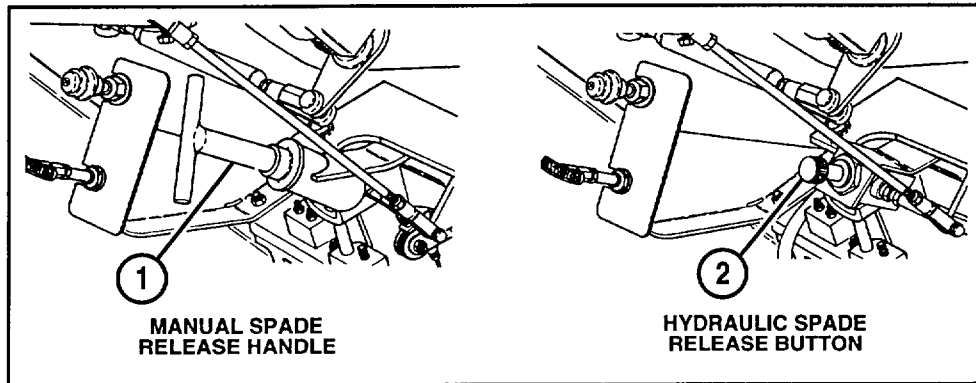
**Refer to paragraph 2-11c(2) for using auxiliary hydraulic system to stow spade.**

(b) Spade is used to stabilize vehicle when:

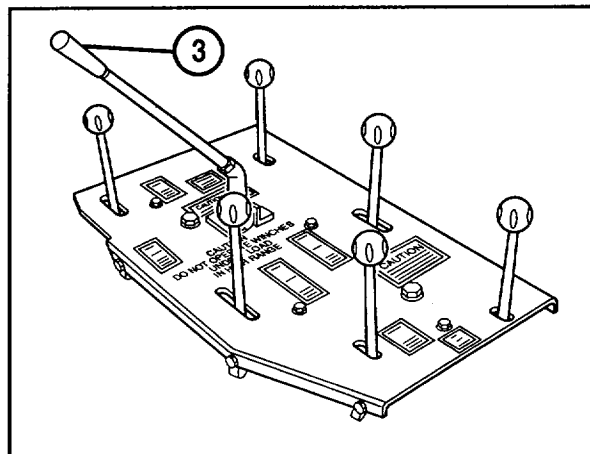
1. Hoisting over 6 tons (5.4 metric tons) without lockout blocks installed.
2. During all main winching operations.

**2-11. OPERATING PROCEDURES-Continued.**

- (c) Raise spade and release lock by pushing manual spade release handle (1) or hydraulic spade release button (2).



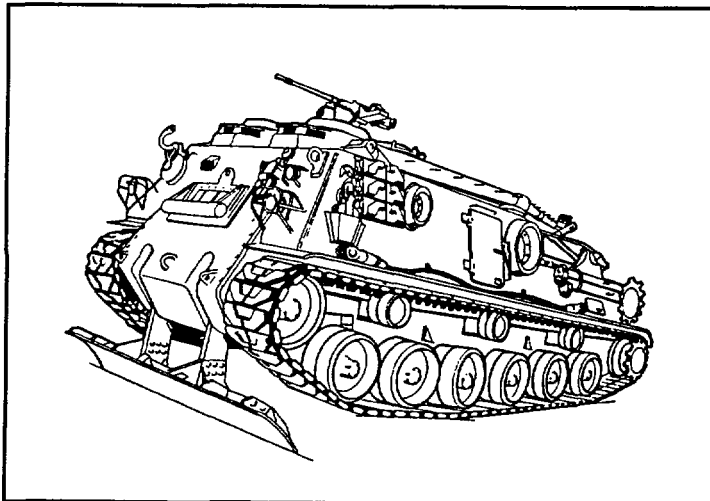
- (d) Move SPADE operating lever (3) and LOWER or RAISE for desired operation.



**CAUTION**

**Spade may be used for light earth moving and leveling (dozing) for preparation of recovery only. Use only lower edge of spade to perform light earth moving. Do not dig spade deep into ground for use as a dozer blade.**

- (e) Lower blade until it touches ground. Keep lever in LOWER, return engine to idle, shift transmission to 3rd gear, release brake, and move vehicle forward slowly. When it stabilizes over spade, shift lever to HOLD. Shift transmission to P and depress brake. Increase engine speed to 1800 rpm and continue with recovery operation.



- (f) To back off spade, move vehicle slowly in reverse and move SPADE operating lever to RAISE.
- (2) Operation. Spade is used to stabilize the vehicle when hoisting loads over 6 tons (5.4 metric tons). It will always be used for winching operations.

#### NOTE

Auxiliary hydraulic system is used for spade operations only in an emergency. See paragraph 2-11c(2) for operating auxiliary hydraulic system. Notify unit maintenance if spade cannot be raised to locked position.

#### e. Boom Operation.

#### WARNING

- During any winching, hoisting, lifting, or boom raising operation all hatches should be closed for operator and crew safety. Do not allow operator or crew to operate vehicle with hatches open. Injury or death could result from cable or rigging failure under load.
  - At no time during M88A1 MRV boom operations are personnel required to be positioned on engine deck of vehicle. The "A" shape of boom support latch (see para. 2-11d(6)) is designed to guide hoist winch cable out of the path of retracting boom.
- (1) General. Boom is powered by main or auxiliary hydraulic system. Driver controls boom from crew compartment.

## 2-11. OPERATING PROCEDURES-Continued.

## NOTE

Auxiliary hydraulic system is used in an emergency to raise or lower boom under no-load condition.

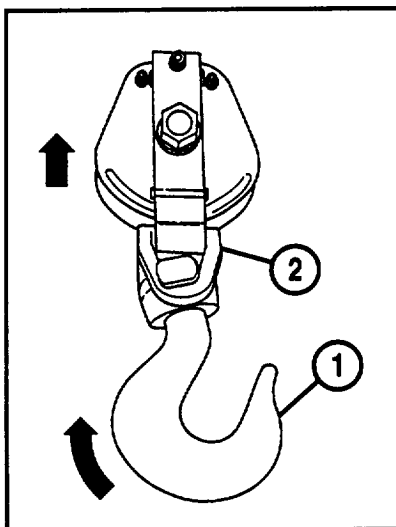
- (2) Rigging the boom.

## NOTE

Two snatch blocks are provided for hoisting operations-one 10-ton (9.1-metric-ton) and one 25 ton (22.7-metric-ton).

- (a) To rig 10-ton (9.1-metric-ton) snatch block for a two-part line:

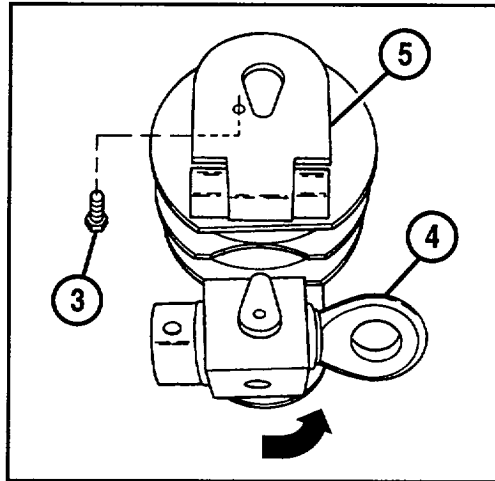
1. Lay block in boom tray with hook (1) forward.
2. Swing hook (1) out and lift hinge (2).
3. Lay cable in pulley and lower hinge (2). Pull hook (1) down to lock hinge.



- (b) To rig 25-ton (22.7-metric-ton) snatch line:

1. Lay block in boom tray with clevis forward.
2. Remove screw (3).
3. Swing clevis (4) and lift hinge (5).
4. Lay cables in snatch block. Do not to tangle or cross cables.

5. Lower hinge. Swing clevis (4) back and replace screw (3).



**WARNING**

Do not use 25-ton (22.7-metric-ton) snatch block if screw (3) is not installed. If there is no hole in hinge for screw, immediately notify unit maintenance for installation. Failure to secure clevis to hinge with screw could result in release of snatch block during lifting operations possibly causing death.

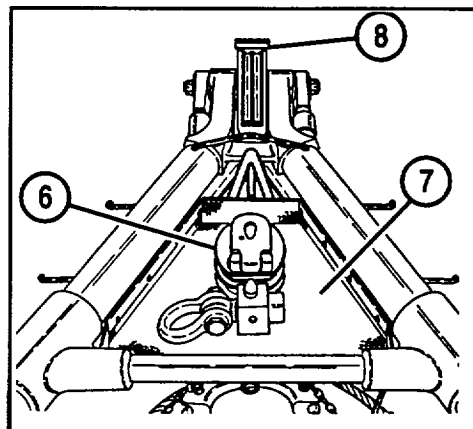
**CAUTION**

In order not to tangle cable when rigging, read following instructions carefully.

**NOTE**

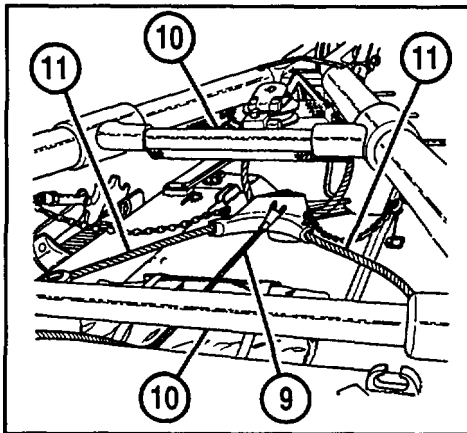
For replacement screw (3), use NSN 5305-00-269-2798.

- (c) Place 10-ton (9.1-metric-ton) or 25-ton (22.7-metric-ton) (6) snatch block in boom tray (7) with open end of block facing forward. Open boom pulley safety latch (8).



2-11. OPERATING PROCEDURES-Continued.

- (d) Have operator pay out hoist cable (9). Pass cable over top of crew compartment and under boom cross members (10). Keep hoists cables between staylines (11).

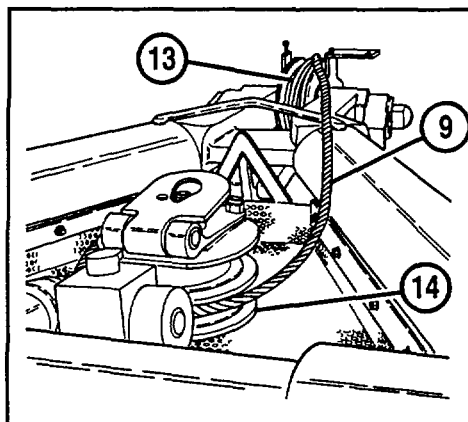
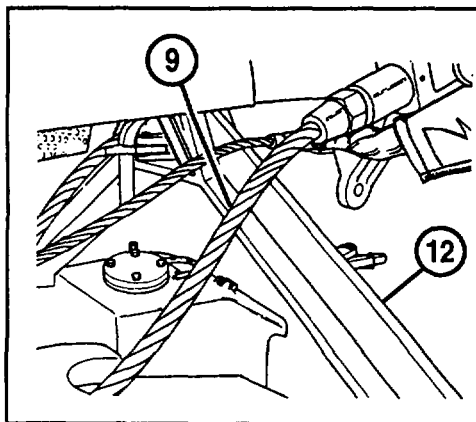


- (e) Pass cable (9) up and over left side of boom support (12).

- (f) Bring cable (9) back, going up and over left boom pulley (13).

- (g) Pull cable (9) forward and lay it on the lower pulley (14) of 25-ton (22.7-metric-ton) snatch block from left to right.

- (h) If rigging a two-part line using 10-ton (9.1-metric-ton) snatch block, close boom safety latch, hook up line to boom dead man (see para. 2-11e(2) m) and close block.

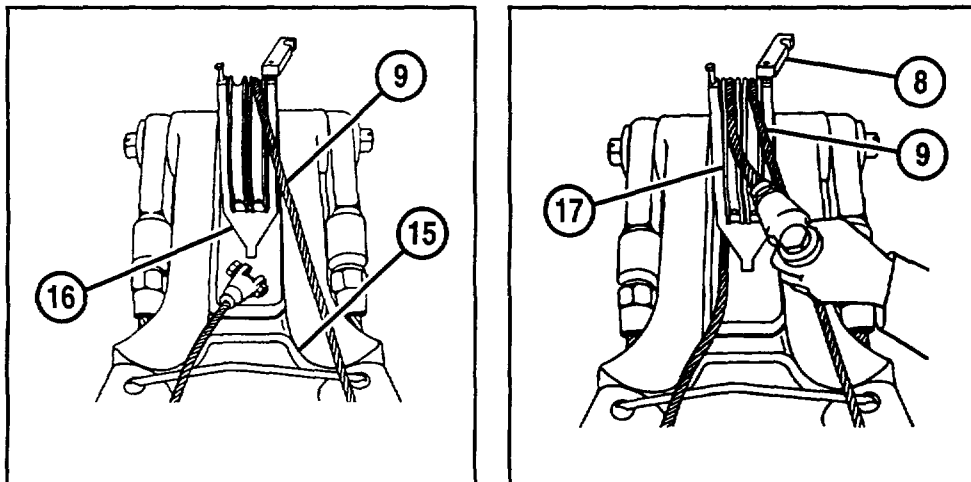


**NOTE**

**If rigging a 25-ton (22.7-metric-ton) snatch block with a four-part line, continue with following steps.**

- (i) Bring cable (9) back over upper boom cross member (15) and down under boom pulley assembly (16).
- (j) Pull cable (9) up and over right boom pulley (17).

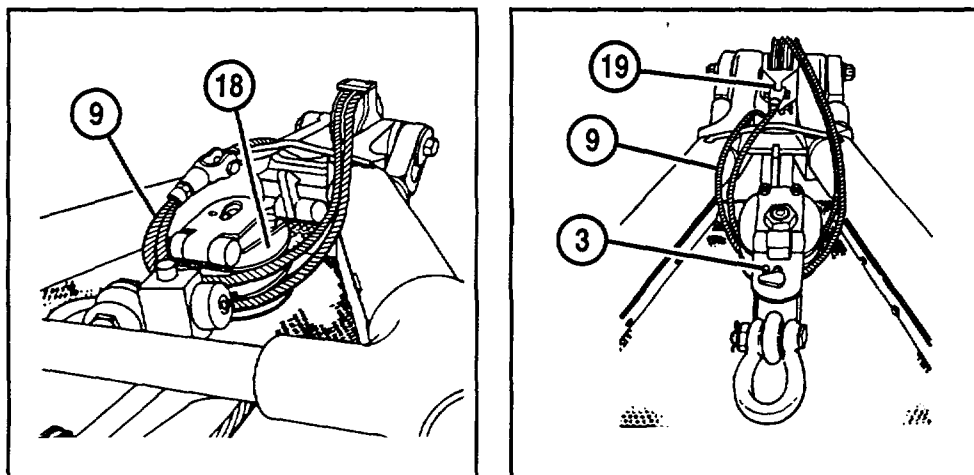
- (k) Close boom pulley safety latch (8).



- (l) Bring cable (9) forward and lay it in upper pulley (18) of block from left to right.
- (m) Pull cable (9) toward boom pulley and secure it to dead man (19).
- (n) Close snatch block. Replace and tighten screw (3).

**WARNING**

Do not use 25-ton (22.7-metric-ton) snatch block if screw (3) is not installed. If there is no hole in hinge for screw, immediately notify unit maintenance for installation. Failure to secure clevis to hinge with screw could result in release of snatch block during lifting operations possibly causing death.





## 2-11. OPERATING PROCEDURES-Continued.

(3) Raising boom.**WARNING**

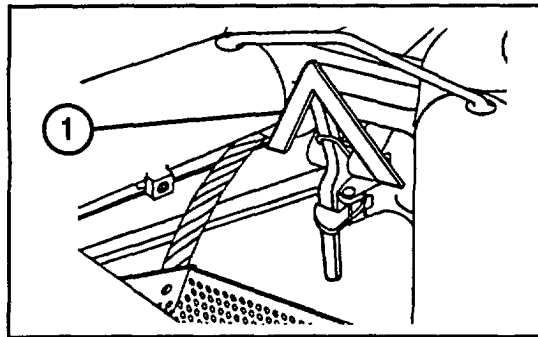
- To avoid injury, do not stand on top of vehicle while boom is being used.
- To avoid injury, do not stand on engine deck while operating boom. Boom support latch will guide hoist winch cable out of path of retracting boom.

**CAUTION**

To avoid damage to boom and hydraulic system, always keep boom in stowed (travel lock) position when not in use.

(a) Prepare main or auxiliary hydraulic system for operation (see para. 2-11c).

(b) Release boom latch (1) and lock in unhooked position.



(c) Move BOOM SAFETY control lever (2) forward to STOW position. Keep BOOM SAFETY lever forward and move BOOM operating lever (3) to FORWARD position.

(d) Loosen stayline cable locking tabs on both left and right sides and position away from stayline cable.

**CAUTION**

Ensure stayline cables do not snag on vehicle top when raising boom.

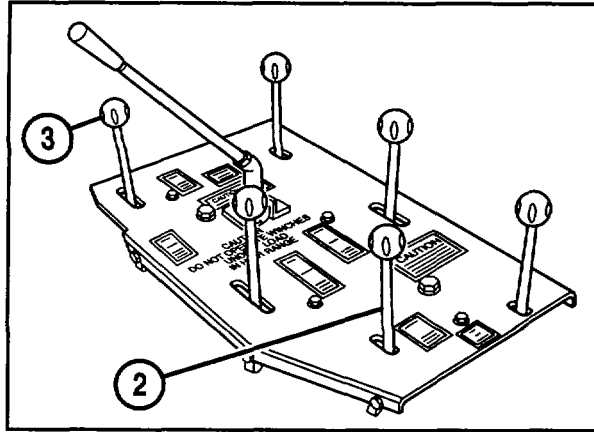
**NOTE**

- These levers must be engaged to operate boom with main engine ONLY. When using auxiliary hydraulics, use only BOOM operating lever (3).
- When AUXILIARY HYDRAULIC position is selected, only BOOM operating lever is needed to raise or lower boom.

(e) Release both levers (2 and 3) when boom is fully raised. They will return to their normal positions.

(4) Precautions to follow when raising boom.

- (a) Chains supporting tie block are not allowed to snag on J-hook (see para. 2-11e).
- (b) Ensure cables (see para. 2-11e) do not snag when raising boom.

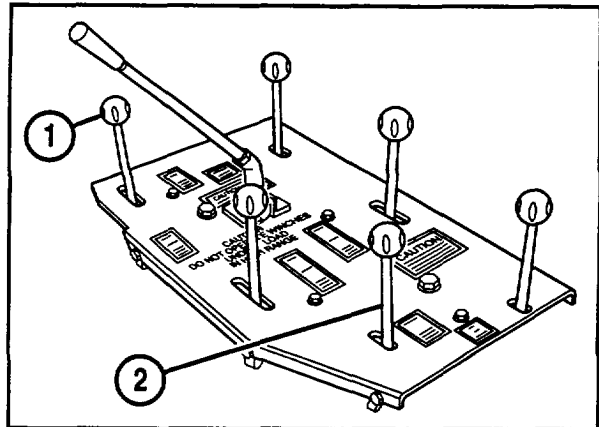


(c) Keep all ropes, stayline cables, and other equipment from catching on deck door hinges and handles to avoid damage and injury.

(5) Operating boom.

**WARNING**

**If powerplant is removed and APU is nonoperational, leave boom in full raised position. Do not attempt to lower boom; damage could occur.**



(a) To move boom back 4 ft (1.2 m), move BOOM operating lever (1) to RETRACT-STOW.

(b) To move boom forward, move BOOM operating lever (1) to FORWARD.

**NOTE**

**When bringing boom all the way back (more than 4 ft [1.2 m]), operate BOOM SAFETY control (2) and BOOM operating (1) levers to bring it forward again.**

## 2-11. OPERATING PROCEDURES-Continued.

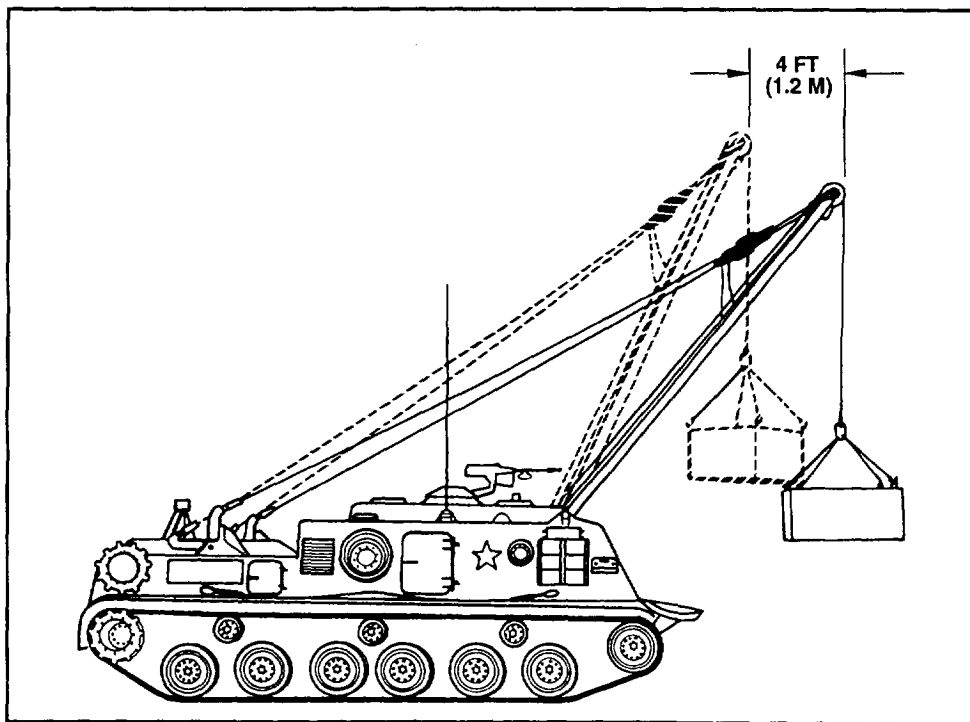
## NOTE

The vehicle can move with a load of up to 6 tons (5.4 metric tons) hanging from boom. Moving loads of 6 to 20 tons (5.4 to 18.1 metric tons) requires lockout blocks. See paragraph 2-11g for instructions on lockout block installation.

- (c) Live boom operation is used to move boom 1 to 4 ft (0.3 to 1.2 m) back from the full forward position. This is for spotting (placing) loads during recovery or maintenance operations. Refer to illustration below for live boom operation.

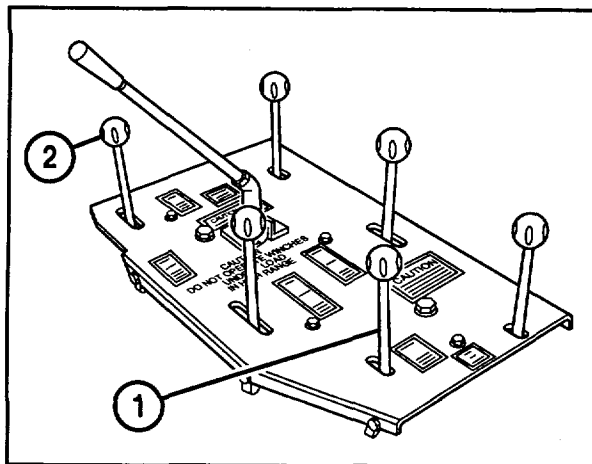
## CAUTION

- Only use BOOM operating lever when retracting boom during live operation, do not use BOOM SAFETY lever.
  - Maximum lift or live boom operation not to exceed 50,000 lb (22,680 kg).
- (d) Use APU to lower boom when powerplant is removed. Place 2 in. x 4 in. (51 mm x 102 mm) wood blocks on air cleaner outlet cover to support boom when engine deck is removed.

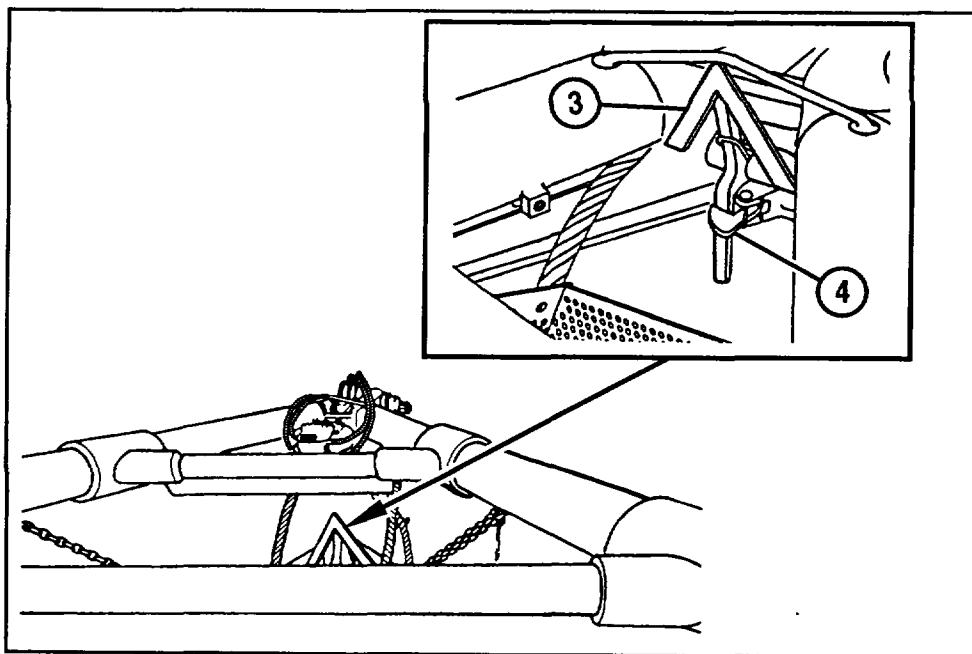


(6) Lowering the boom (for traveling).

- (a) Before lowering boom, raise snatch block, if used, so it will lay in boom tray when boom is lowered.
- (b) Move BOOM SAFETY control lever (1) forward to STOW. Move BOOM operating lever (2) back to RETRACT-STOW.



- (c) To keep hoist cable from being damaged: lower boom. Release controls when boom is full down. Ensure boom latch (3) is locked by pushing latch until spring lock (4) holds it back to secure boom in stowed position before traveling. Secure stayline cables before traveling.



## 2-11. OPERATING PROCEDURES-Continued.

**WARNING**

**Do not keep boom in full-raised position for extended period of time. Failure of hydraulic system could occur, causing boom to free-fall, resulting in injury or death to personnel.**

- (d) To lower a boom that has been in full-raised position for extended period of time, repressurize hydraulic system using following steps.
1. Start engine and engage hydraulic system.
  2. Place BOOM operating lever in FORWARD position and hold for approximately 5 minutes (see para. 2-11e). This allows system to fill with oil and eliminates any air pockets.
  3. Move boom backward and forward several times within 4 ft (1.2 m) live boom area (see para. 2-11e(5)). This will assure that all air pockets have been eliminated and boom will operate smoothly.

**WARNING**

**At no time during M88A1 MRV boom operations are personnel required to be positioned on engine deck of vehicle. The "A" shape of boom support latch (see para. 2-11e) is designed to guide hoist winch cable out of path of retracting boom.**

4. Lower boom to stowed position.

**f. Hoist Winch Operation.**

- (1) Precautions.

**WARNING**

**All personnel must stand clear (at least double distance of cable) in case lines break.**

- (a) Observer must be in view of both operators to direct operations.
  - (b) Inspect rigging before operation.
- (2) Controls. Operator controls payout and reeling speeds for hoist winch cable by using HOIST WINCH SHIFT lever. Speeds may also be controlled by using HOIST WINCH operating lever (see para. 2-1b).

(3) Operation.

- (a) Prepare main or auxiliary hydraulic system for operation (see para. 2-11c).

**CAUTION**

- **Never use hoist winch with less than three wraps on drum.**
- **Minimum engine speed for winching operations is 1500 rpm. Maximum speed is 1800 rpm.**

- (b) Rig boom for a single, two or four-part line (see para. 2-11e).

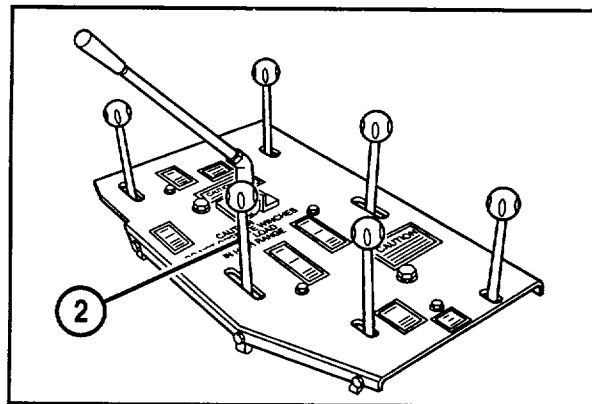
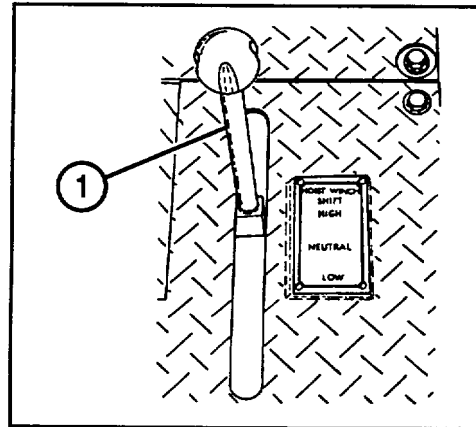
1. Single part line-12,500 lb (5,670 kg) max. load.
2. Four-part line-50,000 lb (22,680 kg) max. load.

- (c) Use spade (see para. 2-11d) or lockout blocks (see para. 2-11g) for loads over 6 tons (5.4 metric tons).

- (d) Move HOIST WINCH SHIFT lever (1) to LOW or HIGH.

**NOTE**

If shift lever will not engage in low or high, move HOIST WINCH operation lever (2) to LOWER while keeping pressure on shift lever.



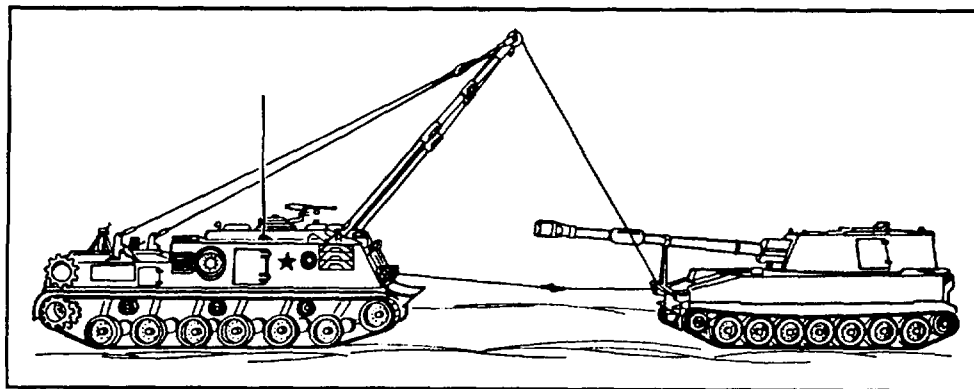
- (e) Move HOIST WINCH operating lever (2) to LOWER or RAISE.

**2-11. OPERATING PROCEDURES-Continued.****WARNING**

**Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries.**

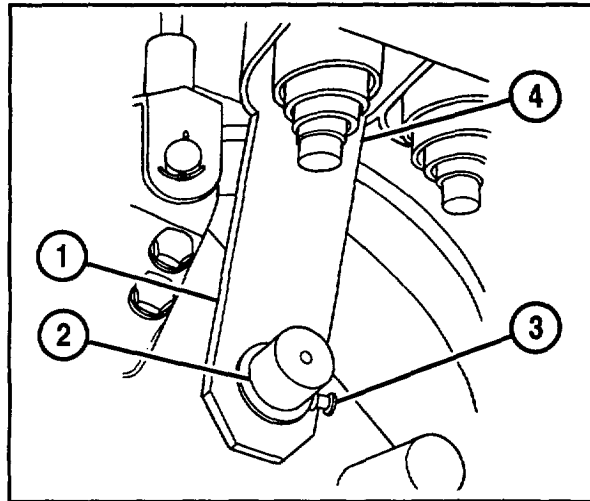
**NOTE**

- **Raising operating lever holds load in position.**
  - **Because main winch cable is so heavy, the hoist winch may be used to help pay out main winch cable. Rig boom for single line (see para. 2-11e).**
- (f) Shift HOIST WINCH SHIFT lever to HIGH only when paying out or paying in hoist winch cable without load. Always handhold wire rope to keep some tension on ropes during this type of operation.

**g. Lockout Blocks.**

- (1) General. Lockout blocks are used when you have to lift and carry loads from 6 to 20 tons (5.4 to 18.1 metric tons). They prevent damaging front suspension system. Blocks will be used for carrying.
- (2) To install lockout blocks:
  - (a) Raise front of vehicle by lowering spade (see para. 2-11d).
  - (b) Slide block (1) over inside spindle (2) of front roadwheel on each side.

- (c) Tighten lock screw (3) to keep it in place.
- (d) Lower vehicle slowly and ensure block lines up with bumper spring mounting (4).



(3) Load limits and carrying speeds:

On level, hard surface (gravel):

Load size of 6 to 15 tons (5.4 to 13.6 metric tons)  
 Vehicle speed of 3 mph (4.8 km/h)

On level, hard surface (smooth):

Load size of 15 to 20 tons (13.6 to 18.1 metric tons)  
 Vehicle speed of 2 mph (3.2 km/h)

**h. Main Winch Operation.**

(1) Precautions.

**CAUTION**

- **Never use main winch with less than three wraps on drum.**
- **Minimum engine speed for winching operations is 1500 rpm. Maximum speed is 1800 rpm.**

- (a) Observer will be in view of both operators to direct operations.



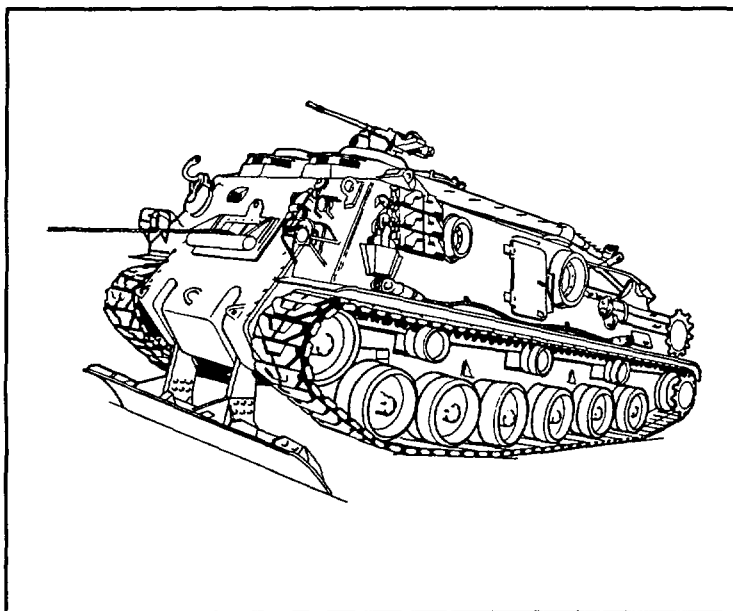
**2-11. OPERATING PROCEDURES-Continued.**

- (b) Inspect rigging before operation.
  - (c) All personnel should stand clear (at least double the distance of cable) in case lines break.
- (2) Controls. The driver controls payout and reeling speeds for main winch cable by using MAIN WINCH SHIFT lever. Speeds may also be controlled by using MAIN WINCH operating lever (see para. 2-1b).
- (3) Operation.
- (a) Prepare main or auxiliary hydraulic system for operation (see para. 2-11c).

**CAUTION**

**Minimum engine speed for winching operations is 1500 rpm.**

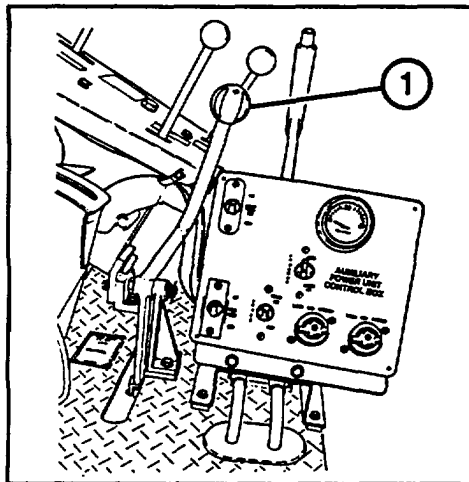
- (b) Lower spade to stabilize vehicle (see para. 2-11d).
- (c) Rig winch cable for a single line (90,000 lb) (40,824 kg) or a two-part line (180,000 lb) (81,648 kg).



- (d) Move MAIN WINCH SHIFT lever (1) to LOW or HIGH.

**NOTE**

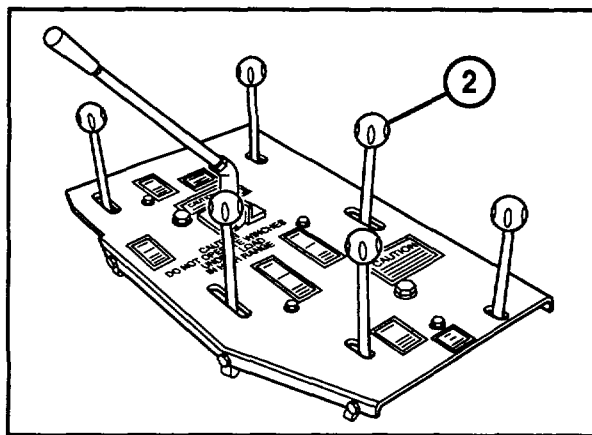
If MAIN WINCH SHIFT lever (1) will not engage in LOW or HIGH, slowly move MAIN WINCH operating lever (2) to PAYOUT while keeping pressure on shift lever.



- (e) Move MAIN WINCH operating lever (2) forward to pay out cable or back to inhaul cable.

**CAUTION**

Do not reel in cable under load in HIGH gear. Reel in cable under a load heavy enough to keep cable tight and off ground.



- (f) When releasing MAIN WINCH operating lever (2), it will return to HOLD and cable will stay where it is.
- (4) Main winch capacities. Main winch is capable of a maximum load of about 90,000 lb (40,824 kg). If using a two-part line, system is capable of inhauling a load of about 180,000 lb (81,648 kg) using the 90-ton (81.6-metric-ton) snatch block. These loads can be used only when main winch cable is almost fully payed out. Attach 90-ton (81.6-metric-ton) snatch block to disabled vehicle and line to towing eye in center front of M88A1.

2-11. OPERATING PROCEDURES-Continued.

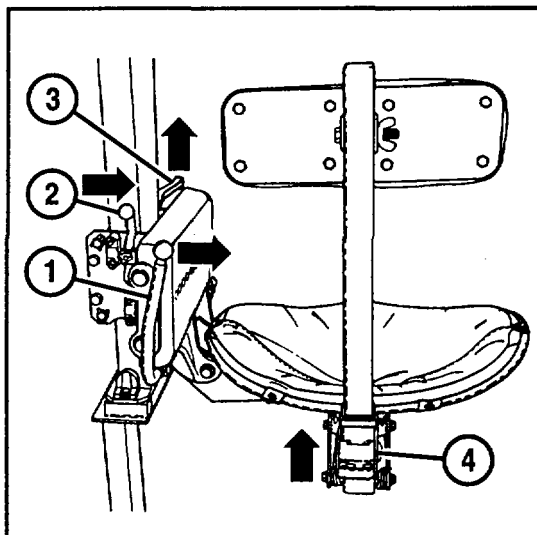
i. Miscellaneous Operating Procedures.

(1) Driver's seat controls.

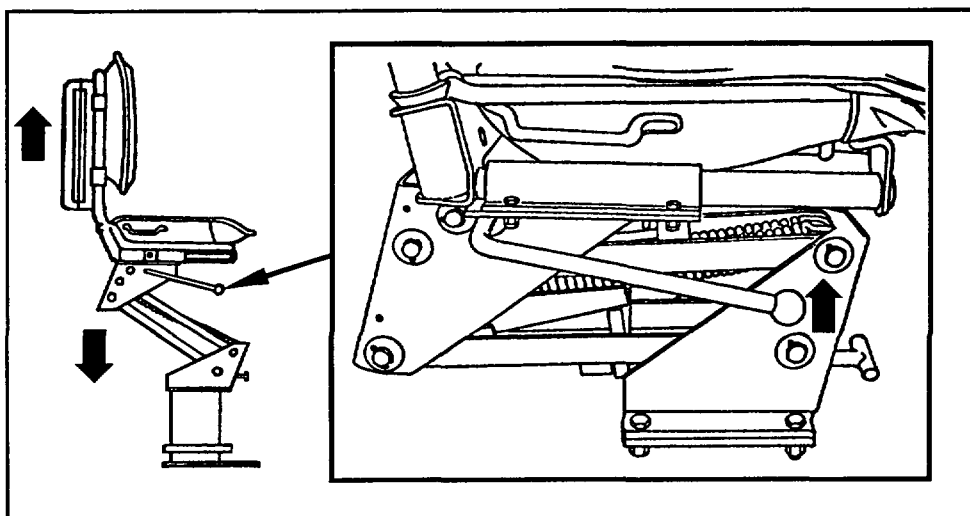
**NOTE**

Have weight on seat when doing steps (b), (c), and (d).

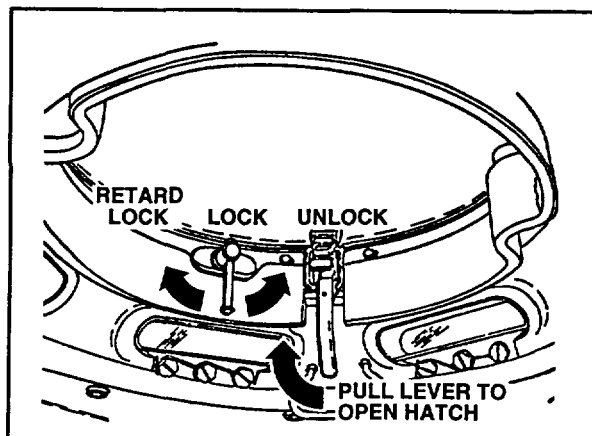
- (a) Pull lever (1) to dump seat. Stand clear.
- (b) Pull lever (2) to move seat forward or backward.
- (c) Lift lever (3) to adjust seat height.
- (d) Lift locking lever (4) to adjust backrest.



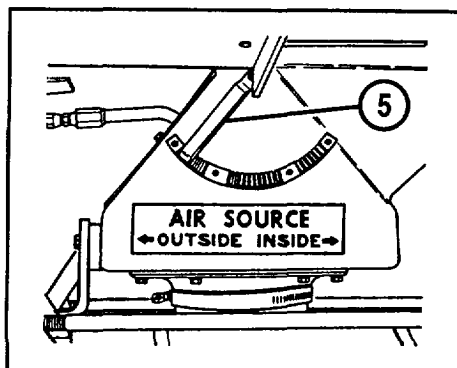
(2) Commander's seat control. Sit in seat while adjusting.



- (3) Commander's cupola controls. Use following illustration as a guide.



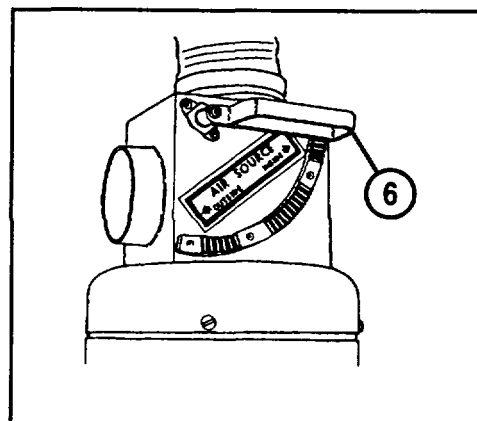
- (4) Air cleaner air control handle. Pull handle (5) and turn to adjust (one above each air cleaner).



- (5) Personnel heater air control handle. Pull handle (6) and turn to adjust.

**NOTE**

Later optional heater design does not include an air control handle assembly.



2-11. OPERATING PROCEDURES-Continued.

- (6) **FUEL CONTROL VALVES.** Four fuel control valves (7) thru (10) are located on rear crew compartment wall. They are used to open or close fuel tank and drain valves. Refer to following tables for fuel valve positions during operation and for draining tanks.

**CAUTION**

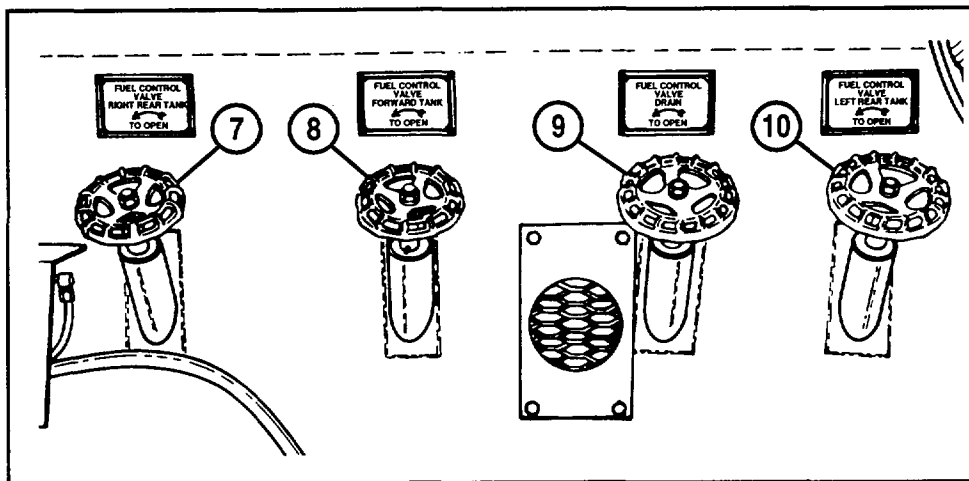
Before operating vehicle, **FUEL CONTROL VALVE FORWARD TANK** must be closed.

**NOTE**

If right and left rear tanks are too low for APU operation, **OPEN** forward tank valve (8). Close valve when finished.

Operation	Fuel Valve Positions			
	Right Rear Tank (7)	Forward Tank (8)	Drain Valve (9)	Left Rear Tank (10)
Normal Operation	Open	Closed	Closed	Open
Refuel-Defuel (Diesel Fuel Only)	Open	Closed	Closed	Open
APU Operation	Open	Closed	Closed	Open

Draining Tanks				
Forward	Closed	Open	Open	Closed
Right Rear	Open	Closed	Open	Closed
Left Rear	Closed	Closed	Open	Open



NOTE

- Forward tank (8) drains whenever drain valve (9) is OPEN.
- Right and left rear tank levels are same when right and left rear tank valves (7 and 10) are OPEN.
- If right or left rear tank leaks, close valve (7 or 10) so more fuel is not lost.
- If forward tank (8) leaks, shut down vehicle and CLOSE the right and left rear tank valves (7 and 10).
- See figure 2-3 for fuel control valve schematic.

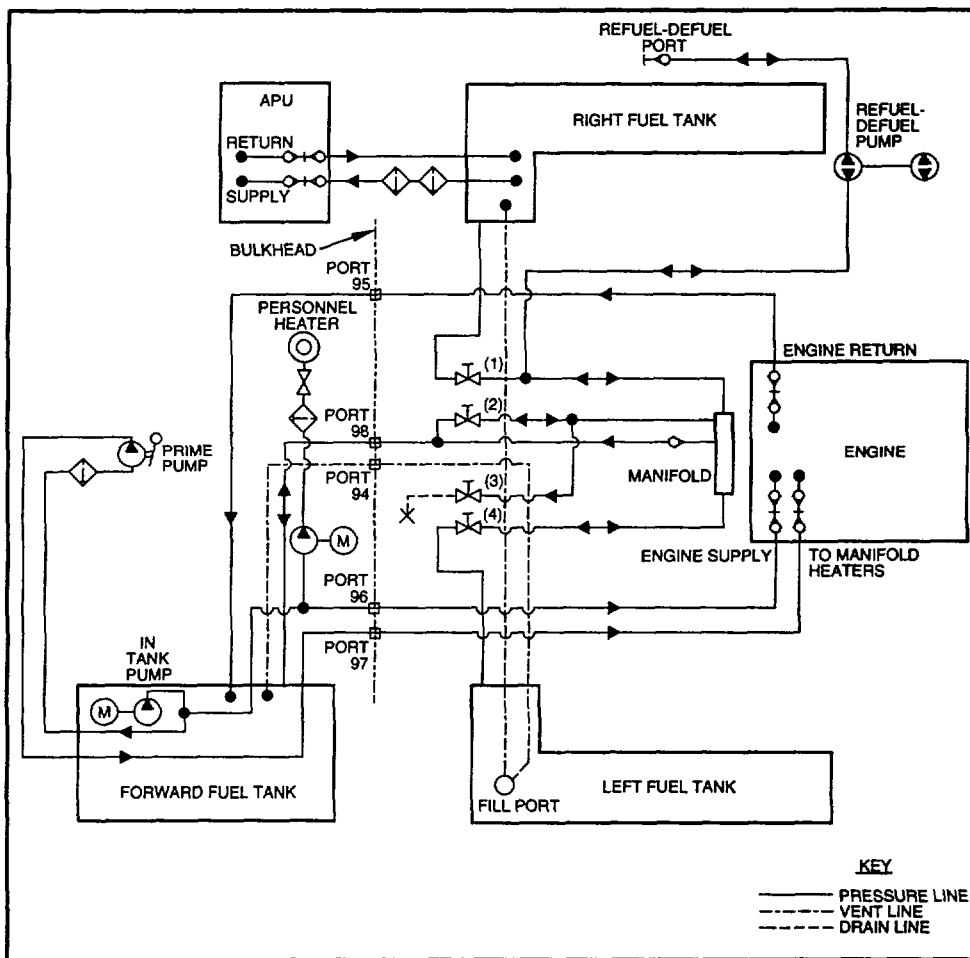


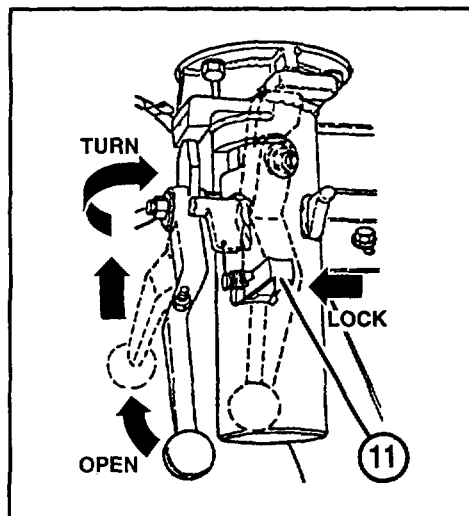
Figure 2-3. Fuel Control Valves.

2-11. OPERATING PROCEDURES-Continued.

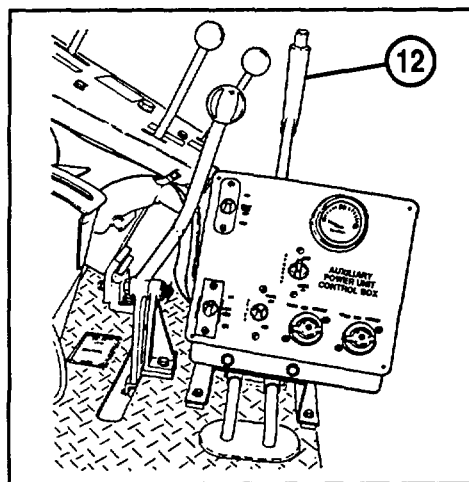
(7) Hatch control. Use illustration as a guide.

**WARNING**

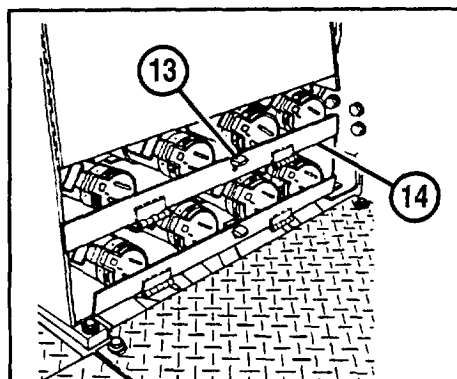
Secure handle with locking tang (11) while operating vehicle with hatches open.



(8) Drain valve lever. Depress button to unlock drain valve lever (12). Pull to open valves. Push to close.



(9) LAW rocket stowage trays. Turn knob (13) and lower bracket (14).



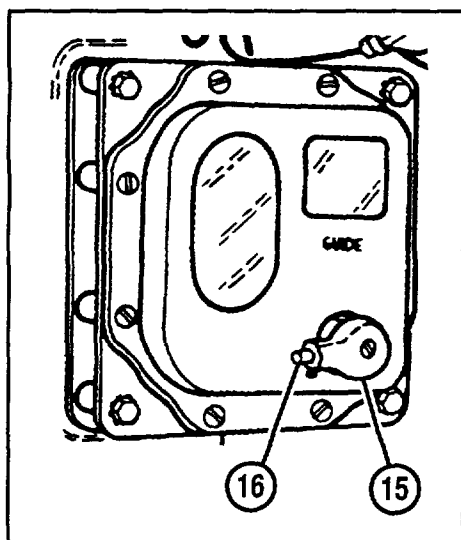
(10) Dome light.

(a) To turn dome light to ON:

1. When red light is ON, turn lever (15) up.
2. When white light is ON, push in safety button (16). Turn lever (15) down.

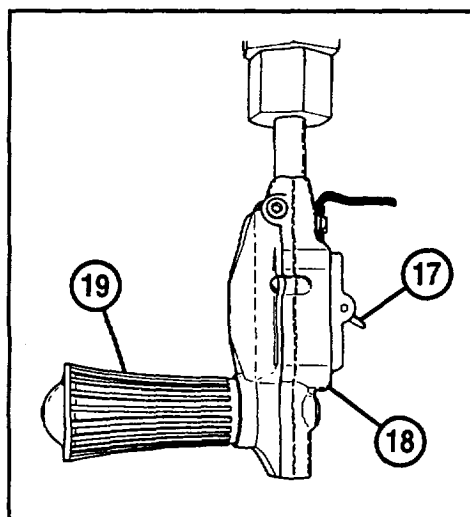
(b) To turn dome light to OFF:

1. If light is on red, push down to stop.
2. If light is on white, push button in and turn lever up to top.



(11) Rigger's outside spotlight control.

- (a) To operate, turn on MASTER switch and push switch (17) up.
- (b) Rotate control (18) to turn light.
- (c) Turn handle (19) to raise or lower light.

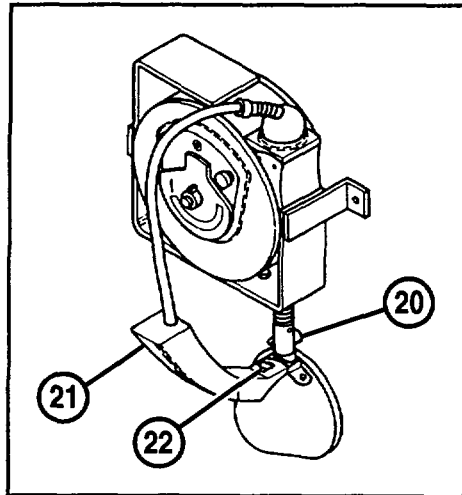




2-11. OPERATING PROCEDURES-Continued.

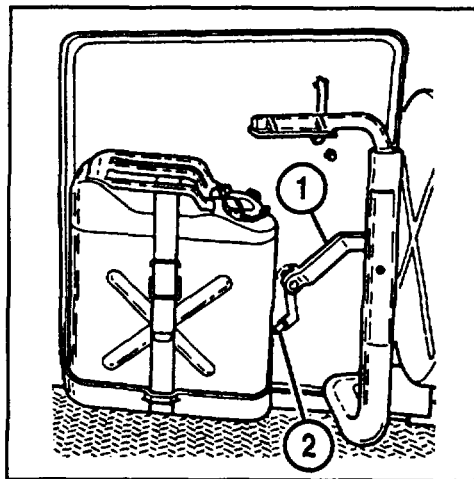
(12) Rigger's trouble light.

- (a) To use, loosen knurled head screw (20) and remove from holder by holding hand grip (21).
- (b) To operate, press ON-OFF switch (22) on hand grip.

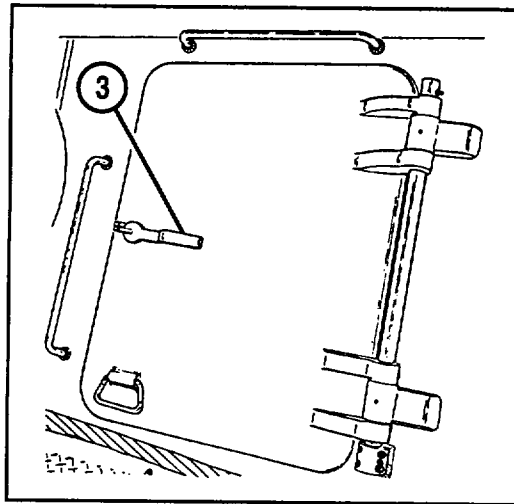


j. **Operating Doors.**

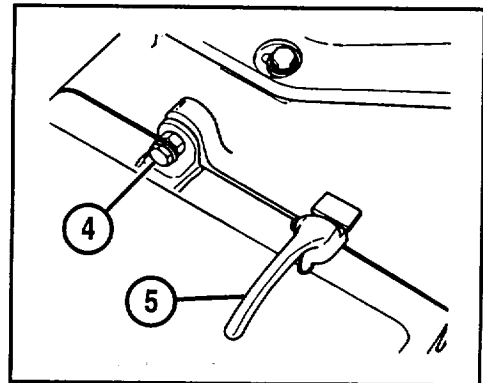
- (1) Right side personnel door inside. Lift handle (1) to open. Insert pin (2) to lock.



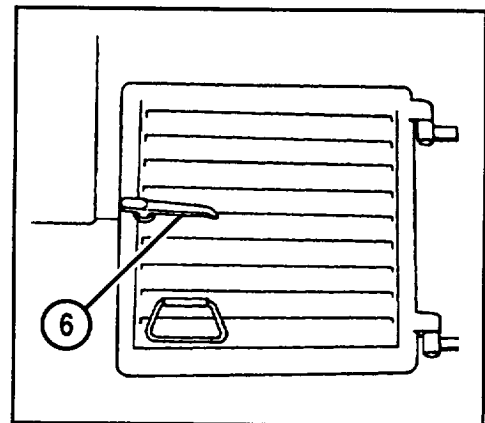
- (2) Right side personnel door-outside. Lift handle (3) to open.



- (3) Engine deck door secure bolt and latch. Loosen bolt (4) and turn latch (5) to open.



- (4) APU compartment door. Lift handle (6) to open.



## 2-12. DECALS AND INSTRUCTION PLATES.

- a. Refer to Appendix E for decals.
- b. Refer to figure 2-4 for name plates.

2-12. DECALS AND INSTRUCTION PLATES-Continued.

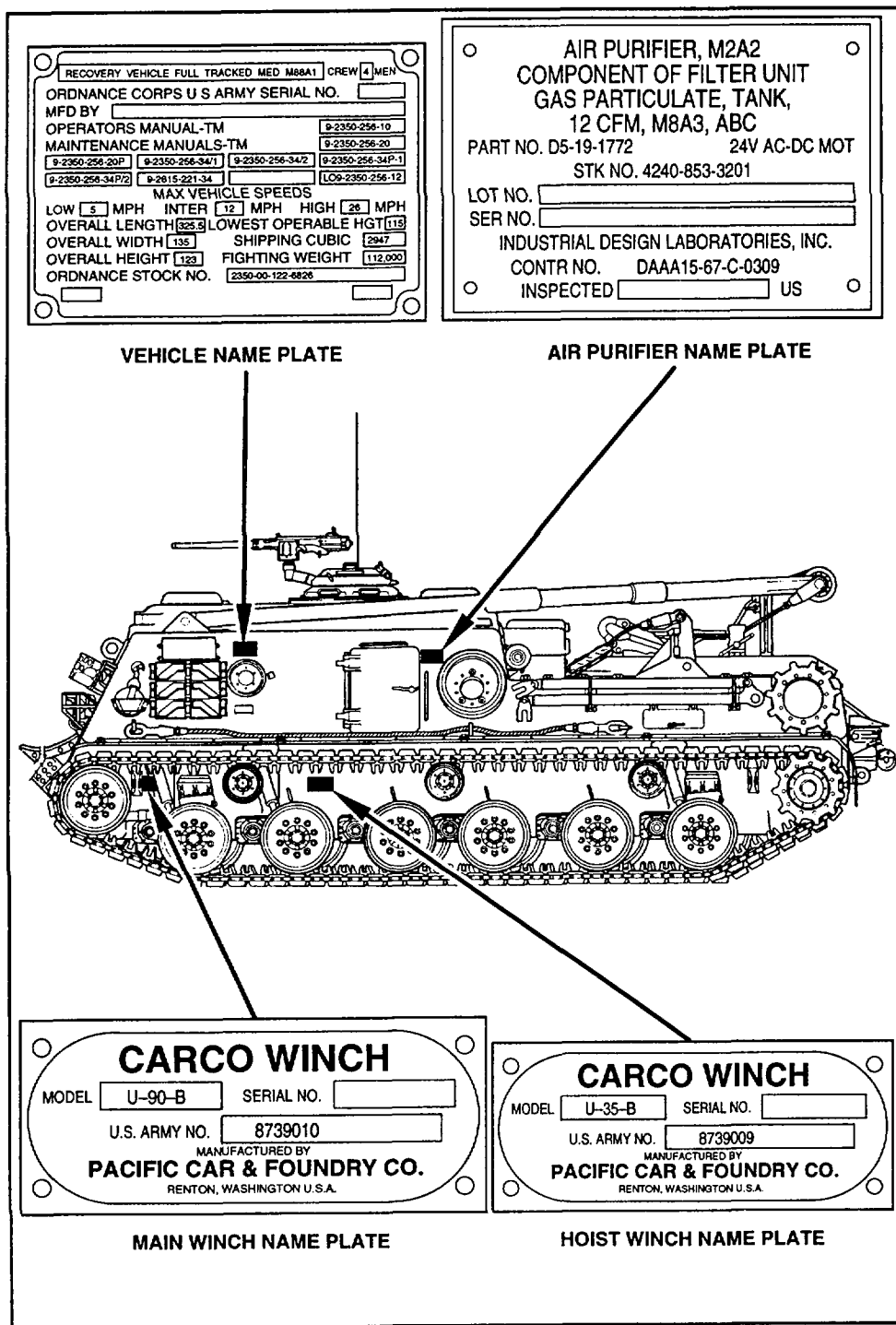


Figure 2-4. Name Plates (1 of 2).

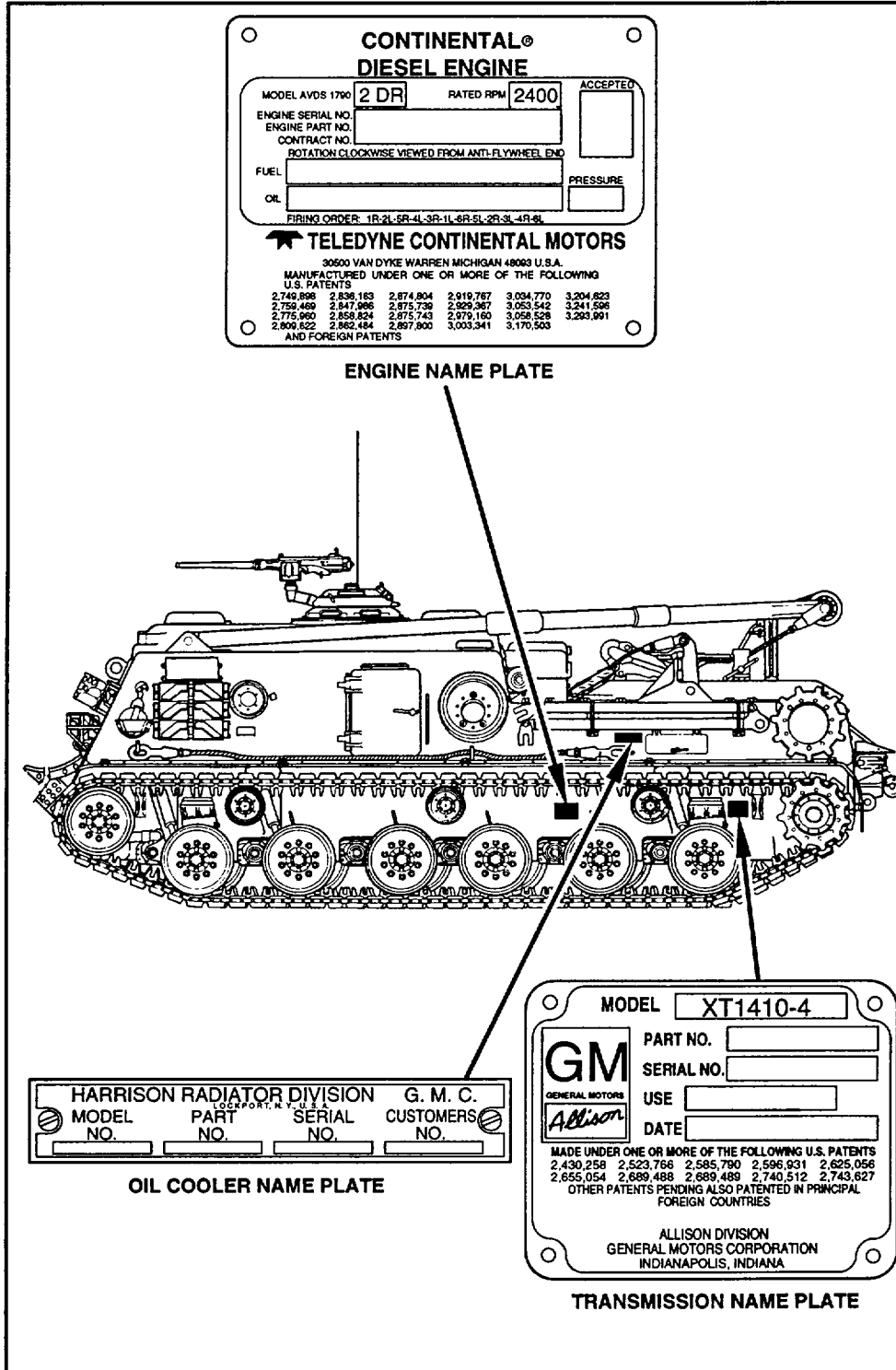


Figure 2-4. Name Plates (2 of 2).

2-13. OPERATION OF AUXILIARY EQUIPMENT.

**WARNING**

To avoid injury to personnel or damage to equipment, read each set of instructions completely before operating equipment.

- a. Communication Equipment. The communication equipment installed in the M88A1 is for internal and external communications. This section describes the equipment and gives basic operating instructions.

**CAUTION**

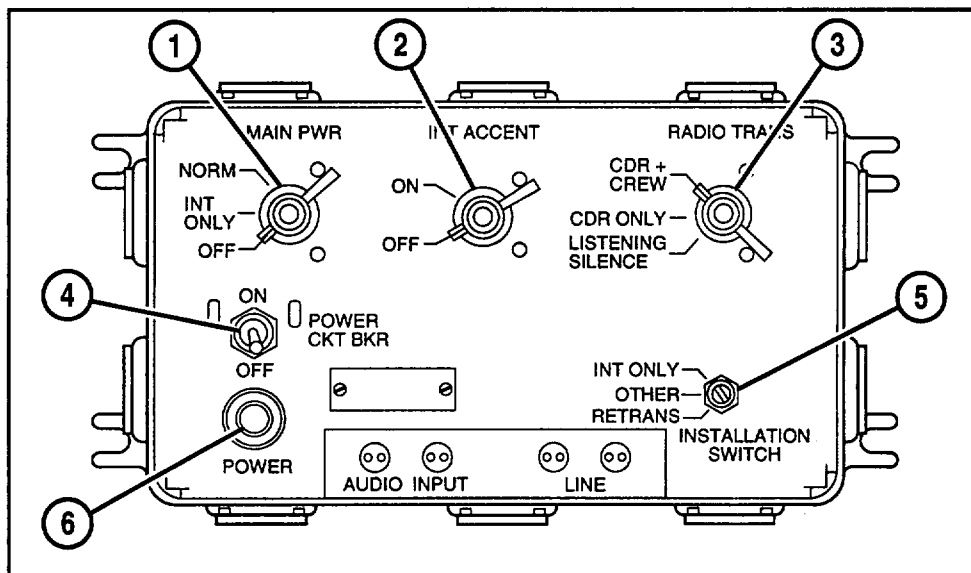
Turn radios OFF before starting main engine or APU.

- (1) AN/VIC-1(V) intercommunication set. This equipment provides communications between crew members during operations. It consists of AM 1780/VRC amplifier and C-2298/VRC control box (one for each crew position).

**CAUTION**

**BEFORE** operating intercom or radio, **ALWAYS**:

- Set AM 1780/VRC amplifier switches (1 thru 5) as shown in illustration below.
  - Set vehicle MASTER switch to on.
  - Set MX-7778A/GRC suppressor to ON.
- (a) Set MAIN PWR switch (1) to NORM.
  - (b) Set POWER CKT BKR (4) to ON. POWER lamp (6) should light. If POWER CKT BKR trips to OFF, reset to ON.

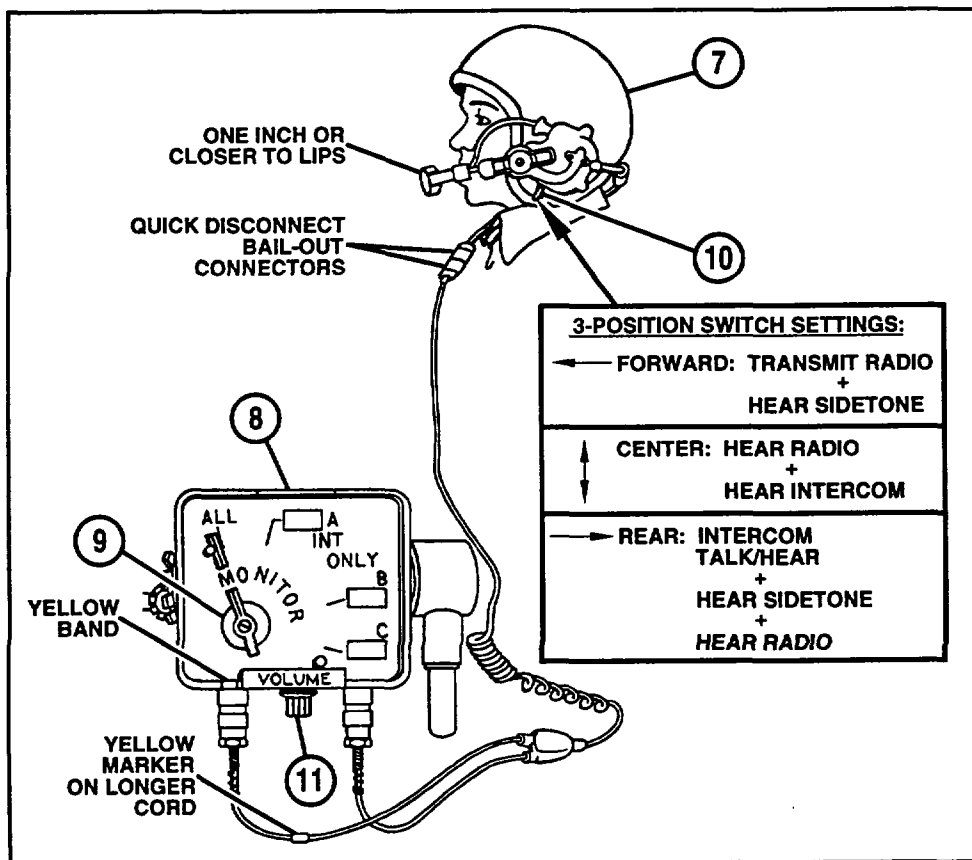


**CAUTION**

If **POWER CKT BKR (4)** trips again, set **MAIN PWR (1)** to **OFF** and notify unit maintenance.

**NOTE**

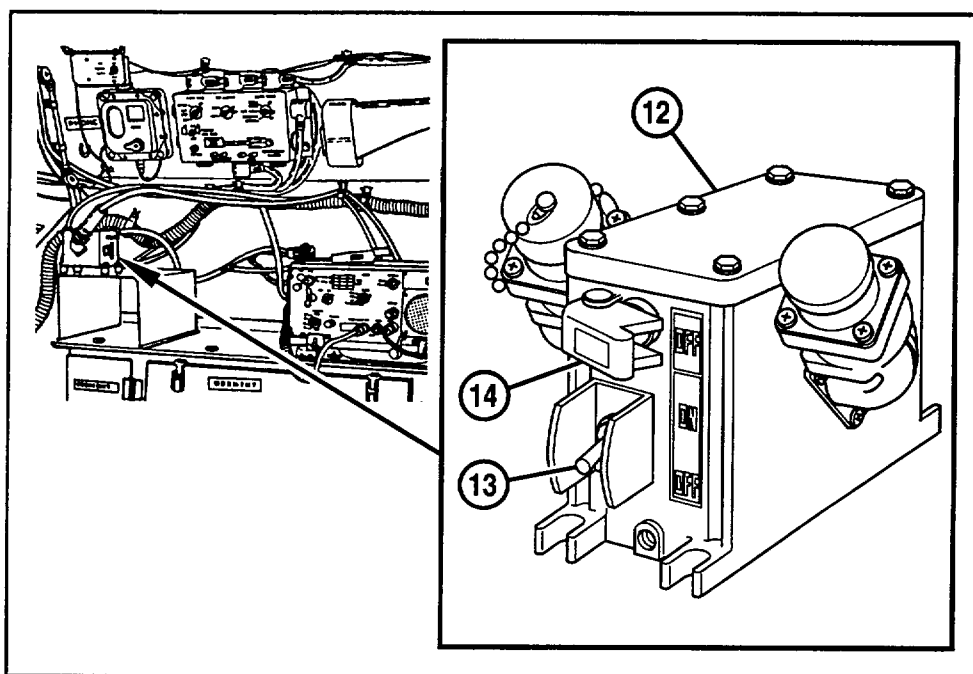
- **INTACCENT-OFF (2):** intercom and radio sound levels are equal
  - **INTACCENT-ON (2):** radio sound level is lower than intercom.
- (c) Connect CVC helmet (7) to C-2278/VRC intercom control set (8) as shown in illustration below.
- (d) Set **MONITOR** switch (9) to **ALL**.
- (e) Set three position switch (10) to desired position (see illustration below).
- (f) Adjust **VOLUME** control knob (11) as necessary.



**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

## (2) MX7778A/GRC suppressor (12) operation.

- (a) Turn vehicle MASTER switch on.
- (b) Turn circuit breaker switch (13) to ON.
- (c) If circuit breaker switch (13) trips OFF because of overload, reset it. If it keeps tripping OFF notify unit maintenance.
- (d) If circuit breaker switch (13) cannot be reset, use battle override switch (14) in an EMERGENCY only. The radios are unprotected when this switch is used.

**b. Deep Water Fording Kit.**(1) General description.

- (a) The deep water fording kit is designed to permit the M88A1 to operate in water up to 8.5 ft (2.59 m) deep.
- (b) The kit provides equipment and sealing materials for the hull, fuel fill cap, APU, personnel heater and main engine air inlets, APU exhaust, main engine generator exhaust, outside fire extinguisher pull handles, nozzles, acetylene vent, stowage compartment, and personnel doors against the entry of water while fording. It will be installed and checked by unit maintenance with your help.

- (c) The design of the deep water fording equipment permits the vehicle to be completely operable on land or in water.
- (2) Equipment description.
- (a) Main engine exhaust. The main engine exhaust system uses pipes for venting the main engine exhaust. Two flexible, bellowed-type pipes are clamped and sealed to the main engine exhaust pipes which remove exhaust gases through the rear engine deck hoods. Four clamps bolted to the engine deck are used to hold the system in proper position.
- (b) Main engine air inlet. The main engine air inlet system provides air for the main engine. The system has two pipes and two rubber seals, which cover each of the air intake vents on the top of the vehicle cab.
- (c) Main engine generator cooling air exhaust system. Adapters, flexible tubing, and an exhaust pipe provide an exhaust outlet for the generator so it can be operated while fording.

**CAUTION**

**APU must not be turned ON during fording operations.**

- (d) APU generator. Preparations and precautions are taken before and after submersion of the APU to prevent corrosion and destruction of leads and generator parts due to exposure to salt water and sand. A sealer plug is used to cover the APU exhaust outlet.

**CAUTION**

**Personnel heater cannot be turned on during fording operations.**

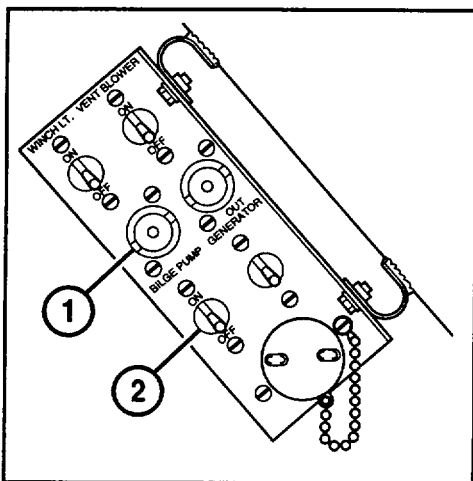
- (e) Personnel heater air inlet and exhaust. Personnel heater air inlet and exhaust must be plugged for fording operations and must be unplugged after fording.
- (f) Acetylene compartment vent. A vent consisting of tubing, fittings, adapter plate, and gasket is attached to a boss which surrounds the four vent holes in the left rear of the cab. It provides ventilation of the compartment during deep water fording operations. Two clips mounted on the left main engine air intake pipe support the vent system.
- (g) Fuel tank vent. Two 90-degree elbows, a rubber hose, two hose clamps, a seal, and a clip are used to seal and vent left tank fill area.



## 2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

(h) Bilge pump, motor, and support assembly.

1. A bilge pump with motor and support assembly will be installed on the hull floor in the hydraulics compartment with the deep water fording kit. The pump is used to remove water which might enter the compartment during fording. The discharge of the pump goes through the bilge pump hose to an outlet adapter mounted on the right side of the personnel compartment. The hose and nozzle assembly can be attached to the outlet adapter to wash down the vehicle after fording.
2. A toggle switch (1) and indicator lamp (2) for operating bilge pump are located on the accessories panel.



3. A relay, which is activated by the toggle switch, controls the pump motor. A circuit breaker provides overload protection for the pump circuit. The switch and relay coil circuit is protected by a circuit breaker in the accessories panel.
- (i) Ventilating blower housing and boom foot drains. A sealing plate fits into and seals the ventilating blower airduct housing. Hose shutoff clamps are used to cut off water flow from the ventilating blower airduct housing and boom foot drains.
- (j) Fire extinguisher system. Seven rubber fire extinguisher nozzle caps stop water and contaminants from entering the extinguisher system. These caps are not sealed and can be removed from the nozzles if the system is needed during fording.

## (k) Sealing taping materials.

1. Apply waterproof tape (Appx. D, item 41 or 42) around transmission oil filler neck and large open areas where required.
2. Fording sealer (Appx. D, item 43) is used as a sealing compound around exterior stowage compartment and personnel doors, main winch cable openings, around nose piece, and all mounting surfaces of vehicle and fording components.
3. Electrical insulating (Appx. D, item 23) and sealing compound (Appx. D, item 43) are used to seal battery terminals, APU generator terminals, main engine generator terminals, and any other electrical connections exposed to water.

(3) Operation instructions.**WARNING**

- **Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear area of all personnel and keep vehicle downwind of installation during test.**
- **Check deepest point of fording area. Maximum depth should not be more than 8.5 ft (2.59 m) including wave height.**

- (a) Engine operation. Start engine and check its operation (see para. 2-10b and 2-10c). Ensure it runs smoothly and is in top shape.

**CAUTION**

**If engine stalls while fording, restart immediately using normal starting procedures (see para. 2-10b). If engine does not start, vehicle must be towed out.**

- (b) Driving vehicle while fording. Open at least one top hatch. Ensure everything is secure on vehicle before entering water. Shift into 1st gear and enter water slowly to avoid forming a bow wave. Keep engine above 950 rpm to avoid stalling. Keep speed at 3 to 4 mph (4.8 to 6.4 km/h), using brake if necessary. Operate bilge pump when it becomes covered by water. Lift access door (see para. 2-6) and turn on winch light (on accessories panel) to help see bilge pump.

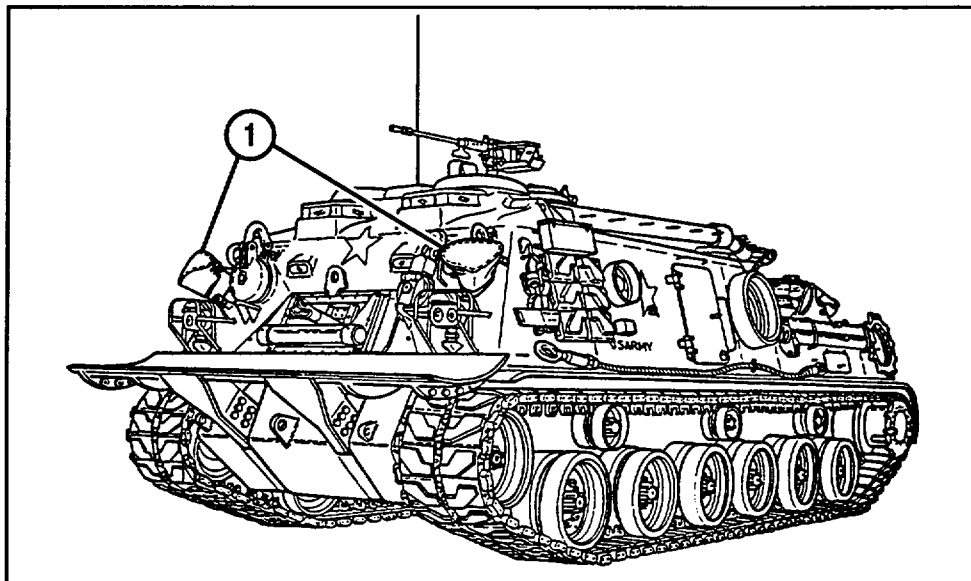
**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

- (c) Driving in reverse. If going in reverse is required, stop vehicle and shift to R. Move back at no more than 3 to 4 mph (4.8 to 6.4 km/h).
- (d) Stopping while fording. If you have to stop the vehicle while fording, depress brake, shift to N, and keep engine speed at 950 to 1000 rpm.

**c. M239 Smoke Grenade System.**

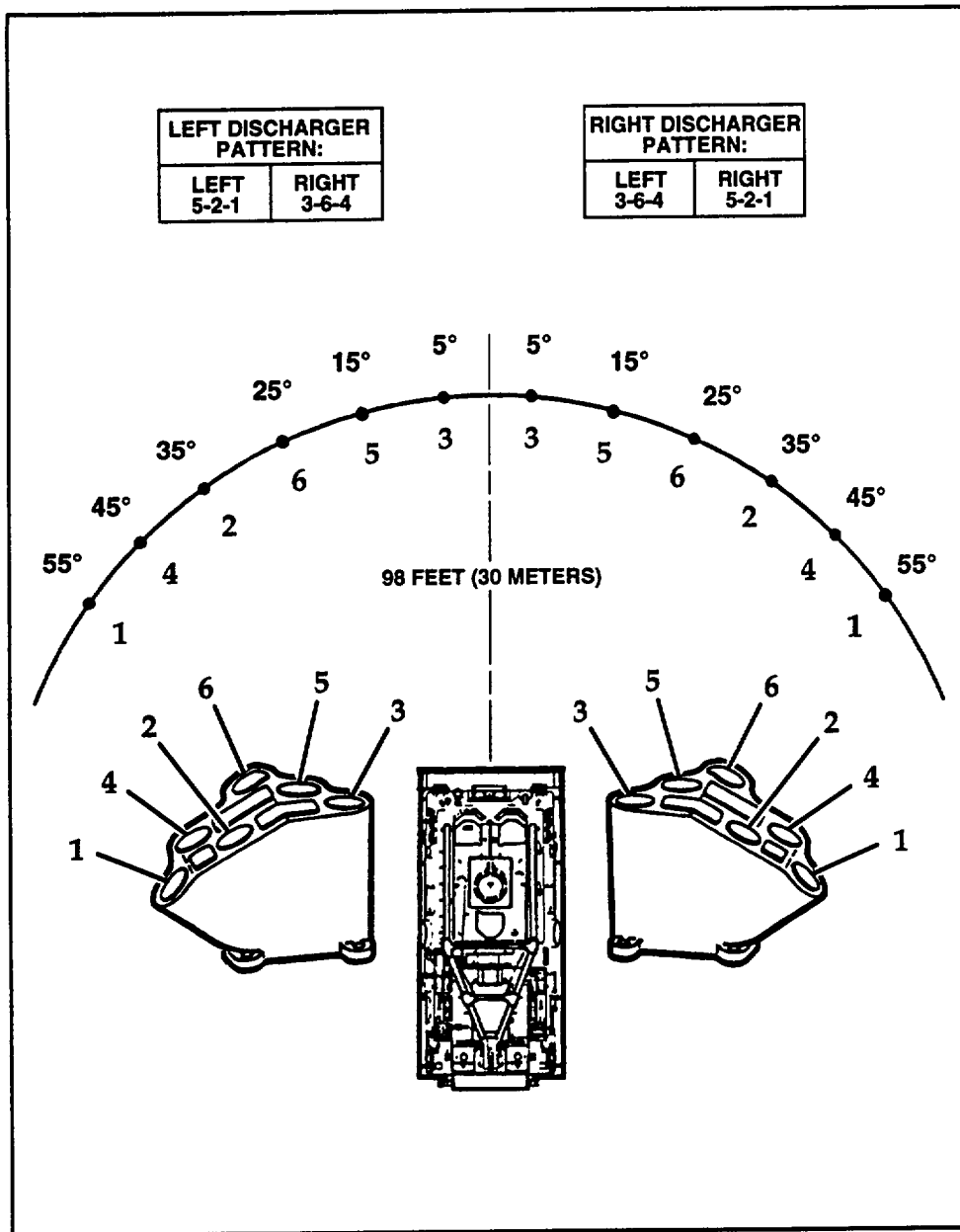
- (1) General. These instructions are for use by the operator and unit maintenance personnel. They apply to the M239 RP screening smoke grenade launcher. Hereinafter, this equipment will be referred to as grenade launcher.
- (2) Record and report forms.
  - (a) Equipment maintenance forms and procedures for their use are prescribed in DA PAM 738-750.
  - (b) Use SF Form 364 to report damage or improper shipment of material.
  - (c) Report accidents involving injury to personnel or damage to material in accordance with AR 385-40.
  - (d) Report accidents or malfunctions in combat or training in accordance with AR 75-1.
  - (e) Refer to TM 740-90-1 for administrative storage instructions on the grenade launcher.
  - (f) Refer to TM 43-0002-31, TM 9-1300-200, and FM 5-25 for destruction instructions on this grenade launcher.
  - (g) Refer to TM 43-0139 for painting instructions on the grenade launcher.
- (3) Description and data.
  - (a) Description.

1. The grenade launcher provides self-screening smoke capability. Twelve smoke grenades, fired in salvo, produce a smoke cloud over a  $110^\circ$  arc in 2 seconds. The cloud is 26 to 33 feet (8 to 10 meters) high, 98 feet (30 meters), from the vehicle and lasts one to three minutes depending on wind conditions. The grenade launcher consists of two British No. 9 Mark 1 smoke grenade dischargers (1) with canvas covers, a smoke discharger pushbutton unit, two ammunition storage bins, and an installation kit composed of mounting brackets, an arming switch, electrical wiring harness, and exterior harness protectors.



2. Each discharger (1) is a six-barreled aluminum casting approximately 10 in. (254 mm) high, 15 in. (381 mm) wide, 18 in. (457 mm) deep, and weighs 33 lb (15.0 kg). One launcher is bolted to a bracket that is mounted on the left outside of the hull, the other on the right side of the hull.
3. Both dischargers are wired to launch grenades from alternate barrels upon activation of either pushbutton on the smoke grenade discharger pushbutton unit. Activation of one pushbutton will launch six grenades, three from each discharger. Activation of both pushbuttons simultaneously will launch all twelve grenades. A single discharger barrel cannot be fired. The smoke grenade screening pattern is shown in the following illustration.

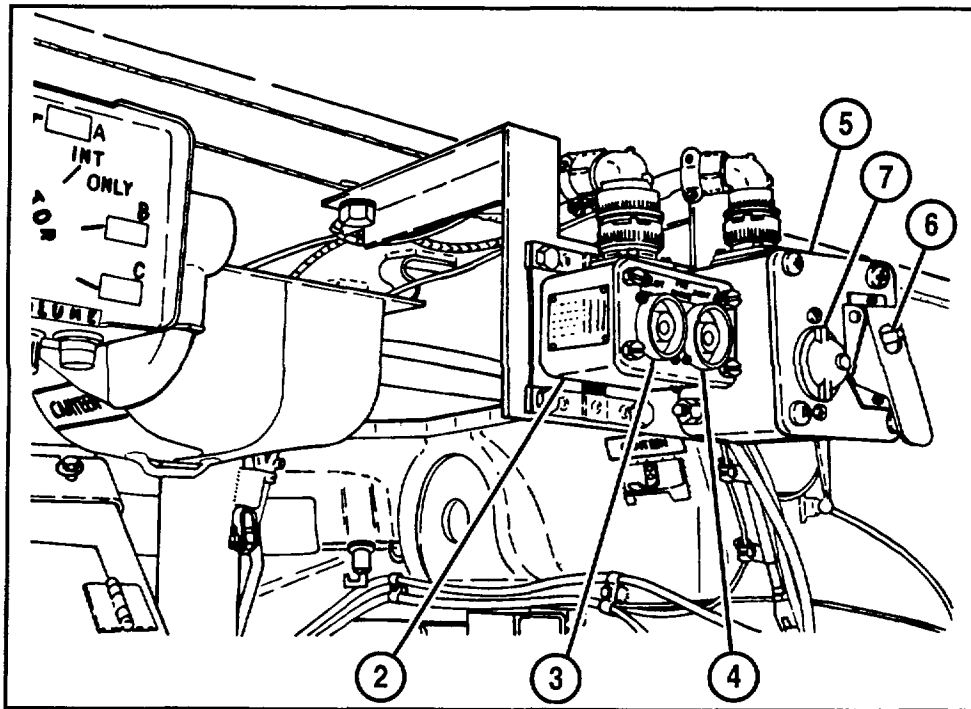
2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.



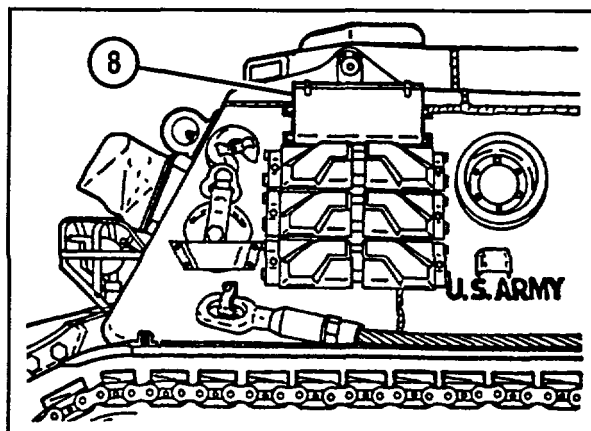
NOTE

The discharger marked "L. Hand" is mounted on the right outside of the hull and the discharger marked "R. Hand" is on the left outside of hull.

4. Smoke discharger pushbutton unit (2), mounted on bracket attached to cab top, near commander's cupola, has two pushbutton switches (3 and 4) used to fire grenades. An arming switch unit (5), mounted next to pushbutton unit, has a latched toggle switch (6) and an armed light (7). Electrical wiring harnesses connect the pushbutton unit and arming switch to dischargers and to vehicle power source.

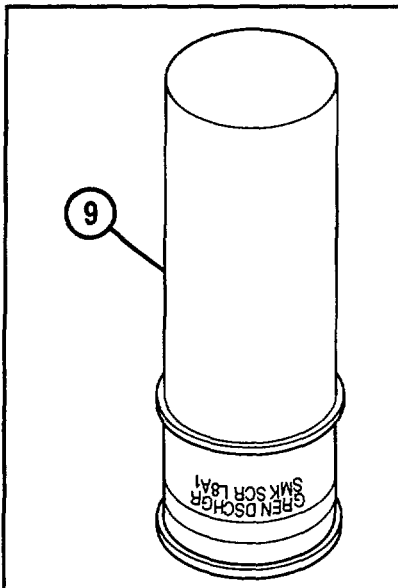


5. Two ammunition storage bins (8) are attached to outside of vehicle, one on each side of hull. Each bin holds six smoke grenades, one reload for each discharger.



**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

- (b) Functional description. UKL8A1 grenades (9) are fired electrically from dischargers. A spring clip in grenade base engages a tip plug (a bulb-like metal pin) in bottom center of the discharger barrel.



- (4) Loading.

**WARNING**

- Grenades contain RP that constitutes fire hazard and danger to all personnel outside vehicle.
- Ensure arming switch is off (lamp not lit) before loading grenades into discharger barrels.
- Never place your body in front of dischargers when loading grenades or when dischargers barrels are loaded.

**CAUTION**

**Follow standard weapon loading procedures when handling and loading grenades.**

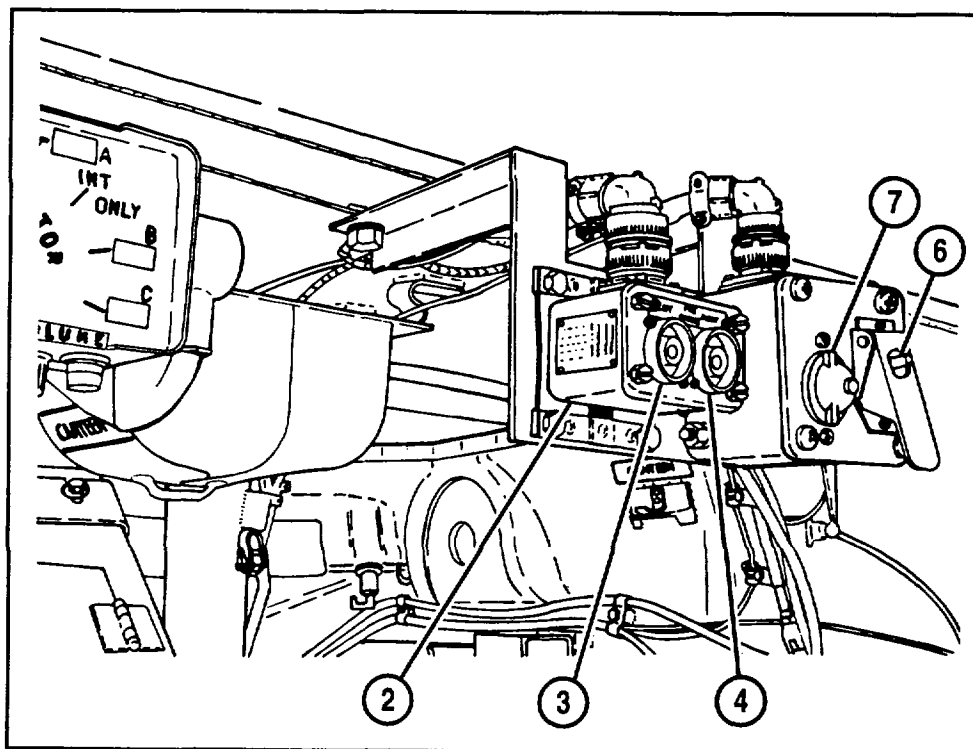
- (a) Remove canvas covers and ensure discharger barrels are clear and clean.
- (b) Remove grenades from six ammunition storage boxes.

- (c) Place six grenades into each ammunition storage bin on each side of hull.
- (d) Load six grenades in each discharger. Insert grenades, base first, into discharger barrel. Push hard on top of grenade with palm of hand and rotate 1/4 to 1/2 turn while pushing on grenade. This will ensure that spring clip at base of grenade is engaged with pin in bottom of discharger barrel and ensure electrical contact.

### WARNING

**Do not fire grenades into strong head wind or while moving rapidly forward.**

- (5) Firing. Turn on vehicle MASTER switch. Lift arming switch switch-guard (6) and place arming switch (6) in DOWN position. When power-on lamp (7) is lit, push LEFT (3), RIGHT (4), or both pushbuttons (3 or 4) on grenade launcher pushbutton unit (2) as mission requires.
- (6) Reloading. Ensure arming switch (6) is off. Ensure all discharger barrels are clear. If grenades are still in discharger refer to paragraph 2-13c(8). If discharger barrels are clear, load dischargers with grenades from two grenade stowage boxes. (A crew member must move outside vehicle to reload dischargers.)





**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**(7) Unloading.**WARNING**

- **Ensure arming switch is off (lamp not lit) before unloading grenades from discharger.**
- **Never place your body in front of dischargers when unloading grenades from discharger.**

- (a) Remove grenades from dischargers and storage bins.
- (b) Return grenades to metal ammunition storage boxes.
- (c) Replace canvas covers over dischargers.

(8) Misfire and duds.

- (a) Misfire. A misfire is the failure of grenades to be launched from grenade discharger barrels. When a misfire occurs, make two additional attempts to fire the grenade (see para. 2-13c(6)). If the grenade still remains, attempt to fire the grenade from another grenade discharger barrel. If grenade remains, treat as a dud.
- (b) Duds. A dud is a grenade that has either failed to be launched from grenade discharger or has been launched but failed to burst. Place dud in an empty ammunition storage box as referenced in TM 60E-3-2-3 and dispose of in accordance with local SOP.

(9) Ammunition.

- (a) Description. UKL8A1 RP screening smoke launcher grenades are used with the M239 grenade launcher. They are filled with a red phosphorus and butyl rubber mix. Each grenade is approximately 2.625 in. (58 mm) in diameter, 7.281 in. (185 mm) long, and weighs approximately 1.5 lb (0.68 kg).
- (b) Function. A grenade is propelled from the discharger barrel when electrical current at the firing contact ignites the fuze. The fuze ignites the propellant charge and a delay composition and, in-turn, the gunpowder bursting charge. This bursts the rubber case and ignites the red phosphorus/butyl rubber composition to produce an immediate smoke cloud.

(c) Destruction to prevent enemy usage, Refer to TM 43-0002-31 for destruction of grenades.

(10) Shipment and storage. See table 2-2.

Table 2-2. Shipment and Storage Data for Grenades.

Requirements	Designation
Storage Compatibility Group	G
Quantity Distance Class	1.4
Department of Transportation (DOT) Class	Explosive C
DOT Marking Label	Explosive C
DOT Marking	Smoke Grenade Handle  Keep Fire Away

**d. Exhaust Smoke Generating System.**

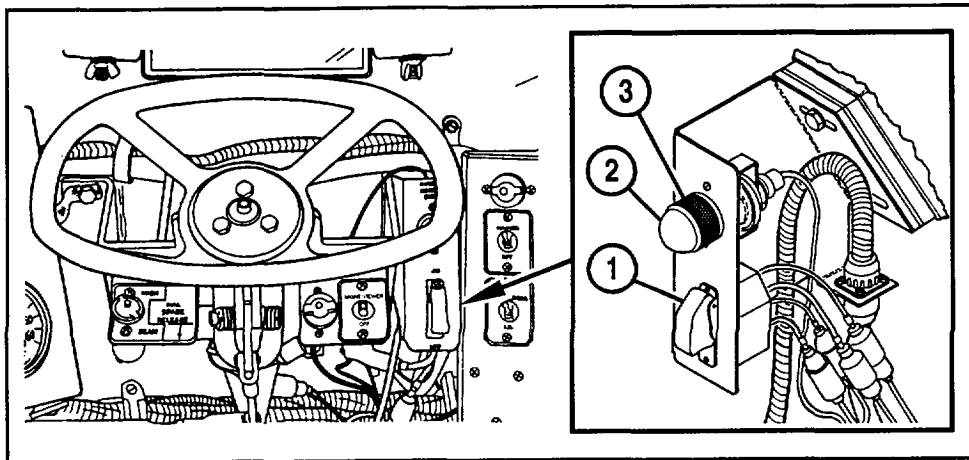
(1) General description.

- (a) The exhaust smoke generating system provides a Model AVDS-1790-2DR engine, a self-screening smoke capability. The smoke generating system allows diesel fuel from the vehicle fuel tanks to be sprayed into the exhaust system. The fuel vaporizes and blends with engine exhaust gases. The fuel vapor cools on contact with the ambient air and condenses to form a homogeneous smoke screen.
- (b) The exhaust smoke generating system consists of solenoid valves, switch assemblies, shutoff valve, indicator light, mounting brackets, fuel hose assemblies, electrical leads, and attaching parts.
- (c) The solenoid valves and fuel tube assemblies are attached to the rear of the engine. Fuel to operate the smoke generating system is taken from the main fuel supply at the front of the engine.

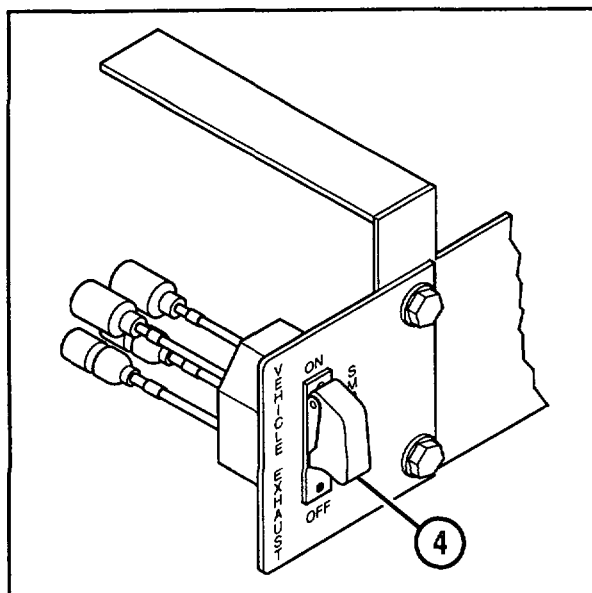
2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

(2) Controls.

- (a) Switch (1) operates smoke generating system from driver's compartment. Indicator light (2) can be dimmed by turning knurled lens holder (3).



- (b) On vehicles equipped with M239 Smoke Grenade System, a second switch (4) is located at commander's station at left-hand side of commander's grenade switch bracket.



## (3) Operation.

**WARNING**

- **Never activate smoke generating system in a building or closed area, or with personnel at rear of vehicle**
- **Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear area of all personnel and keep vehicle downwind of installation during test.**

**CAUTION**

- **Do not activate smoke generating system when engine is idling. Engine speed must be at least 1600 rpm.**
- **Always be aware of wind direction and speed when using smoke generator.**
- **After initial operation, recheck system for any possible fuel leaks.**
- **Do not operate smoke generator if vehicle fuel supply is low.**
- **Engine should be run for a minimum of 5 minutes after smoke system is shut down to clear exhaust.**

**NOTE**

**Smoke generating system will not produce smoke if the vehicle fuel is JP-8.**

- (a) Turn on vehicle MASTER switch and warm up engine.
- (b) Maintain an engine speed of at least 1600 rpm.
- (c) Activate smoke generating switch by opening safety guard and moving switch (1 or 4) to ON. Indicator light (2) at driver's compartment will illuminate when system is activated.

**e. APU Operation.****WARNING**

**Personnel must stay clear of APU exhaust area during and immediately after engine operations. Contact with these areas can cause burns. Clear area of all personnel and keep vehicle downwind of installation during test.**

- (1) General. APU is used to charge the vehicle batteries. It also powers the fuel transfer pump and the hydraulic power to operate the following only if the engine fails.

**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

- (a) Main winch. Pay out cable to loosen load and/or inhaul cable under no-load conditions.
- (b) Hoist winch. Lower suspended load or raise cable under no-load conditions.

**CAUTION**

**This is not a normal function of the auxiliary hydraulic system.**

**NOTE**

**In an EMERGENCY ONLY, if main engine fails during hoisting operations and you have a load hanging from boom, auxiliary hydraulic system may be used to lower load. This is to allow you to loosen cable and reel it in. Start auxiliary hydraulic system (see para. 2-11c) and move HOIST operating lever SLOWLY to LOWER until load rests on ground.**

- (c) Spade-raise or lower. The spade can be raised from the stabilizing position by releasing the vehicle brakes while raising it. If the spade is deeply implanted, the vehicle must be towed back while raising the spade.
  - (d) Boom-raise or lower.
- (2) Starting instructions. See paragraph 2-10b for normal starting instructions. Instructions for starting APU in extremely cold weather (32 to -25°F [0 to -32°C]) are found in paragraph 2-16b. Before starting APU, see PMCS (see tab. 2-1) for checking oil level.
  - (3) Charging batteries. To charge batteries, start APU and allow to run for 3 minutes. Turn on generator switch and charge for 30 minutes. If there is not enough power to start main engine after charging, notify unit maintenance.
  - (4) Refuel and defuel.
    - (a) General. The fuel transfer pump is used when fueling vehicle from drums or from another vehicle. It is also used to transfer fuel from the M88A1 to another vehicle. Controls and fuel hose are located in right stowage compartment on outside of vehicle.

**WARNING**

**Access door to APU can swing and injure personnel performing maintenance checks and services, especially if spare roadwheel is mounted in place, unless access door is properly secured by a strap. (Use stowage strap numbers in paragraph E-7, items 3, 8, and 9. Stowage strap is routed through lower access door ring handle and stowed roadwheel hub, and then tied to secure door in an open position.)**

**CAUTION**

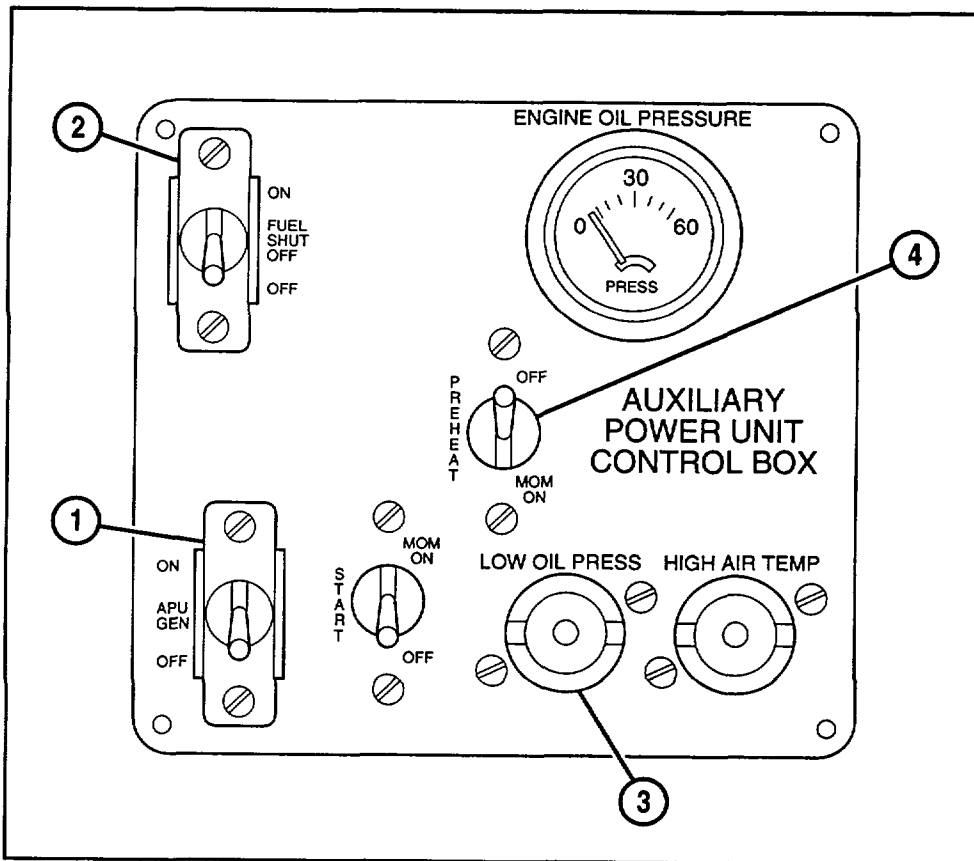
**Turn off radio and electrical switches before starting APU.**

(b) Before starting APU.

1. Ensure hydraulic SYSTEM SELECTOR control lever is on MAIN (see para. 2-1b(3)).
2. Check hydraulic POWER level for OFF (see para. 2-1b(5)).
3. Turn MASTER switch on and FUEL PUMP switch OFF (see para. 2-1e).
4. Check APU GEN switch (1) for OFF.

(c) Starting APU.

1. Turn FUEL SHUTOFF switch (2) to ON. LOW OIL PRESS light (3) will come on and stay on until engine runs.
2. PREHEAT switch (4) is kept on until engine starts.



**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

3. Hold PREHEAT switch (4) down for: 20 seconds if temperature is above 55°F (13°C) or 1 minute if it is below 55°F (13°C).

**NOTE**

**In extremely cold weather (32 to -25°F [0 to -32°C]), see paragraph 2-16b for cold weather starting instructions.**

4. Turn START switch (5) to ON and hold until engine starts. If engine does not start in 1 minute, release START switch and keep PREHEAT switch (4) down for another 20 seconds or 1 minute and try again. If engine still does not start, troubleshoot (see tab. 3-1).
5. When engine starts, release two switches (4 and 5).

**CAUTION**

**If LOW OIL PRESSURE light (3) stays on after engine starts or comes on while engine is running, Turn FUEL SHUTOFF switch (2) to OFF. Stop APU and troubleshoot.**

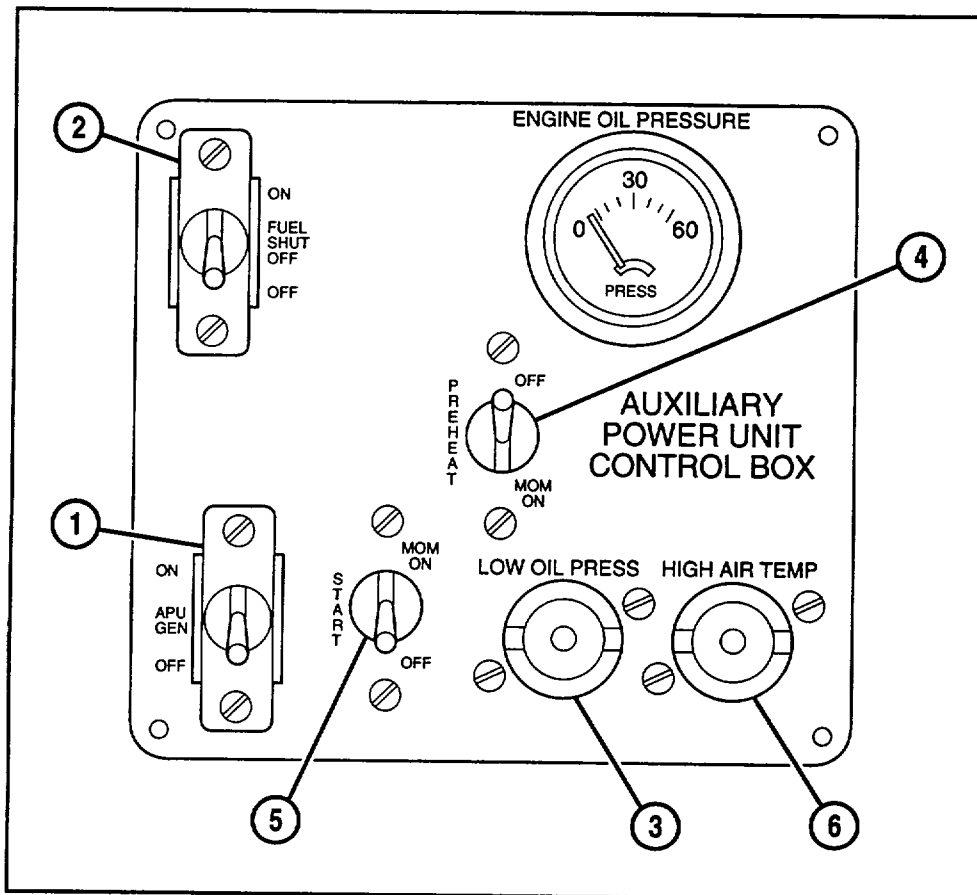
6. Let APU warm up for 3 minutes before turning on generator switch or operating the auxiliary hydraulic system.

**CAUTION**

- **Do not run APU for longer than 1 hour with generator or hydraulics engaged in a heavy load condition. After 1 hour, turn off auxiliary generator or hydraulic system. Run engine to allow it to cool before engaging hydraulics or generator again.**
- **If HIGH AIR TEMP light (6) comes on during operation, turn off APU and let it cool. If light comes on often, notify unit maintenance.**

7. While APU is operating, frequently check APU CONTROL BOX for possible malfunctions.
8. To stop, turn APU GEN and FUEL SHUTOFF switches (1 and 2) to OFF.
9. If FUEL SHUTOFF switch (2) does not stop APU, turn MASTER switch to OFF.

10. If APU still runs, go outside to APU compartment and turn off emergency fuel shutoff valve (see para. 2-5).



(d) Transfer pump set-up.

**WARNING**

**No smoking or open flames are permitted during any refuel or defuel operation and M88A1's portable CO<sub>2</sub> fire extinguisher must be manned and readily accessible.**

1. Check fuel tank FUEL CONTROL VALVES for desired position (see para. 2-11i(6)).

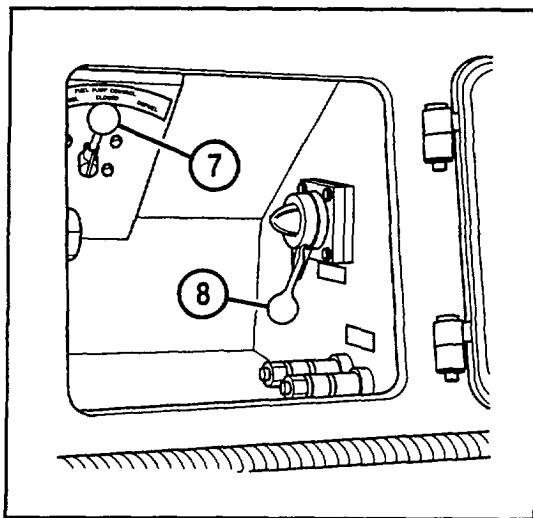
**CAUTION**

**Do not change FUEL PUMP CONTROL handle without setting FLOW REGULATOR handle to 10.**

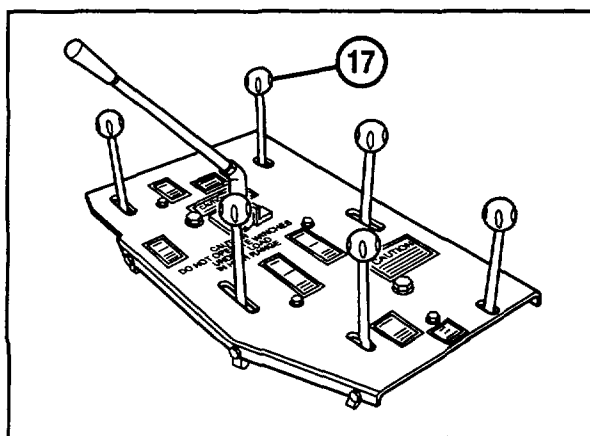
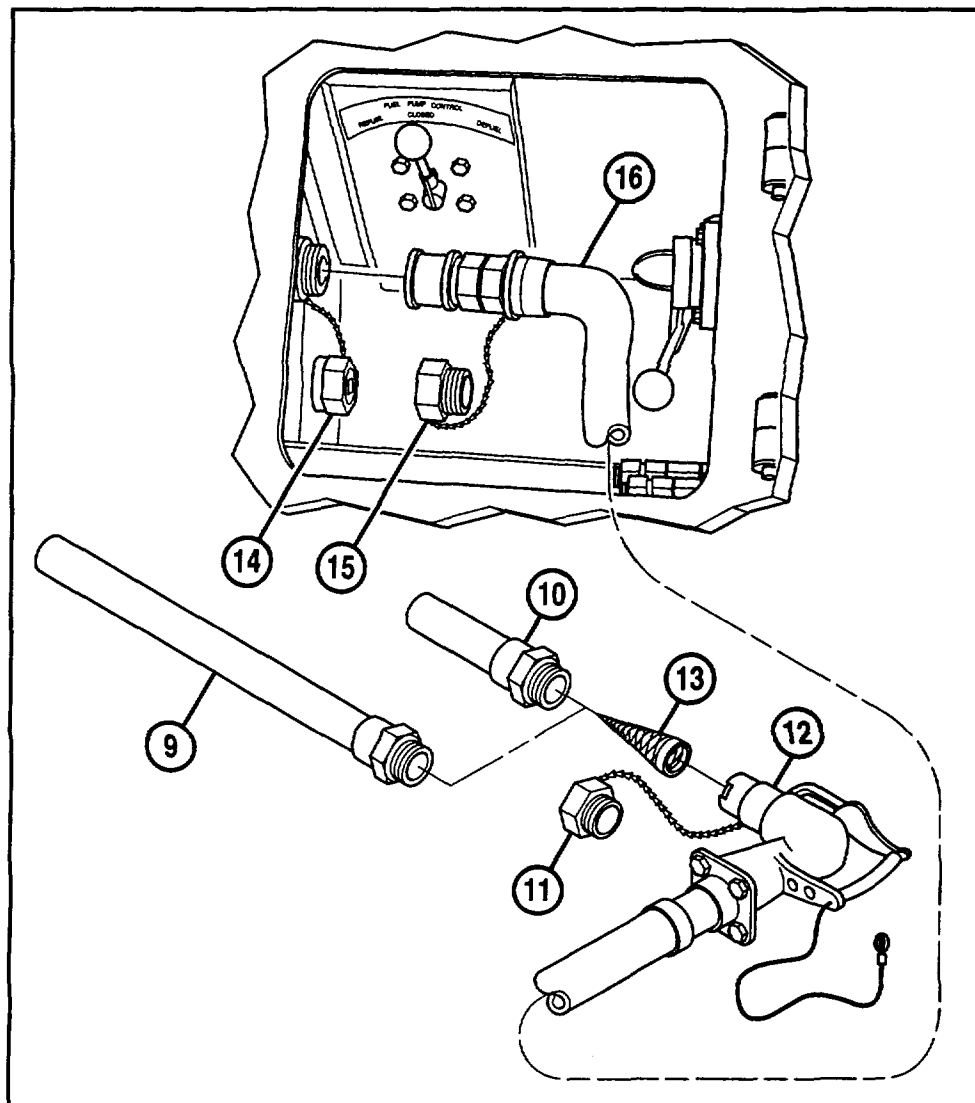


**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

2. Ensure FUEL PUMP CONTROL handle (7) is set to CLOSED.
3. Move FLOW REGULATOR handle (8) to 10.

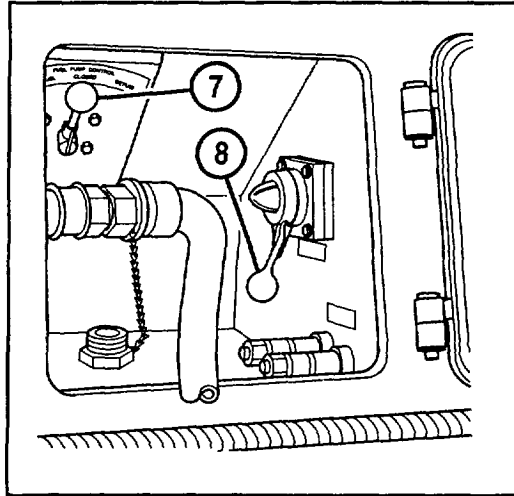


4. Select filler tube for desired operation, long filler tube (9) to take fuel on (refuel), or short filler tube (10) for defueling M88A1.
5. Remove dust cap (11) from nozzle (12).
6. Place filter (13) in filler tube (9 or 10). Remove dust cap (14) and screw tube onto nozzle (12) hand tight. (If leakage occurs tube may be tightened slightly by wrench.) 7. Remove compartment to outlet fuel hose connection cap (14) and fuel hose plug (15) and connect fuel hose (16).
8. Start APU (see para. 2-13e) and shift SYSTEM SELECTOR CONTROL lever (17) to REFUEL.



**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

9. Move FUEL PUMP CONTROL handle (7) to desired position (REFUEL places fuel into M88A1, DEFUEL removes fuel from the M88A1).
10. Set FLOW REGULATOR control handle (8) to desired position. Refer to table 2-3 for flow settings. Normal operating range will be 3.25 on flow regulator setting (26.5 gpm [100 Lpm]).

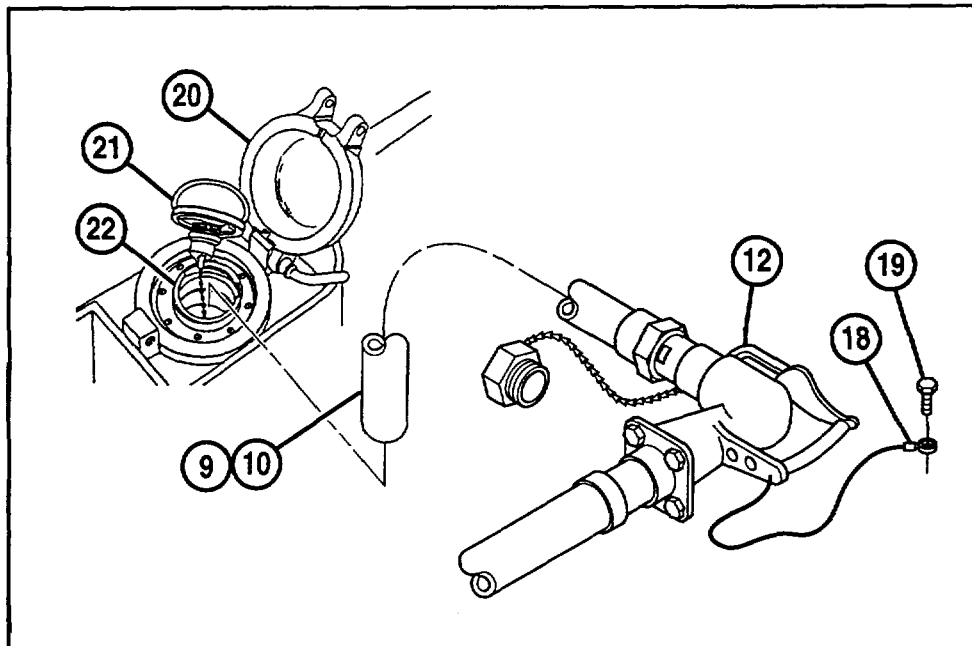
**CAUTION**

**All personnel must dismount vehicles and manned fire extinguisher must be readily accessible.**

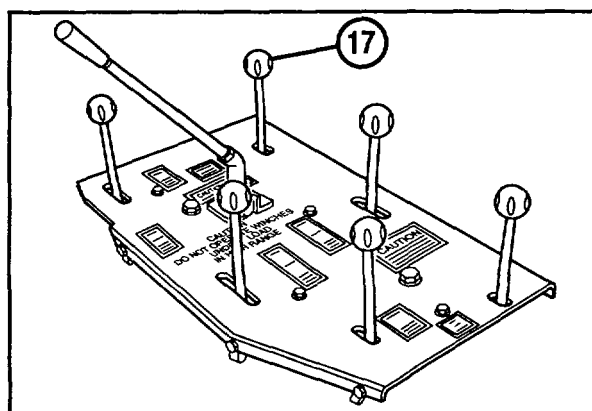
11. Ground fuel hose assembly by connecting attached grounding cable (18) to object to/from which fuel is being transferred with existing screw (19).
12. Open fuel fill cover (20) and remove fuel filler cap (21) and insert filler tube (9 or 10) into tank filler pipe (22). Avoid damaging filler pipes or strainers.

**CAUTION**

**When refueling M88A1, remove fuel filler cap (21) for venting and have an observer watch fuel tank filler pipe (9 or 10) to avoid overfilling and spillage of fuel 13. Avoid overfilling by attending nozzle constantly.**

(e) Transfer pump shutdown.

1. Move FLOW REGULATOR handle (8) to 10.
2. Set FUEL PUMP CONTROL handle (7) to CLOSED.
3. Remove screw (19) and disconnect grounding cable (18). Reinstall screw.
4. Engage nozzle (12) handle to relieve fuel pressure in hose. Remove tube (9 or 10) from fuel tank filler pipe (22) and replace filler cap (21) and close fuel filler cover (20).
5. Shift SYSTEM SELECTOR CONTROL lever (17) to MAIN.



2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

6. Shut down APU if no longer needed.
7. Disconnect fuel hose (16) and replace hose connection cap (14) and plug (15).
8. Disconnect long tube (9) from nozzle (12) and ensure short tube (10) with filter (13) is installed on nozzle with dust cap (11) in place before unit is stowed.

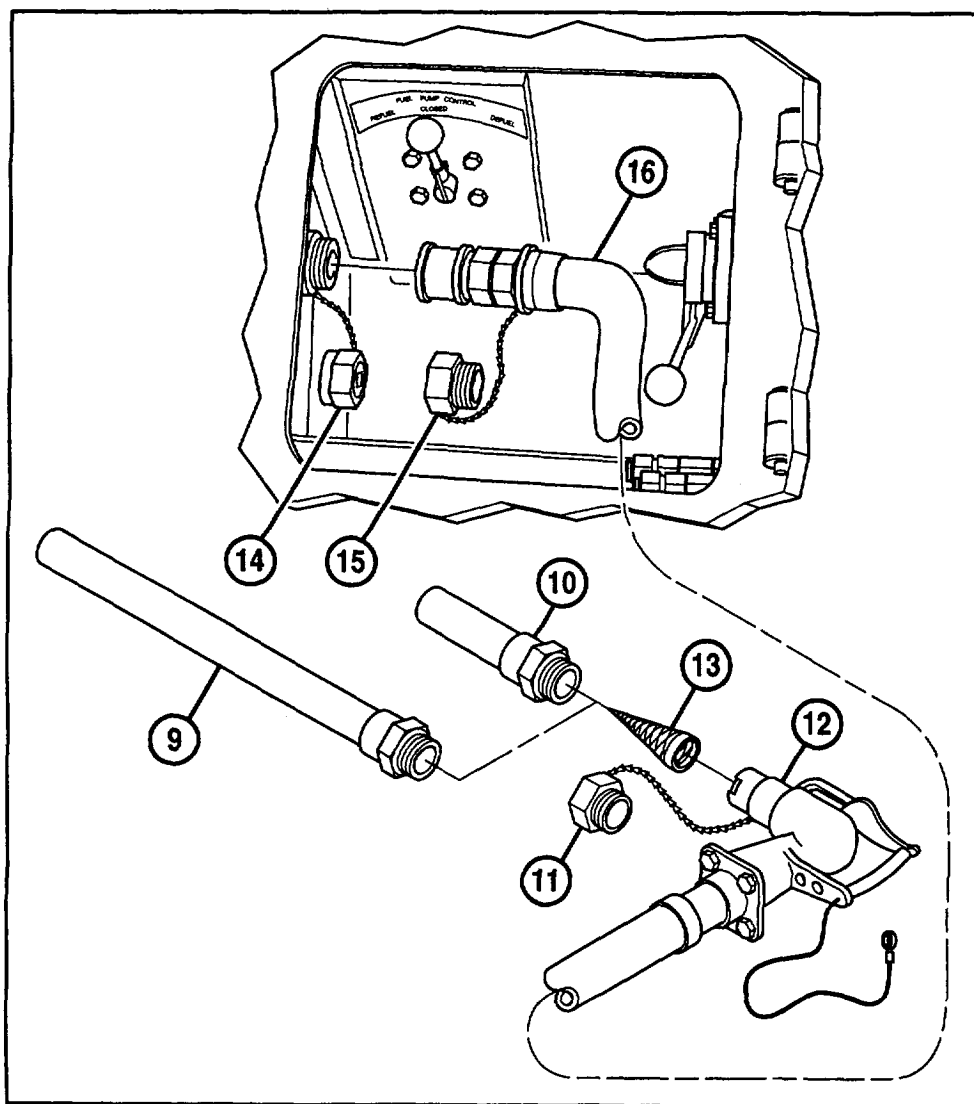


Table 2-3. Flow Regulator Setting for Operation of Impact Wrench and Fuel Transfer Pump.

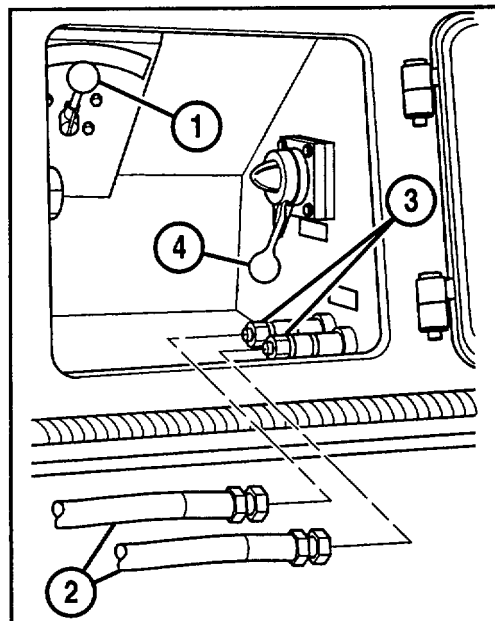
Flow Regulator Setting	Approximate Flow Output at Regulator, gpm (Lpm)	Average Torque Output, lb-ft (N·m)		Approx. Fuel Transfer Pump Output, gpm (Lpm)
		1-in. bolt at 5 sec.	1-in. bolt at 10 sec.	
0	6.3 (23.8)	Do not use	Do not use	36 (136.3)
0.50	6.2 (23.5)	Do not use	Do not use	35.5 (134.4)
1.00	6.0 (22.7)	Do not use	Do not use	35 (132.5)
1.50	5.8( 22.0)	Do not use	Do not use	34 (128.7)
2.00	5.5 (20.8)	Do not use	Do not use	33.5 (126.8)
2.50	5.1 (19.3)	Do not use	Do not use	33 (124.9)
3.00	4.5 (17.0)	Do not use	Do not use	29 (109.8)
3.25	4.1 (15.5)	940 (1274)	Do not use	26.5 (100.3)
3.50	3.9 (14.8)	800 (1084)	1000 (1355)	24 (90.8)
3.75	3.5 (13.2)	620 (840)	770 (1044)	21 (79.5)
4.00	3.2 (12.1)	490 (644)	580 (786)	18.5 (70.0)
4.25	2.8 (10.6)	360 (488)	480 (650)	16 (60.6)
4.50	2.4 (9.1)	305 (413)	450 (610)	14 (53.0)
5.00	1.7 (6.4)	--	--	9 (34.1)
5.50	1.1 (4.1)	--	--	3 (11.4)
6.00 thru 10.00	0	--	--	0

**f. Hydraulic Impact Wrench Operation.**

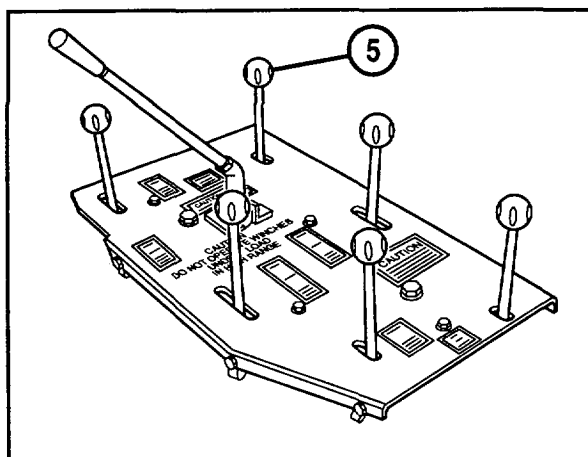
- (1) General. A portable hydraulic impact wrench with hoses is located in the right stowage compartment. It is a 3/4-in. square drive wrench with one 3/8-in. and one 1/2-in. quick disconnect, self-sealing hose.
- (2) Operation. Table 2-3 lists the flow regulator settings. For maintenance and operation of the hydraulic impact wrench refer to TM 9-5130-338-12&P.

**2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.**

- (a) Check FUEL PUMP CONTROL handle (1) for CLOSED position.
- (b) Connect impact wrench hoses (2) to quick disconnect couplings (3).
- (c) Move FLOW REGULATOR control handle (4) to 10.
- (d) Turn on auxiliary hydraulic system (see para. 2-11c).



- (e) Shift SYSTEM SELECTOR CONTROL lever (5) to REFUEL.



- (f) Adjust FLOW REGULATOR control handle (4) for approximate torque settings (see tab. 2-3). Also, check torque requirements for item being worked on.
- (g) Bleed small amount of hydraulic fluid from hoses (2) prior to storing. This prevents pressure buildup in lines.
- (h) Refer to TM 9-5130-388-12&P for hydraulic impact wrench operation instructions.

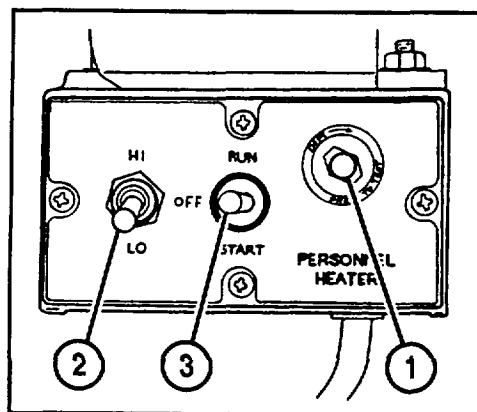
### g. Personnel Heater Operation.

- (1) General. The personnel heater gives off heated air for the crew compartment.

#### WARNING

**Do not operate personnel heater with ventilating blower closed (see para. 2-13h).**

- (2) Press indicator light (1) to see if it glows. If it does not glow, replace it. If it still does not glow, troubleshoot (see tab. 31).
- (3) Set HI/LO switch (2) to desired position.
- (4) Hold heater control switch (3) to START.



- (5) Wait 2 to 4 minutes for indicator light (1) to come on. Move heater control switch (3) to RUN.
- (6) If indicator light (1) fails to glow, move heater control switch (3) to OFF.
- (a) Press indicator light (1). If it lights, wait 2 minutes and try to start heater again.
- (b) If it does not light, troubleshoot (see tab. 3-1).
- (7) To stop heater, move heater control switch (3) to OFF. Light will go out in a short time.

#### NOTE

**Personnel heater can be operated with MASTER switch OFF. Run like this for only a short time. Batteries will drain quickly in cold weather.**

### h. Ventilating Blower Operation.

#### WARNING

**DO NOT operate ventilating blower in an area where air is contaminated.**

- (1) General. The ventilating blower circulates fresh outside air throughout the crew compartment.

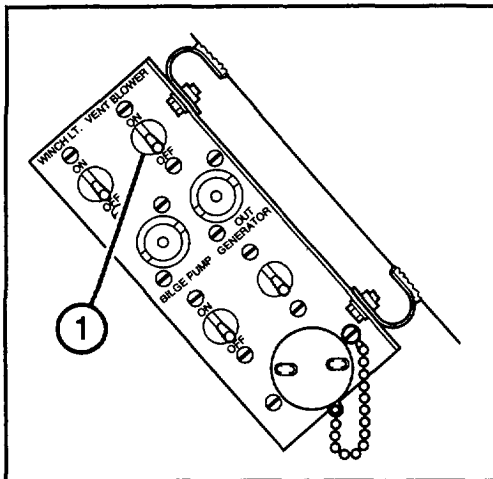


## 2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

## NOTE

**MASTER switch must be on to operate ventilating blower.**

- (2) Turn VENT BLOWER switch (1) on accessories panel to ON.



- (3) Turn VENT BLOWER switch (1) to OFF to stop operation.

**i. Portable Fire Extinguisher Operation.**

- (1) General. Two portable fire extinguishers are located on the right and left side of the crew compartment. They are used to fight local fires inside and outside the vehicle.

**WARNING**

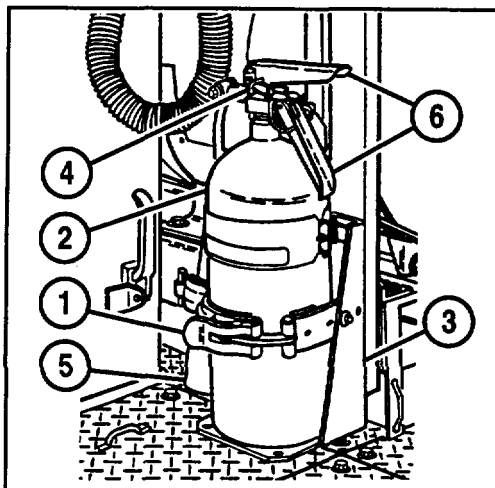
- Fire extinguisher CO<sub>2</sub> can cause suffocation and severe burns.
- Handle fire extinguisher carefully. Do not hit or drop cylinder.
- Do not point fire extinguisher at personnel
- Do not touch cone when using fire extinguisher: hands will be severely burned.

- (2) Pull latch (1) and remove fire extinguisher (2) from bracket (3).

- (3) Pull safety pin (4).

- (4) Point cone (5) at base of fire.

- (5) Squeeze handles (6).



**NOTE**

**Unit maintenance must replace used fire extinguishers.**

**j. Fixed Fire Extinguisher System Operation.**

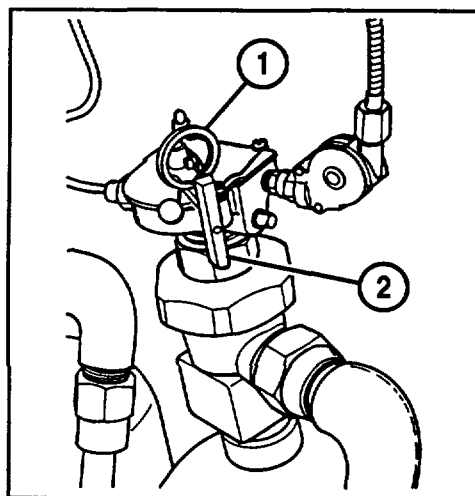
- (1) General. The system contains two banks of four cylinders each. Pull handles are located on the left wall of the crew compartment behind the driver and forward of the left crew compartment door on the outside of the vehicle. These handles are used to discharge the fire extinguishers.

**NOTE**

**Some older vehicles have pull handles mounted above battery grille doors.**

- (2) The fixed fire extinguishers will put out electrical and fuel fires in the hydraulic and engine compartments.
- (3) Operation.

- (a) To arm fixed fire extinguisher system. Pull locking pin (1) and push lever (2) forward on rear cylinder of each bank.

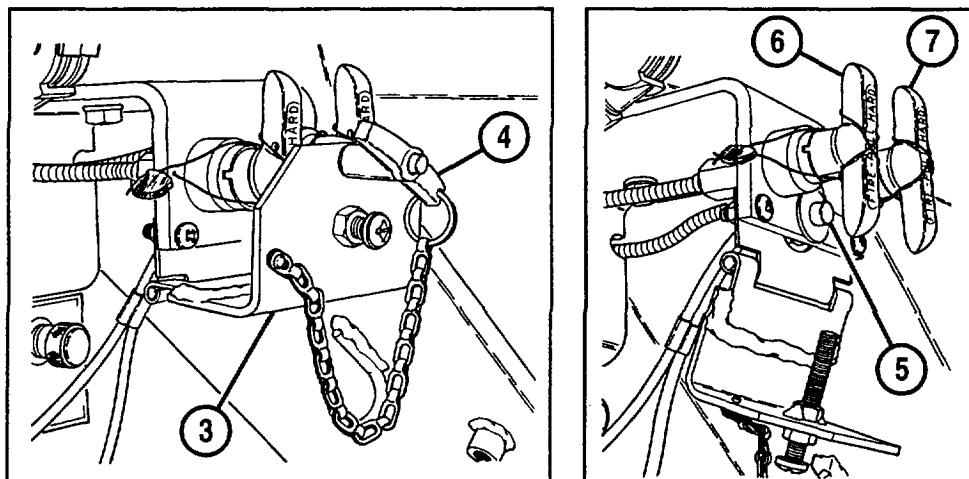


## 2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

## NOTE

Steps (b) and (c) below refer to pull handles located inside vehicle only.

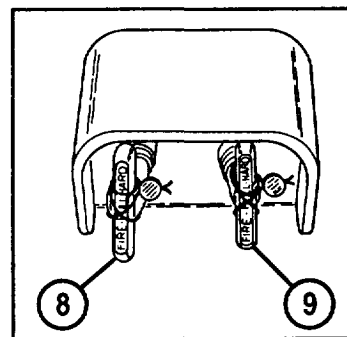
- (b) Press button on quick-release pin (3) and lower shield (4). When shield is lowered pushbutton (5) is released activating fuel shutoff solenoid, stopping engine.
- (c) Pull handle (6) discharges right bank and pull handle (7) discharges left bank.



## NOTE

Step (d) refers to pull handles located outside vehicle only.

- (d) Pull handle (8) discharges right bank and pull handle (9) discharges left bank.



## WARNING

- Grab handles tight and pull **HARD**. If fire is intense or if an explosion is possible, pull **BOTH** handles and **GET A WAY FAST**.
  - Have unit maintenance replace discharged cylinders. Do not operate vehicle if system has been discharged.
- (e) Before vehicle can be restarted, swing shield (4) upward on its hinges and reinsert quick-release pin (3).

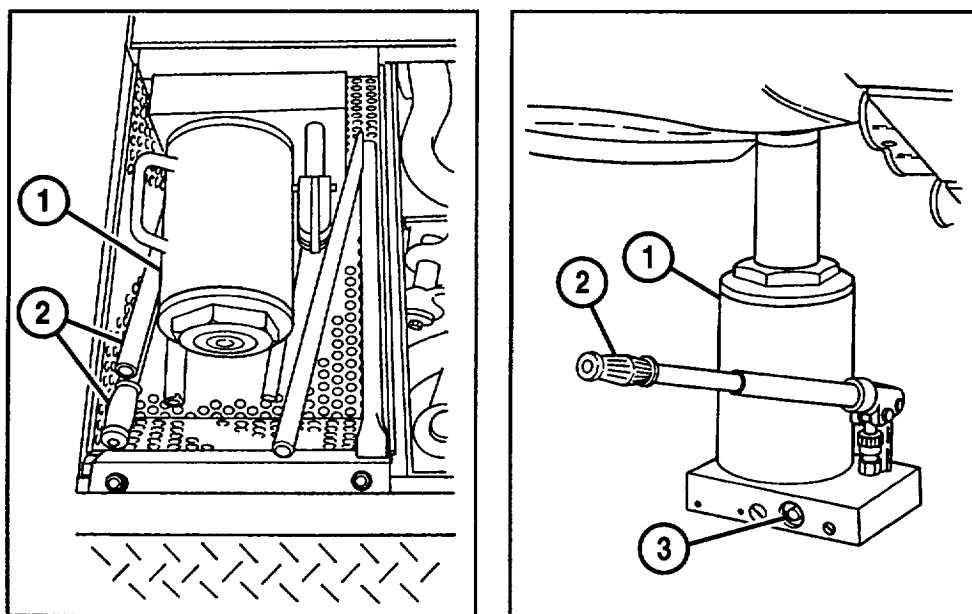
### k. Vehicle Jack Operation.

- (1) General. Three vehicle jacks are stowed on the left side of the crew compartment behind the operator. A 12-ton (10.9-metric-ton) and a 30-ton (27.2-metric-ton) jack are on the oddment tray. The other 30-ton (27.2-metric-ton) jack is under the crew compartment access door (see para. 2-6l).

#### NOTE

**The 12-ton (10.9-metric-ton) and 30-ton (27.2-metric ton) jacks work in same way.**

- (2) Open access door (see para. 2-6l) for jack (1) and handles (2) (two pieces).
- (3) Close valve (3) before using.
- (4) Place jack (1) on hard level ground.
- (5) Connect handle (2) and lift.
- (6) To lower, slowly unscrew valve (3).



### 1. Gas-Particulate Filter Unit (GPFU).

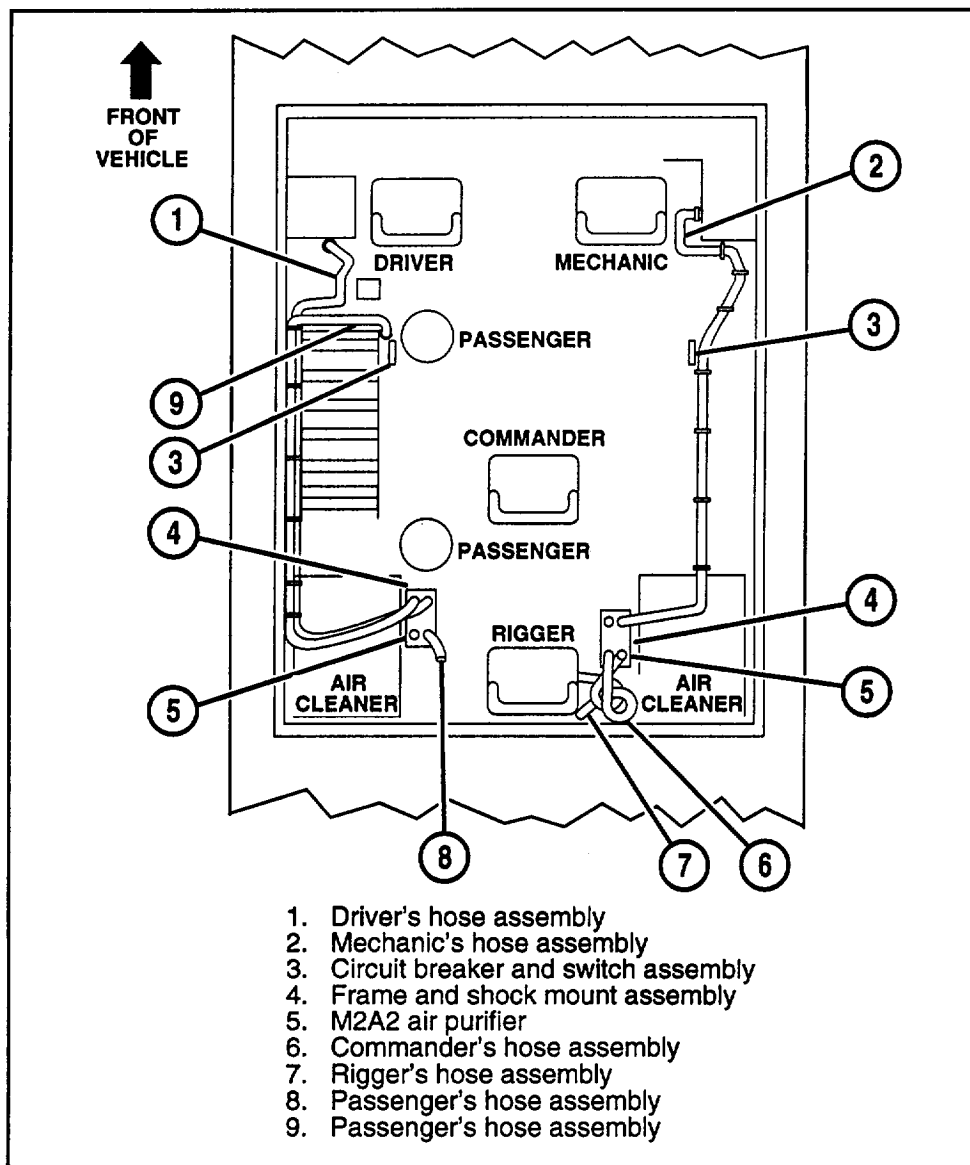
- (1) Equipment description.

#### WARNING

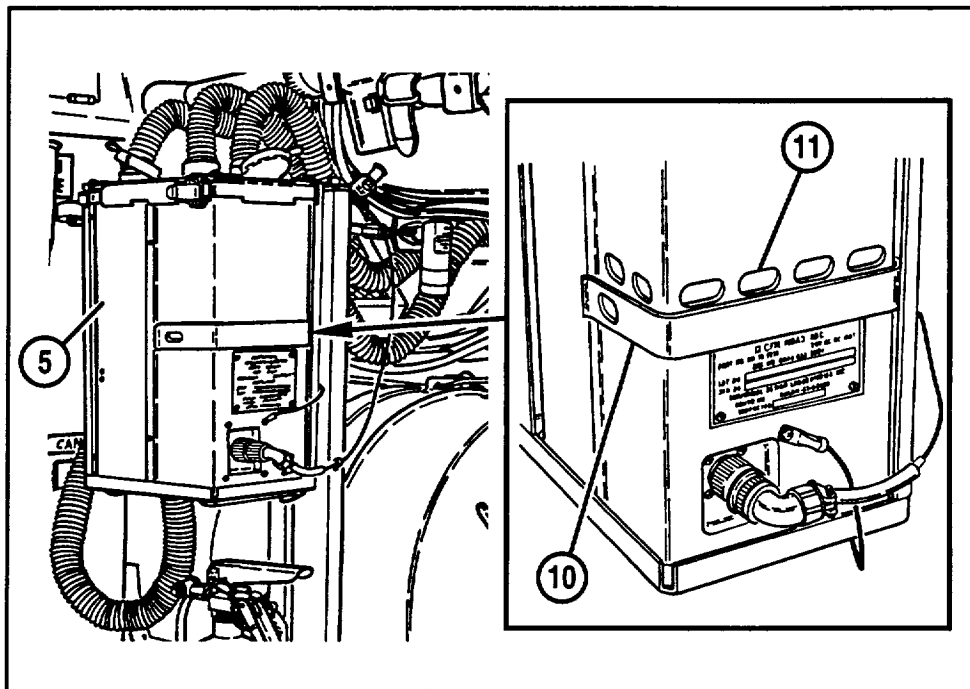
**Do not expect your protective mask to protect you from carbon monoxide poisoning. It will not do it.**

2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

- (a) General. Each M8A3 GPFU supplies filtered air to four or fewer persons in the crew compartment. It removes all known chemical agents, dust, and other particles from the air. Two units are installed in the vehicle. Filtered breathing air is supplied through the hoses to the M25A1 mask worn at each crew member and passenger station. The illustration and legend below show the layout of the system in the vehicle.



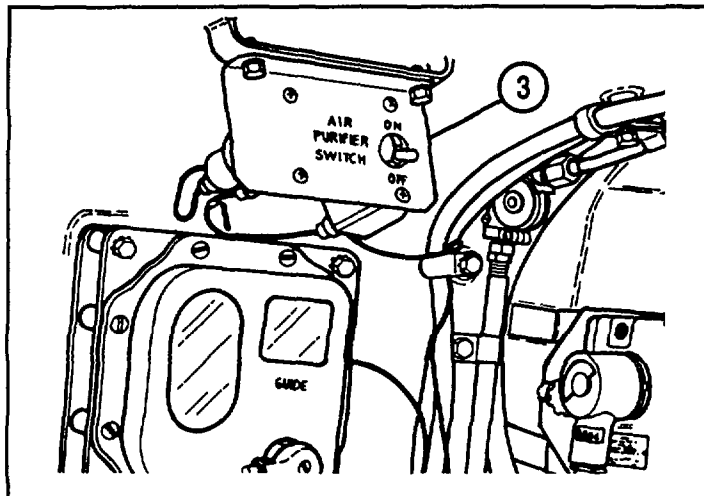
- (b) M2A2 air purifier. The M2A2 air purifier assembly (5) has an M13 particulate filter, an M12A1 gas filter, and an M1A1 air purifier precleaner in a steel housing. The M12A1 gas filter has a flow of up to 12 cubic feet per minute (0.34 cubic meters per minute). Four outlet sockets are provided for attaching hoses. When less than four crew members use the unit, one of the airflow sockets is covered by a control cap without a centerhole. The other sockets, when not in use, are covered with control caps with a centerhole.
- (c) Spring clip. Spring clip (10) covers air holes (11) in the center of the housing during shipment, storage, when not in use and when the vehicle is being cleaned. During operation, the spring clip must be removed from the air intake holes by moving it down.



- (d) Hose assemblies. Each hose has two coupling halves. One end attaches to the unit and the other attaches to a protective mask.
- (e) Cable assemblies. Four cables are required for each M8A3 filter unit. They connect the filter unit, switch and circuit breaker to the dome light power receptacle.

## 2-13. OPERATION OF AUXILIARY EQUIPMENT-Continued.

- (f) Circuit breaker and switch assembly. Two air purifier circuit breaker switch assemblies (3) are located in crew compartment. Left unit is located near the driver's dome light, right unit is located near mechanic's dome light.

(2) GPFU Operation.(a) Starting.

1. Check MASTER switch for on.
2. Put masks on and adjust facepiece.
3. Move spring clip down to open air inlet holes.
4. Turn AIR PURIFIER SWITCH(s) ON.
5. Attach hoses from purifier unit outlets to masks.

**NOTE**

**Masks will only be worn inside vehicle.**

(b) Stopping.

1. Uncouple hoses from masks.
2. Turn units OFF.
3. Remove masks.
4. Stow masks and hoses.
5. Move spring clip up to cover holes.

**2-14. PREPARATION FOR MOVEMENT.** Before moving M88A1, check to see that all systems and stowage compartments are secured for travel. The following steps are specific items to be checked before moving.

- a. Ensure boom is properly lowered and secured.
- b. Ensure stayline and snatch blocks are properly secured.
- c. Ensure following doors are closed and secured:
  - Right and left personnel doors
  - Right and left stowage compartment doors
  - APU compartment door
  - Hoist winch cable access door
  - Engine and transmission access doors
  - Battery access doors
  - Fuel fill cover
- d. Secure commander's cupola, driver's hatch, mechanic's hatch, and rigger's hatch in either open position or closed position.
- e. If hydraulic impact wrench has been used, disconnect and properly stow wrench.
- f. Properly secure following items::
  - Tow bars
  - Tow cable
  - Sledge hammer
  - Pioneer tool set
  - Mattock
  - Oxygen cylinder
  - Tarpaulin
  - Crowbar
  - Vise
  - Utility chain



**2-14. PREPARATION FOR MOVEMENT-Continued.**

- g.** Ensure following items are properly secured with restraint straps, bars, or retaining clips:
  - Caliber .50 ammunition boxes
  - LAW rockets
  - Bolt cutter
  - M16 rifle
  - Oil cans
  - Water cans
  - Tool box
- h.** Ensure all other loose items are properly stowed or secured.

**SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS****2-15. GENERAL.**

- a. This section contains information for operating M88A1 under unusual weather and terrain conditions. Instructions on special care for equipment and fording operations are provided.
- b. Information found in FM 21-306, Manual for the Tracked Combat Vehicle Driver, is important to you. Study it to improve your ability as a driver.
- c. Refer to following for maintenance under unusual conditions before operating vehicle:
  - (1) Table 2-1 for PMCS.
  - (2) Paragraph 3-14 for maintenance under unusual conditions.
  - (3) Appendix F for lubrication instructions.
  - (4) TM 9-6140-200-14 for battery care.
- d. When equipment fails because of exposure to extreme conditions refer to table 3-1 and notify unit maintenance.

**2-16. UNUSUAL ENVIRONMENT/WEATHER CONDITIONS.****a. Extreme Cold Weather Conditions.**

- (1) Extreme cold weather causes oil to thicken, insulation to crack, materials to become brittle and break, and batteries to freeze. Because of these and other problems the vehicle will be more difficult to operate.
- (2) Armament used in extreme cold weather operations must be properly lubricated. Vision devices must not be moved suddenly from warm to cold or cold to warm areas. Condensation may cause clouding of lenses and rusting of internal parts. Do not breathe on lenses.
- (3) Refer to and study information in FM 31-70, FM 31-71, and FM 9207. This information is necessary for effective operation of vehicle during cold weather.

**2-16. UNUSUAL ENVIRONMENT/WEATHER CONDITIONS-Continued.****b. Extreme Cold Weather Operation (32 to -25°F [0 to -32°C]).**(1) Starting and Warmup Procedures.**WARNING**

- Ear protection must be worn by personnel in vehicle because of high vehicle noise.
- Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear area of all personnel and keep vehicle downwind of installation during test.

**CAUTION**

Turn off radio and electrical switches before starting or stopping the engine.

- (a) Shift transmission (1) to P. Depress brakes (2) to lock it. Ensure steering wheel (3) is centered and locked.

**NOTE**

Ensure fuel tank FUEL CONTROL VALVES are properly positioned (see para. 2-11i).

- (b) Turn MASTER switch (4) on. Check FUEL PUMP switch (5) for ON.

**NOTE**

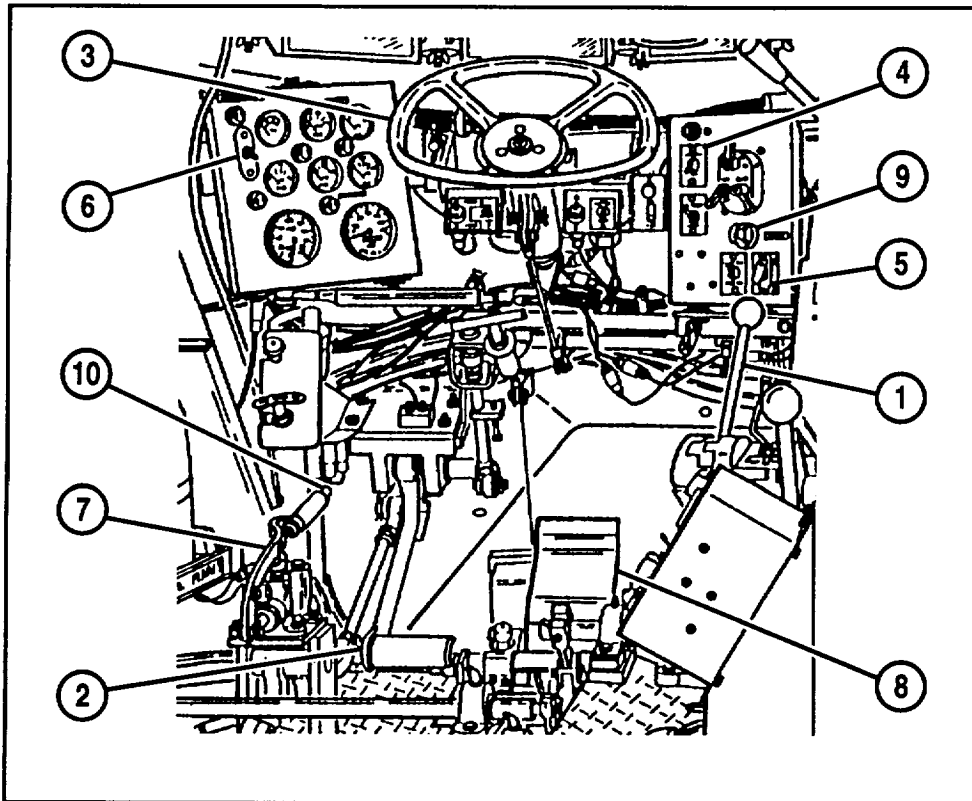
When MASTER switch is on, the master and mechanical transmission warning lights will stay on until the engine is running. If lights do not come on, troubleshoot (see tab. 3-1).

- (c) Move FUEL TANK selector switch (6) up and down to check fuel levels.
- (d) Operate purge pump (7) until back pressure is felt, 3 to 4 strokes should do it.

**CAUTION**

If engine fails to start after pushing START button for 30 seconds, stop cranking, turn off MASTER switch and wait 3 to 5 minutes. Repeat starting procedures. If engine does not start on third try, troubleshoot (see tab. 3-1).

- (e) Depress accelerator pedal (8) to its full travel. Push START button (9).
- (f) With START button depressed, operate purge pump again and depress manifold heater switch (10). When engine starts, stop pumping and release manifold heater switch and START button. Hold accelerator pedal down until engine runs smooth.

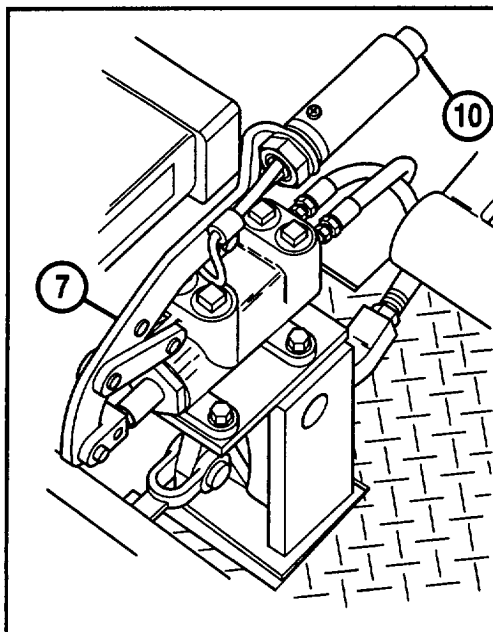
**NOTE**

If engine fails to crank, troubleshoot (see tab. 3-1).

- (g) If engine fails to start due to low batteries, start APU (see para. 2-13e) to charge batteries or slave start vehicle (see para. 2-10d).

**2-16. UNUSUAL ENVIRONMENT/WEATHER CONDITIONS-Continued.**

- (h) Keep engine speed at 1000 to 1200 rpm until engine runs smoothly.
- (i) If engine runs rough after starting, do the following:
  1. Hold brake and shift transmission to N.
  2. Push START button.
  3. Push in manifold heater switch (10) on purge pump (7).



4. If engine will not smooth out after several attempts at pumping, notify unit maintenance.
- (j) Check generator blower operation (see para. 2-10b).
  - (k) Check engine operation (see para. 2-10c).

**WARNING**

**Use of ether as a starting aid is prohibited. Use of ether as a starting aid produces extremely high firing pressures which may cause serious engine damage, such as broken pistons and/or piston rings, bent connecting rods, or cylinder mounting stud failure.**

**CAUTION**

**Before moving out, drive slowly for 100 yards (91.4 m) to warm up suspension lubricants.**

- (l) Constantly watch gages for unusual readings. Stop vehicle if problems are noted and troubleshoot (see tab. 3-1).
  - (m) Refer to TM 21-306 for instructions on driving through snow, ice, and unusual terrain.
- (2) At Halt or Park.
- (a) Park vehicle in a sheltered area if halted for a short shut down period. If no shelter is available, have vehicle face wind. For long shutdown periods, park on high, dry ground or on planks or brush. This prevents tracks from freezing to ground. Chock in place if necessary.
  - (b) After shutting down, place hydraulic levers in N so they will not freeze in an engaged position.
  - (c) Clean vehicle of snow, ice, and mud immediately. Perform all after-operation procedures in table 2-1. Cover vehicle with canvas tarpaulins to protect it from snow.
  - (d) Protect batteries from freezing.
  - (e) Refuel vehicle immediately after operation to reduce condensation in tanks.
- (3) Armament. Cover machine gun when not in use. Refer to TM 91005-213-10 for maintenance of machine gun in cold weather.
- (4) Starting APU.
- (a) Before starting APU in extremely cold weather (32 to -25°F [0 to -32°C]) refer to Appendix F for following:
    - 1. Check engine crankcase oil grade and level.
    - 2. Check chain case oil grade and level.
  - (b) When starting APU in extremely cold weather (32 to -25°F [0 to -32°C]) do following:
    - 1. Check to see that APU has been properly serviced for cold weather operation.

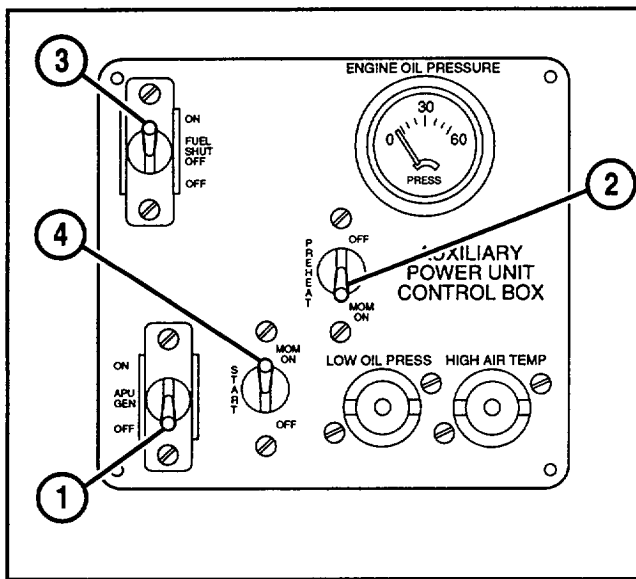
**2-16. UNUSUAL ENVIRONMENT/WEATHER CONDITIONS-Continued.**

2. Turn MASTER switch on and FUEL PUMP switch to OFF.
3. Set hydraulic SYSTEM SELECTOR control lever on MAIN and hydraulic POWER control lever on OFF (see para. 2-1b).
4. Ensure APU generator switch (1) is OFF.
5. To start APU:

**NOTE**

**PREHEAT switch (2) is held ON until engine starts.**

- a. Turn FUEL SHUTOFF switch (3) to ON.
- b. Turn PREHEAT switch (2) to ON for 120 seconds.
- c. Turn START button (4) to ON until engine runs or for 60 seconds. If engine does not start, continue with step d.



- d. Turn PREHEAT switch (2) to ON for 60 seconds.
- e. Turn START button (4) to ON until engine runs (no longer than 30 seconds).

**CAUTION**

- **Do not crank engine for longer than 30 seconds at a time.**
- **Do not attempt to start APU for longer than 5 minutes. If it does not start, notify unit maintenance.**
  6. If APU does not start, repeat procedures and try again. Troubleshoot if engine fails to start on second try (see tab. 3-1).
  7. To stop APU, turn FUEL SHUTOFF switch (3) to OFF.

**c. Extreme Hot Weather Conditions.**

- (1) General. Vehicle may overheat during long, hard towing operations in high gear or when driving at high speeds. Check temperature gages and warning lights often. Stop vehicle to cool it off whenever practical. Keep ventilating blower on during operation. Inspect air cleaners and oil coolers often. Clean off dust, insects, or debris from oil coolers by brushing off screens or flushing with low pressure water. Add tropical electrolyte to batteries (refer to TM 9-6140-200-14).
- (2) At Halt or Park.
  - (a) Do not park vehicle in sun for a long time. Protect it from sun, sand, and dust.
  - (b) If you cannot find shelter for parking, cover vehicle with canvas. Be sure to protect periscopes, vision blocks, and engine compartments from sand.
  - (c) Check vehicle often for rust and fungus when it is shutdown for a long time in hot, humid weather. Clean and lubricate any areas where this is evident.
- (3) Vision Devices. Check periscopes for fungus growth on lenses and clean if any is present. If paint (Appx. D, items 17, 18, 19, or 20) is chipped, touch up immediately to prevent rusting.

**CAUTION**

**Never let M24 periscope be exposed to direct sunlight. Keep periscope in box during daytime operation.**



## 2-16. UNUSUAL ENVIRONMENT/WEATHER CONDITIONS-Continued

### d. Operation on Unusual Terrain.

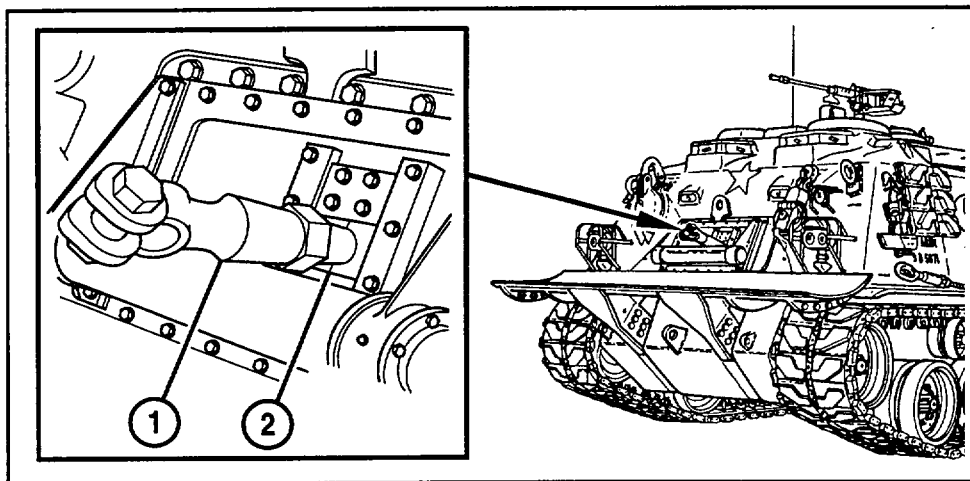
- 1) Mud. Use 1st gear when driving through mud to prevent digging in. If temperatures will freeze, park on solid ground or put branches back under track. Clean tracks, roadwheels, and sprockets.
- 2) Snow. Go up grades as straight as possible and avoid sharp turns.  
When snow is soft or fine, drive cautiously.
- 3) Ice. Drive carefully and steadily on ice. If vehicle starts to skid, let off accelerator.
- 4) Sand. Be careful not to spin tracks. If tracks spin, slow down and move steadily. Do not let engine labor for too long. It might overheat. When traveling in soft sand, do not make any sharp turns in 1st gear. Tracks will be thrown because of sand buildup in suspension system. Wide turns should be made in 2nd or 3rd gear.
- 5) Dust. Check air cleaner restriction gage located directly above air cleaners and clean filter daily (see para. 3-11).

## 2-17. FORDING AND SWIMMING.

- a. **General.** You may have to drive vehicle into water during operations. Normal fording (without extra equipment) is allowable up to 56 in. (1422 mm). Perform following when fording:

- b. **Before Fording:**

- (1) Reel in main winch cable until light pressure is applied between clevis (1) and opening (2) to reduce entrance of water.



- (2) Ensure hull drain valves are closed. Check drain valve lever (see para. 2-1g(2)).

**NOTE**

**Ensure all hull access plates are installed and secured with all bolts present.**

- (3) Do not go in water over 56 in. (1422 mm) deep for normal fording.

**c. Fording.**

- (1) Shift into 1st gear and speed up engine to prevent stalling if water hits it. Keep engine speed above 950 rpm.
- (2) Enter water slowly.
- (3) Keep engine above 950 rpm. Drive 3 to 4 mph (4.8 to 6.4 km/h) to prevent making a bow wave.
- (4) If vehicle is completely submerged to a point where water enters engine compartment, keep engine speed up to prevent water from entering engine. Move vehicle out of water immediately and drain engine compartment by operating drain valve lever (see para. 2-1g(2)). If engine stalls while completely submerged, have vehicle towed out. Apply temporary preservation as outlined in Appendix F. Notify unit maintenance.

- d.** If you have to stop while engine is under water, brake vehicle and shift to N. Keep engine at 950 to 1000 rpm. To move again, shift to 1st and go forward slowly at 3 to 4 mph (4.8 to 6.4 km/h). Keep engine above 950 rpm.

- e. Deep Water Fording.** Refer to paragraph 2-13b for deep water fording kit description and operating instructions.

**f. After-Fording Operations.**

- (1) Open drain valves (see para. 2-11i). Check engine oil level for presence of water. If change of oil color or excessive water is noted, drain oil and refill (Appx. D, item 27 or 28). Run engine for a few minutes to help evaporate and blow out any water that might have entered.
- (2) Refer to paragraph 3-14 for maintenance instructions of vehicle and armament.

**2-18. EMERGENCY PROCEDURES.** Backup operation capability is provided for several M88 systems. These backup capabilities permit mission completion even if major components fail. Following paragraphs include specific instructions for operating equipment.

**2-18. EMERGENCY PROCEDURES-Continued.**

**APU.** If main engine fails, APU can be used to provide hydraulic power to following components:

- (1) Main Winch. Pay out cable to loosen and/or inhaul cable under no-load conditions.
- (2) Hoist Winch.
  - (a) Raise cable under no-load conditions. If main engine fails during a hoisting operation and a load is hanging from boom, APU can be used to lower load.
  - (b) Start auxiliary hydraulic system and move HOIST lever SLOWLY to LOWER until load rests on ground.

**CAUTION**

**This is not a normal function of auxiliary hydraulic system.**

- (3) Spade. Raise or lower under no-load conditions. Spade can be raised from stabilizing position by releasing vehicle brakes while raising it. If spade is deeply implanted, vehicle must be towed back while raising spade.
- (4) Boom. Raise or lower under a no-load condition.

**CHAPTER 3  
MAINTENANCE INSTRUCTIONS**

<b>Section I.</b>	<b>Lubrication Instructions.....</b>	<b>3-2</b>
3-1.	Lubrication Instructions .....	3-2
<b>Section II.</b>	<b>Troubleshooting Procedures .</b>	<b>3-3</b>
3-2.	Introduction .....	3-3
3-3.	Malfunction Index.....	3-3
3-4.	Troubleshooting Procedures .....	3-6
<b>Section III.</b>	<b>Maintenance Procedures .</b>	<b>3-19</b>
3-5.	General .....	3-19
3-6.	Suspension and Track.....	3-19
3-7.	Vision Devices .....	3-35
3-8.	Caliber .50 Machine Gun and Mount Maintenance .....	3-44
3-9.	Lamp Replacement .....	3-46
3-10.	Main Engine Air Cleaner.....	3-48
3-11.	Auxiliary Power Unit (APU) Air Filter Maintenance.....	3-52
3-12.	Oxygen Cylinder and Regulator Valve Replacement .....	3-53
3-13.	Acetylene Cylinder and Regulator Valve Replacement .....	3-55
3-14.	Maintenance Under Unusual Conditions .....	3-57

**SECTION I. LUBRICATION INSTRUCTIONS**

**3-1. LUBRICATION INSTRUCTIONS.** Lubrication instructions are in Appendix F of this manual. All lubrication instructions are mandatory.

**Section II. TROUBLESHOOTING PROCEDURES**

**3-2. INTRODUCTION.**

- a. This section contains information needed to locate and correct problems which may occur in the M88A1 Medium Recovery Vehicle. Troubleshooting is a step-by-step method of discovering trouble or inspecting for cause and correcting it. If a problem shows up that you cannot fix, is not listed, or is not within your level of repair, notify unit maintenance.
- b. Always be alert for unusual noises. Check out any evidence of failure or malfunction. Inspect all systems or equipment that do not operate at peak performance. Discovering and correcting a problem when it first appears will usually result in less serious damage to the vehicle and provide safer conditions for you and the crew.

**3-3. MALFUNCTION INDEX.** The following index is provided to assist you in locating the correct troubleshooting procedure quickly:

**MALFUNCTION INDEX**

	<b>Troubleshooting Procedure No.</b>
<b>ENGINE</b>	
Engine fails to crank or cranks slowly when START button is pushed .....	1
Engine cranks, but fails to start .....	2
Engine starts, but fails to keep running.....	3
Engine stops while operating vehicle uphill during recovery or going up a steep grade.....	4
Engine will not return to idle.....	5
Engine runs roughly and misfires .....	6
Engine lacks power.....	7
Engine overheats.....	8
 <b>STARTING SYSTEM</b>	
No sound from starter when main engine START button is pushed .....	9
Starter operates slowly, but does not start engine .....	10
Lights dim or ventilating blower motor slows down with engine off .....	11
Low oil pressure.....	12
Excessive oil being used .....	13
No oil pressure .....	14
Engine oil temperature exceeds 240° Fahrenheit (F) (115° Celsius [C]).....	15

**3-3. MALFUNCTION INDEX-Continued.**

**OPERATOR'S CONTROLS**

Vehicle will not steer or steers in only one direction..... 16  
 Brakes will not effectively stop vehicle or drag at one or both sides ..... 17  
 Engine does not respond properly to throttle control ..... 18  
 Purge pump handle operates too easily..... 19

**TRANSMISSION**

Vehicle will not drive in forward or reverse gears ..... 20  
 Transmission oil pressure low..... 21  
 Transmission oil high temperature WARNING light and horn come on..... 22  
 Vehicle drives in one gear, creeps in neutral (N), but stalls when shifted to another gear..... 23  
 Vehicle has good steering in one direction, but not in opposite Direction or grabs ..... 24  
 Vehicle pulls to one side when no steering is applied..... 25

**WINCHES AND BOOM**

MAIN or HOIST WINCH SHIFT lever will not shift ..... 26  
 Main or hoist winch brake or hoisting boom will not hold load or will not work..... 27  
 Main or hoist winch will not operate in both directions in low or High gear ..... 28  
 Main or hoist winch or hoisting boom will not develop full power or speed..... 29  
 Winch operates on auxiliary hydraulic power, but does not operate on main engine hydraulic power..... 30

**AUXILIARY HYDRAULIC SYSTEM**

Auxiliary hydraulic system will not work ..... 31  
 Boom and spade will not work with APU engine running..... 32

**LIGHT SYSTEM**

Lights do not work..... 33  
 Any lights except WARNING lights and flasher light flicker, will not go off, or will not burn..... 34  
 WARNING light will not burn..... 35  
 Flasher light burns, but fails to flash ..... 36  
 Flasher light will not burn..... 37

RADIO INTERFERENCE SUPPRESSION SYSTEM

Radio interference (static) with vehicle not in motion, but with engine running..... 38  
 Radio interference with electrical units in operation (heater, blower, etc.)..... 39

APU

Engine fails to start . ..... 40  
 Engine starts, but fails to keep running or runs roughly..... 41

VENTILATING BLOWER

Ventilating blower does not run when VENT BLOWER switch is turned ON..... 42

PERSONNEL HEATER

Excessive time for ignition ..... 43  
 Heater fails to ignite ..... 44  
 Heater fails to continue burning..... 45  
 Smoke from heater..... 46

TRACKS AND SUSPENSION

Vehicle leans to one side..... 47  
 Thumping noise as track passes over track support rollers ..... 48  
 Thumping noise from suspension system ..... 49

GAS-PARTICULATE FILTER UNIT(GPFU)

Insufficient airflow at all stations ..... 50  
 Airflow is too high at all stations ..... 51  
 GPFU will not operate when switch is on ..... 52

BILGE PUMP

Bilge pump does not pump water ..... 53  
 Bilge pump starts and stops when switch is on or fails to operate completely..... 54

GRENADE SYSTEM

System operates, but arming light does not come on..... 55  
 System does not operate properly ..... 56  
 Vehicle fails to make smoke when engine is running and smoke generating system is activated ..... 57  
 Smoke produced is of poor quality or quantity..... 58  
 Vehicle smokes when generating system is not activated ..... 59



**3-4. TROUBLESHOOTING PROCEDURES.** Table 3-1 provides troubleshooting malfunctions, tests or inspections, and corrective actions that can be performed by you.

*Table 3-1. Troubleshooting Procedures.*

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

**NOTE**

**If you find something wrong that is not listed in this table or something you cannot fix, notify unit maintenance.**

**ENGINE**

**1. ENGINE FAILS TO CRANK OR CRANKS SLOWLY WHEN START BUTTON IS PUSHED.**

- Step 1. Check MASTER switch for proper functioning with transmission shift lever in park (P) position. Turn on several items of electrical equipment and see if they operate.  
If equipment fails to operate, notify unit maintenance.
- Step 2. Check battery terminals and electrolyte level.  
Fill electrolyte up to split rings and tighten any loose terminals. If batteries are still bad, notify unit maintenance.
- Step 3. Check for low battery charge indicated on BATTERY-GENERATOR gage.  
Run APU to charge batteries (see para. 2-13e(3)).
- Step 4. Check starting and generating system for broken wires and loose connections.  
Tighten all loose connections or notify unit maintenance of any broken wires.
- Step 5. Check for unusual noises or vibration when START button is pushed.  
If starter attempts to operate but engine fails to turn over, engine may be mechanically seized. Notify unit maintenance.

**2. ENGINE CRANKS, BUT FAILS TO START.**

- Step 1. Check fuel controls for proper setting.
  - a. Ensure enough fuel is present.
  - b. Push in FUEL SHUTOFF handle.
  - c. Turn FUEL PUMP switch ON.
  - d. Operate purge pump.

**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

- 
- Step 2. Check for bent or loose fuel lines.  
Notify unit maintenance.
- Step 3. Extremely cold temperatures prevent engine from starting.  
See paragraph 2-16b and attempt to start using cold start procedures.
3. **ENGINE STARTS, BUT FAILS TO KEEP RUNNING.**
- Step 1. Check fuel level.  
Engine may start and run on fuel remaining in engine fuel system and stop when fuel is gone. If engine starts each time purge pump is used but will not continue to run, notify unit maintenance.
- Step 2. Check for air trapped in fuel lines.  
Operate purge pump until engine continues to run.
- Step 3. Check restriction indicator (see para. 3-10).  
Service air cleaners (see para. 3-10).
4. **ENGINE STOPS WHILE OPERATING VEHICLE UPHILL DURING RECOVERY OR GOING UP A STEEP GRADE.**  
Check forward fuel tank valve to see if it is open.  
Close forward tank gate valves or valve (see para. 2-5ax).  
If rear tanks are 1/2 or more full, move vehicle to level area or downgrade. Open forward gate valves or valve to allow fuel to flow into forward tank. Then close forward gate valves or valve.
- NOTE**
- Operation for long periods in recovery operation with vehicle in fixed position on incline will lower front fuel tank supply below pump inlet.**
5. **ENGINE WILL NOT RETURN TO IDLE.**  
Check for loose, missing, or bent accelerator or hand throttle linkage.  
Notify unit maintenance.
6. **ENGINE RUNS ROUGHLY AND MISFIRES.**
- Step 1. Check restriction indicator (see para. 3-10).  
Service air cleaners (see para. 3-10).
- Step 2. Check for fuel leaks.  
Turn off engine and notify unit maintenance.

Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>ENGINE-Continued.</b>		
Step 3.	Engine operating at below normal temperature (one or more cylinders not firing).	Run engine at a higher rpm (1000 to 2000 revolutions per minute [rpm] for 3 to 5 minutes). If engine continues to misfire, notify unit maintenance.
7.	<b>ENGINE LACKS POWER.</b>	
Step 1.	Check for bent, broken, or missing throttle linkage.	Notify unit maintenance.
Step 2.	Check restriction indicator (see para. 3-10).	Service air cleaners and air inlets (see para. 3-10).
Step 3.	Check vehicle steering. If vehicle tends to pull in either direction, brakes could be adjusted too tightly causing excessive drag.	Notify unit maintenance.
Step 4.	Check track tension.	Adjust if necessary (see para. 3-6b).
Step 5.	Check transmission oil level.	Fill as specified in Appendix F.
8.	<b>ENGINE OVERHEATS.</b>	
Step 1.	Check oil level.	Fill as specified in Appendix F.
Step 2.	Check oil lines, coolers, tubes, and pump for leaks.	Notify unit maintenance.
Step 3.	Check cooling fans for proper operation.	Notify unit maintenance.
Step 4.	Check track tension.	Adjust to proper tension (see para. 3-6b).
Step 5.	Brakes too tight causing drag and sluggish handling.	Notify unit maintenance.

---

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
--------------------	---------------------------	--------------------------

---

**STARTING SYSTEM**

9. NO SOUND FROM STARTER WHEN MAIN ENGINE START BUTTON IS PUSHED.
- Step 1. Check MASTER switch and transmission shift lever for proper setting.  
Place shift lever in P and turn MASTER switch on.
- Step 2. Check for loose battery connections, missing, loose, or broken wires.  
Tighten battery connections. Notify unit maintenance of any other malfunction.
10. STARTER OPERATES SLOWLY, BUT DOES NOT START ENGINE.
- Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.  
Run APU until batteries are charged (see para. 2-13e(3)).  
Slave start vehicle if necessary (see para. 2-10d).
- Step 2. Check for loose connections or broken wires.  
Notify unit maintenance.
- Step 3. Check for any unusual vibrations or noises which could mean a mechanical seizure.  
Notify unit maintenance.
11. LIGHTS DIM OR VENTILATING BLOWER MOTOR SLOWS DOWN WITH ENGINE OFF.
- Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.  
Run APU to charge batteries (see para. 2-13e(3)). Slave start vehicle if necessary (see para. 2-10d).
- Step 2. Check battery cables and terminals for corrosion or loose connections.  
Clean and tighten terminals and connections.
- Step 3. Check electrolyte level in batteries.  
Notify unit maintenance.
12. LOW OIL PRESSURE.
- Step 1. Check oil level.  
Add oil as specified in Appendix F.

Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

**STARTING SYSTEM-Continued.**

- Step 2. Check for leaking, damaged, or loose oil line connections.  
Notify unit maintenance.
  
- 13. EXCESSIVE OIL BEING USED.
  - Step 1. Check engine compartment for leaks.  
Notify unit maintenance.
  
  - Step 2. Check engine oil level for overfill.  
Drain to proper level as specified in Appendix F.
  
  - Step 3. Check air cleaners for dirt and debris which may get into cylinders causing excessive wear.  
Clean air cleaners (see para. 3-10) and notify unit maintenance.
  
- 14. NO OIL PRESSURE.
  - Step 1. Check engine oil level.  
Fill as specified in Appendix F.
  
  - Step 2. Check for excessive oil leak.  
Notify unit maintenance.
  
- 15. ENGINE OIL TEMPERATURE EXCEEDS 240°F (115°C).
  - Step 1. Check engine oil high temperature warning light, gage, and horn.  
Stop engine and notify unit maintenance.
  
  - Step 2. Problem occurs during towing operation.  
Shift transmission to lower gear.

**OPERATOR'S CONTROLS**

- 16. VEHICLE WILL NOT STEER OR STEERS IN ONLY ONE DIRECTION.  
Check for bent, missing, loose, or improperly adjusted steering control linkage.  
Notify unit maintenance.
  
- 17. BRAKES WILL NOT EFFECTIVELY STOP VEHICLE OR DRAG AT ONE OR BOTH SIDES.  
Check for loose, missing, bent, or broken linkages.  
Notify unit maintenance.

---

**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

---

18. ENGINE DOES NOT RESPOND PROPERLY TO THROTTLE CONTROL.

Check for loose, missing, bent, broken, or improperly adjusted accelerator control linkage.

Notify unit maintenance.

19. PURGE PUMP HANDLE OPERATES TOO EASILY.

Check for broken pump lines, bad pump, or clogged lines to pump.

Purge pump should operate with some resistance. If handle operates too easily, notify unit maintenance.

**TRANSMISSION**

20. VEHICLE WILL NOT DRIVE IN FORWARD OR REVERSE GEARS.

Check for bent, missing, loose, or improperly adjusted shift linkage.

Notify unit maintenance.

21. TRANSMISSION OIL PRESSURE LOW.

Step 1 Check oil level.

Fill as specified in Appendix F.

Step 2. Check for leaks.

Notify unit maintenance.

22. TRANSMISSION OIL HIGH TEMPERATURE WARNING LIGHT AND HORN COME ON.

Step 1. Check oil coolers for restriction of airflow.

Clean away debris. If problem continues, notify unit maintenance.

Step 2. Check transmission oil level.

Fill as specified in Appendix F.

Step 3. Problem occurs during towing operation or when operating on rough ground.

Shift transmission to lower gear.

23. VEHICLE DRIVES IN ONE GEAR, CREEPS IN N, BUT STALLS WHEN SHIFTED TO ANOTHER GEAR.

Check for missing, bent, or loose shift linkage.

Notify unit maintenance.

Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

**TRANSMISSION-Continued.**

- 24. VEHICLE HAS GOOD STEERING IN ONE DIRECTION, BUT NOT IN OPPOSITE DIRECTION OR GRABS.  
 Check steering control linkage for missing, bent, or loose parts.  
 Notify unit maintenance.
- 25. VEHICLE PULLS TO ONE SIDE WHEN NO STEERING IS APPLIED.  
 Step 1. Check track tension.  
 Adjust track tension (see para. 3-6b).  
  
 Step 2. Check steering control linkage for bent, loose, or missing parts.  
 Notify unit maintenance.

**WINCHES AND BOOM**

- 26. MAIN OR HOIST WINCH SHIFT LEVER WILL NOT SHIFT.  
 Check linkage for bent, missing, or loose parts.  
 Notify unit maintenance.
- 27. MAIN OR HOIST WINCH BRAKE OR HOISTING BOOM WILL NOT HOLD LOAD OR WILL NOT WORK.  
 Check oil level in hydraulic oil tank.  
 Fill as specified in Appendix F. Notify unit maintenance.
- 28. MAIN OR HOIST WINCH WILL NOT OPERATE IN BOTH DIRECTIONS IN LOW OR HIGH GEAR.  
 Listen for unusual noises during winch operation.  
 Notify unit maintenance.
- 29. MAIN OR HOIST WINCH OR HOISTING BOOM WILL NOT DEVELOP FULL POWER OR SPEED.  
 Check oil level in hydraulic oil tank.  
 Fill as specified in Appendix F.
- 30. WINCH OPERATES ON AUXILIARY HYDRAULIC POWER, BUT DOES NOT OPERATE ON MAIN ENGINE HYDRAULIC POWER.  
 Malfunction in the main hydraulic system.  
 Notify unit maintenance.

---

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
--------------------	---------------------------	--------------------------

---

**AUXILIARY HYDRAULIC SYSTEM**

31. **AUXILIARY HYDRAULIC SYSTEM WILL NOT WORK.**  
Check oil level in hydraulic oil tank.  
Fill as specified in Appendix F. Notify unit maintenance if problem continues.
32. **BOOM AND SPADE WILL NOT WORK WITH APU ENGINE RUNNING.**  
Check APU emergency winch control valve.  
Turn valve to NORMAL OPERATION position (see para. 2-11c(2)(e)). If problem continues, notify unit maintenance.

**LIGHT SYSTEM**

33. **LIGHTS DO NOT WORK.**  
Check MASTER switch.  
Turn MASTER switch on.
34. **ANY LIGHTS EXCEPT WARNING LIGHTS AND FLASHER LIGHT FLICKER, WILL NOT GO OFF, OR WILL NOT BURN.**  
Step 1. Check lamp.  
Tighten or replace as necessary.
- Step 2. Check for broken switches and broken wires.  
Notify unit maintenance.
35. **WARNING LIGHT WILL NOT BURN.**  
Check lamp and connectors.  
Replace lamp and notify unit maintenance if problem continues.
36. **FLASHER LIGHT BURNS, BUT FAILS TO FLASH.**  
Check flasher unit connections.  
Notify unit maintenance.
37. **FLASHER LIGHT WILL NOT BURN.**  
Check lamp and switch connections.  
Replace lamp if necessary. Notify unit maintenance if problem continues.



Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

### RADIO INTERFERENCE SUPPRESSION SYSTEM

38. RADIO INTERFERENCE (STATIC) WITH VEHICLE NOT IN MOTION, BUT WITH ENGINE RUNNING.  
 Check battery ground connection.  
 Tighten as required.
39. RADIO INTERFERENCE WITH ELECTRICAL UNITS IN OPERATION (HEATER, BLOWER, ETC.).  
 Check for broken, missing, or loose connections or wiring.  
 Tighten any loose bonding or mounting connections  
 and notify unit maintenance of any malfunctions in  
 electrical components.

### APU

#### WARNING

**APU access door must be secured prior to performing any maintenance checks. Use stowage strap (Appx. E, item 4, 5, or 6) and route through lower access door and stowed roadwheel and tie to secure door in open position.**

40. ENGINE FAILS TO START.
- Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.  
 Slave start vehicle (see para. 2-10d).
- Step 2. Check battery connections.  
 Clean and tighten connections.
- Step 3. Check air intake for restrictions.  
 Remove restrictions and clean air filter (see para. 3-10).
- Step 4. Check fuel level.  
 Refuel vehicle.
- Step 5. Have unit maintenance troubleshoot starting system according to procedures in TM 9-2350-256-20.
41. ENGINE STARTS, BUT FAILS TO KEEP RUNNING OR RUNS ROUGHLY.
- Step 1. Check for water in fuel filters.  
 Drain filters (see para. 2-5ai) of condensation.

---

**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

---

- Step 2. Check air intake for restrictions.  
Remove restrictions or clean filter (see para. 3-10).

**WARNING**

**NBC contaminated filter must be handled using adequate precautions and must be disposed of by trained personnel.**

**VENTILATING BLOWER**

42. VENTILATING BLOWER DOES NOT RUN WHEN VENT BLOWER SWITCH IS TURNED ON.  
Step 1. Check MASTER switch.  
MASTER switch must be turned on.
- Step 2. Check MASTER switch and VENT BLOWER switch for loose connections.  
Notify unit maintenance.

**PERSONNEL HEATER**

43. EXCESSIVE TIME FOR IGNITION.  
Check battery and electrical connections.  
Notify unit maintenance.
44. HEATER FAILS TO IGNITE.  
Step 1. Check vehicle fuel level.  
Add fuel to tanks as required.
- Step 2. Check press-to-test for glow.  
Notify unit maintenance if lights stay out.
45. HEATER FAILS TO CONTINUE BURNING.  
Step 1. Check fuel level.  
Add fuel to tanks as required.
- Step 2. Check for loose cable connections.  
Tighten connections. If problem continues, notify unit maintenance.
46. SMOKE FROM HEATER.  
Check exhaust for restrictions.  
Remove restrictions.

Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>TRACKS AND SUSPENSION</b>		
47. VEHICLE LEANS TO ONE SIDE.	Step 1. Pry wheels with crowbar on low side of vehicle to check for broken torsion bar.	If wheel can be lifted, notify unit maintenance.
	Step 2. Check track tension.	Adjust track tension (see para. 3-6b).
48. THUMPING NOISE AS TRACK PASSES OVER TRACK SUPPORT ROLLERS.	Check for DEAD track link by driving vehicle slowly forward and watching for a DEAD link which will fall below the level of the other links.	Replace DEAD link (see para. 3-6d).
49. THUMPING NOISE FROM SUSPENSION SYSTEM.	Check for wheels that have base separation of rubber from metal of one half the width of original contact around entire wheel or if damage to tire is enough to cause thumping during use. Check for loose, damaged, or leaking shock absorbers. Check track tension and overheated hubs.	Adjust track tension if necessary (see para. 3-6b). Notify unit maintenance.
<b>GPFU</b>		
50. INSUFFICIENT AIRFLOW AT ALL STATIONS.	Step 1. Check for kinked or pinched air hoses. Check for loose connections.	Straighten or replace hoses. Tighten loose connections.
	Step 2. Check for clogged particulate filters or low electrical power.	Notify unit maintenance.
51. AIRFLOW IS TOO HIGH AT ALL STATIONS.	Air purifier is out of adjustment.	Notify unit maintenance.
52. GPFU WILL NOT OPERATE WHEN SWITCH IS ON.	Step 1. Ground wire is loose or missing.	Notify unit maintenance.

**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION**

Step 2. Electrical cable assemblies are loose or missing.  
Notify unit maintenance.

Step 3. Switch or circuit breaker is defective.  
Notify unit maintenance.

**BILGE PUMP**53. **BILGE PUMP DOES NOT PUMP WATER.**

Step 1. Check for clogged bilge pump inlet.  
Remove obstruction from pump inlet. If failure is due to clogged pump inlet screen, notify unit maintenance.

Step 2. Check for clogged bilge pump vent.  
Remove obstruction from pump vent.

54. **BILGE PUMP STARTS AND STOPS WHEN SWITCH IS ON OR FAILS TO OPERATE COMPLETELY.**

Check for corroded, disconnected, or loose harness connections at switch, circuit breaker, or solenoid relay.  
Tighten loose connections. If pump failure is due to corroded contacts, notify unit maintenance.

**GRENADE SYSTEM**55. **SYSTEM OPERATES, BUT ARMING LIGHT DOES NOT COME ON.**

Check lamp.  
Tighten or replace as necessary.

56. **SYSTEM DOES NOT OPERATE PROPERLY.**

Inspect all cable harnesses for broken wires or switches.  
Tighten all connectors. Notify unit maintenance.

57. **VEHICLE FAILS TO MAKE SMOKE WHEN ENGINE IS RUNNING AND SMOKE GENERATING SYSTEM IS ACTIVATED.**

Step 1. Check fuel shutoff valve.  
Fuel shutoff valve should be in open position.

Step 2. Check generator output to smoke generating solenoid valves.  
Notify unit maintenance of any power malfunction.

Step 3. Check for fuel leaking from hull drains or mixed with cooling air.  
Repair ruptured fuel hose or loose connection. Notify unit maintenance.

Table 3-1. Troubleshooting Procedures-Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

**GRENADE SYSTEM-Continued.**

- Step 4. Check solenoid valves.  
With engine running, have someone turn smoke generating system switch ON and OFF. Feel solenoid valves to determine if they activate. Notify unit maintenance of any apparent solenoid malfunction.
  - Step 5. Check for voltage at solenoid valves.  
Notify unit maintenance of any lack of voltage.
  - Step 6. Check ground connection.  
Repair as necessary.
  - Step 7. Check for plugged, pinched, or damaged fuel tube assemblies.  
Notify unit maintenance.
  - Step 8. Check for restricted fuel tube adapters in engine exhaust pipe.  
Notify unit maintenance.
58. SMOKE PRODUCED IS OF POOR QUALITY OR QUANTITY.
- Step 1. Check for fuel leaking from hull drains or mixed with cooling air.  
Repair ruptured fuel hose or loose connection. Notify unit maintenance.
  - Step 2. Check for plugged, pinched, or damaged fuel tube assemblies.  
Notify unit maintenance.
  - Step 3. Check engine fuel filters.  
Replace as necessary. Notify unit maintenance.
  - Step 4. Check for restricted fuel tube adapters in engine exhaust pipe.  
Notify unit maintenance.
59. VEHICLE SMOKES WHEN GENERATING SYSTEM IS NOT ACTIVATED.
- Step 1. Check for voltage at solenoid valves.  
If voltage is indicated, check wiring harness and bulkhead connectors for short circuit. Notify unit maintenance.
  - Step 2. Check solenoid valves.  
Replace solenoid valves if they do not shut off fuel flow.

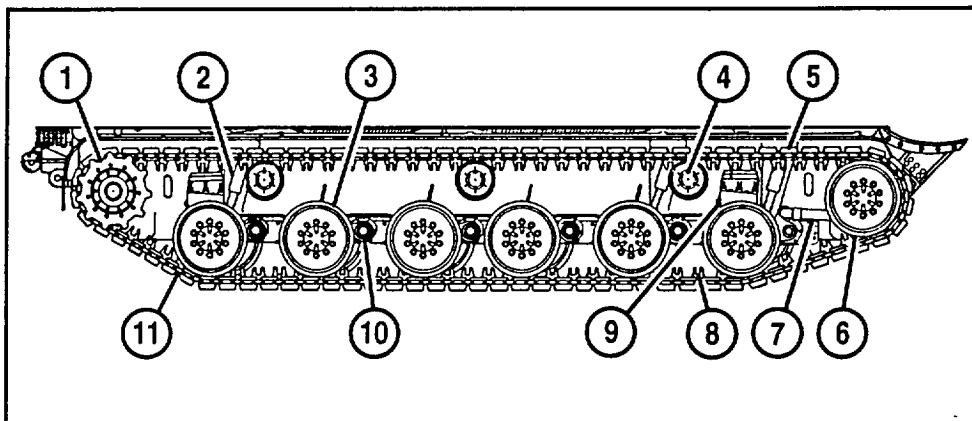
**Section III. MAINTENANCE PROCEDURES**

**3-5. GENERAL.** This section provides maintenance procedures to be performed by the crew. Notify unit maintenance for any additional service.

**3-6. SUSPENSION AND TRACK.**

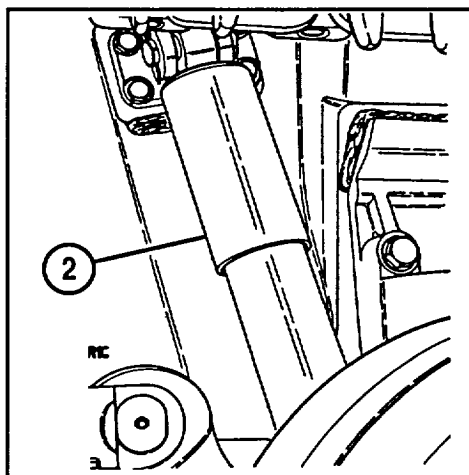
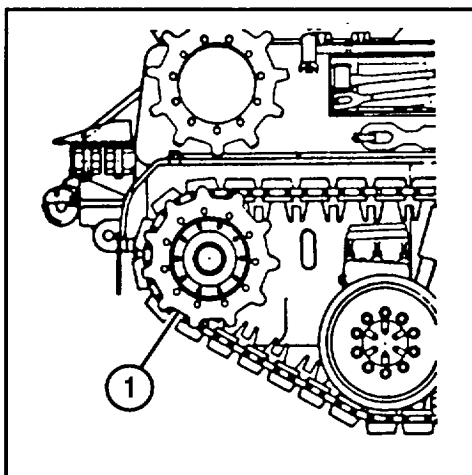
**NOTE**

- Check suspension system and track each day before using vehicle.
- Callouts in illustration below correspond to callouts in steps that follow.



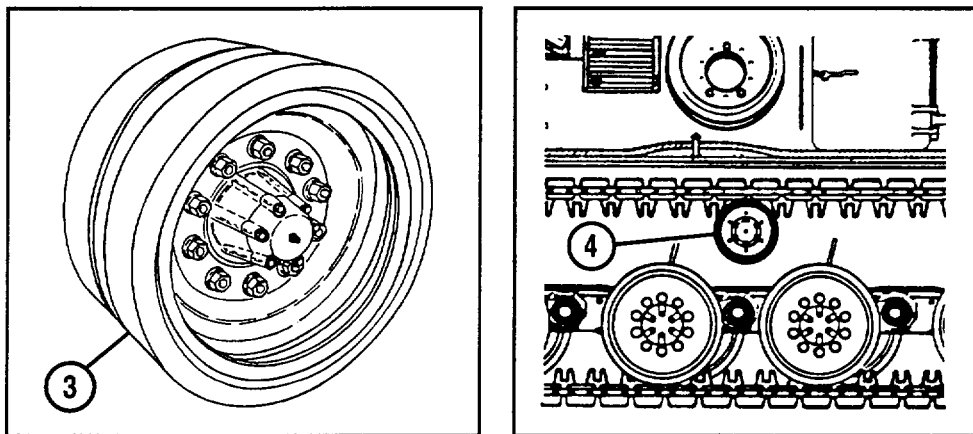
**a. Inspection.** Check for:

- (1) Loose, worn, or damaged drive sprockets (1).
- (2) Damaged shock absorbers (2).

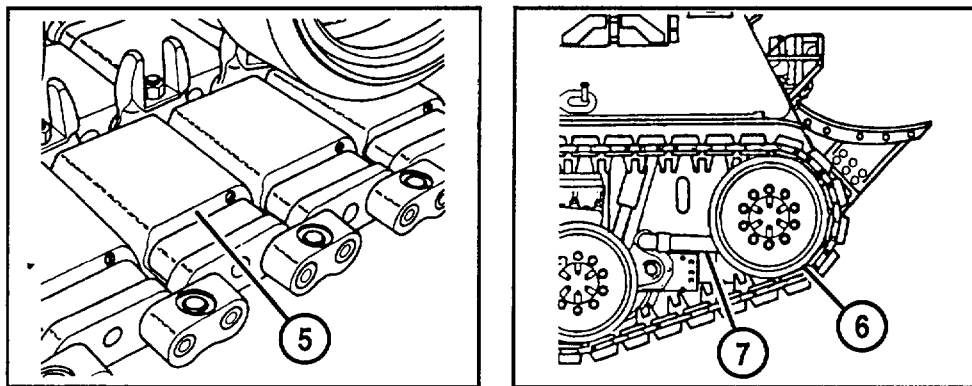


3-6. SUSPENSION AND TRACK-Continued.

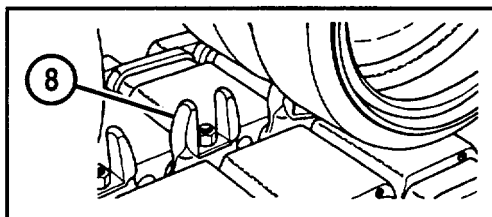
- (3) Loose or damaged roadwheels or wheel tires (3).
- (4) Loose or damaged track support rollers or roller wheel tires (4).



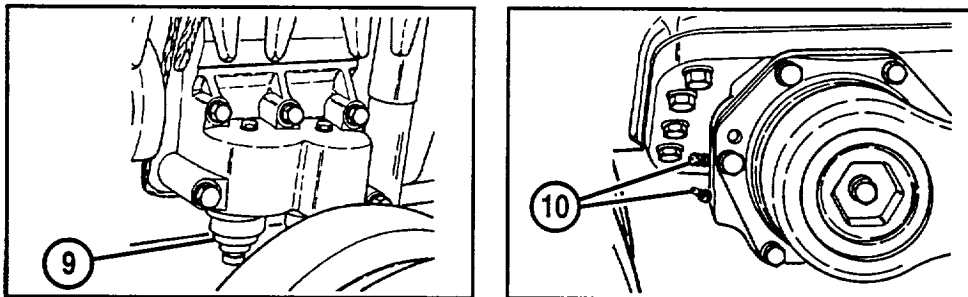
- (5) Damaged track shoes (5). Check grouser height for 0.375 inches (in.) (9.5 millimeters [mm]) or more. Check for missing rubber or rubber worn down to pins.
- (6) Loose or damaged compensating idler wheel (6) or adjusting link (7).



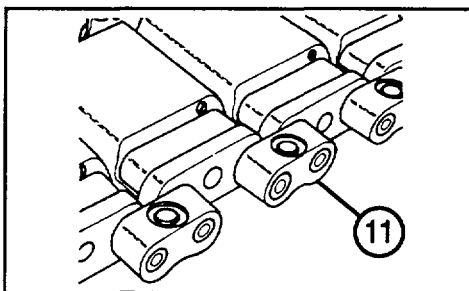
- (7) Loose or damaged track center guides (8).



- (8) Broken bumper springs (9).
- (9) Broken or damaged lubrication fittings (10).

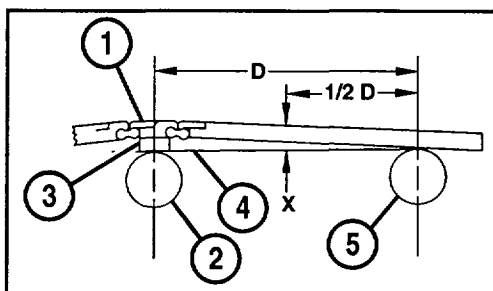


- (10) Loose or damaged track shoe end connectors (11).



**b. Track Tension Adjustment.**

- (1) Move vehicle back and forth a few times over hard level ground. Coast to a stop without braking. Center track shoe (1) over number (No.) 2 support roller (2).
- (2) Pry up track and place a 6 in. (152 mm) square by 1 in. (25 mm) thick block (3) between No. 2 support roller (2) and track.
- (3) Place straight edge or taught line (4) flush with tops of No. 2 support roller (2) and No. 3 support roller (5).
- (4) Measure distance between centers of No. 2 and No. 3 support rollers (2 and 5) (D).





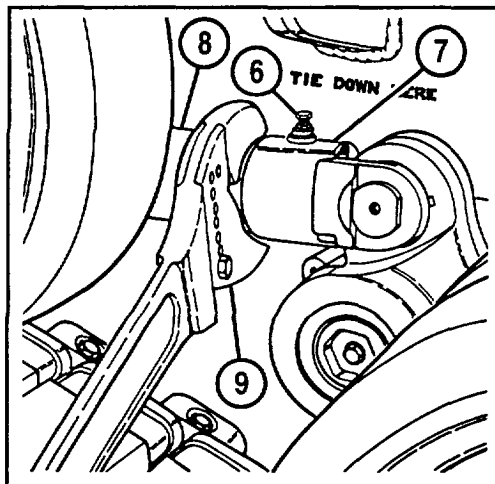
3-6. SUSPENSION AND TRACK-Continued

- (5) Loosen lock screw (6) on track adjusting link (7).

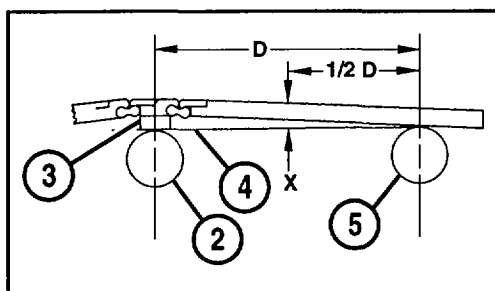
**NOTE**

**If shaft (8) of adjusting link (7) shows a red groove, stop adjusting, fully decrease tension, and remove one track shoe assembly (see para. 3-6d). Readjust track.**

- (6) Use track adjusting wrench (9) to increase or decrease track tension.



- (7) Stop when measured clearance is 0.125 to 0.1875 in. (3.2 to 4.8 mm) from top of line or straight edge (4) to bottom of track midway between support rollers (2 and 5) at point X (1/2 D).



- (8) Tighten lock screw (6) on track adjusting link (7). Remove block (3) and line or straight edge (4).

**c. Track Disconnect.**

- (1) Loosen track tension (see para. 3-6b).

**WARNING**

When breaking track, stand clear to prevent injury to personnel.

**NOTE**

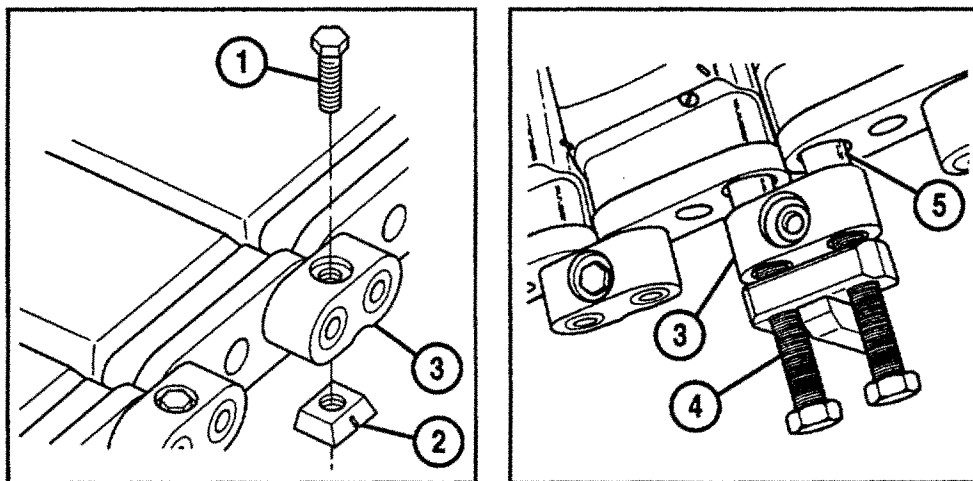
Disconnect track between idler wheel and first roadwheel.

- (2) Remove bolt (1) and wedge (2) from outside end connector (3). When loosening bolt, tap head of bolt with hammer to loosen wedge.

**NOTE**

Perform step (3) for manual pullers and step (4) for hydraulic pullers.

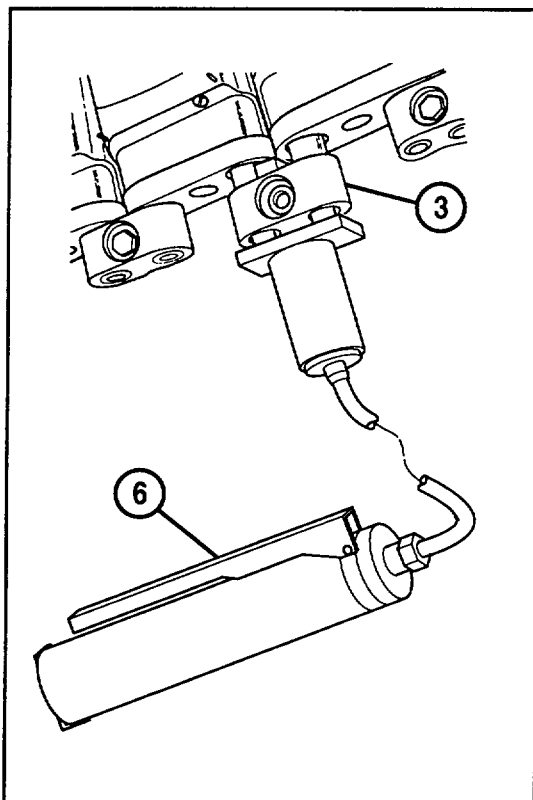
- (3) Tighten end connector puller (4) screws against end of track link pins (5). Strike heads of end connector screws sharply with hammer to help loosen end connector (3) from track link pins. Take up slack by tightening end connector puller screws. Tighten end connector puller screws equally so end connector moves squarely off track link pins. Stop using hammer when just tightening screws moves end connector. Stop when end connector has moved 1 in. (25 mm) from track.

**NOTE**

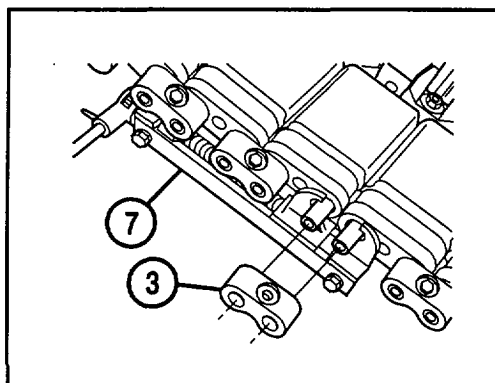
Repeat steps (2) and (3) for inside end connector using a manual puller.

3-6. SUSPENSION AND TRACK-Continued.

- (4) Pump handle (6) until gap between end connector (3) and track is about 1 in. (25 mm).



- (5) Install two track jacks (7) and remove two end connectors (3).



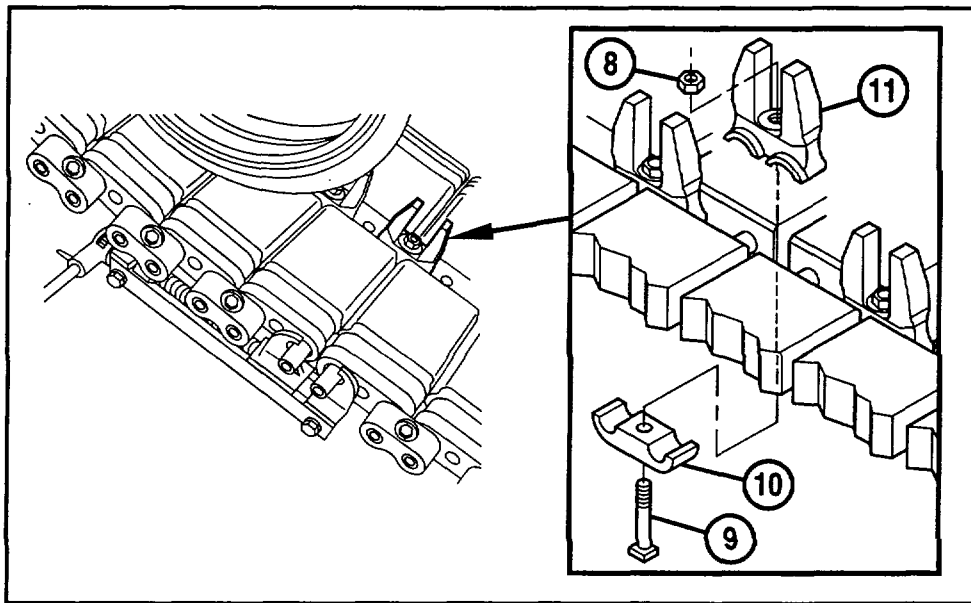
**NOTE**

Repeat steps (2) and (4) for inside end connector using a hydraulic puller.

**NOTE**

**Use socket 10894847-1 with socket wrench or impact wrench for center guide nut.**

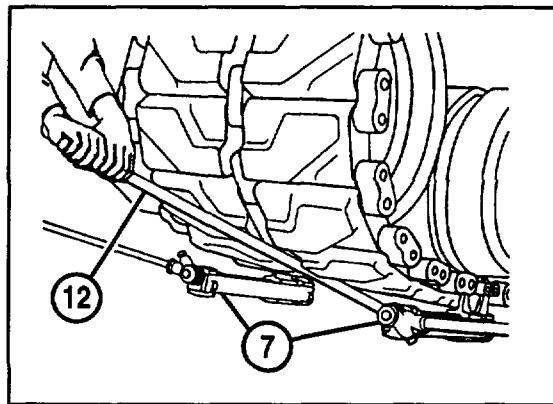
- (6) Remove center guide nut (8), tee head bolt (9), track shoe center cap (10), and center guide (11).



- (7) Loosen track jacks (7) evenly.

- (8) Hold track up with bar (12) and remove track jacks (7).

- (9) Separate track.

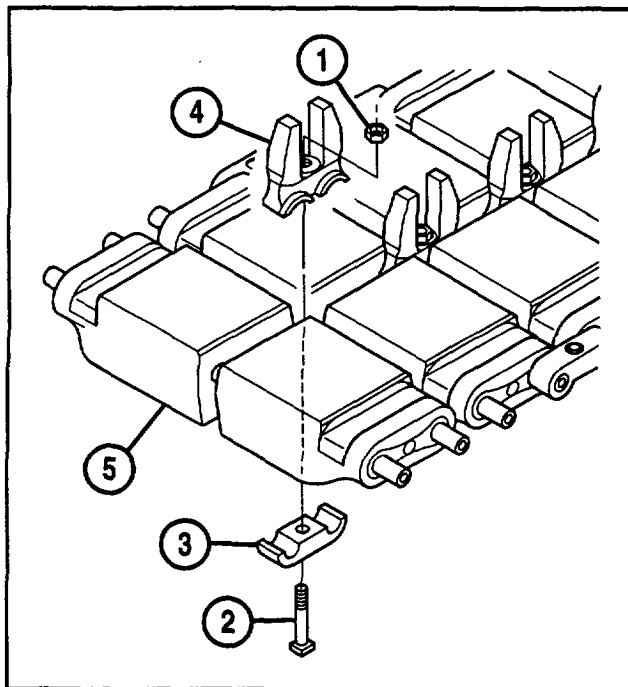


**d. Track Shoe Replacement.**

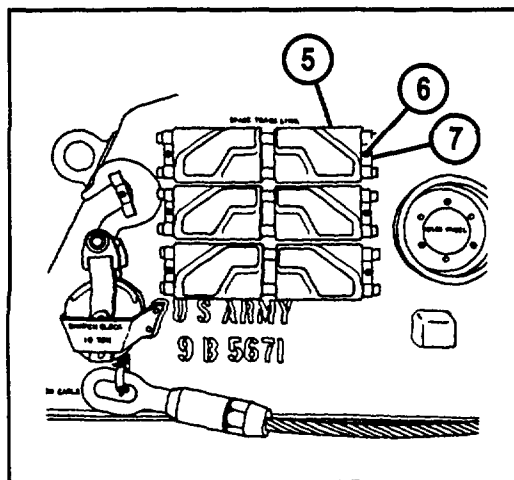
- (1) Disconnect track (see para. 3-6c).

3-6. SUSPENSION AND TRACK-Continued.

- (2) Remove center guide nut (1), tee head bolt (2), track shoe center cap (3), center guide (4), and track shoe (5).

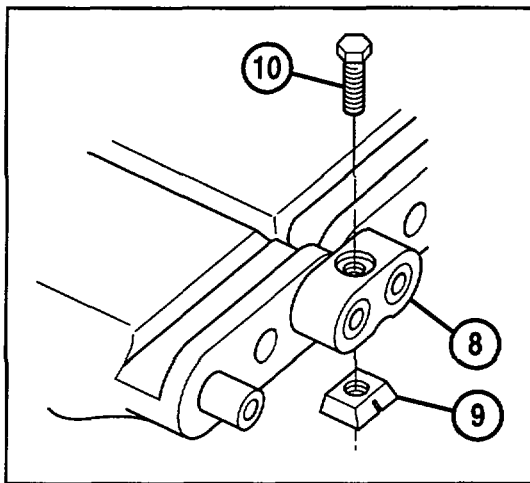


- (3) Remove replacement track shoe (5) from stowage by loosening nuts (6) and clamps (7).



- (4) Install replacement track shoe (5), center guide (4), track shoe center cap (3), tee head bolt (2), and center guide nut (1).

- (5) Install outside end connector (8) and tap it on.
- (6) Install wedge (9) and bolt (10) to outside end connector (8).



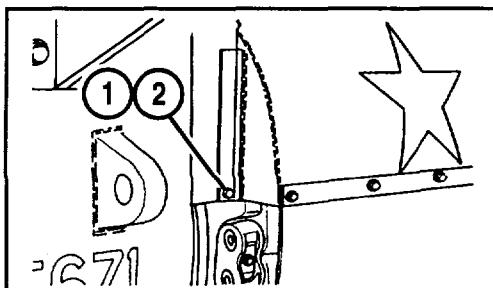
- (7) Repeat steps (5) and (6) for inside end connector.
- (8) If necessary, repeat procedure to replace additional track shoes.
- (9) As soon as possible, notify unit maintenance to torque disturbed end connector bolts to 140-160 pound-feet (lb-ft) (190-217 Newton- meters [N•m]) and center guide to 300-320 lb-ft (406-430 N•m), and again after 50 miles (80 kilometers [km]).

**e. Track Removal.**

**NOTE**

**If both tracks are to be removed, do one at a time.**

- (1) Disconnect track (see para. 3-6c).
- (2) Remove screws (1) and washers (2) from rear fender section so it can swing up if track hits it.

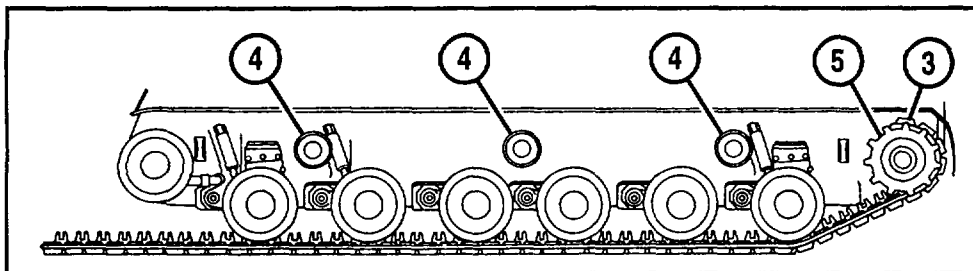


- (3) Start engine (see para. 2-10) and hold brakes. Shift transmission to reverse (R).

3-6. SUSPENSION AND TRACK-Continued.

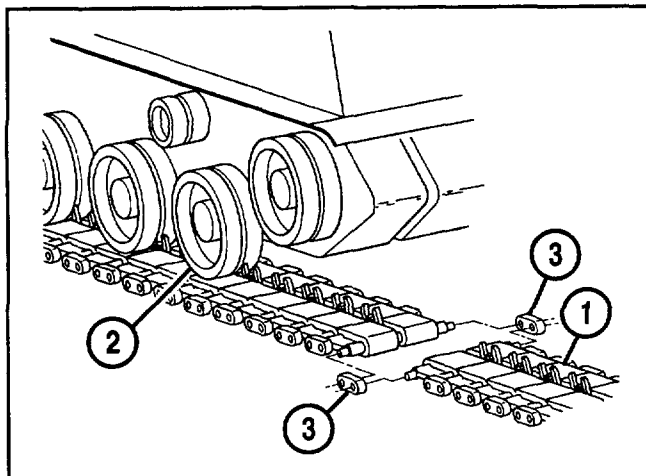
NOTE

- When moving in reverse, turn steering wheel right if removing left track, left if removing right track.
  - Vehicle may be pulled if it cannot move under its own power.
- (4) Increase engine power very SLOWLY when moving vehicle in reverse.
  - (5) Maintain slow constant speed so track (3) does not foul up in support rollers (4).
  - (6) As soon as track (3) leaves sprocket (5), shift to park (P), lock steering wheel and brake and stop engine (see para. 2-10i).

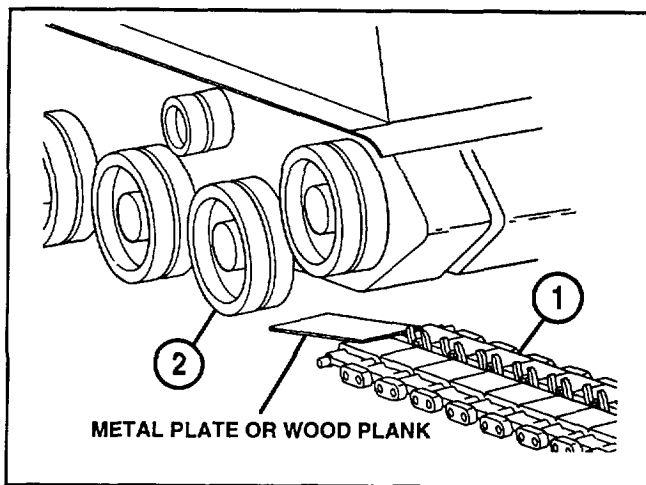


f. Track Installation.

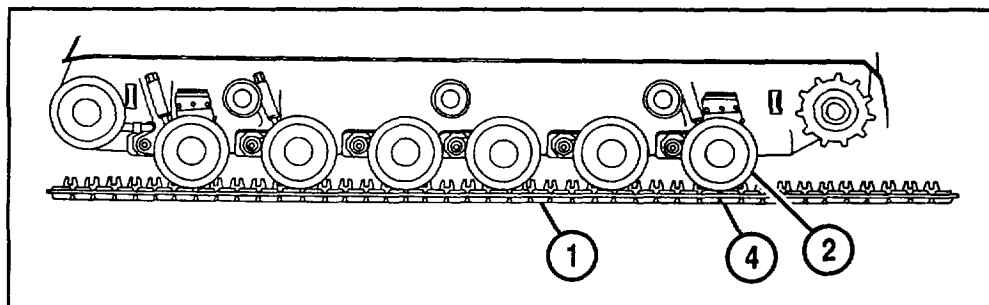
- (1) Installing new track (1) with vehicle roadwheels resting on old track. Lay out new track in line with roadwheels (2) in front or rear of vehicle with points of "V" pattern directed toward rear. Join new track to old track temporarily with two end connectors (3). Do not install wedges or bolts.



- (2) Installing new or thrown track (1) with roadwheels (2) resting on ground. Place heavy metal plate or sturdy wood plank on track link nearest vehicle to form a ramp. If plate or plank is not available, dig a trough under first few track links so upper surfaces of links are level with ground surface.



- (3) Move vehicle forward or backward onto track (1) and position vehicle so center of rear roadwheel (2) is resting on 16th track link (4) from rear of track.



**NOTE**

**To steer vehicle when driving forward:**

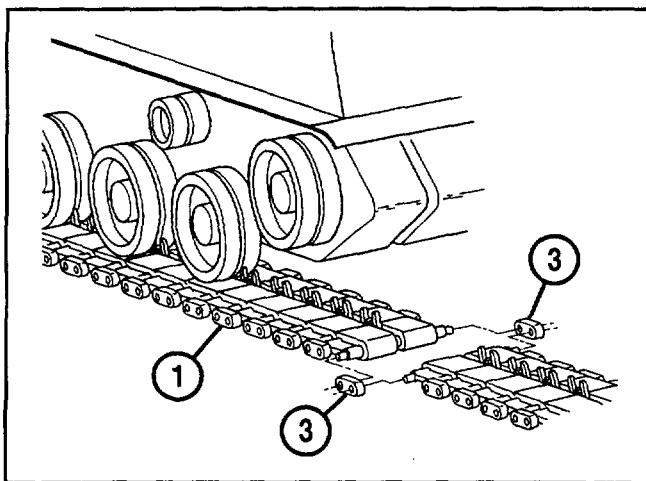
- Turn steering wheel right for right track installation.
- Turn steering wheel left for left track installation.
- Turn steering wheel opposite direction for reverse.

- (4) Set vehicle brakes.

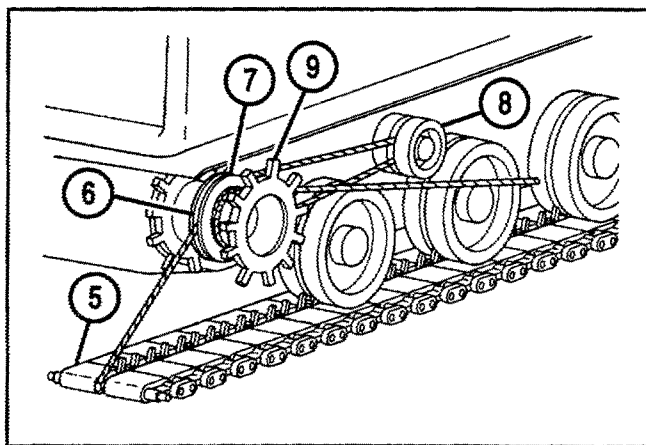


**3-6. SUSPENSION AND TRACK-Continued.**

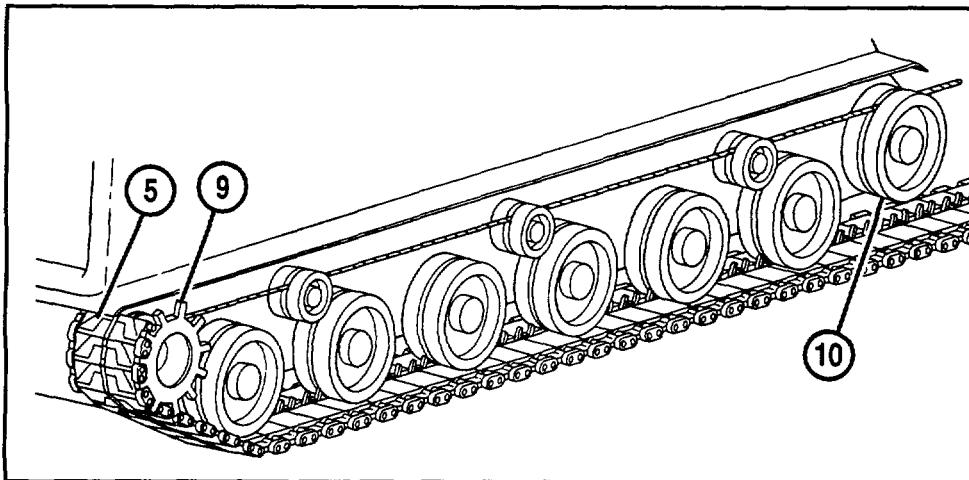
- (5) If applicable, disconnect two end connectors (3) and remove old track from new track (1).



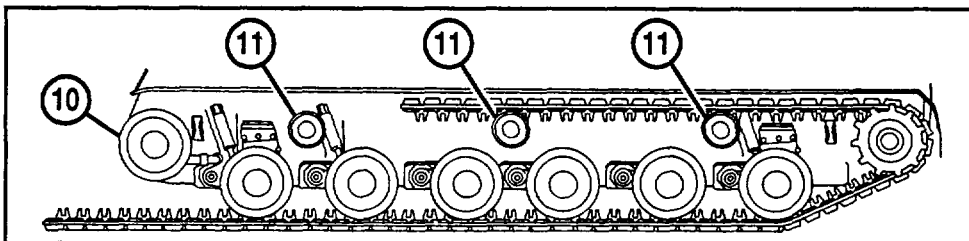
- (6) Secure rope (Appx. B, item 65) to center of pin in rear track link assembly (5). Pass rope over center guide groove (6) of sprocket hub (7), around rear support roller (8), and back around sprocket hub. Take two turns with rope around sprocket hub and pull free end of rope taut.
- (7) Start engine and allow to idle. Place transmission shift lever in 1st and release brakes.
- (8) Hold free end of rope taut and walk in front of and to side of drive sprocket. This setup forms a power pulley system which pulls rear end of track onto drive sprocket (9).



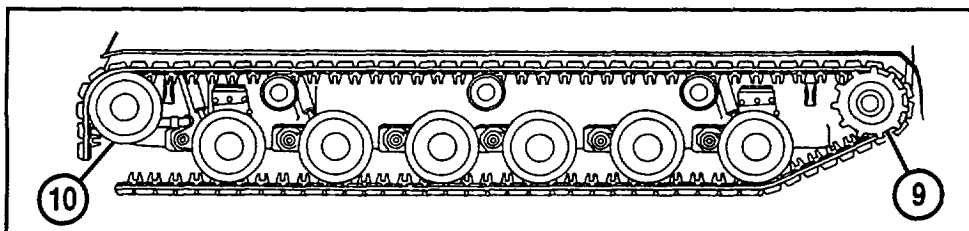
- (9) When teeth of drive sprocket (9) have engaged at least three track links, apply brakes, place transmission shift lever in P position, and remove rope from hub. With rope still secured to rear track link assembly (5), extend rope forward over compensating idler wheel (10).
- (10) Place transmission shift lever in 1st and release brakes.



- (11) Operate engine at speed enough to drive sprocket and move free end of track over three support rollers (11) and toward compensating idler wheel (10). Walk in front and slightly to one side of vehicle. Keep tension on rope to guide loose end of track over support rollers and compensating idler wheel.

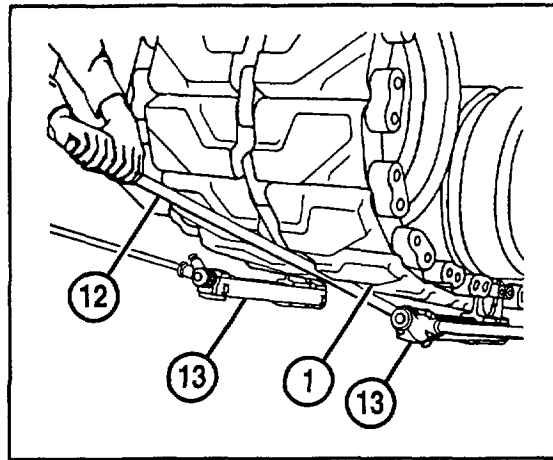


- (12) When end of track has passed over compensating idler wheel (10) and track is tight around drive sprocket (9), apply brakes, place transmission shift lever to neutral (N), and shut off engine.



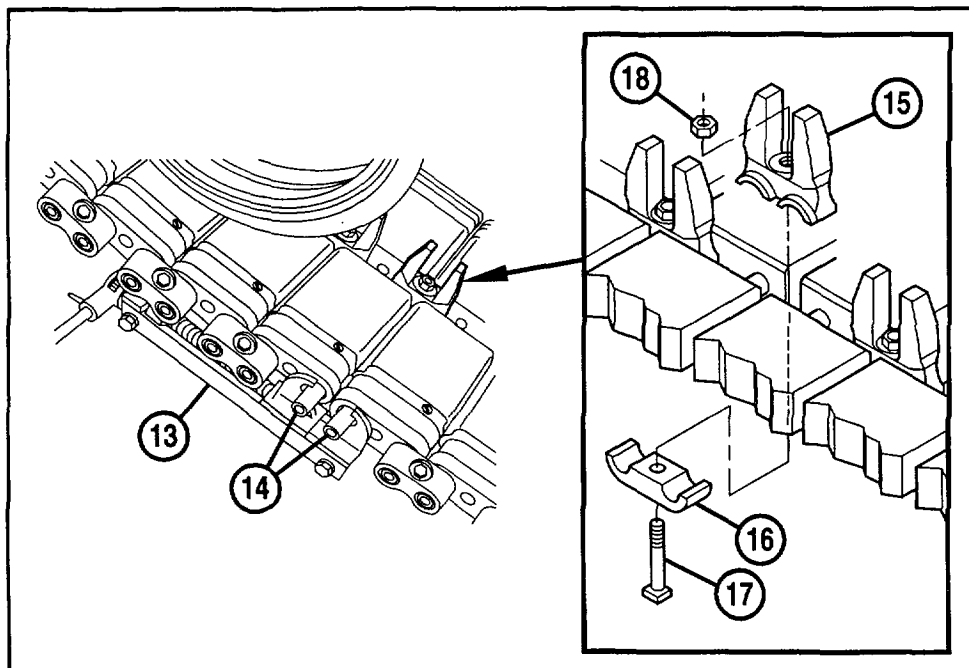
3-6. SUSPENSION AND TRACK-Continued.

- (13) Lift track (1) with bar (12) and install two track jacks (13).



- (14) Tighten track jacks (13) evenly until track link pins (14) are close enough to install center guide (15).

- (15) Install center guide (15), track shoe center cap (16), tee head bolt (17), and center guide nut (18) but do not fully tighten center guide nut.



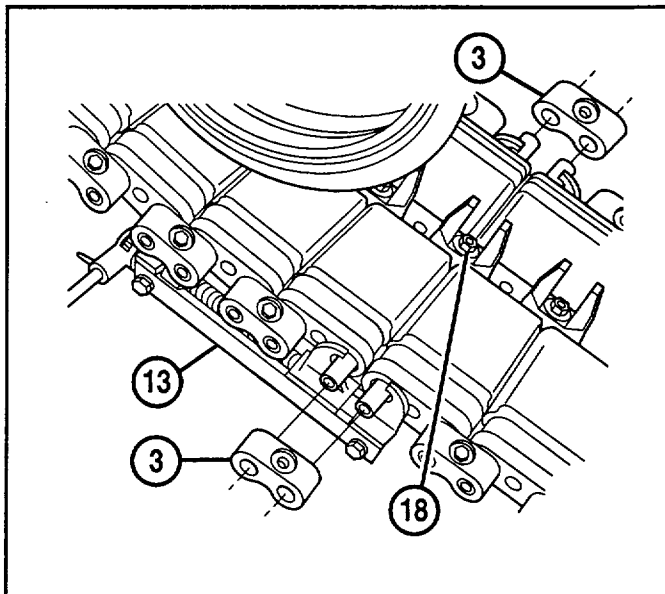
(16) Tighten track jacks (13) evenly until two end connectors (3) can be tapped on.

(17) Hand tighten center guide nut (18).

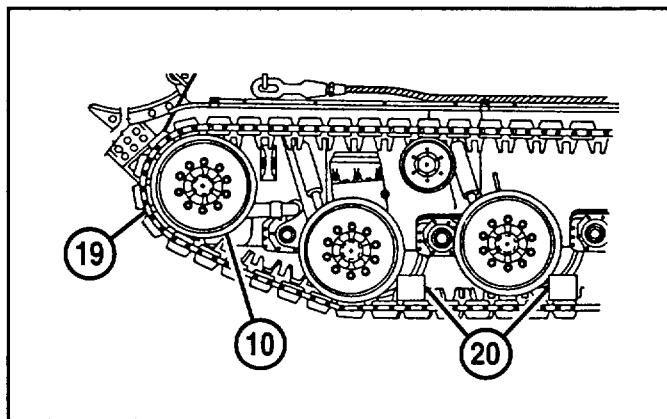
**CAUTION**

**Do not remove track jacks by striking with hammer or other object.**

(18) Remove two track jacks (13).

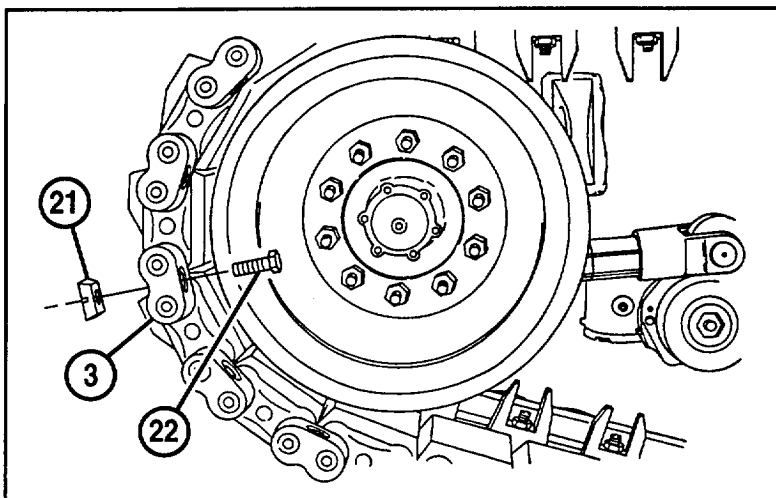


(19) Move vehicle backward until the point of connection (19) is just over compensating idler wheel (10). Insert chocks (20).



**3-6. SUSPENSION AND TRACK-Continued.**

(20) Install wedge (21) and bolt (22) to outside end connector (3).

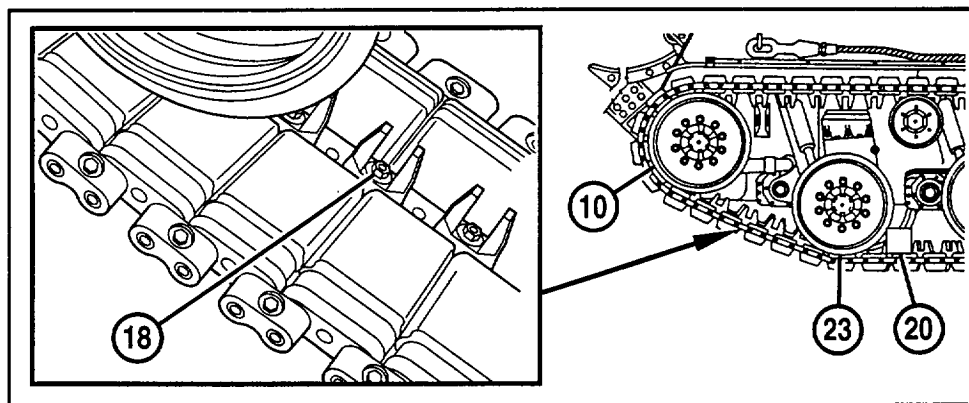


**NOTE**

**Repeat step (20) for inside end connector.**

(21) Remove chocks (20).

(22) Move vehicle forward and stop when center guide (at the point of connection) is between compensating idler wheel (10) and first roadwheel (23) and adjacent track links are in a straight line (same plane). Set vehicle brakes and tighten nut (18) securely.



(23) Adjust track tension (see para. 3-3).

**NOTE**

**Check tightness of wedge bolts and center guide bolts when next After-Operation Preventive Maintenance Checks and Services (PMCS) is performed.**

### 3-7. VISION DEVICES.

#### a. General.

- (1) Vision devices are generally rugged but mishandling will result in damaged equipment.
- (2) Do not turn screws or other parts that are not needed for operation.
- (3) Do not move any knob or part beyond its limit. Forcing parts will result in damaged equipment.
- (4) Keep devices dry. Wipe completely before stowing periscopes.
- (5) Properly stow or cover M24, M24A1, and AN/WS-2(V)1A periscopes when not in use.
- (6) If a device fails to work, gets water in it, or has damaged lenses, turn it over to unit maintenance.
- (7) Touch up (Appx. D, item 17, 18, 19, or 20) scratch or chipped areas that expose bare metal. Never paint whole device.

#### b. Lenses.

- (1) Keep lenses clean and dry. Proper care will ensure good vision. Keep M24, M24A1, and AN/WVVS-2(V)1A periscopes protected from direct sunlight.
- (2) It is prohibited to clean lenses and windows with pastes or abrasives.
- (3) Only use lens tissue (Appx. D, item 38) to wipe lenses and windows. Cloths are not permitted. Use camel-hair brush (Appx. D, item 6) to remove dirt or dust.
- (4) Keep lenses free from oil or grease. Do not touch lenses or windows with your fingers. Use alcohol (Appx. D, item 21) on lens tissue to remove grease or oil. If alcohol is not available use lens tissue. Do not rub too hard. Lenses have special coatings on them.
- (5) Condensation might result if lenses are cooler than surrounding air. Place instrument in warm place to dry. Keep away from high heat.

#### c. Lubrication. The M17, M24, M24A1, and AN/WS-2(V)1A periscopes do not require lubrication.

## 3-7. VISION DEVICES-Continued.

## d. M17 Periscope.

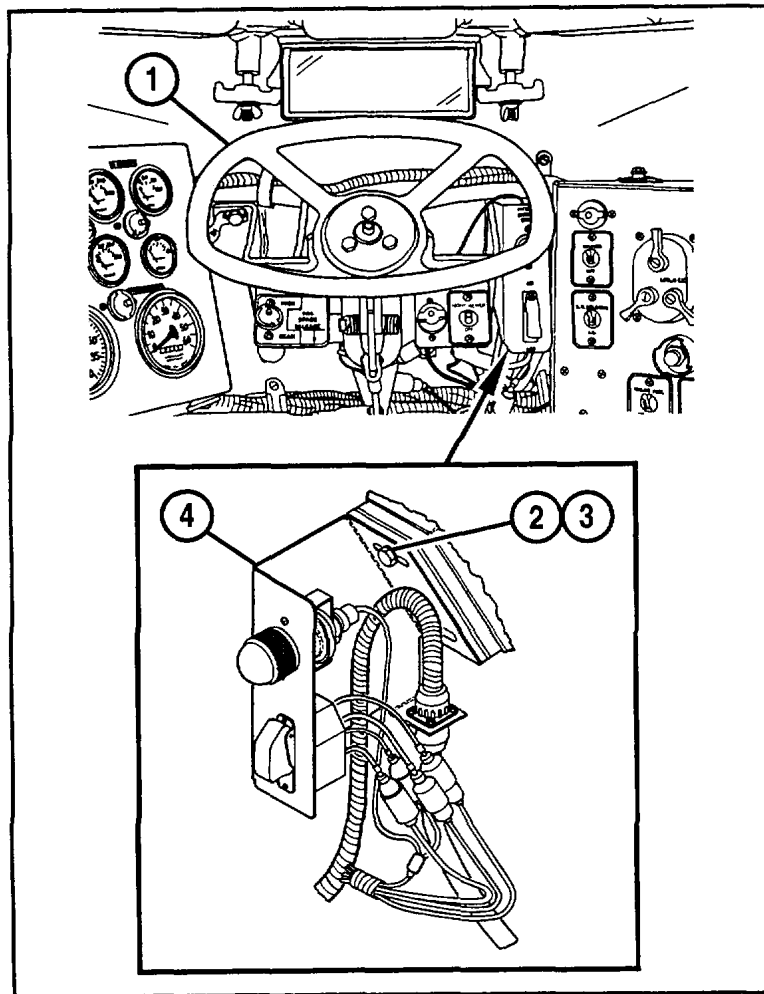
(1) Removal.**WARNING**

Chock roadwheels to prevent vehicle from rolling.

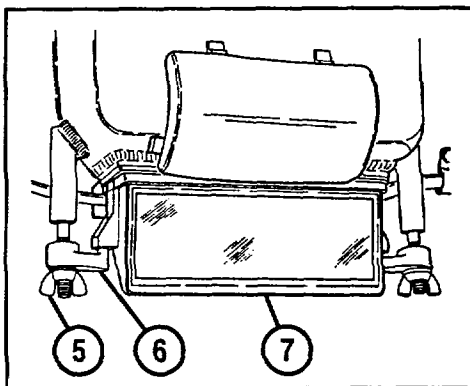
**NOTE**

For vehicles equipped with exhaust smoke generating system, go to step (a). For vehicles not equipped with exhaust smoke generating system, go to step (c).

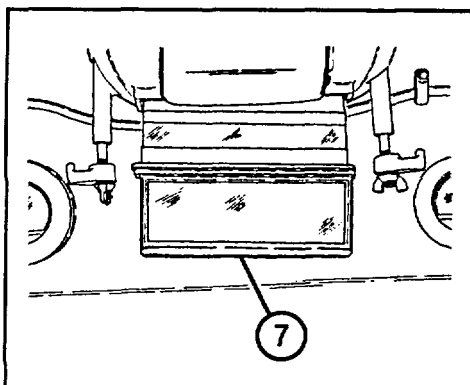
- (a) Turn steering wheel (1) right.
- (b) Remove two screws (2), two washers (3), and vehicle exhaust smoke bracket (4).



- (c) Loosen two wingnuts (5) and turn two retainers (6) until they clear periscope (7).



- (d) Pull down on periscope (7) to remove it from recess.



(2) Installation.

- (a) Insert periscope (7) into recess.  
 (b) Turn two retainers (6) and tighten two wingnuts (5) to secure periscope (7).

**WARNING**

**Chock roadwheels to prevent vehicle from rolling.**

**NOTE**

**Steps (c) and (d) below apply only to vehicles equipped with exhaust smoke generating system.**

- (c) Turn steering wheel (1) right.  
 (d) Install vehicle exhaust smoke bracket (4), two washers (3), and two screws (2).



3-7. VISION DEVICES-Continued.

e. M24/M24A1 Periscope.

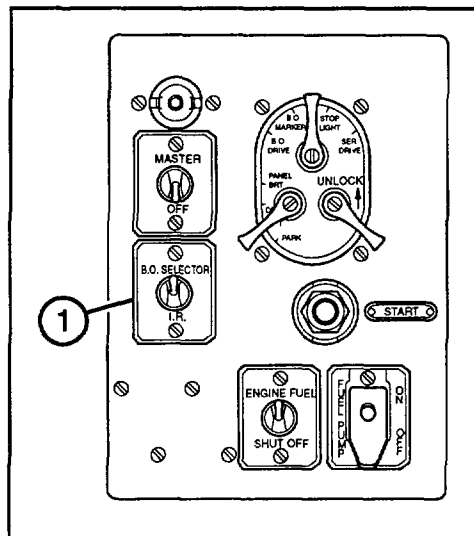
(1) Removal.

**WARNING**

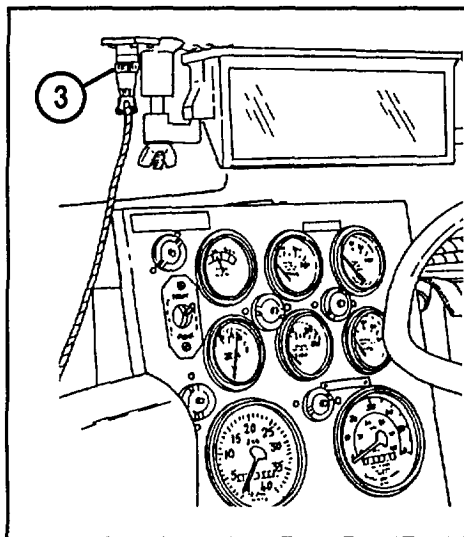
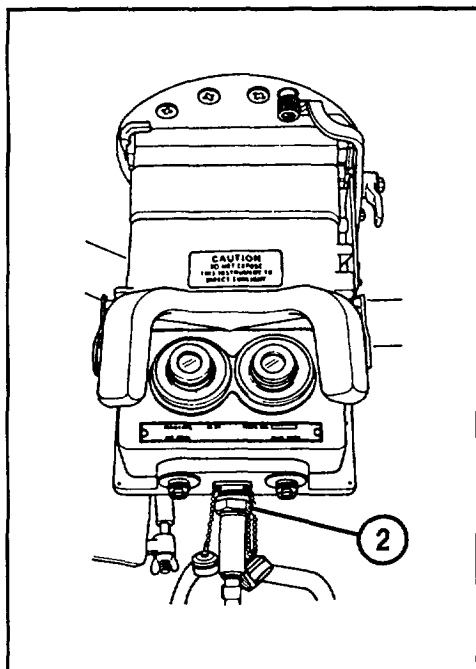
- Be very careful. Periscope cable carries 16,000 volts. DO NOT remove cable until system is turned off.
- Ensure MASTER BATTERY and IR power switches (1) are turned off.

**CAUTION**

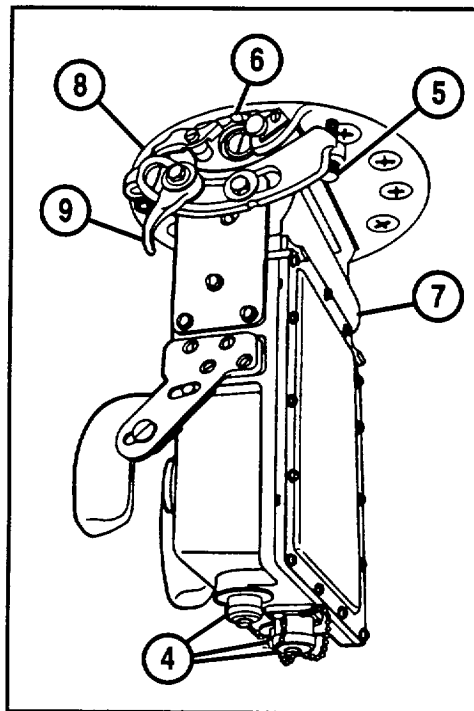
Do not open hatch with M24, M24A 1, or AN/VVS-2(V)1A periscope installed.



(a) Remove cable plug from receptacle (2) and connect to dummy receptacle (3).



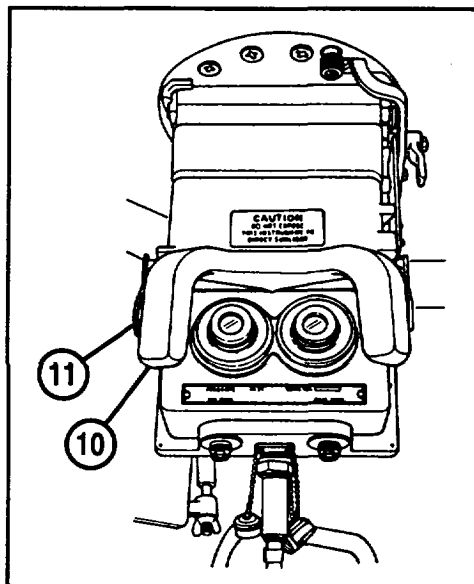
- (b) Install three caps (4) and loosen adjustment screw (5).
- (c) Unlock retainers (6) and remove periscope (7) from mount (8) and stow in periscope stowage box.



(2) Installation.

- (a) Guide head of periscope (7) into mount (8) until retainers (6) lock periscope in place.
- (b) Adjust elevation angle using lever (9). Tighten adjustment screw (5) on elevation clamp until clamp is seated firmly to mount (8). Remove three caps (4).

- (c) Remove power cable from dummy receptacle (3) and connect to receptacle (2).
- (d) To adjust headrest (10), loosen adjusting knobs (11), move headrest to desired position, and tighten adjusting knobs.



3-7. VISION DEVICES-Continued.

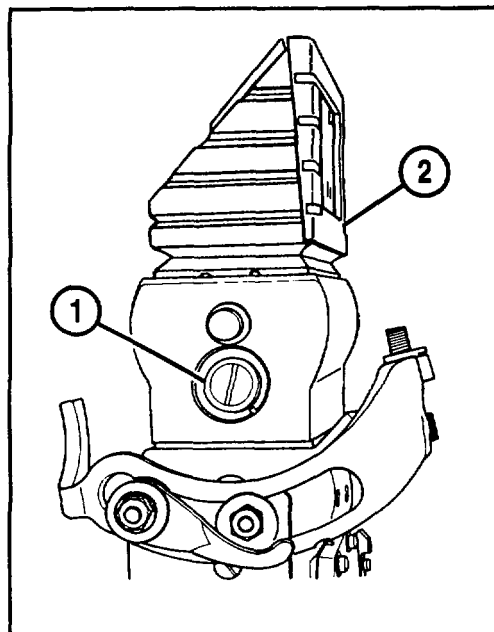
f. M24 Periscope Head Assembly.

(1) Removal.

- (a) Move latch (1) on each side of periscope 1/4 turn to left.
- (b) Remove M24 periscope head assembly (2).

(2) Installation.

- (a) Install M24 periscope head assembly (2).
- (b) Move latch (1) on each side of periscope 1/4 turn to right to lock in place.



g. ANIVVS-2(V)1A Periscope.

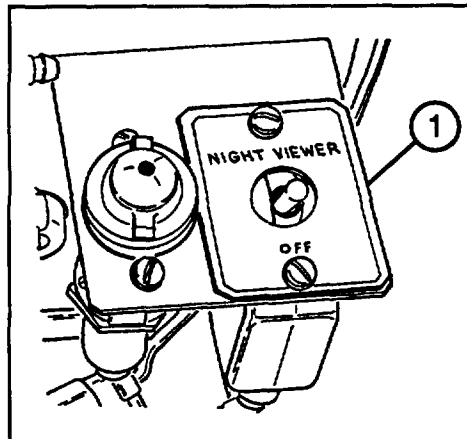
(1) Removal.

**WARNING**

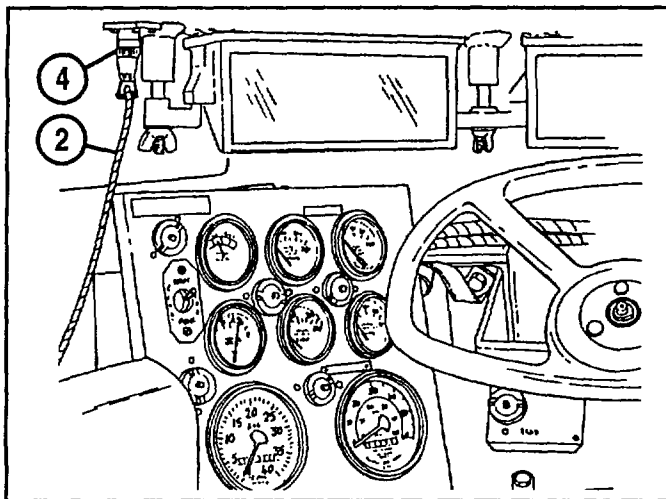
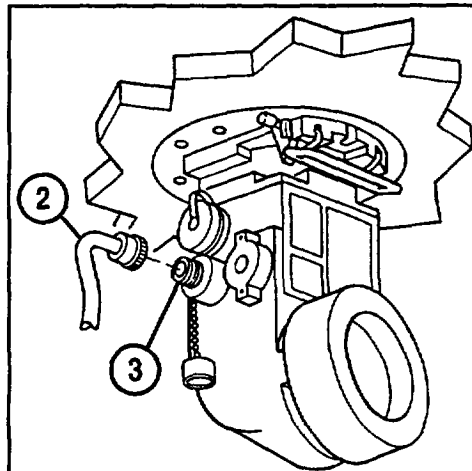
Ensure MASTER switch and NIGHT VIEWER switch (1) are turned off.

**CAUTION**

AN/VVS-2(V)1A periscope battery is needed only when vehicle is not running and periscope is needed. At all other times battery will be stowed in periscope stowage compartment. Battery may leak and damage periscope.



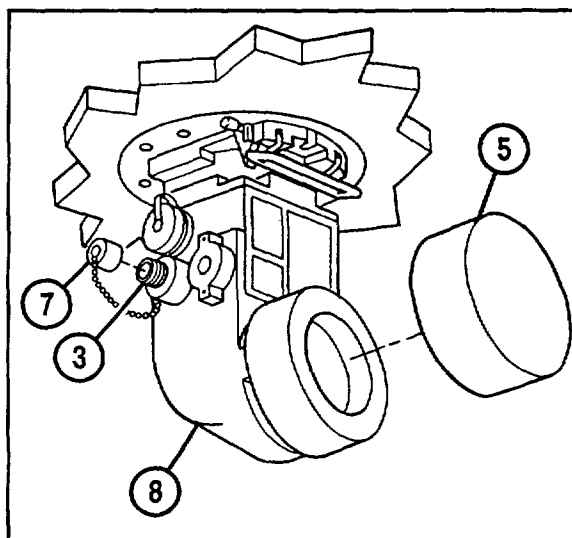
- (a) Disconnect power cable (2) from receptacle (3).
- (b) Connect power cable (2) to dummy receptacle (4).



**NOTE**

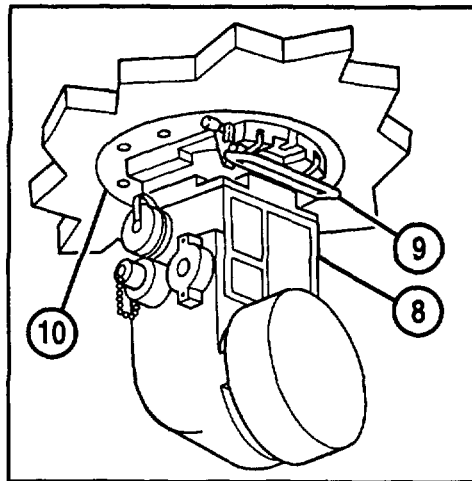
Snap-on eyepiece cover (5) and snap-on lens cover (6) are located in periscope storage box.

- (c) Install cap (7) on receptacle (3).
- (d) Install snap-on eyepiece cover (5) to periscope (8).



3-7. VISION DEVICES-Continued.

- (e) Press lever (9) and remove periscope (8) from mount (10).



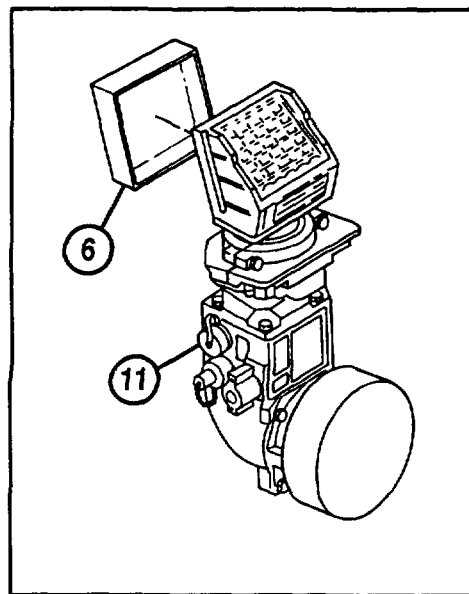
**CAUTION**

Stow battery in periscope stowage box when not in use. Battery may leak and damage periscope.

**NOTE**

If battery power has been used, dispose of battery in accordance with SB 11-30 after each night's operation. Normal battery life is 6 to 8 hours.

- (f) Remove battery cap (11) and ensure battery has been removed. Reinstall battery cap.
- (g) Install snap-on lens cover (6).



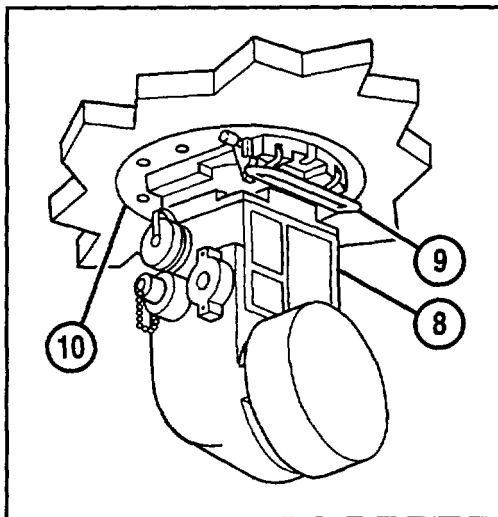
- (2) Installation.

**CAUTION**

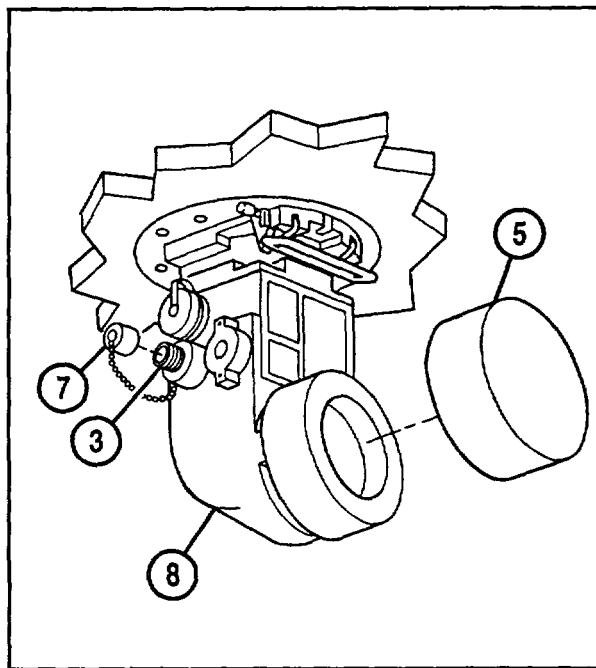
**Do not expose objective lens to direct sunlight or bright light.**

- (a) Close and lock driver's hatch.
- (b) Remove snap-on lens cover (6) and stow in periscope stowage box.
- (c) Remove battery cap (11) and ensure battery has been removed. Reinstall battery cap.

- (d) Turn mount (10) to position detent and align sides of mount with sides of periscope (8).
- (e) Press and hold lever (9) and raise periscope through hatch and lock into place by releasing lever.

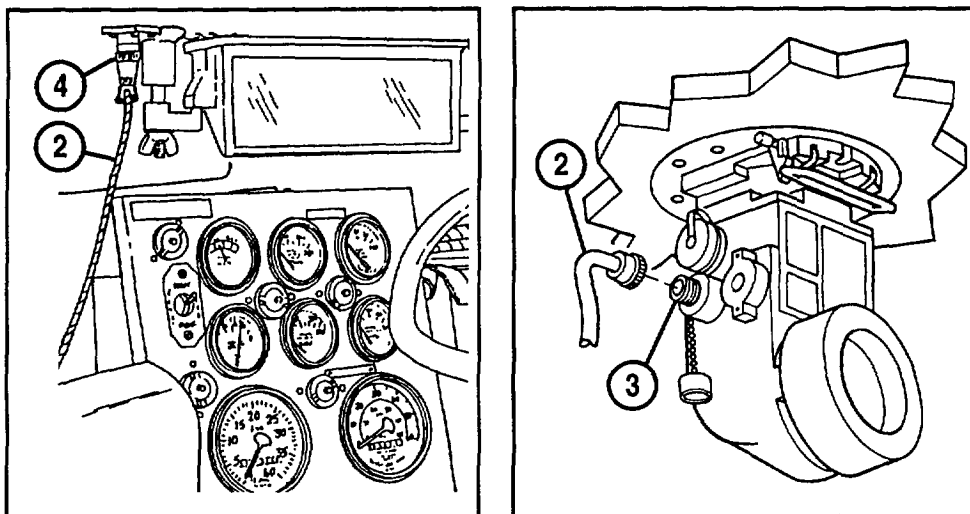


- (f) Remove snap-on eyepiece cover (5) from periscope (8) and stow in periscope stowage box.
- (g) Remove cap (7) from receptacle (3).



**3-7. VISION DEVICES-Continued.**

- (h) Disconnect power cable (2) from dummy receptacle (4) and connect power cable to receptacle (3).



- h. **Inspection of Vision Devices.** Perform daily and weekly PMCS found in table 2-1.

**3-8. CALIBER .50 MACHINE GUN AND MOUNT MAINTENANCE.**

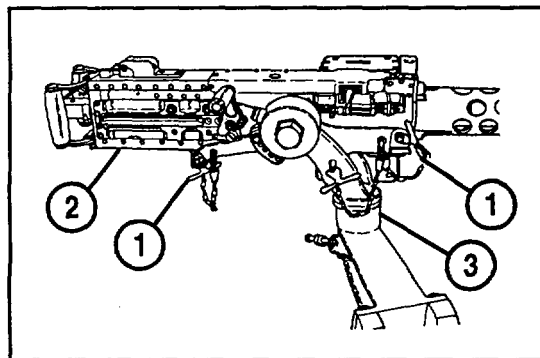
**a. Machine Gun.**

- (1) Removal.

**WARNING**

**Ensure machine gun is not loaded prior to servicing.**

- (a) Pull two locking pins (1).
- (b) Remove machine gun (2) from mount (3).



- (2) Installation.

- (a) Install machine gun (2) into mount (3).
- (b) Insert two locking pins (1).

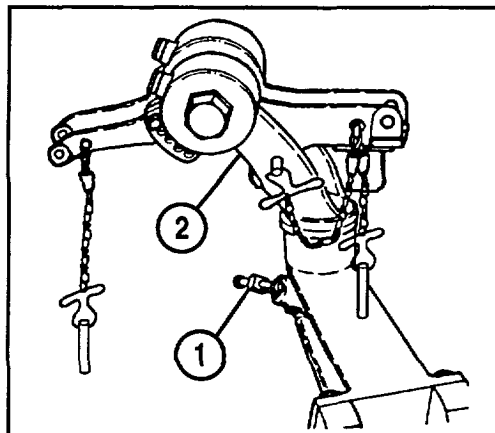
**b. Machine Gun Mount**

(1) Removal.

**WARNING**

**Ensure machine gun is not loaded prior to servicing.**

- (a) Remove machine gun (see para. 3-8a(1)).
- (b) Loosen traverse locking screw (1).
- (c) Remove mount (2) slowly.



(2) Installation.

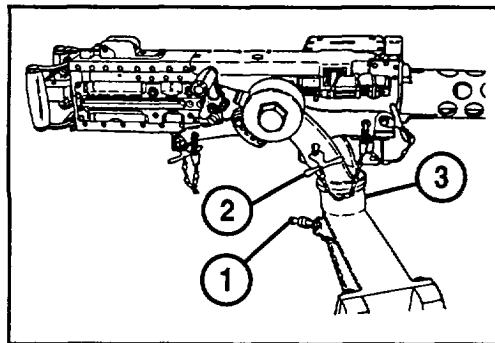
- (a) Install mount (2).
- (b) Tighten traverse locking screw (1).
- (c) Install machine gun (see para. 3-8a(2)).

(3) Operational Check of Machine Gun Mount.

**WARNING**

**Ensure machine gun is not loaded prior to servicing.**

- (a) Loosen traverse locking screw (1).
- (b) Remove elevation lock pin (2).
- (c) Check mount (3) for easy side-to-side and up-and-down movement.
- (d) Reinstall lock pin (2) and tighten traverse locking screw (1).





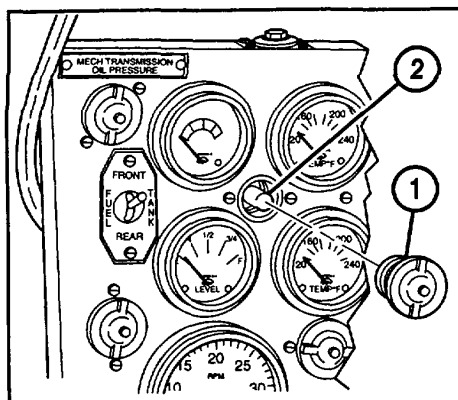
**3-9. LAMP REPLACEMENT.**

a. **General.** You are authorized to change instrument, dome, and blackout (B.O.) marker light lamps. Any other service needed in these areas will be referred to unit maintenance.

**b. Instrument Panel Light Lamp.**

(1) Removal.

- (a) Unscrew lens (1).
- (b) Push in and turn lamp (2) to left and remove.



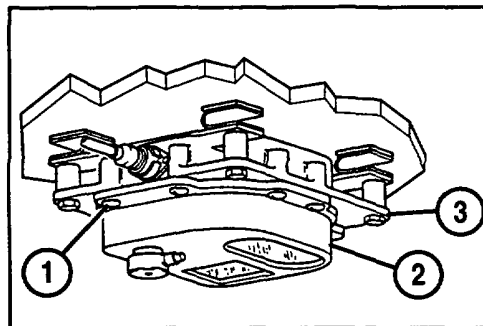
(2) Installation.

- (a) Push in and turn lamp (2) to right.
- (b) Reinstall lens (1).

**c. Dome Light Lamp.**

(1) Removal.

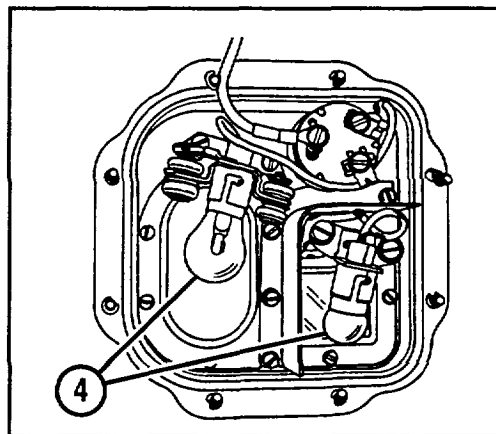
- (a) Loosen eight screws (1) and remove dome light door assembly (2) from bracket (3).



- (b) Push in and turn two lamps (4) to remove.

(2) Installation.

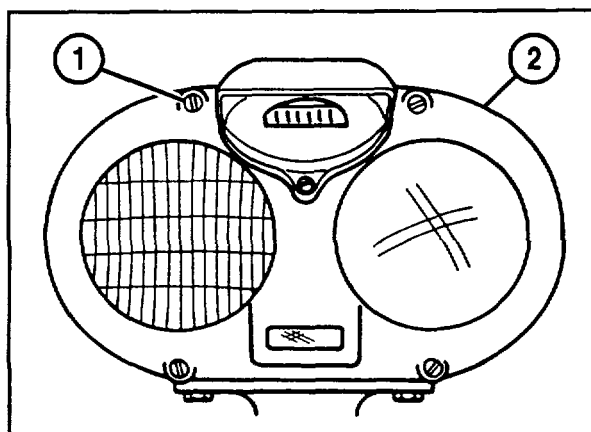
- (a) Push in and turn two lamps (4) to install.
- (b) Aline dome light door assembly (2) with bracket (3) and tighten eight screws (1).



**d. B.O. Marker Light Lamp.**

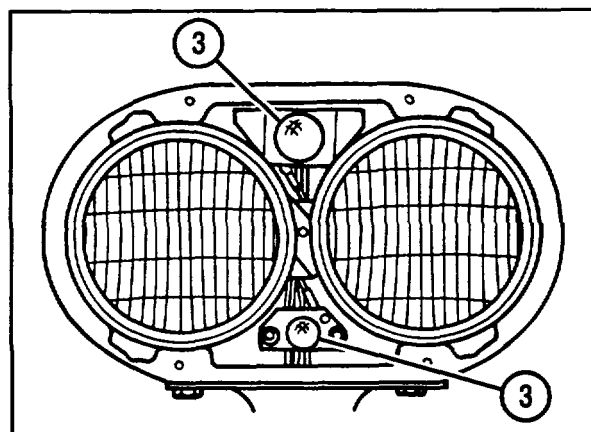
(1) Removal.

- (a) Loosen four screws (1) and remove cluster cover (2).
- (b) Push in and turn two lamps (3) to remove.



(2) Installation.

- (a) Push in and turn two lamps (3) to install.
- (b) Install cluster cover (2) and tighten four screws (1).



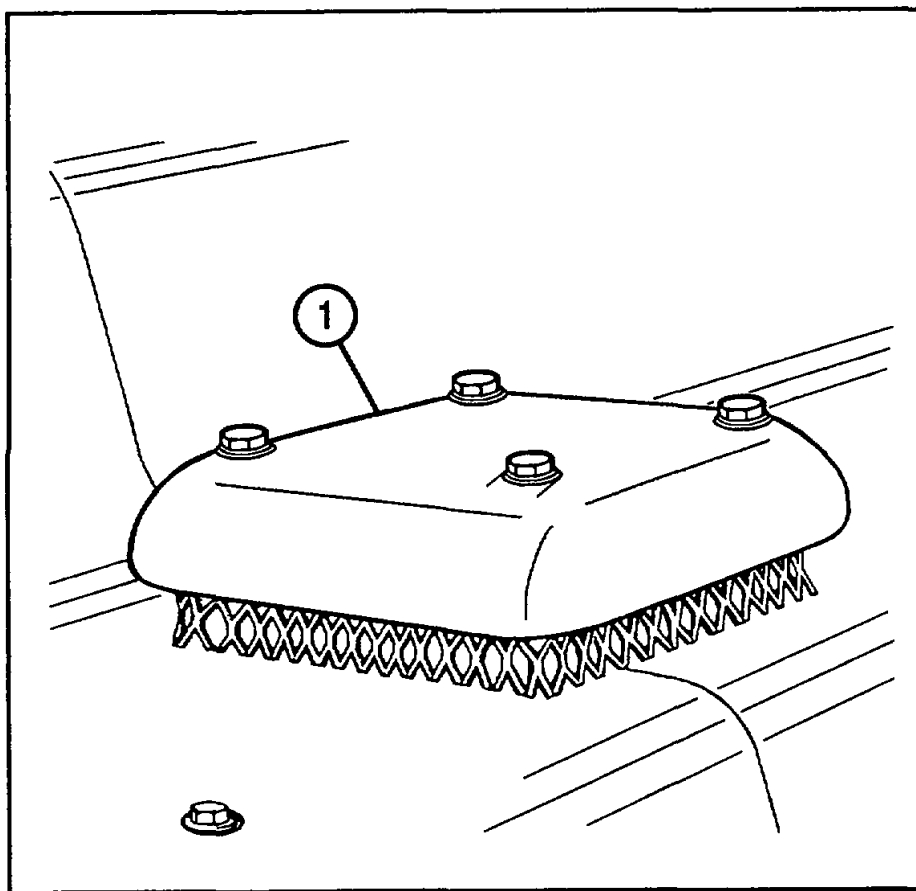
**3-10. MAIN ENGINE AIR CLEANER.****WARNING**

NBC contaminated filters must be handled using adequate precautions (refer to FM 21-40) and must be disposed of by trained personnel.

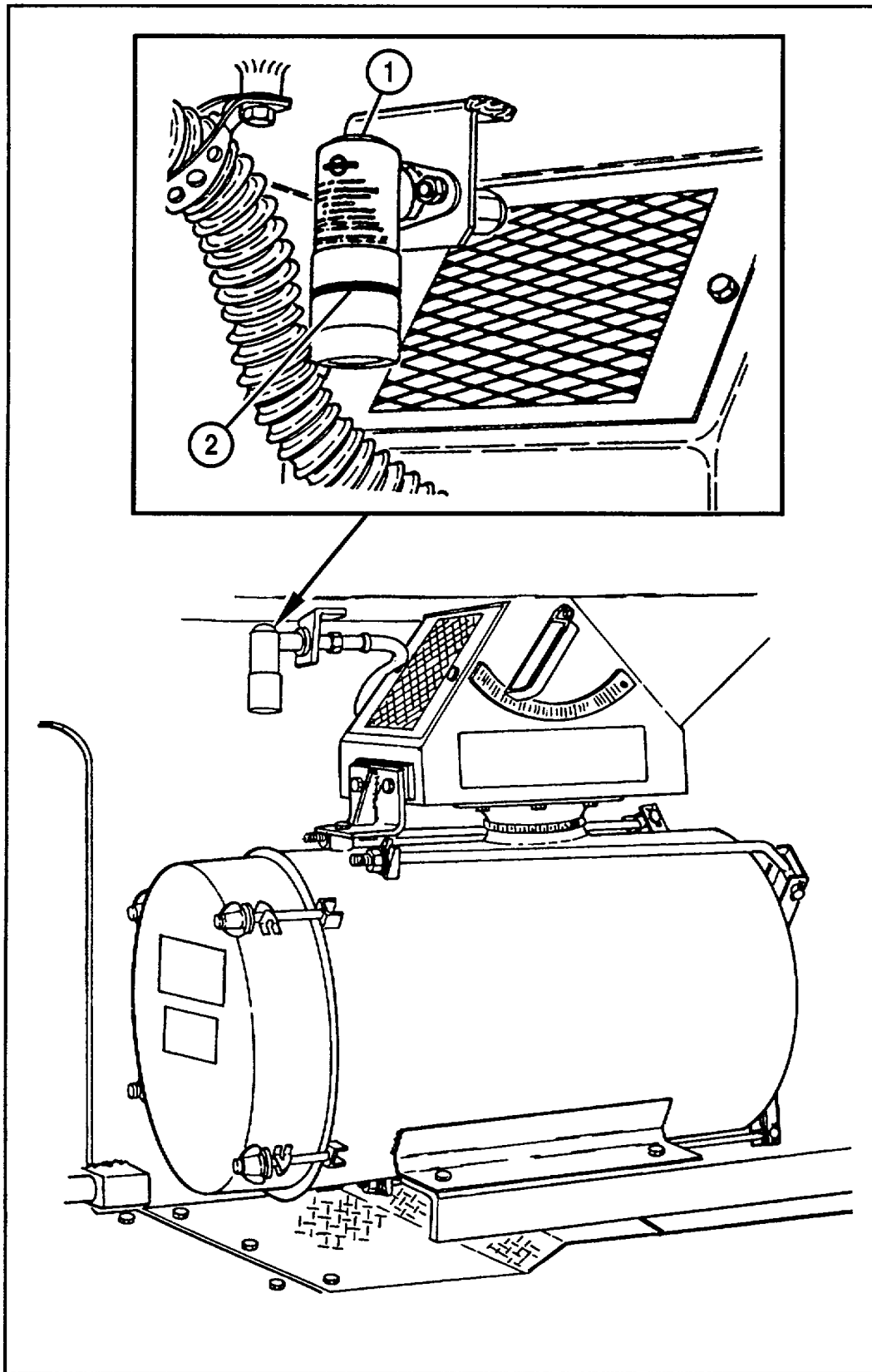
**CAUTION**

Main engine air cleaner is only source of air to the engine. It is your responsibility to ensure it is properly maintained to avoid damage to engine. Maintenance instructions are given for air intake screen, air cleaner dust cover, and filter element.

- a. **Air Intake Screen.** Remove dirt or mud restricting airflow through air intake screen (1).



- b. **Filter Element Replacement.** A restriction indicator (1) is located above each air cleaner. It will read green when air cleaner is working properly. As filter becomes restricted, a red sleeve (2) appears. When airflow restriction is maximum, a red sleeve fully covers green and locks into place. When this happens, filter element must be cleaned or replaced. To reset it, press top of restriction indicator.



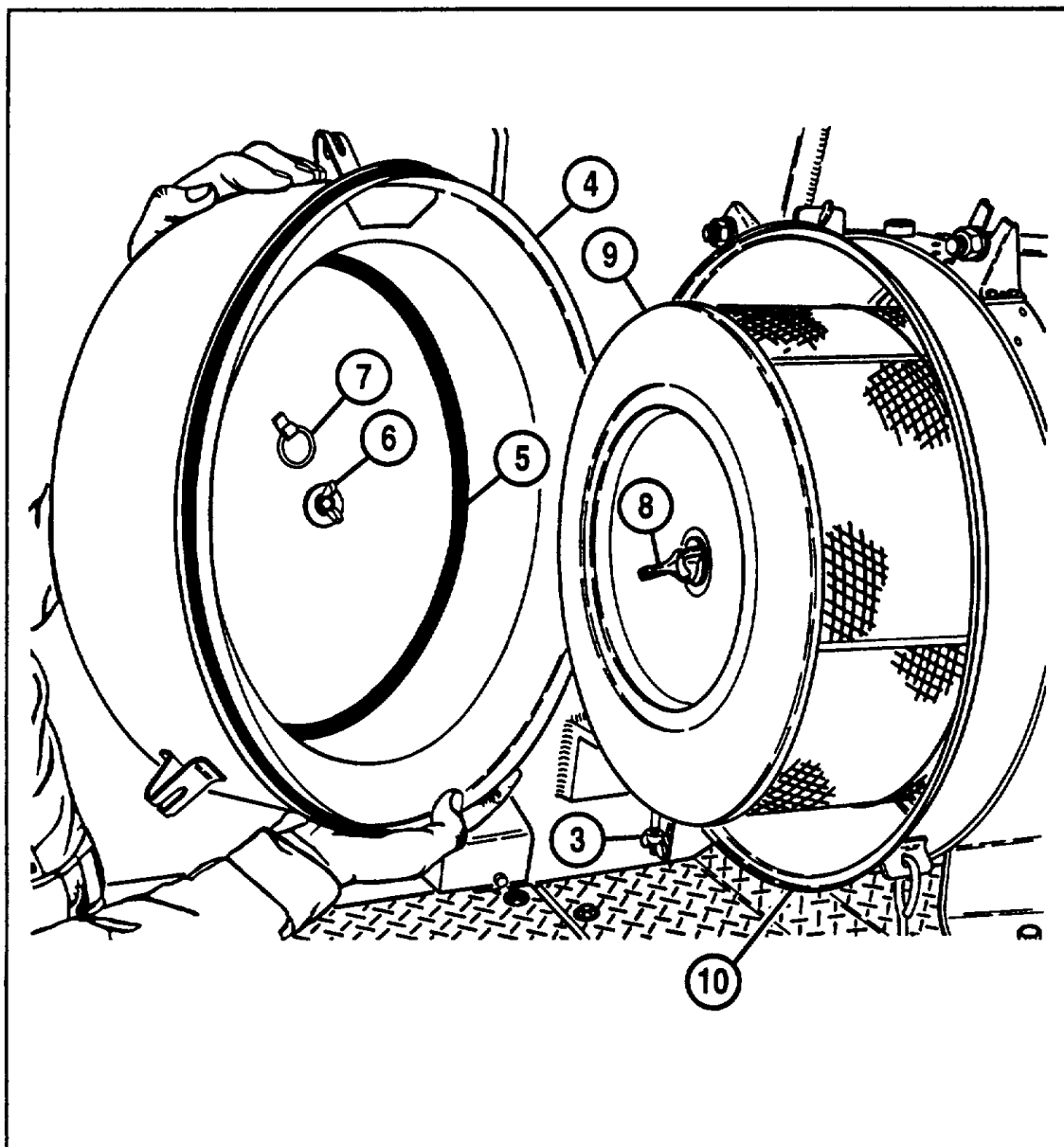
**3-10. MAIN ENGINE AIR CLEANER-Continued.**

- (1) Loosen and pull away four wingnut clamps (3) from dust cover (4).
- (2) Remove dust cover baffle (5) by removing wingnut (6) and pulling ring (7). Clean dust cover with water-damp cloth (Appx. D, item 40).

**NOTE**

**Remove and clean dust cover (4) daily or as required.**

- (3) Unscrew filter element wingnut (8) and remove filter element (9).



**CAUTION**

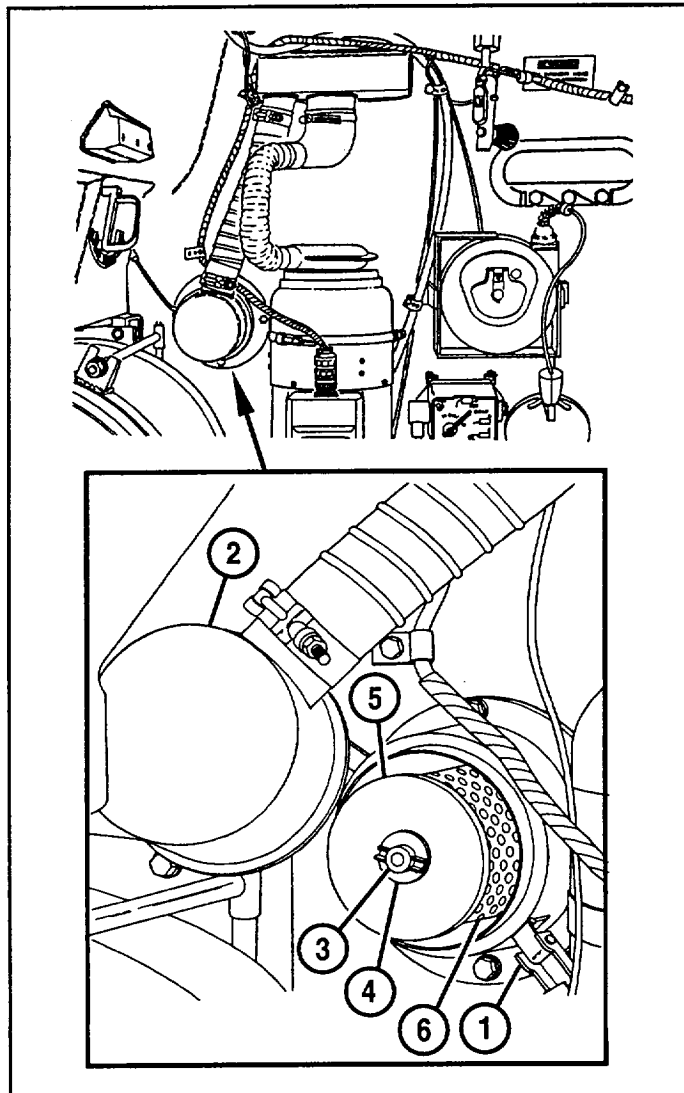
- **Only in an emergency, use compressed air of 100 pounds per square inch (psi) (690 kilopascals [kPa] ) or less. Blow dust from inside out. Hold nozzle no closer than 1 in. (25 mm) from metal cover so you do not tear paper. If filter is torn, dirt will enter engine and damage it.**
  - **Do not rap filter against hard surface to clean it. You might damage seals and allow dirt to enter engine.**
  - **Do not wash filter more than 2 times. When it is due for third washing, replace it.**
- (4) Rinse dust away from filter element (9) with clean water at no more than 10 psi (69 kPa).
  - (5) Soak filter element (9) in lukewarm water using nonfoaming detergent (Appx. D, item 14) for 15 minutes. Do not use solvents, fuel oils, or gasoline.
  - (6) Shake filter element (9) slightly before removing from water.
  - (7) Rinse filter element (9) with clean water (low pressure) from inside out.
  - (8) Set filter element (9) aside in a dust-free area to dry or circulate heated air at no more than 150°F (66°C).
  - (9) Wipe inside of air filter housing (10) with clean water-damp cloth (Appx. D, item 40) and inspect filter element (9) for tears or holes. If any are found, replace filter element.
  - (10) Install filter element (9) and hand tighten filter element wingnut (8).
  - (11) Install dust cover baffle (5), ring (7), and wingnut (6).
  - (12) Install four wingnut clamps (3).

**c. Inspection.**

- (1) Inspect filter element (9) by shining a light from inside out. If a tear or hole is discovered, replace filter element immediately.
- (2) Have all damaged seals replaced immediately.

**3-11. APU AIR FILTER MAINTENANCE.**

- a. Open filter housing clips (1) and remove housing (2).
- b. Remove wingnut (3), washer (4), plate (5), and filter (6).
- c. If filter (6) is dirty and clogged, clean in same manner as main engine air cleaner filter element (see para 3-10b(4) thru 3-10b(9)).
- d. Install filter (6), plate (5), washer (4), and wingnut (3).
- e. Install housing (2) and filter housing clips (1).



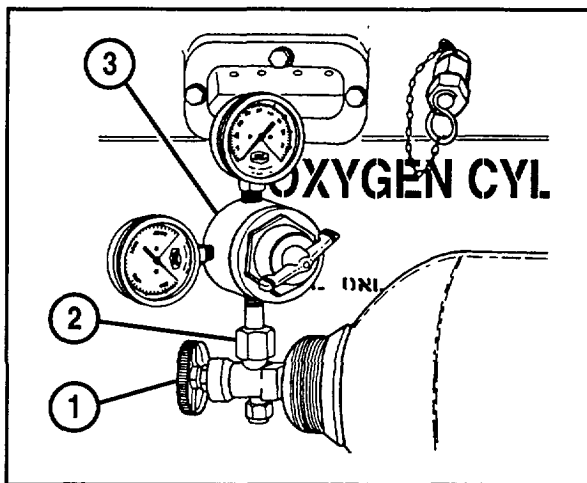
3-12. OXYGEN CYLINDER AND REGULATOR VALVE REPLACEMENT.

**WARNING**

Ensure valve (1) is closed.

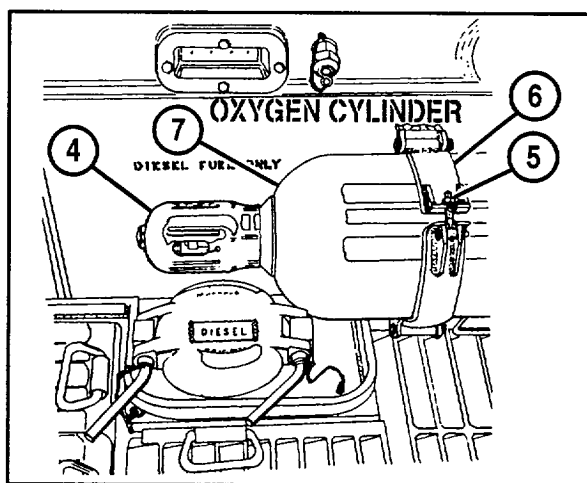
a. Removal.

- (1) Loosen nut (2) and remove regulator valve and gages (3).



- (2) Install safety cap (4).

- (3) Loosen nut (5) on two strap assemblies (6) and remove oxygen cylinder (7).





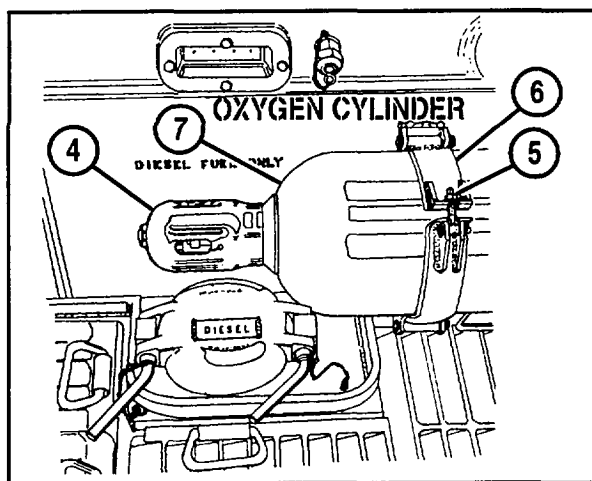
## 3-12. OXYGEN CYLINDER AND REGULATOR VALVE REPLACEMENT-Continued.

**CAUTION**

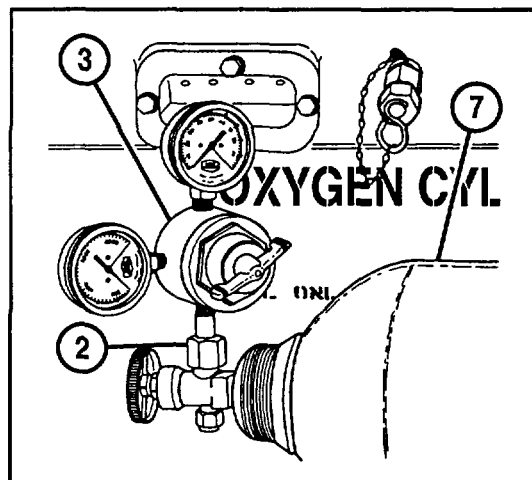
Cap oxygen cylinder when regulator valve and gages (3) are detached. Keep fittings clean at all times.

**b. Installation.**

- (1) Lay oxygen cylinder (7) between two strap assemblies (6).
- (2) Rotate oxygen cylinder (7) so valve outlet inside safety cap (4) is pointing up.
- (3) Tighten nut (5) on two strap assemblies (6) to secure oxygen cylinder (7).



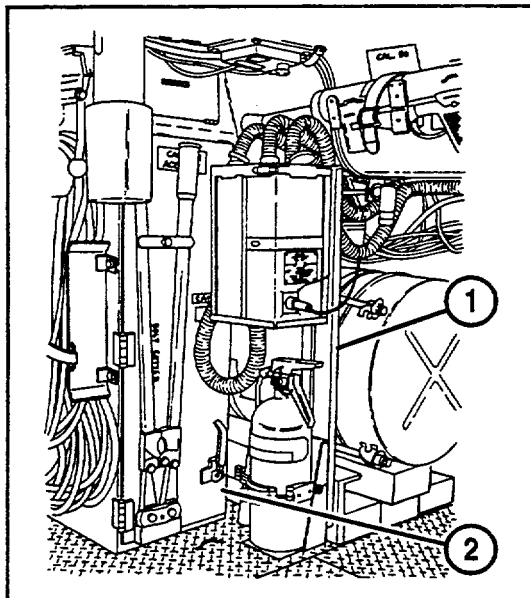
- (4) Position regulator valve and gages (3) so they can be easily read.
- (5) Aline valve (3) fitting to oxygen cylinder (7) and tighten nut (2).
- (6) Refer to TM 9-237 for regulator valve operation instructions.



**3-13. ACETYLENE CYLINDER AND REGULATOR VALVE REPLACEMENT.**

**a. Removal.**

- (1) Unhook top rear of hinge assembly (1) and swing it away from stowage cabinet door (2). Open stowage cabinet door.

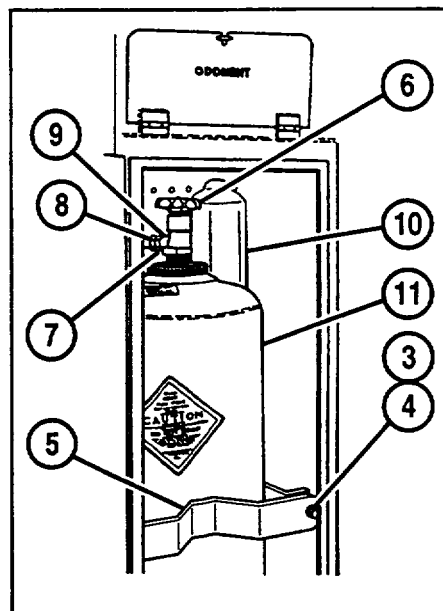


- (2) Remove screws (3), lockwashers (4), and bracket (5).

**WARNING**

**Ensure valve (6) is closed.**

- (3) Loosen nut (7) and disconnect hull outlet tube (8) from regulator valve outlet (9).
- (4) Install safety cap (10) and remove acetylene cylinder (11).

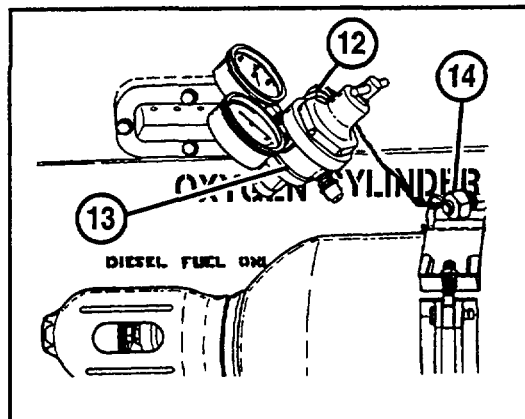


**3-13. ACETYLENE CYLINDER AND REGULATOR VALVE REPLACEMENT-Continued.**

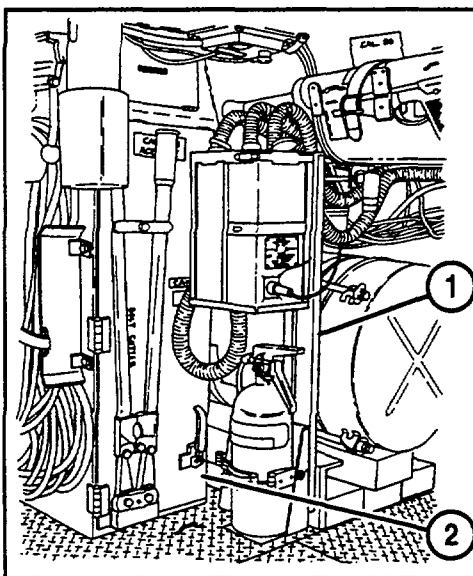
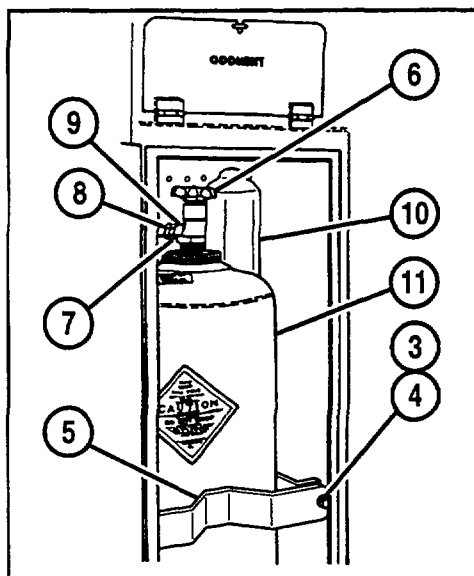
- (5) Loosen nut (12) and remove regulator valve (13).
- (6) Install hull outlet fitting plug (14).

**b. Installation.**

- (1) Put acetylene cylinder (11) in cabinet and remove safety cap (10). Aline regulator valve outlet (9) with hull outlet tube (8). Tighten nut (7).



- (2) Install bracket (5), screws (3), and lockwashers (4), and close stowage cabinet door (2).
- (3) Hook top rear of hinge assembly (1) and swing it toward stowage cabinet door (2).
- (4) Remove hull outlet fitting plug (14).
- (5) Position regulator valve (13) gages so they can be easily read.
- (6) Tighten nut (12).
- (7) Refer to TM 9-237 for regulator valve operation instructions.



**3-14. MAINTENANCE UNDER UNUSUAL CONDITIONS.****a. General.**

- (1) Special care in cleaning and lubricating the vehicle must be taken where the extremes in temperature, humidity, and terrain conditions exist. Good care of the vehicle ensures proper operation and functioning. It also guards against excessive wear of the working parts and deterioration of the materiel. Approved storage and handling instructions for lubricants and fuels should be followed.
- (2) Refer to Appendix F for lubrication instructions. These services should be done often during extremely cold and hot weather; prolonged travel periods, fording, continued exposure to wet or salty air; operation in sand, dust, or mud; or for short start-and-stop operating periods. Any one of these conditions may weaken lubricants.
- (3) When repeated failure of materiel results from exposure to extreme conditions, report problem on DA Form 2404 and notify unit maintenance.

**b. Extreme Cold Weather Maintenance.****NOTE****Make frequent inspections of inactive vehicles.**

- (1) Batteries. Extreme cold causes batteries to freeze and prevents them from furnishing enough power for engine starts. Refer to FM 31-70 for information about effects of cold weather on batteries. Remove batteries from vehicle and store them in a warm place whenever vehicle is not in use for long periods.
- (2) Tracks and suspension. Park vehicle on a footing of planks or brush to prevent tracks from freezing to ground. Chock, if necessary. Clean mud, snow, and ice from tracks and suspension as soon as possible. Refer to FM 31-70 for effects of cold weather on tracks and suspension.
- (3) Canvas covers and tarpaulins. Canvas covers and tarpaulins are hard to use in cold weather. Whenever possible tarpaulins should be warmed and unfolded in heated areas. Clean vehicle of snow, ice, and mud before covering. Cover and shield vehicle, but keep ends of cover off ground to prevent them from freezing. Always cover the rear deck of the vehicle to keep snow out of engine compartment.

**3-14. MAINTENANCE UNDER UNUSUAL CONDITIONS-Continued.**

- (4) Metal parts. Metal parts become more brittle and cannot take shock loads at arctic temperatures. Make frequent inspections of metal areas. Remove corrosion from exterior metal surfaces with abrasive paper (Appx. D, item 11) or cloth (Appx. D, item 40) and apply a protective coating of paint (Appx. D, item 17, 18, 19, or 20), oil, or suitable rust preventive (Appx. D, item 12 or 13).
- (5) Plastic and rubber parts. Any parts made of plastic or rubber materials must be handled carefully. These become brittle in cold weather and may break due to vibration or handling. To prevent insulation from cracking and causing short circuits, warm rubber or plastic insulated cables before bending and ensure all cables are secure in vehicle.
- (6) Armament.
  - (a) Keep bore of machine gun and firing mechanism covered when not in use to prevent entrance of snow.
  - (b) Clean bore of machine gun while barrel is still warm, if possible.

**CAUTION**

**Severe damage to weapon might result if recoil mechanism is frozen.**

- (c) Recoil mechanism may stick unless it is exercised frequently. Refer to FM 23-65 or TM 9-1005-213-10 for methods of exercising.
- (7) Vision devices. Vision devices should not be exposed to sudden changes in temperature. Equipment used outside at low temperatures should stay outside to avoid fogging.

**c. Extreme Hot Weather Maintenance.**

- (1) Batteries.
  - (a) Electrolyte level. In hot climates check electrolyte level daily.
  - (b) Self-discharge. A battery will self-discharge faster if left standing for long periods in high temperatures. If vehicle is parked for several days, remove batteries and store in a cool place.

**NOTE**

**Do not store acid-type batteries near stacks of tires. Acid fumes will deteriorate rubber.**

- (2) Hull and cab.
  - (a) In hot, damp areas, corrosion will occur on all parts of materiel. It will appear as rust and paint blisters on metal surfaces and mildew, mold, or fungus growth on fabrics and glass.
  - (b) Protect all unfinished, exposed metal surfaces with a film of preservative lubricating oil (medium) (Appx. D, item 25). Cables and terminals should be protected by ignition insulation compound (Appx. D, item 23).
  - (c) Frequently inspect inactive vehicles. Remove corrosion from exterior with abrasive paper (Appx. D, item 11) or cloth (Appx. D, item 40) and apply protective coating of paint (Appx. D, item 17, 18, 19, or 20), oil (Appx. D, item 25), or suitable rust preventive (Appx. D, item 12 or 13).
- (3) Armament. Inspect parts often for moisture or corrosion. Thoroughly dry all exposed, unpainted surfaces such as bore, breech, and firing mechanisms and oil as prescribed in TM 9-1005-213-10. In dry, dusty, or sandy areas, leave exposed surfaces dry, such as recoil slides. Combining oil with sand makes an abrasive paste far more damaging than no oil at all. At other times, keep these surfaces lubricated to prevent rusting.
- (4) Vision devices. Inspect parts for moisture, corrosion, or fungus growth. In dry, dusty, or sandy areas, keep exposed optical surfaces protected from blowing sand.

**d. Maintenance After Fording.**

- (1) General. Although vehicle housings are sealed to prevent leakage, water may enter, especially during submersion. The following services should be done on all vehicles exposed to partial or complete submersion, especially in salt water.
- (2) Hull and cab. Drain and clean hull. Clean all exposed surfaces and touch up paint (Appx. D, item 17, 18, 19, or 20) where necessary. Coat unpainted metal parts with preservative lubricating oil (Appx. D, item 25).
- (3) Engine and transmission. Check the lubricant in the engine and transmission for water contamination. If contamination exists drain, flush, and refill the item with the correct lubricant. Refer to Appendix F.

**3-13. MAINTENANCE UNDER UNUSUAL CONDITIONS-Continued.**

- (4) Suspension. Clean and lubricate all parts as specified in Appendix F. Lubricate generously into each lubrication fitting to force out any water.
- (5) Batteries. Check the batteries for level of electrolyte to be sure that no water entered through the vent caps. This is important if the vehicle was submerged in salt water.
- (6) Electrical connections. Check all electrical connections for corrosion.
- (7) Fuel system. Drain fuel tanks of any accumulated water.
- (8) Air cleaners. If water is found in the air cleaner, clean and dry the filter element (see para. 3-10).
- (9) Condensation. The sudden cooling of the warm interior air upon submersion might cause condensation of moisture within instruments. A period of exposure to warm air after fording should eliminate this condition.
- (10) Vision devices. If moisture has entered optical instruments, turn them in to unit maintenance for repair at earliest opportunity.
- (11) Armament.
  - (a) Perform authorized lubrication services (refer to TM 9-1005-213-10 for caliber .50 machine gun).
  - (b) Cleaning and lubrication. Drain or wipe dry all trapped moisture. Clean all exposed parts and coat with preservative lubricating oil. Refer to Appendix F.
- (12) Deep-water fording. Refer to TM 9-238 for deep-water fording information.

**e. Maintenance After Operation on Unusual Terrain.**

- (1) Mud. Clean and lubricate all parts as soon as possible after operation in mud. Refer to Appendix F.
- (2) Sand or dust. Clean engine and engine compartment. Touch up (Appx. D, item 17, 18, 19, or 20) all painted surfaces damaged by wind-blown sand. Lubricate completely to force out any sand or dust. Air cleaner dust covers must be cleaned daily. Oil coolers should be cleaned daily with compressed air. Notify unit maintenance to check and clean fuel oil filters.

## CHAPTER 4 MAINTENANCE OF AUXILIARY EQUIPMENT

### Section I. COMMUNICATIONS SYSTEMS

**4-1. GENERAL.** The communication equipment installed in the M88A1 is for internal and external communications. This section covers the AN/VRC-44, AN/VRC-46, and AN/VRC-64 radio systems, the MX-7778A/GRC suppressor, and the TSEC/KY-38 X-mode equipment.

**4-2. INSPECTION.** Preventive Maintenance Checks and Services (PMCS) must be done on all radio and intercommunication equipment (see tab. 2-1). This maintenance must also be done when:

- a. Equipment is first installed.
- b. Equipment is reinstalled after removal for any reason.
- c. At least once a week if equipment is in standby condition.

### 4-3. REMOVAL AND INSTALLATION.

#### WARNING

**Ensure vehicle MASTER switch is OFF before installing or removing radio or intercom equipment to avoid electrical shock and burns.**

#### a. Removal.

- (1) Disconnect all cables from equipment being used.
- (2) Loosen latching thumbscrews on front of mount.
- (3) Pull equipment out from mount.

#### b. Installation.

- (1) Insert equipment into mount.
- (2) Tighten latching thumbscrews on front of mount.
- (3) Connect all cables.



**4-4. CLEANING.**

- a. Inspect outside surfaces of equipment for dirt, grease, dust, and fungus.
- b. Remove dust, fungus, and loose dirt on cases and connectors with soft, clean cloth (Appx. D, item 40) or brush (Appx. D, item 7).

**WARNING**

- **P-D-680 type II dry-cleaning solvent is hazardous. Wear protective clothing and eye protection when using. Do not expose dry-cleaning solvent to high temperatures (over 130°F [54°C]). Use only in well-ventilated areas.**
  - **Keep all doors and hatches open when using dry-cleaning solvent or mineral spirits paint thinner. Fumes are toxic. Do not use near open flame.**
- c. Use dry-cleaning solvent (Appx. D, item 16) or mineral spirits paint thinner (Appx. D, item 48) on cloth (Appx. D, item 40) to remove grease and dirt from cases.
  - d. Clean front panels and knobs with clean cloth. If dirt is hard to remove, dampen cloth with water. Use mild soap (Appx. D, item 10) if necessary.

**4-5. REFERENCES.** Refer to Appendix A for further information for radio and intercommunication equipment supplied with M88A1.

Section II. DEEP WATER FORDING

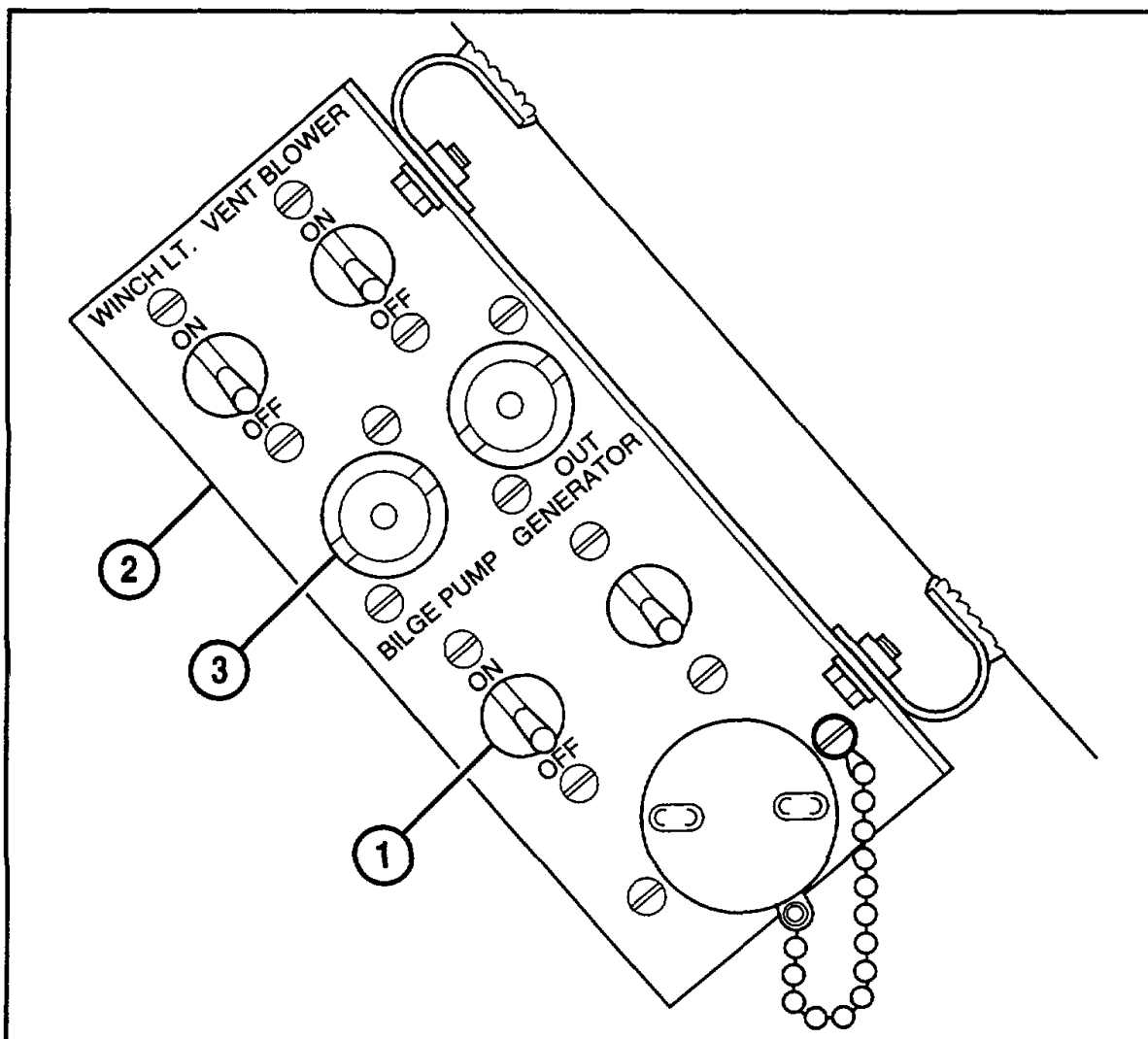
4-6. INSPECTION OF DEEP WATER FORDING KIT INSTALLATION.

- a. **Inspection.** Check kit installation to ensure all parts have been installed. Ensure all necessary areas have been sealed or taped and attaching hardware (screws, clamps) are present and tight. Ensure equipment removed from vehicle for fording has been properly stowed.

NOTE

If you plan on fording in a sandy area over 56 in. (1.42 m) deep for a long time, remove engine compartment hull access plates before entering water. This allows sand to drain out instead of building up and binding controls when leaving water.

- b. **Bilge Pump Operation.** Ensure bilge pump works before entering water. Turn BILGE PUMP switch (1) ON at accessories control panel (2). BILGE PUMP indicator light (3) should come on and there should be no unusual noises from pump. Turn BILGE PUMP switch to OFF when pump is checked.



**4-7. AFTER-FORDING MAINTENANCE.**

- a. If tactical situation permits, stop in shallow water and open drain valves (see para. 2-1g(2)) to allow water to enter hull.
- b. Attach hose and nozzle assembly (supplied with kit) to bilge pump outlet. Operate bilge pump to hose down vehicle. Wash off sand, mud, and salt water. Operate main engine and auxiliary power unit to get out any moisture which might have seeped in during fording.
- c. Turn off bilge pump when finished and move to dry land to drain hull. Close drain valves.
- d. Drain all water out of stowage compartments and hoses.

**NOTE**

**If you intend to continue fording, check all fording components for good sealing and tightness.**

- e. Remove all sealer, tape, and deep water fording kit components. Reinstall all items removed before fording.
- f. Lubrication and Painting. Lubricate vehicle in accordance with Appendix F immediately after fording. Paint all chipped or exposed surfaces in accordance with TM 43-0139 and FM 5-20.
- g. See table 3-1 for malfunction, cause, and corrective action to be taken if bilge pump fails to operate properly.

**Section III. M239 SMOKE GRENADE LAUNCHER****4-8. CLEANING (WEEKLY).**

- a. Clear debris from discharger barrels.
- b. Ensure drain holes in discharger barrels are clear by inserting a stiff wire.

**NOTE**

**Do not use wire brush to clean discharger barrels.**

- c. Clean discharger barrels with rifle bore cleaner (Appx. D, item 9) or soap (Appx. D, item 10) and water as applicable.
- d. Wipe with dry cloth (Appx. D, item 40). Ensure no residue remains around tip plugs located at bottom center in each discharger barrel.
- e. Lightly apply lubricant, small arms to pins in each discharger barrel.

**4-9. COVERS.** After mission, install canvas covers to protect discharger barrels from dust and grit.

**APPENDIX A  
REFERENCES**

**A-1. SCOPE.** This appendix lists all bulletins, forms, field manuals, technical manuals, pamphlets, and regulations referenced in this manual.

**A-2. ARMY REGULATIONS.**

Malfunctions Involving Ammunition and Explosives .....AR 75-1  
 Field Report of Accidents .....AR 385-40

**A-3. COMMON TABLE OF ALLOWANCES.**

Army Medical Department Expendable/Durable Items .....CTA 8-100  
 Expendable/Durable Items (Except: Medical, Class V,  
 Repair Parts and Heraldic Items).....CTA 50-970

**A-4. DEPARTMENT OF THE ARMY FORMS.**

Recommended Changes to Publications and Blank Forms ..... DA Form 2028  
 Recommended Changes to Equipment Technical Publications ..... DA Form 2028-2  
 Equipment Inspection and Maintenance Worksheet ..... DA Form 2404

**A-5. DEPARTMENT OF THE ARMY PAMPHLET.**

The Army Maintenance Management System (TAMMS)..... DA PAM 738-750

**A-6. FIELD MANUALS.**

Camouflage, Basic Principles and Field Camouflage..... FM 5-20  
 Explosives and Demolitions ..... FM 5-25  
 Operation and Maintenance of Ordnance Material in  
 Extreme Cold Weather 0° to -65F.....FM 9-207  
 Vehicle Recovery Operations.....FM 20-22  
 First Aid for Soldiers .....FM 21-11  
 NBC (Nuclear, Biological, and Chemical) Defense .....FM 21-40

**A-6. FIELD MANUALS-Continued.**

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

**A-7. STANDARD FORMS.**

Operator Report on Motor Vehicle Accidents ..... SF Form 91

Report of Discrepancy (ROD) ..... SF Form 364

Product Quality Deficiency Report ..... SF Form 368

**A-8. SUPPLY BULLETIN.**

FSC Class 6135; Primary Battery Management  
Data Subscription Form.....SB 11-30

**A-9. TECHNICAL BULLETIN.**

Nonaeronautical Equipment Army Oil  
Analysis Program (AOAP) ..... TB 43-0210

**A-1 0. TECHNICAL MANUALS.**

Operator's Manual: Machine Gun, Cal. .50, Browning,  
M2, Heavy Barrel, Flexible, w/e; Mount, Tripod,  
Machine Gun, Cal. .50, M2 w/e and Mount,  
Machine Gun, Antiaircraft: Cal 50, M63 w/e ..... TM 9-1005-213-10

Operator's Manual for Machine Gun, Fixed, M85  
(NSN 1005-00-690-2790)..... TM 9-1005-231-10

Explosive Ordnance Disposal Procedures,  
Grenade, Smoke, Model L8A1 ..... TM 9-1185-41

Ammunition, General..... TM 9-1300-200

Operator's and Organizational Maintenance  
Manual for Grenades ..... TM 9-1330-200-12

Operator's Manual: Welding Theory and Application.....TM 9-237

Deep-Water Fording of Ordnance Material.....TM 9-238

Equipment Serviceability Criteria (ESC)..... TM 9-2350-242-ESC

Unit Maintenance Manual, Recovery Vehicle, Full-Tracke  
Medium, M88A1 (NSN 2350-00-122-6826) ..... TM 9-2350-256-20

Operator and Unit Maintenance Manual (Including  
Repair Parts List) for Wrench, Impact, Hydraulic,  
Model IW-12-140T (PN 12322630)..... TM 9-5130-338-12&P

Organizational, Field, and Depot Maintenance  
Repair Parts List for Wrench, Impact, Hydraulic ..... TM 9-5130-338-15P

Operator's, Organizational, Direct Support, and  
General Support Maintenance Manual for Lead  
Acid Batteries ..... TM 9-6140-200-14

Operator's Maintenance Manual for Radio Sets:  
AN/VRC-12 (NSN 5820-00-223-7412),  
AN/VRC-43 (NSN 5820-00-223-7415),  
AN/VRC-44 (NSN 5820-00-223-7417),  
AN/VRC-45 (NSN 5820-00-223-7418),  
AN/VRC-46 (NSN 5820-00-223-7433),  
AN/VRC-47 (NSN 5820-00-223-7434),  
AN/VRC-48 (NSN 5820-00-223-7435),  
AN/VRC-49 (NSN 5820-00-223-7437),  
(Used w/Intercom System) ..... TM 11-5820-401-10-2

Organizational Maintenance Manual for Radio Sets:  
AN/VRC-12 (NSN 5820-00-223-7412),  
AN/VRC-43 (NSN 5820-00-223-7415),  
AN/VRC-44 (NSN 5820-00-223-7417),  
AN/VRC-45 (NSN 5820-00-223-7418),  
AN/VRC-46 (NSN 5820-00-223-7433),  
AN/VRC-47 (NSN 5820-00-223-7434),  
AN/VRC-48 (NSN 5820-00-223-7435),  
AN/VRC-49 (NSN 5820-00-223-7437),  
(Used w/Intercom System, AN/VIC-1(V)  
(EE150-JA-MMO-0201-E1 54-VRC-12, 43) ..... TM 11-5820-401-20-2

Operator's Manual for Viewers, Driver's, Night Vision,  
AN/VVS-2(V)-1, AN/VVS-2(V)-1A, AN/VVS-2(V)-2,  
AN/VVS-2(V)-2A, and AN/VVS-2(V)-3 ..... TM 11-5855-249-10

Operator's and Organizational Maintenance Manual:  
Radio Sets, AN/VRC-53 (NSN 5820-00-223-7467),  
AN/VRC-64 (NSN 5820-00-223-7475),  
AN/GRC-125 (NSN 5820-00-223-7411),  
AN/GRC-160 (NSN 5820-00-223-7473) and  
Amplifier Power Supply Groups OA-3633/GRC  
and OA-3633A/GRC (NSN 5820-00-973-3383)..... TM 11-5820-498-12

**A-10. TECHNICAL MANUALS-Continued.**

Operator's and Organizational Maintenance  
 Manual for Intercommunication Set,  
 AN/VIC-1(V) (NSN 5830-00-856-3273):  
 Control Intercommunication Set,  
 C-10456/VRC (NSN 5830-01-082-0804),  
 C-10680/VRC and Amplifier, Audio  
 Frequency, AM7046/VRC..... TM 11-5830-340-12  
 Operator's Manual Viewers, Driver's, Night  
 Vision AN/VVS-2(V)1A ..... TM 11-5855-249-10

Operator's Organizational, Direct Support  
 and General Support Maintenance Manual  
 for Headset-Microphone Kit ..... TM 11-5965-286-14

Manual for Track Vehicle Driver.....TM 21-306

Destruction of Chemical Weapons and Defense  
 Equipment to Prevent Enemy Use..... TM 43-0002-31

Painting Instructions for Army Materiel..... TM 43-0139

Explosive Ordinance Disposal Procedures,  
 Grenade, Smoke, Model L8A1 ..... TM 60E-3-2-3

Administrative Storage of Equipment..... TM 740-90-1

Procedures for Destruction of Tank-Automotive  
 Equipment to Prevent Enemy Use (U.S. Tank-  
 automotive and Armaments Command)..... TM 750-244-6



**APPENDIX B  
COMPONENTS OF END ITEMS (COEI) AND  
BASIC ISSUE ITEMS (BII) LISTS**

**Section I. INTRODUCTION**

**B-1. SCOPE.** This appendix lists COEI and BII for the M88A1 to help you inventory the items for safe and efficient operation of the vehicle and its equipment.

**B-2. GENERAL.** The COEI and BII lists are divided into the following sections:

- a. Section II, COEI.** This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the M88A1. 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 the COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to assist you in identifying the items.
- b. Section III, BII.** These essential items required to place the M88A1 in operation, to operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the M88A1 during operation and when it is transferred between property accounts. This list is your authority to request/requisition them based on authorization of the end item by the Table of Organization and Equipment (TOE)/Modified Table of Organization and Equipment (MTOE). Illustrations are furnished to help you find and identify the items.

**B-3. EXPLANATION OF COLUMNS.**

The following provides an explanation of columns found in the tabular listings:

- a.** Column (1), Illo. No., gives you the number of the item illustrated.
- b.** Column (2), National Stock Number (NSN), identifies the stock number of the item to be used for requisitioning purposes.
- c.** Column (3), Description, Commercial and Government Entity Code (CAGEC), and part number (PN), identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (in parentheses) and the PN.
- d.** Column (4), Unit of Issue (U/I), indicates how the item is used for the NSN shown in column (2).

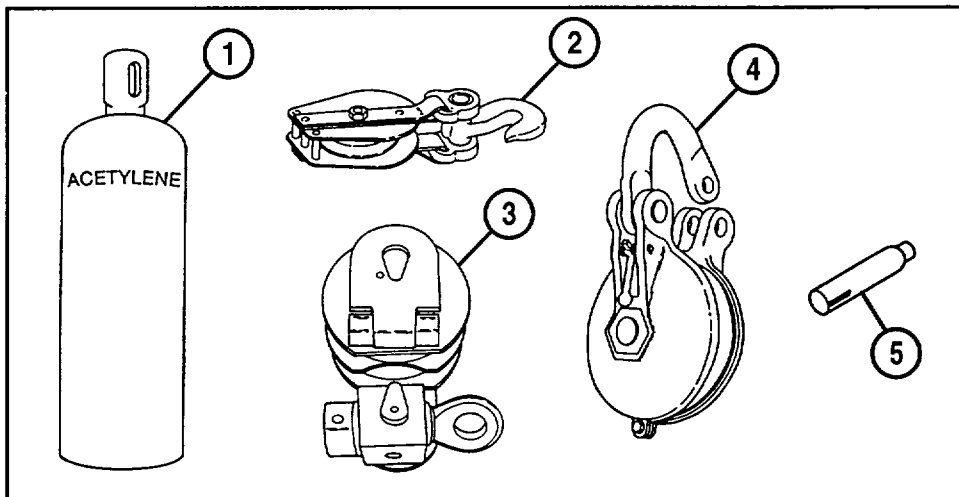
**B-3. EXPLANATION OF COLUMNS-Continued.**

- e. Column (5), Qty Req, indicates the quantity of the item furnished with the equipment.

**B-4. ABBREVIATIONS.**

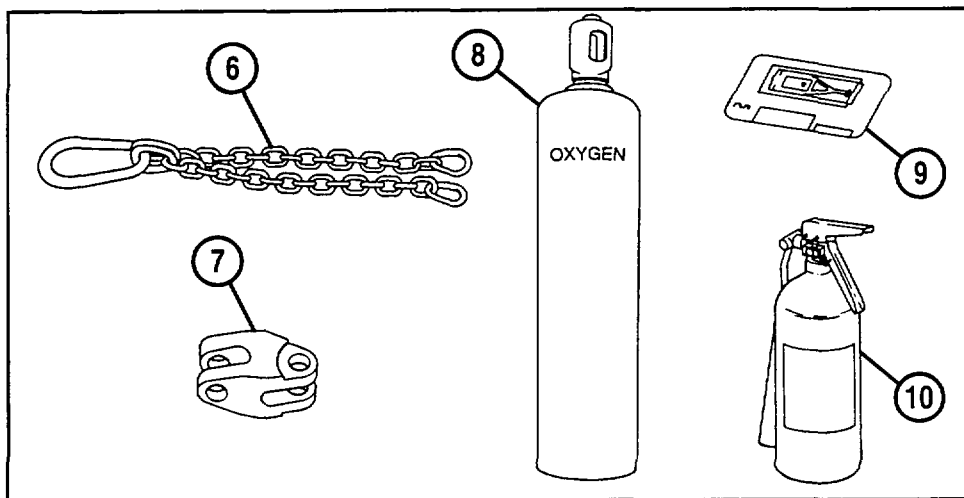
Abbreviation	Explanation
ammo .....	ammunition
CAGEC .....	Commercial and Government Entity Code
cal .....	caliber
cu. ft .....	cubic feet
cuz m.....	cubic meter
dia .....	diameter
ft.....	foot
HD.....	heavy duty
Ill. No.....	illustration number
in .....	inch
IR.....	infrared
kg.....	kilogram
kPa.....	kilopascal
L.....	liter
LAW .....	Light Assault Weapon
lb.....	pod
lg.....	long
m.....	meter
mn.....	millimeter
MTOE .....	Modified Table of Organization and Equipment
No.....	number
NSN.....	National Stock Number
o.d.....	outside diameter
pc.....	piece
PN.....	part number
psi .....	pound per square inch
pt.....	point
Qty Req .....	quantity required
sq. dr .....	square drive
TOE.....	Table of Organization and Equipment
U /I.....	Unit of Issue
w .....	wide
w/.....	with
w/e.....	with equipment
w/o .....	without
w/oe.....	without equipment
x.....	by (as in 2 x 4)

SECTION II. COEI

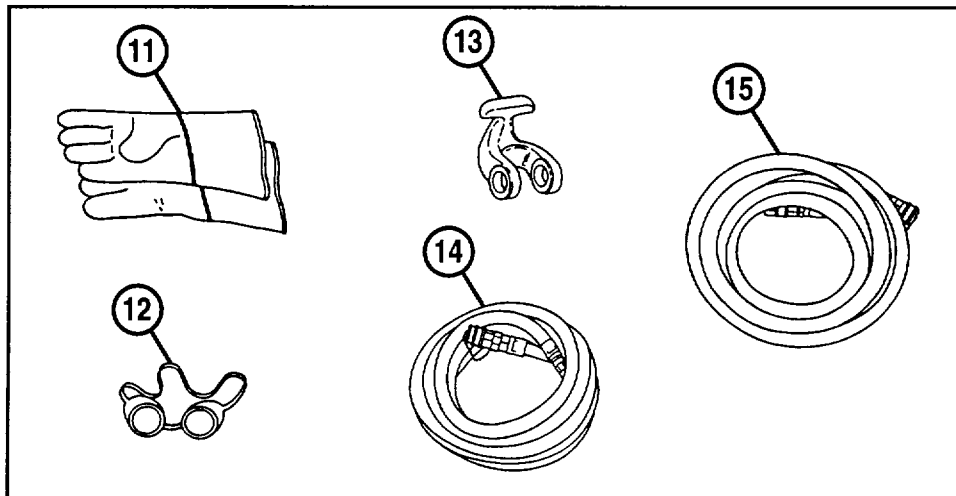


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
1	6830-00-292-0137	ACETYLENE, TECHNICAL: compressed-gas, 125-cu.-ft (3.54-cu.-m) 250-psi (1723-kPa), ICC Spec 8 or 8AL, w/ valve and cap (filled) approx. 10.5-in.-(266.7-mm-) dia. x 29-in.-(736.6-mm-) high (in acetylene compartment, left rear wall) (81348) BBA106	EA	1
2	3940-00-105-9933	BLOCK, TACKLE: snatch, wire-rope, 10-ton (9.1-metric-ton) (above fender, left) (19207) 11631726	EA	1
3	3940-00-792-9881	BLOCK, TACKLE: snatch, wire-rope, 25-ton (22.7-metric-ton) (above spade, left front) (19207) 8379923	EA	1
4	3940-00-792-9882	BLOCK, TACKLE: snatch, wire-rope, 90-ton (81.7-metric-ton) (above spade, engine deck) (19207) 8379922	EA	2
AND				
5	5315-01-255-0958	PIN: (19207) 10884795	EA	

SECTION II. COEI-Continued

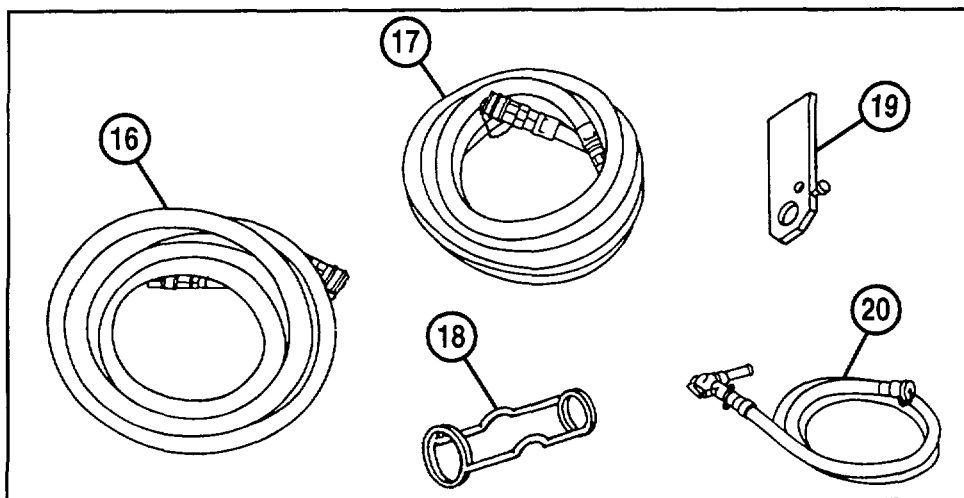


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
6	4010-00-133-6517	CHAIN ASSEMBLY, DOUBLE LEG: Lifting, HD 0.875-in. (22.2-mm) (draped around tow pintle) (19207) 10929894	AY	1
7	2540-00-863-3153	CLEVIS ASSEMBLY: tow bar (medium duty) (in exterior compartment, left side) (19207) 10894255	AY	2
8	6830-00-292-0129	CYLINDER: compressed-gas, "oxygen" 250-cu.-ft (7.08-cu.-m), 2265-psi (15,617-kPa), ICC Spec, 3AA w/valve and cap (filled) (on exterior, rear of cab, on engine deck) (96906) MS39224-17	EA	1
9	7690-01-056-2033	DIAGRAM, STRAP LOCATOR: (in pamphlet bag) (19207) 11672125		1
10	4210-00-683-8815	EXTINGUISHER, FIRE: portable, 5-lb (2.27-kg) CO2 (in brackets, inside cab) (19207) 7359703	EA	2
		OR		
	4210-00-270-4512	EXTINGUISHER, FIRE: portable, 5-lb (2.27-kg) CO2 (in brackets, inside cab) (19207) 7714780		2

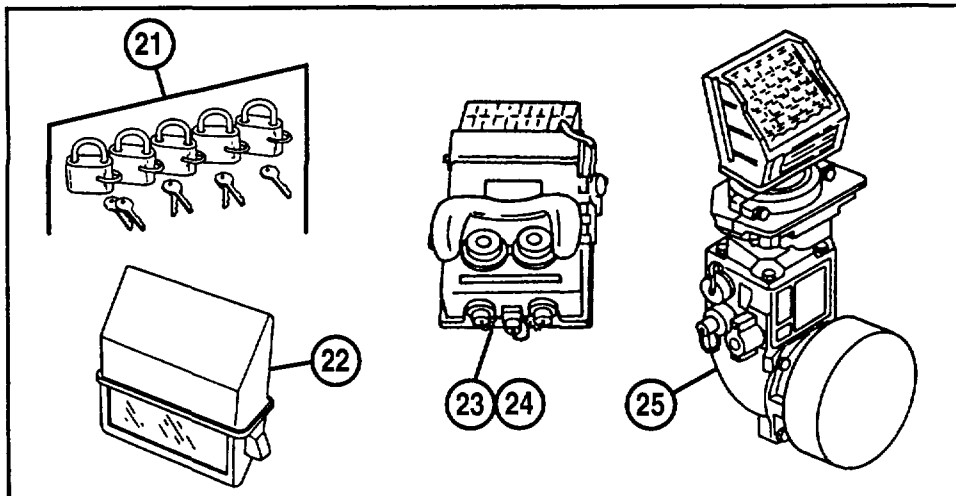


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
11	8415-00-268-7859	GLOVES, WELDERS: leather gauntlet, size-large (in small parts box) (96906) MS35902-70		1
12	4240-00-203-3804	GOGGLES, IND WELDER'S: w/eye cups, plastic, ventilated, w/hardened glass filter lens (type II) CO-BS shade No. 6, w/hardened glass covered lens (type 111), 2-in.-(50.8-mm-) dia. lens, w/2 hardened spare cover lens, headband supported, over-spectacle type, w/o case (in small parts box) (81348) GGG-G-513		1
13	2540-00-706-8219	HOOK, TOW CABLE: (in exterior compartment, left side) (19207) 7068219	EA	4
14	5130-00-792-9883	HOSE ASSEMBLY: impact wrench, 0.5-in.-(12.7-mm-) x 25-ft-(7.57-m-) lg. (in compartment, right side exterior) (19207) 10867293	AY	2
15	5130-00-792-9884	HOSE ASSEMBLY: impact wrench, 0.375-in.-(9.5-mm-) x 25-ft-(7.57-m-) lg. (in compartment, right side exterior) (19207) 10867295	AY	2

Section II. COEI-Continued.

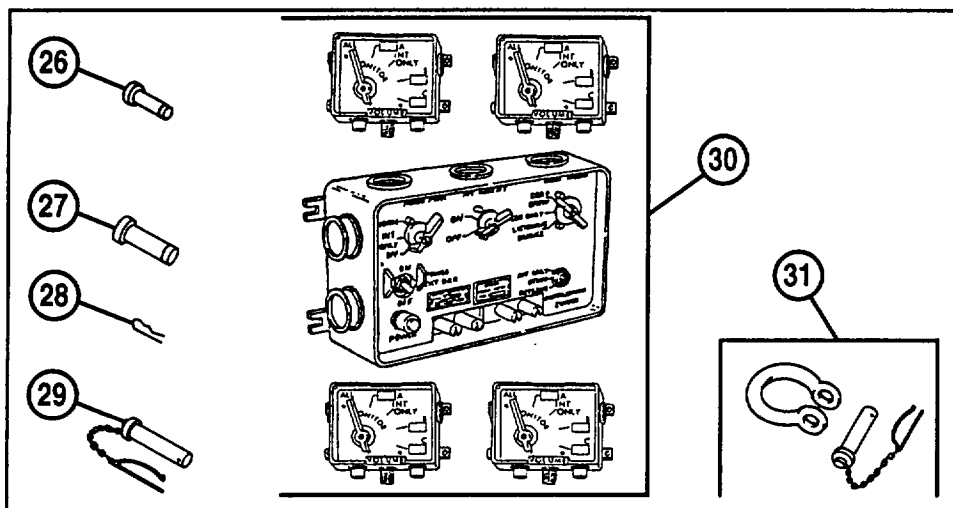


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
16	4720-00-273-9886	HOSE ASSEMBLY, NONMETALLIC: gas, "acetylene," red, w/coupling, 0.3125-in.(7.9-mm) x 50-ft-15.2-m), type II, (substitute hose, acetylene, 0.3125-in. (7.9-mm) x 50-ft (15.2-m), CE No. 33-5080-050) (on left side of acetylene compartment) (24161) ZZ-H-461	AY	1
17	4720-00-293-7997	HOSE, NONMETALLIC: gas, "oxygen," green, w/couplings, 0.3125-in. (7.9- mm) x 50-ft (15.2-m), type II (on left side of acetylene compartment) (24161) ZZ-H-461	EA	1
18	5120-00-965-0326	IGNITERS: friction, wire frame style round-file, single flint, hooded type (in small parts box) (93084) GG-1-271, type 1, style A, G35		1
19	2530-01-004-4209	LOCK, TRACK, LOCKOUT: (under drawers in front of main oddment compartment, right side) (19207) 11672126		2
20	2590-00-861-9982	NOZZLE ASSEMBLY, FUEL: (in compartment, right side exterior) (19207) 10884808	AY	1



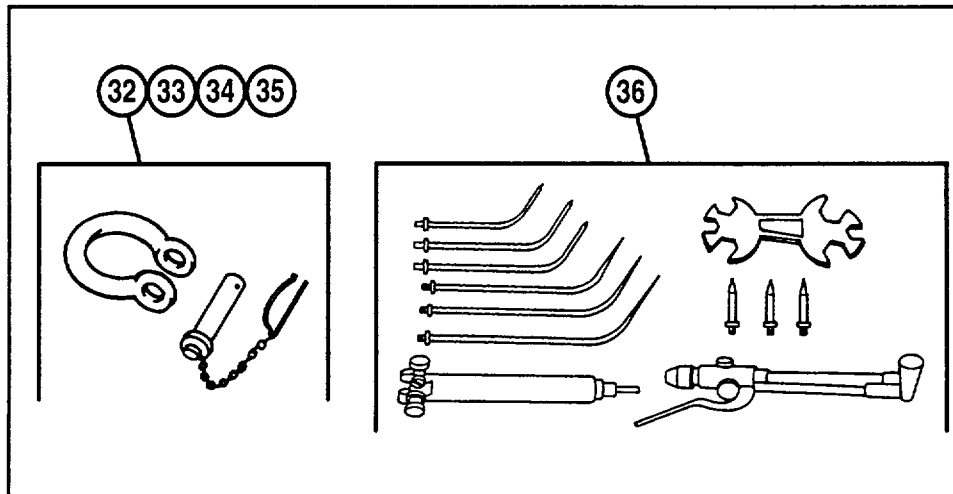
(1) Ill. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
21	5340-00-682-1505	PADLOCK SET: 1.75-in. (44.5-mm) w/ clevis includes 5 locks (keyed alike) and 7 keys (1 cable, 1 cab side door, 1 right and 1 left stowage compartment door, 1 APU access door) (96906) MIL-P-17802, MS21313-52		1
22	6650-00-704-3549	PERISCOPE, M17 (T24): driver, mechanic, and rigger (at each crew position) (19207) 7043549	EA	7
23	1240-00-344-4647	PERISCOPE, M24 (T41): driver's IR (in box 7972888 on cable chute near commander) (19200) 8293676	EA	1
		OR		
24	1240-01-005-6036	PERISCOPE, M24A1: (19200) 11747127	EA	1
25	5855-01-096-0871	VIEWER, NIGHT VISION: (05234) ANNVS-2(V)1 A	EA	1

Section II. COEI-Continued.



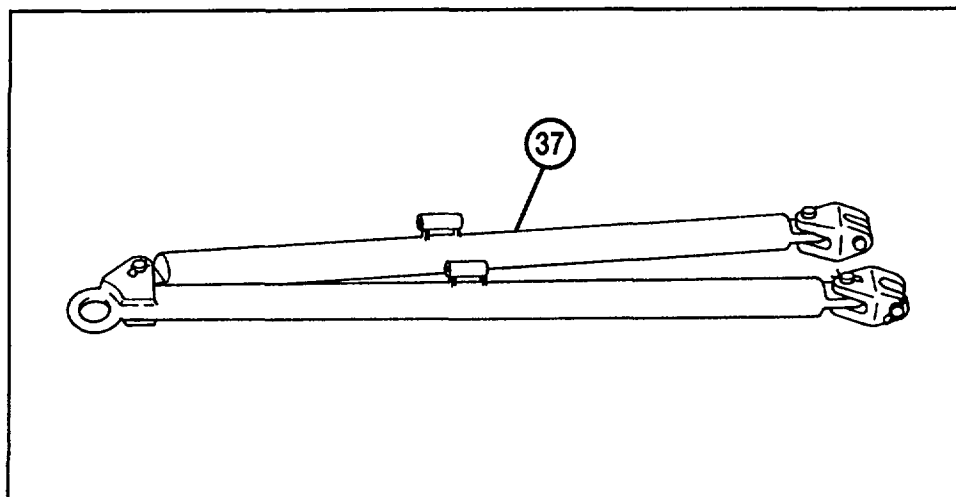
(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
26	5315-00-706-9195	PIN, GROOVED, HEADED: tow cable hook (used with hook 7068219) (in exterior compartment, left side) (19207) 7069195	EA	2
27	5315-00-200-8376	PIN, GROOVED, HEADED: clevis, tow bar (used with clevis 8383805) (in right basket under floor, behind driver) (19207) 8383813	EA	4
28	5315-00-350-4326	PIN, LOCKING: attaching, for HD tow bar (in small parts box) (19207) 5213744	EA	16
29	4010-00-291-7979	PIN, SHACKLE: for shackle 7357963 (in small parts box) (19207) 7357978	EA	2
30	5830-00-543-0737	RADIO, INTERCOMMUNICATION SYSTEM: (80058) AN/VIC-1		1
31	2540-00-318-0326	SHACKLE ASSEMBLY: anchor, 0.875-in.-(.22.2-mm-) dia. with pin 7357982 (in right basket under floor, behind driver) (19207) 7357967		6



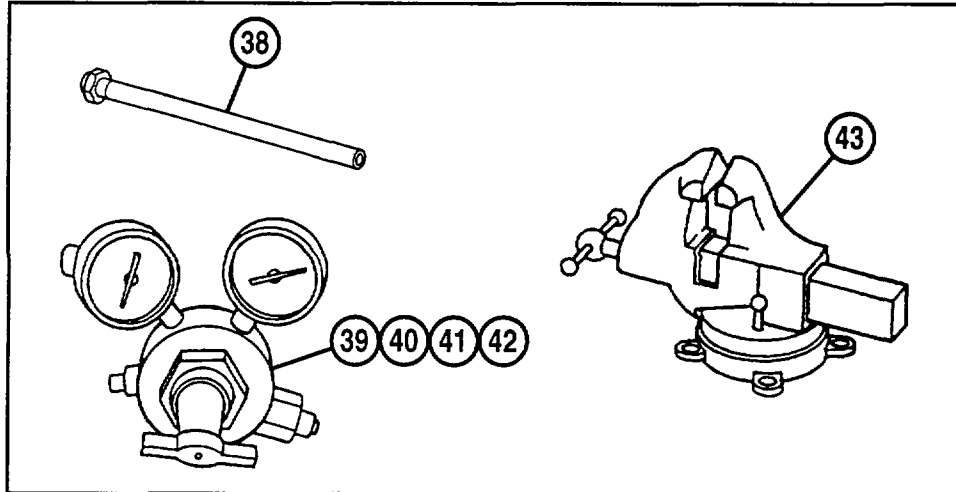


(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
32	4030-00-951-9874	SHACKLE: 0.4375 in. (11.1 mm) dia. w/ pin 7357978 (in small parts box) (19207) 7357963		4
33	4030-00-373-1256	SHACKLE, ANCHOR, HIGH STRENGTH: 1.25-in.-(31.8-mm-) dia., Spec MIL-S- 24214, type I, grade B, class 1 (in exterior compartment, left side) (81349)		2
34	4030-00-377-1388	SHACKLE, ANCHOR, HIGH STRENGTH: 1.75-in.-(44.5-mm-) dia., Spec MIL-S- 24214, type I, grade B, class 1 (in right basket under floor, behind driver) (81349) MIL-S-24214		2
35	4030-00-377-1389	SHACKLE, ANCHOR, HIGH STRENGTH: for front center towing eye, 2-in.-(50.8- mm-) dia., Spec MIL-S-24214, type I, grade B, class 1 (in right basket under floor, behind driver) (81349) MIL-S-24214		2
36	3433-00-294-6743	TORCH SET, "ACETYLENE AND OXYGEN": medium duty, w/wrench, 6- weld and 3-cut tips (in small parts box) (81349) MIL-T-13880, type 2		1

Section II. COEI-Continued.

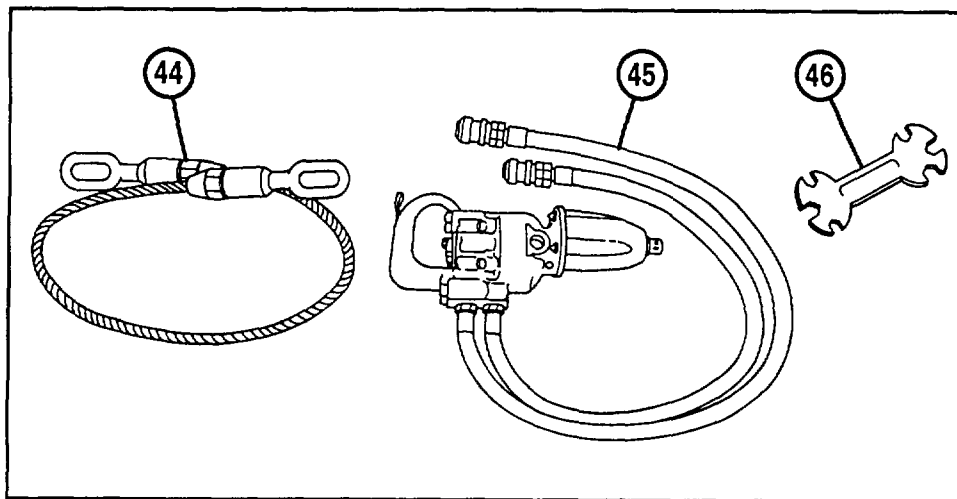


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
37	2540-00-378-2012	TOW BAR, MOTOR VEHICLE: tow "V," HD 8.5-ft-(2.59-m-) lg. (above left rear fender) (19207) 8383802  Complete with: • standard clevis 8724449 • standard pin (19207) 10929861 • lock pin (19207) 5213744  OR		2
	2540-01-267-2912	TOW BAR, MOTOR VEHICLE: tow "V," HD 8.5-ft-(2.59-m-) lg. (above left rear fender) (19207) 12322663  Complete with: • standard clevis 12322662 • standard pin (19207) 10929861 • lock pin (19207) 5213744		2



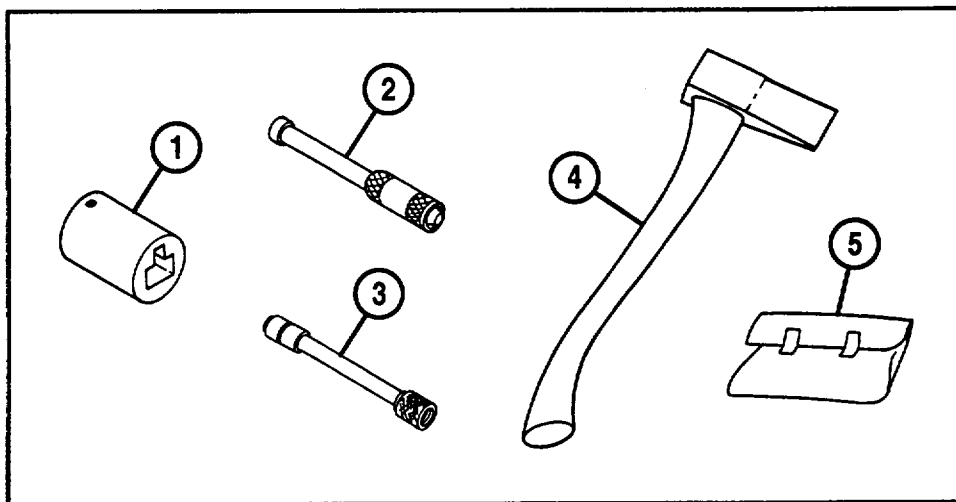
(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
38	4710-00-792-9886	TUBE ASSEMBLY, METAL: filler, nozzle, 34-in.-(864-mm-) lg. (in exterior compartment, right side) (19207) 10867298	AY	1
39	4820-00-641-3519	VALVE, REGULATING, FLOW: pressure compressed gas, "acetylene," w/coupling, adapter, and outlet, type V (in oddment compartment) (86346) MIL-R-13877, R2047	EA	1
40	4820-00-641-3519	VALVE, REGULATING, FLOW: pressure fluid pressure "oxygen", w/coupling, adapter, and outlet, type VI (Linde Purox R-201 or equal) (in oddment compartment, above acetylene compartment) (81349) MIL-R-13877	EA	1
41	4820-00-828-7192	VALVE, CHECK, ACETYLENE: (63026) 0690-0023	EA	1
42	4820-00-828-7190	VALVE, CHECK, OXYGEN: (55681) H691	EA	1
43	5120-00-243-9072	VISE, BENCH AND PIPE: 5-in.-(127-mm-) jaw and 6-in.-(152-mm-) opening (on engine deck, left side) (19207) GGG-V-410, 7974484	EA	1

Section II. COEI-Continued.



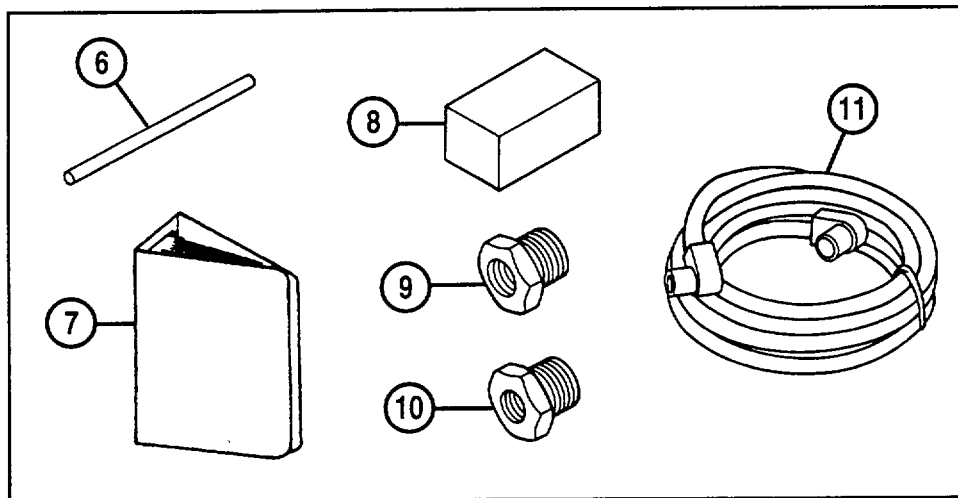
(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
44	4010-01-041-9752	WIRE ROPE ASSEMBLY: tow, steel, 1.06-in.-(26.9-mm-) dia. x 15-ft-(4.57- m-) lg. (1 above right fender, 1 above left fender) (19207) 7360553-1		2
OR				
	4010-00-202-2427	WIRE ROPE ASSEMBLY, TOW, STEEL: (19207) 7360555		2
45	5130-00-790-2284	WRENCH, IMPACT, HYDRAULIC, 3/4- IN.-SQ.-DR.: (in exterior compartment, right side) (19207) 8395499	EA	1
OR				
	5120-00-494-1929	WRENCH, IMPACT, HYDRAULIC, 3/4-IN- SQ.-DR.: (in exterior compartment, right side) (19207) 12322630	EA	1
46	5120-00-494-1929	WRENCH, TORCH AND REGULATOR, "ACETYLENE AND OXYGEN": (in small parts box) (80382) 8090028	EA	1

Section III. BII.

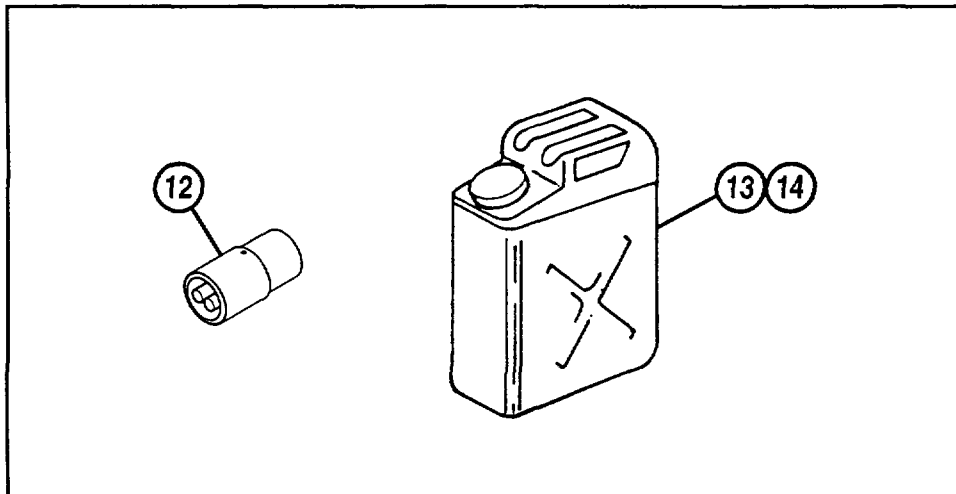


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
1	5120-00-340-2013	ADAPTER, FIXTURE, TRACK: socket wrench, 3/4-in.-sq.-dr. to attach impact wrench to track fixture (in small parts box) (19207) 8708133	EA	2
2	4930-00-204-2550	ADAPTER, GREASE GUN: thin stem gun, lubrication, sleeve type (stowed on lubricating gun in rear oddment compartment, right side) (81349) MIL-L-4387, type IV, class 2	EA	1
3	4930-00-288-1511	ADAPTER, GREASE GUN COUPLING: lubrication, hydraulic gun tube, flex. 12-in.- (305-mm-) lg. (style C fix x) (in rear oddment compartment, right side) (81349) MIL-L-4387, type IV, class 1	EA	1
4	5110-00-293-2336	AXE, CHOPPING, SINGLE BIT: 4-lb-(1.8-kg-) (in pioneer rack on exterior right side) (81348) GGG-A-926	EA	1
5	2540-00-670-2459	BAG, PAMPHLET: (on front side of oddment compartment, right side) (19207) 7961712		1

Section III. BII-Continued.

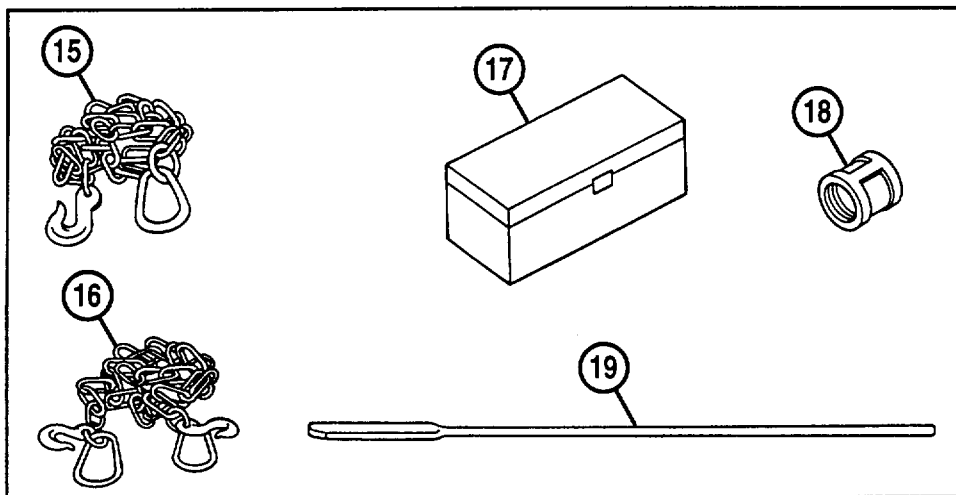


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
6	5120-00-526-6044	BAR, PINCH: 0.5625-in.-(14.3-mm-) dia. stock x 11.875-in.-(302-mm-) lg. (in small parts box) (19204) 5266044	EA	1
7	7510-00-889-3494	BINDER, LOOSE LEAF: for manuals (in pamphlet bag) (19207) 11677003		1
8	5120-00-965-0603	BOX, FLINT TIP, FRICTION IGNITERW/ HOLDER: sleeve type, threaded, 5-40 NC 6 per box (in small parts box) (81348) GG-I-271		1
9	4730-00-277-5609	BUSHING: reducer, 3/4-in. pipe for external thread and 1/2-in. pipe for internal thread (in small parts box) (88044) AN912-7	EA	2
10	4730-00-194-0219	BUSHING: reducer, 3/4-in. pipe for external thread and 3/8-in. pipe for internal thread (in small parts box) (88044) AN912-8	EA	2
11	6150-01-022-6004	CABLE ASSEMBLY, POWER ELECTRICAL: 24-volt, 20-ft-(6.1-m-) lg., slave cable (on floor under right air cleaner) (19207) 11682336-1	EA	1



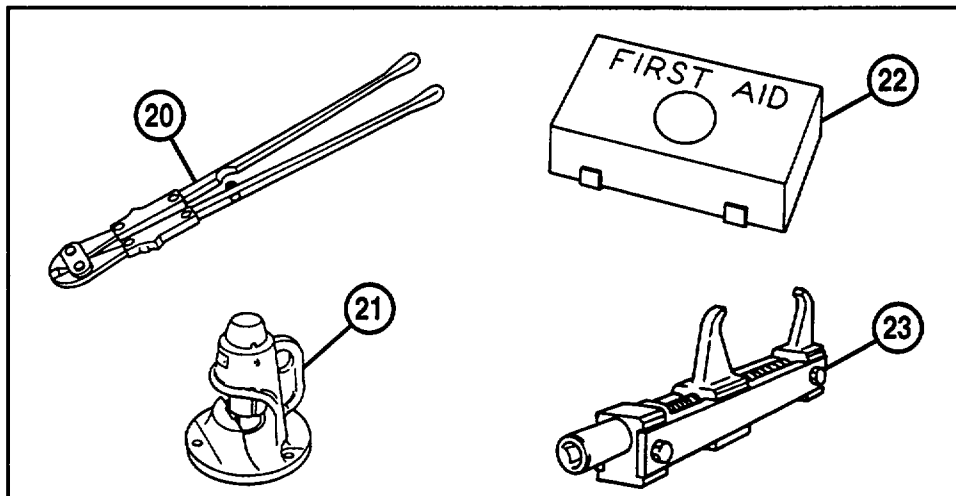
(1) Ill. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
	2590-00-148-7961	OR CABLE KIT, SPECIAL PURPOSE: Adaptive, optional with adapter PN 11677570 and cable PN 11682336-1 (in small parts box, cable under right air cleaner on floor) (56161) 10502786	EA	1
		AND		
12	5935-00-322-8959	ADAPTER, CONNECTOR, TO SLAVE CABLE TO RECEPTACLE: (in small parts box) (19207) 11677570		2
13	7240-00-222-3088	CAN, GASOLINE, MILITARY, 5-GALLON (18.9-L): (on interior of right and left access door) (19207) MIL-C-1283, 11677019	EA	2
14	7240-00-242-6153	CAN, WATER, MILITARY, 5-GALLON (18.9-L): (on floor, right and left side of cable chute near commander) (19207) 11655980	EA	2

Section III. BII-Continued.



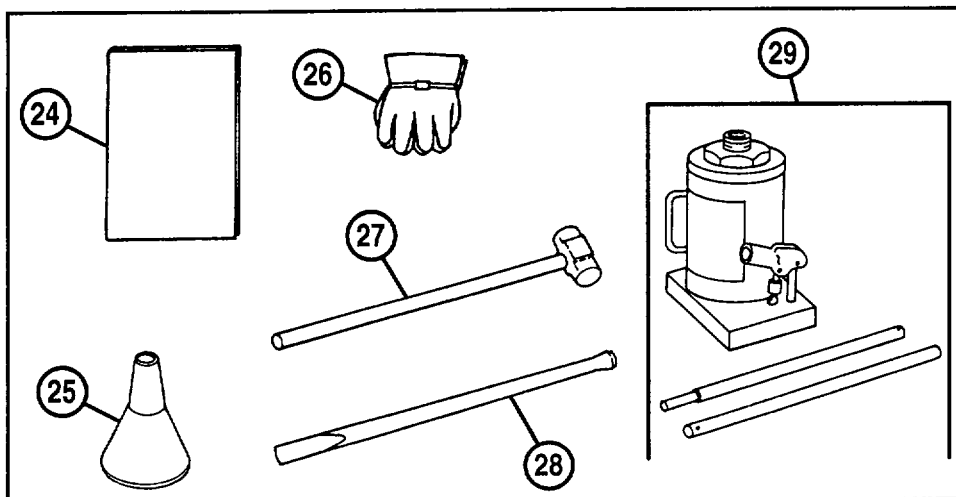
(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
15	4010-01-010-2536	CHAIN ASSEMBLY: single leg, utility, 0.75-in.-(1 9.1-mm-) x 12-ft-(3.66-m-) (in exterior compartment, left side) (19207) 8744250	EA	2
16	4010-00-473-6166	CHAIN, UTILITY, SINGLE LEG: 0.625-in.-(15.9-mm-) x 16-ft-(4.88-m-) with hook and end link (2) (in right basket under floor, behind driver) (19207) 7077063	EA	2
17	3439-00-383-3634	CLEANER SET, WELDING AND CUTTING TIPS: 12-pc. in metal case (in small parts box) (81349) MIL-C-17223		1
18	4730-00-905-2692	COUPLING, PIPE: 3/4-in. NPT (in small parts box) (96906) MS39233-16	EA	1
19	5120-00-224-1390	CROWBAR: pinch point, 5-ft-(1.52-m-) lg. x 1.25-in.-(31.2-mm-) w. (on top of engine deck cover) (81348) GGG-B-101	EA	2



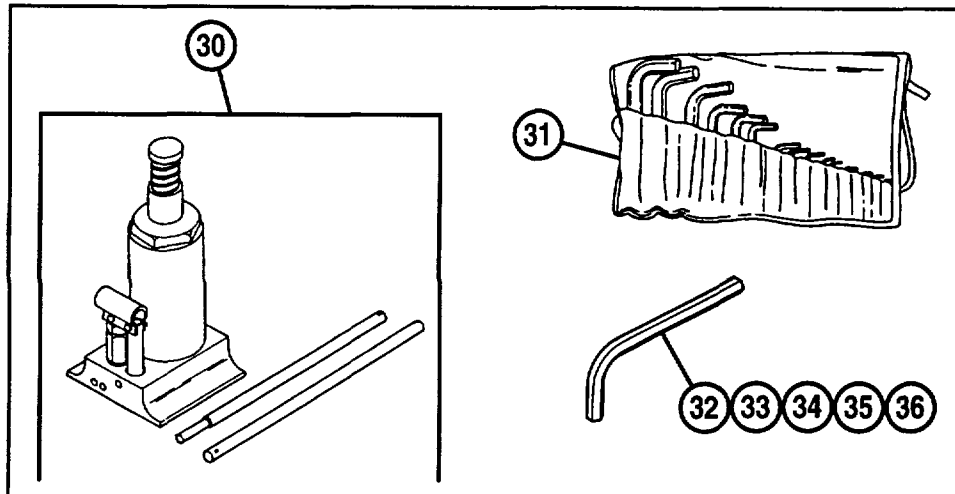


(1) Illu. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
20	5110-00-188-2524	CUTTER, BOLT, RIGID-HD: clipper cut 0.625-in.-(15.9-mm-) bolt and 0.5625-in.-(14.3-mm-) rod cap, 36-in.-(914-mm-) lg. (on acetylene compartment door) (81348) GGG-C-740	EA	1
21	5110-00-293-1066	CUTTER, WIRE ROPE, HAND OPERATED: hammer impact, 1.5-in.-(38.1-mm-) capacity, pedestal type (in compartment, right side exterior) (81348) GGG-C-C0800 TYP3S3	EA	1
22	6545-00-922-1200	FIRST AID KIT: motor vehicle, 12-unit, size 1 (in rear oddment compartment, right side) (64616) SC-C-6545-IL, VOL 2		1
23	5120-01-016-2149	FIXTURE, TRACK CONNECTING: 3/4-in.-female-dr. (in basket on winch mount under subfloor, left side; bars in left basket under floor behind driver) (19207) 12252120	EA	2
	5120-00-605-3926	OR FIXTURE, TRACK CONNECTING: w/bar lever (19200) 8741739	EA	2

Section III. BII-Continued.

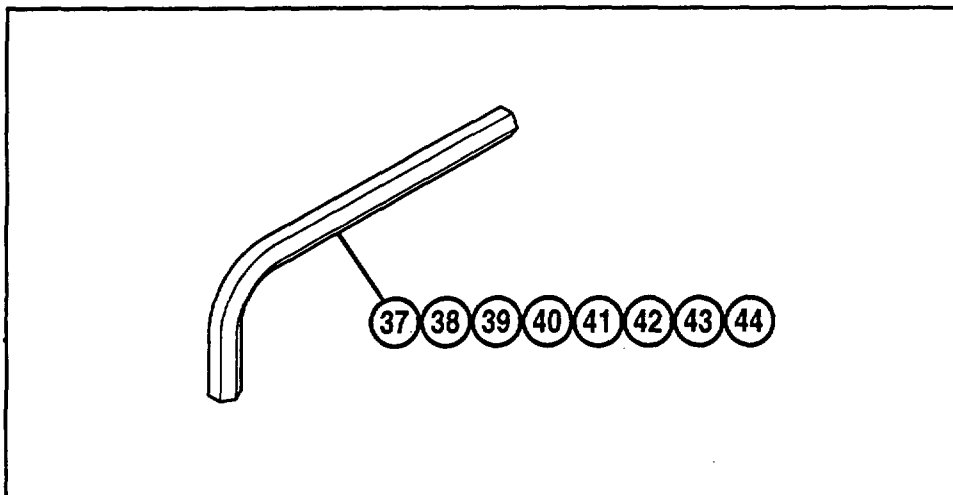


(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
24	7510-01-065-0166	FOLDER, EQUIPMENT RECORD: (81349) MIL-F-43986	EA	1
25	7240-00-404-9795	FUNNEL, PLASTIC: 0.5-gallon (1.89-L) (in compartment, right side exterior) (58536) A-A-1663	EA	1
26	8415-00-268-7870	GLOVES, LEATHER, WORK, W/O GAUNTLET: (in drawer, left section main oddment compartment) (58536) A-A-55060		2
27	5120-00-203-4656	HAMMER, HAND: blacksmith, double- face, 10-lb (4.54-kg), (type 10, class 1) (above pioneer rack on exterior right side) (81348) GGG-H-86	EA	1
28	5120-00-288-6574	HANDLE, MATTOCK: 36 in. (914 mm) lg., (in pioneer rack on exterior right side) (81348) NN-H-93, B Grade	EA	1
29	5120-00-188-1790	JACK, HYDRAULIC, HAND: 30-ton (27.2-metric ton) capacity w/operating handle (one in tray under floor behind driver, one in rack under cal. .50 ammo rack, left side) (96906) MS16282-1	EA	2

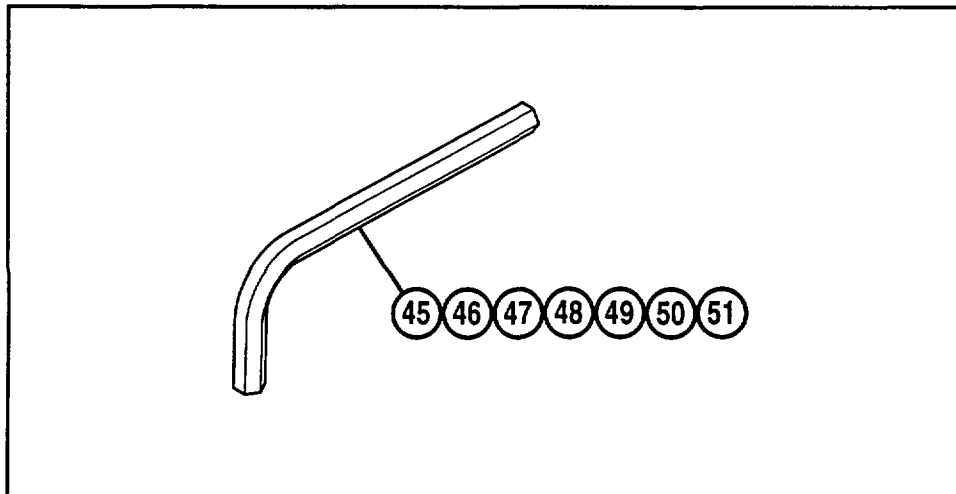


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
30	5120-00-224-7330	JACK, HANDLE, HAND: 12-ton-(10.9-metric-ton) capacity (in rack under cal .50 ammo rack, left side) (28047) E12-9A	EA	1
31	5120-00-935-4641	KEY: socket head screw, hex, drive, L-type handle, 20 keys w/case (in rear oddment compartment, right side) (81348) GGG-K-275  Composed of:		1
32	5120-00-555-2639	KEY: socket head screw, 0.028-hex (81348) GGG-K-00275	EA	1
33	5120-00-198-5400	KEY: socket head screw, 0.050-hex (81348) GGG-K-00275	EA	1
34	5120-00-198-5401	KEY: socket head screw, 0.050-hex (81348) GGG-K-00275	EA	1
35	5120-00-198-5398	KEY: socket head screw, 0.050-hex (81348) GGG-K-00275	EA	1
36	5120-00-224-2504	KEY: socket head screw, 5/64-in.-hex, 1-31/32-in.-lg. (10001) 41-W-2446	EA	1

Section III. BII--Continued.

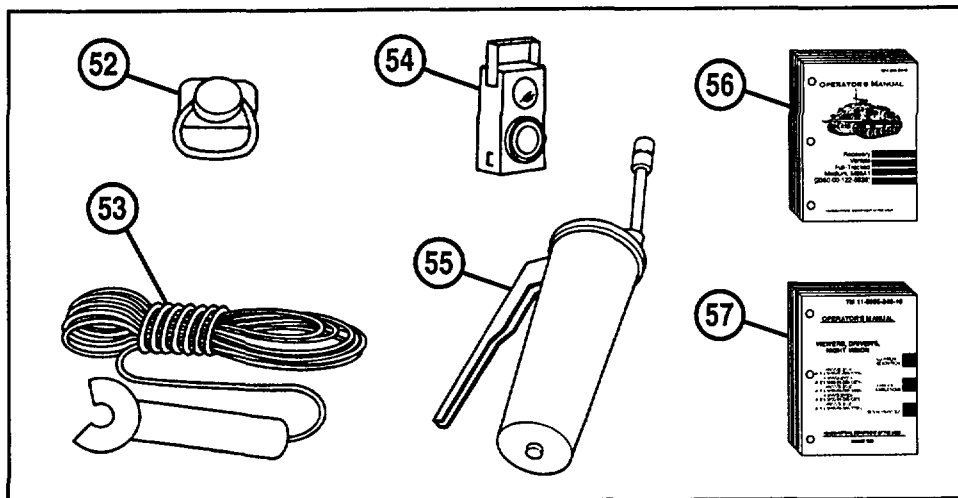


(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
37	5120-00-242-7410	KEY: socket head screw, 3/32-in.-hex, 2-3/32-in.-lg. (10001) 41-W-2449-2	EA	1
38	5120-00-889-2162	KEY: socket head screw, 7/64-in.-hex (81348) GGG-K-00275	EA	1
39	5120-00-240-5292	KEY: socket head screw, 1/8-in.-hex (81348) GGG-K-00275	EA	1
40	5120-00-889-2163	KEY: socket head screw, 9/64-in.-hex (81348) GGG-K-00275	EA	1
41	5120-00-198-5392	KEY: socket head screw, 5/32-in.-hex (81348) GGG-K-00275	EA	1
42	5120-00-240-5300	KEY: socket head screw, 3/16-in.-hex (81348) GGG-K-00275	EA	1
43	5120-00-242-7411	KEY: socket head screw, 7/32-in.-hex, 3-7/32-in.-lg. (81348) GGG-K-275	EA	1
44	5120-00-224-4659	KEY: socket head screw, 1/4-in.-hex, 3-11/32-in.-lg. (81348) GGG-K-00275	EA	1

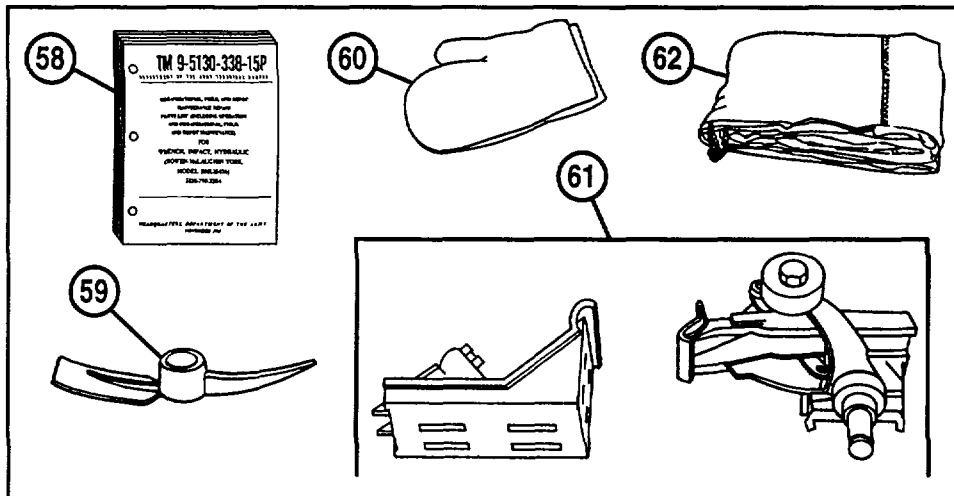


(1) Illu. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
45	5120-00-240-5274	KEY: socket head screw, 5/16-in.-hex, 3-27/32-in.-lg. (81348) GGG-K-00275	EA	1
46	5120-00-198-5390	KEY: socket head screw, 3/8-in.-hex, 4-1/4-in.-lg. (81348) GGG-K-00275	EA	1
47	5120-00-240-5277	KEY: socket head screw, 7/16-in.-hex (81348) GGG-K-00275	EA	1
48	5120-00-198-5391	KEY: socket head screw, 1/2-in.-hex, 5-11/32-in.-lg. (81348) GGG-K-00275	EA	1
49	5120-00-240-5268	KEY: socket head screw, 9/16-in.-hex, 5-27/32-in.-lg. (81348) GGG-K-00275	EA	1
50	5120-00-224-2510	KEY: socket head screw, 5/8-in.-hex, 6-1/4-in.-lg. (81348) GGG-K-00275	EA	1
51	5120-00-222-1489	KEY: socket head screw, 3/4-in.-hex (81348) GGG-K-00275	EA	1

Section III. BII-Continued.

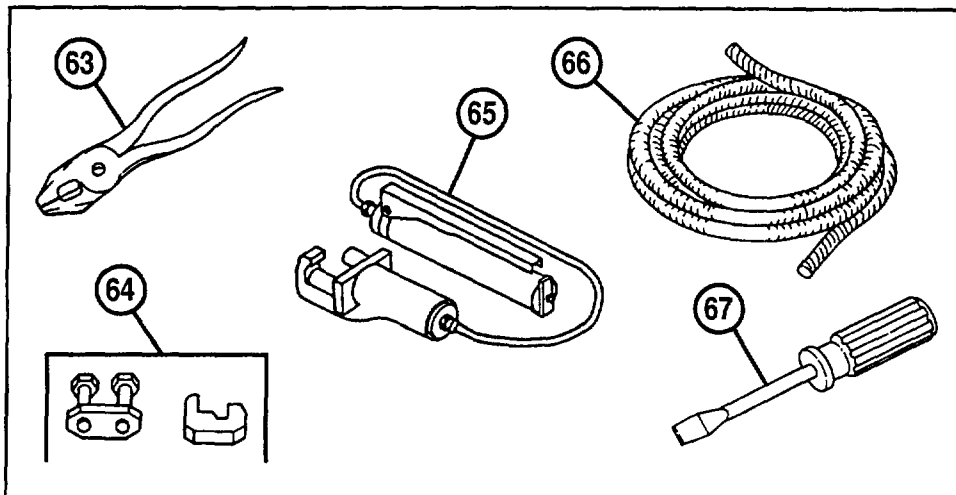


(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
52	6230-00-498-9408	LANTERN, ELECTRIC: portable 6-volt w/o battery (in rear oddment stowage compartment, right side) (81349) MIL-L-18838	EA	1
53	6230-00-086-4293	LIGHT, EXTENSION: inspection, 25-ft- (7.62-m-) lg. w/single contact plug and socket (in small parts box) (19204) 17-C-35079-47	EA	1
54	6230-00-796-2657	LIGHT, FLASHER: portable (in case on rear of commander's seat) (19207) 8387795	EA	1
55	4930-00-766-3545	LUBRICATING GUN: 21-oz. (621-mg) capacity, 18,000-psi (124,110-kPa) (in rear oddment compartment, right side) (19207) MIL-G-3859, 10947522	EA	1
56		MANUAL, TECHNICAL, OPERATOR'S: (in pamphlet bag) TM 9-2350-256-10	BK	1
57		MANUAL, TECHNICAL, VIEWER, DRIVER'S NIGHT VISION: (in pamphlet bag) TM 11-5855-249-10	BK	1



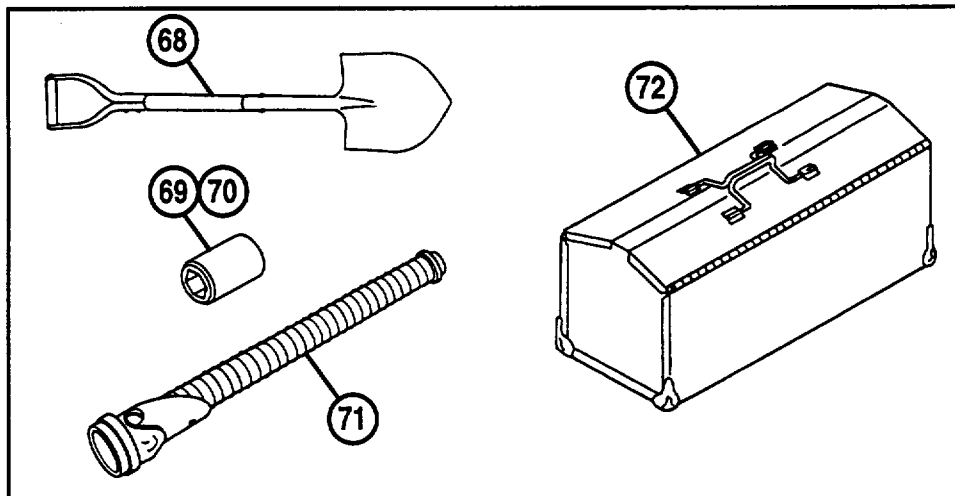
(1) Ill. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
58		MANUAL, TECHNICAL, WRENCH, IMPACT, HYDRAULIC: (in pamphlet bag) TM 9-5130-338-15P	BK	1
59	5120-00-243-2395	MATTOCK: pick w/o handle, (type II, class F) (in pioneer rack on exterior right side) (19207) 11677022	EA	1
60	8415-01-092-0039	MITTENS, HEAT PROTECTIVE: asbestos, M1942 (in small parts box) (81349) MIL-M-11199		2
61	1005-00-836-7286	MOUNT, MACHINE GUN, CAL50: (on commander's cupola) (19207) 8367286  OR  1005-00-704-6650	EA	1
62	2540-00-653-7589  8340-00-841-6456	PAULIN, COTTON, DUCK: 12-ft (3.65-m) x 12-ft (3.65-m) (in basket on front engine deck) (19207) 6537589  OR  PAULIN, COTTON, DUCK: 12-ft (3.65-m) x 17-ft (5.18-m) (81348) K-P-146	EA  EA	1

Section III. BII Continued.



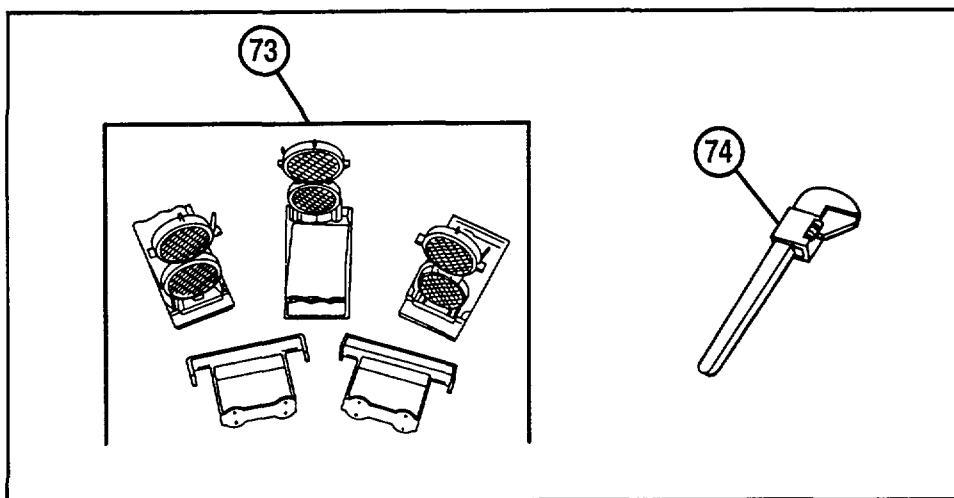
(1) Ill. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
63	5120-00-239-8251	PLIERS, LINEMAN'S: w/side cutter style 10, sect A, reference drawing group 61 Fed C66-P-471, type IX, class 1, style A, nom. size, 8-in. (203.2-mm)(in small parts box) (72368) 1950	EA	1
64	5120-00-301-0037	PULLER, TRACK END CONNECTOR, TRACK (LINK PIN): (under drawers in front oddment compartment, right side) (19207) 8708874	EA	1
OR				
65	5120-01-052-5642	PULLER AND PUMP END CONNECTOR, TRACK (LINK PIN): (under drawers in front oddment compartment, right side) (19207) 12285479	EA	1
66	4020-01-204-7039	ROPE, FIBROUS, 100-FT (30.48-m): (on paulin on engine deck) (19207) 12322571	EA	1
67	5120-00-227-7338	SCREWDRIVER, FLAT TIP: extra HD S-handle, w/w.-inserts, 5-in.-(127.0-mm-) blade (in small parts box) (81348) GGG-S-121	EA	1



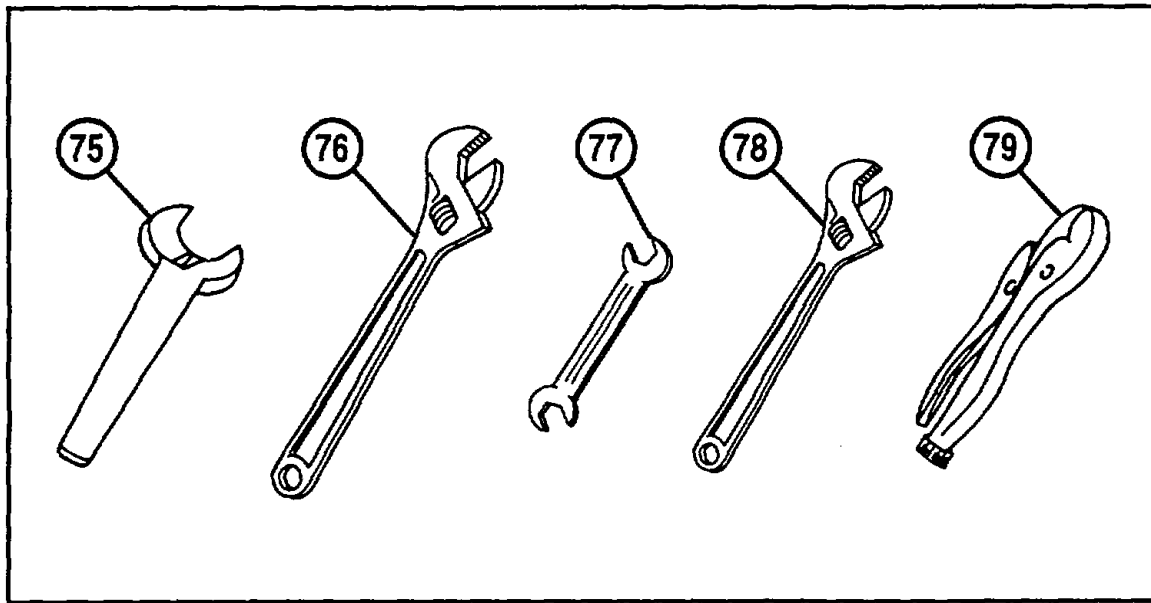


(1) Illu. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
68	5120-00-293-3336	SHOVEL, HAND: general purpose, D-handled size 2, round point (in pioneer rack on exterior right side) (19207) 11655784	EA	1
69	5130-01-084-6025	SOCKET WRENCH, POWER DRIVE: 6-pt, thin wall, 1-5/16-in.-opening, 1-13/16-in. maximum o.d. (use on track center guide nut) (in small parts box) (19207) 10894847-1	EA	1
70	5130-00-964-9113	SOCKET, SOCKET WRENCH, POWER DRIVE: 6-pt, thin wall, 1-1/4-in.-opening, used on track center guide nut (in small parts box) (19207) 10894847	EA	1
71	7240-00-177-6154	SPOUT, CAN, FLEX, NOZZLE, CAM TYPE: (in main oddment compartment, above ammo rack, right side) (09647) 838-A-7511	EA	2
72	5140-00-498-8772	TOOL BOX, MECHANICAL GENERAL W/TOTE: 21-in.-(533.4-mm-) lg., 8.5-in.-(215.9-mm-) w., 7.375-in.-(187.3-mm-) deep (empty) (for small parts) (under ammo rack, cal. .50 near left access door) (80063) CH77		1

Section III. BII-Continued.

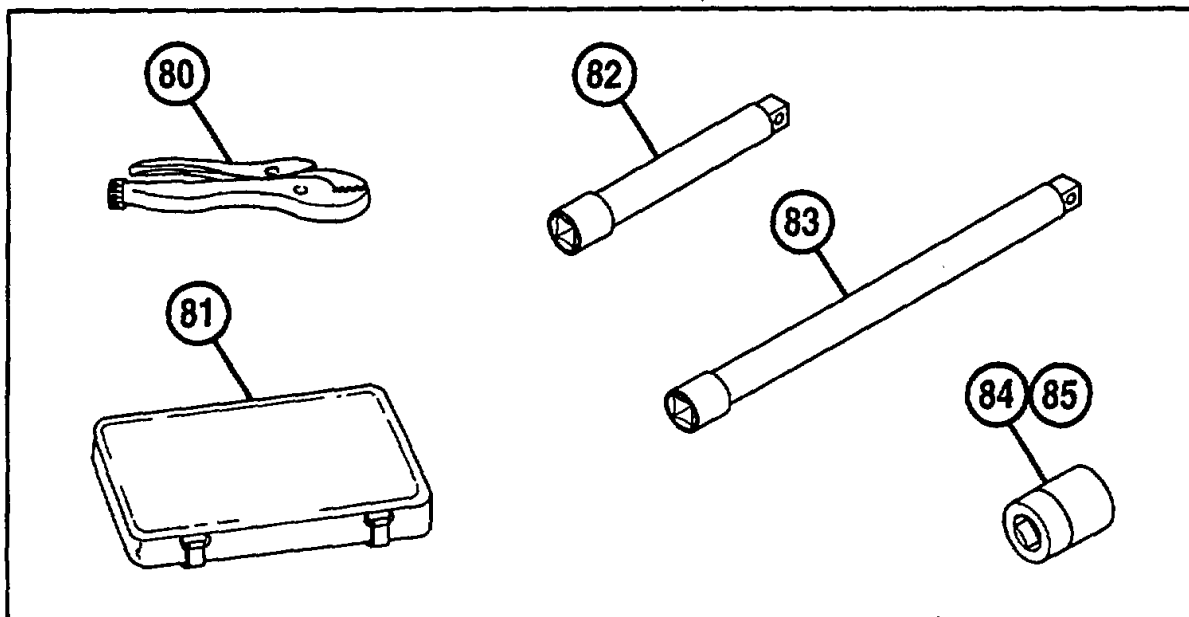


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
73		WARNING DEVICE KIT: reflector type, w/ flags (in rear oddment compartment, right side) (19207) 8744251  Composed of: <ul style="list-style-type: none"> <li>• 1-CARRIER (bracket)</li> <li>• 2-FLAG, red, 12 in. (304.8 mm) x 12 in.                          (304.8 mm)</li> <li>• 2-FLAGSTAFF, folding type</li> <li>• 3-REFLECTOR, red</li> </ul> <p style="text-align: center;">OR</p> HIGHWAY, FLARE KIT WARNING DEVICE SET: portable, triangular- shaped, with open center, 3 devices per set in container (19207) 11669000		1
74	5120-00-264-3793	WRENCH, ADJUSTABLE: auto type, 15.0-in.-(381.0-mm-) lg., 0-to 3.625-in. (0- to 92.1-mm) jaw opening (in small parts box) (81348) GGG-W-631	EA	1

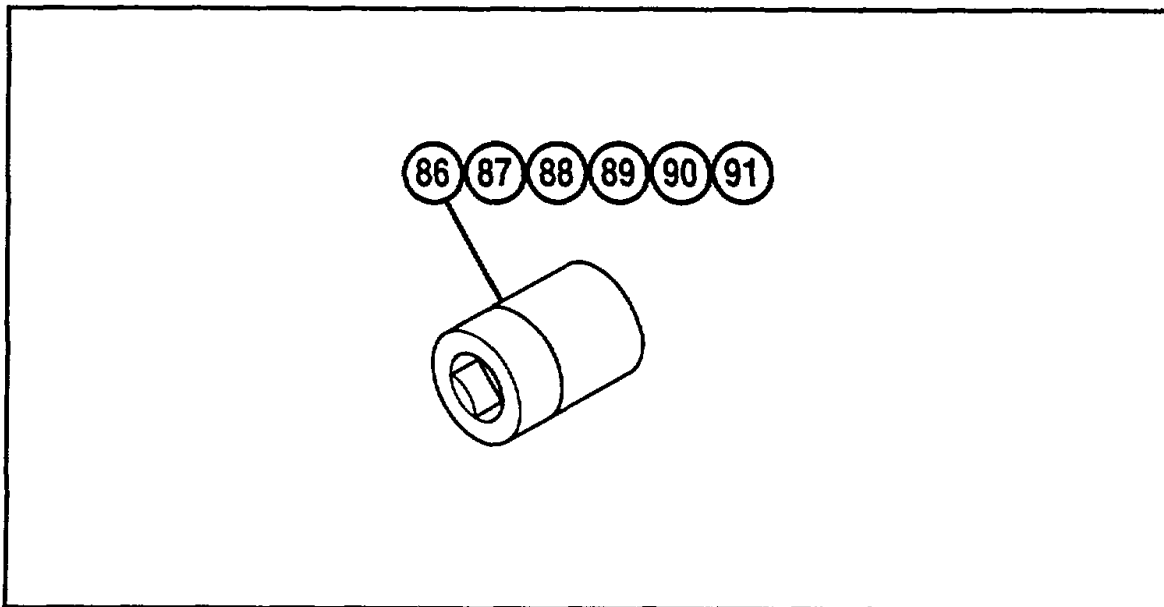


(1) Illno. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
75	5120-00-277-6470	WRENCH, OPEN-END ADJUSTABLE: 2.9375- to 4.75-in. (74.6- to 120.7-mm) jaw opening (on cal. .50 ammo rack near left access door) (81348) GGG-W-631, type I, class 2	EA	1
76	5120-00-240-1414	WRENCH, OPEN-END, ADJUSTABLE: single head, 2.0625-in.-(52.4-mm-) jaw opening, 18-in.-(457.2-mm-) lg. (in small parts box) (81348) GGG-W-631	EA	1
77	5120-00-277-2307	WRENCH, OPEN-END, FIXED: double- head 15° head-angle, engages 5/16-in. and 3/8-in. openings, 3-3/4 in.-lg.-(in small parts box) (58536) A-A1356	EA	1
78	5120-00-264-3796	WRENCH, OPEN-END, ADJUSTABLE: single head, straight-handle, 0- to 1.322-in. (0- to 33.58-mm) jaw opening capacity, 12-in.-(305-mm-) lg. (in small parts box) (96508) D712	EA	1
79	5120-00-494-1911	WRENCH, PLIERS, CURVED JAW STYLE: w/wirecutter, 8.5-in.-(216-mm-) lg. (in small parts box) (81348) GGG-W-00649	EA	1

Section III. BII-Continued.

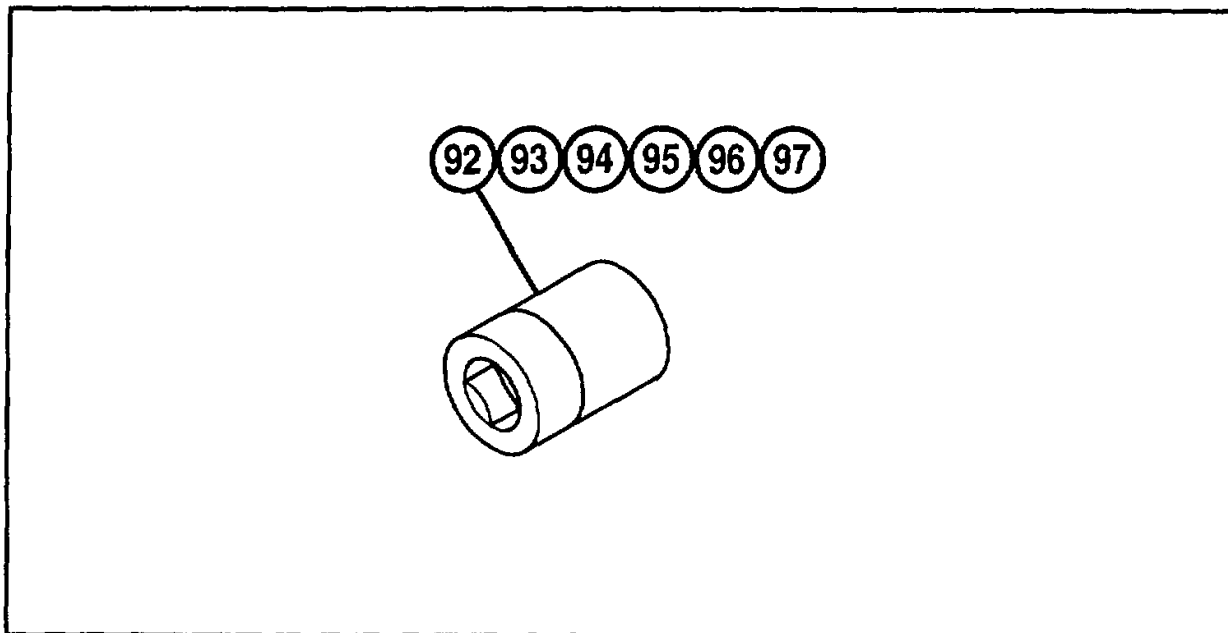


(1) Illo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
80	5120-00-277-4244	WRENCH, PLIERS, VISE GRIP: 8.5-in.- (215.9-mm-) lg. (in spare parts box) (81348) GGG-W-00649	EA	1
81	5130-00-357-5135	WRENCH SET, SOCKET: 3/4-in.-sq.-dr., 6-pt HD industrial type, w/case, w/extension bars, 9/16- to 1-1/2-in. openings, 18 pieces (in rear oddment compartment, right side) (58536) A-A-399A  Composed of:		1
82	5130-00-449-6656	EXTENSION, SOCKET WRENCH: HD, 3/4-in.-sq.-dr., 7-in.-lg. (96906) MS16577-7	EA	1
83	5130-00-449-6657	EXTENSION, SOCKET WRENCH: HD, 3/4-in.-sq.-dr., 13-in.-lg. (81348) GGG-W-660	EA	1
84	5130-00-227-6698	SOCKET, SOCKET WRENCH: 3/4-in.- sq.-dr., 6-pt HD, 9/16-in.-opening (80204) B107.2	EA	1
85	5130-00-227-6699	SOCKET, WRENCH WRENCH: 3/4-in.- sq.-dr., 6-pt HD, 5/8-in.-opening (81348) GGG-W-660	EA	1

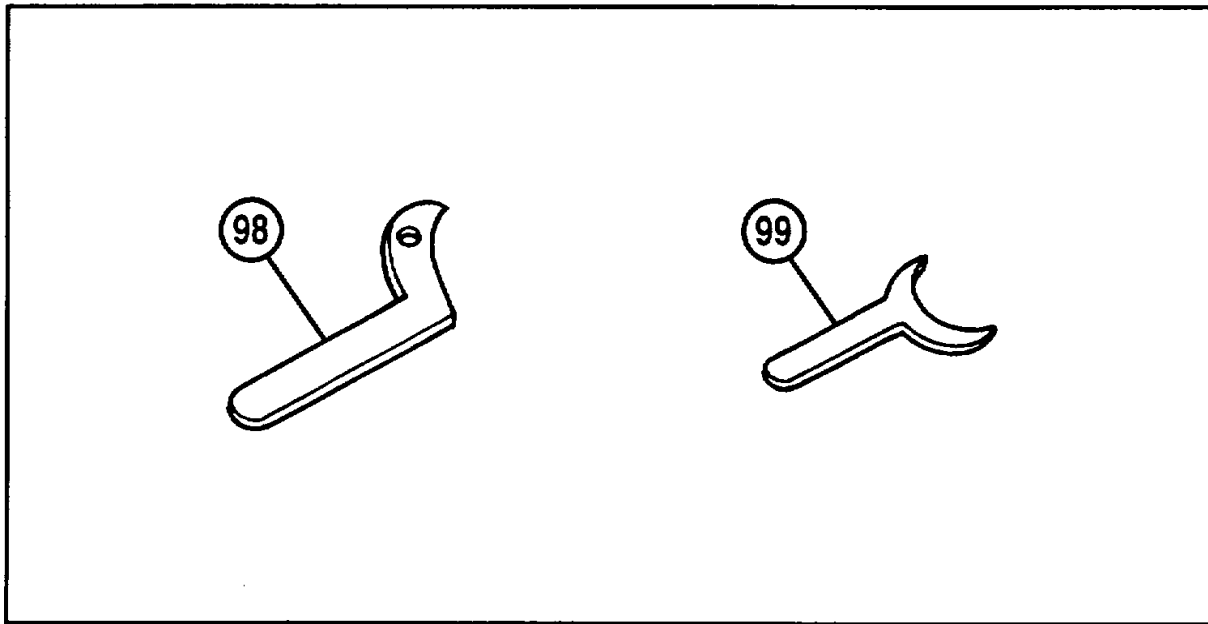


(1) Illlo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
86	5130-00-227-6700	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 11/16-in.-opening (55719) IM222	EA	1
87	5130-00-227-6701	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 3/4-in.-opening (80204) B107.2	EA	1
88	5130-00-227-6676	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 13/16-in.-opening (81348) GGG-W-660	EA	1
89	5130-00-227-6677	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 7/8-in.-opening (80204) B107.2	EA	1
90	5130-00-293-1411	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 15/16-in.-opening (80204) B107.2	EA	1
91	5130-00-227-6679	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-in.-opening (80204) B107.2	EA	1

Section III. BII-Continued.



(1) Ilo. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
92	5130-00-293-1412	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-1/16-in.-opening (80204) B107.2	EA	1
93	5130-00-227-6681	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-1/8-in.-opening (80204) B107.2	EA	1
94	5130-00-227-6683	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-1/4-in.-opening (80204) B107.2	EA	1
95	5130-00-227-6684	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-5/16-in.-opening (80204) B107.2	EA	1
96	5130-00-227-6686	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-7/16-in.-opening (80204) B107.2	EA	1
97	5130-00-236-3979	SOCKET, SOCKET WRENCH: 3/4-in.-sq.-dr., 6-pt HD, 1-1/2-in.-opening (80204) B107.2	EA	1



(1) Illu. No.	(2) NSN	(3) Description, CAGEC, and PN	(4) U/I	(5) Qty Req
98	5120-00-277-9076	WRENCH, SPANNER, ADJUSTABLE HOOK: (in small parts box) (81348) GGG-W-665	EA	1
99	5120-00-293-0245	WRENCH, SPANNER: nonadjustable face, 2-1/4-in. center to center of pins, 1/4-in.-dia., 6-7/8-in.-lg. (in small parts box) (98897) 325291	EA	1

**APPENDIX C  
ADDITIONAL AUTHORIZATION LIST (AAL)**

**Section I. INTRODUCTION**

**C-1. SCOPE.** This appendix lists items you are authorized for the support of the M88A1 Medium Recovery Vehicle.

**C-2. GENERAL.** This list identifies items that do not have to accompany the M88A1 and do not have to be turned in with it. These items are all authorized to you by, Common Table of Allowances (CTA), Modified Table of Organization and Equipment (MTOE), Table of Distribution and Allowance (TDA), or Joint Table of Allowances (TA).

**C-3. EXPLANATION OF LISTING.** National Stock Numbers (NSNs), descriptions, Unit of Issue (U/I), and quantities recommended (Qty. Recm.) are provided to help you identify and request the additional items you require to support this equipment.



## Section II. ADDITIONAL AUTHORIZATION LIST.

(1) NSN	(2) Description, CAGEC, and PN	(3) U/I	(4) Qty. Recm.
6135-00-120-1020	BATTERY, DRY, 1.5-VOLT: type BA-2030/U (in flashlights) 5030200	EA	8
6135-00-050-3280	BATTERY, DRY, 6-VOLT: type BA-200/U (1 in portable lantern, 2 in flashlight) (99993) 050-3280	EA	3
6650-00-530-0974	BINOCULAR, 171A1 W/E: in bracket on cab ceiling, front of commander (19200) 6702518  Composed of:  • 1-BINOCULAR, M17A1: 7597723  • 1-CASE, CARRYING, M63A1: (19207) 7694281, A6702518		
8140-00-960-1699	BOX, AMMO, CAL 50, M2A1: (in upper left section of cal. .50 ammo rack near left access door) (19200) 7553296	EA	1
	CARTRIDGE, 5.56 MM: for 2 rifles, 5.56 mm M16/M16A1 or cartridge, 7.62 mm (for M14) (in cal. .50 ammo box, M2A1 in cal. .50 ammo rack, upper left section)	EA	300
	CARTRIDGE, CAL. .45: in 12-30 mag. for 2 machine guns, cal. 45, M3A1: in 2 ammo cases 7052438 (in oddment tray, right of mechanic)	EA	360
8465-00-705-2438	CASE, AMMO: canvas carrying (in oddment tray right of mechanic) (19207) 7052438	EA	2
4230-01-133-4124	DECONTAMINATION APPARATUS: M13		1
6230-00-264-8261	FLASHLIGHT: electric, hand, 2 cell w/lamp, w/o batteries (at each crew position) (81361) E5-51-527		

(1) NSN	(2) Description, CAGEC, and PN	(3) U/I	(4) Qty. Recm.
	GRENADE, HAND: (In boxes 7388581 subfloor, left rear of mechanic)	EA	8
5120-00-595-8387	JACK KIT: (on left side of crew compartment behind driver)	EA	1
	LAW, LAUNCHER AND AMMO: (8 in box on right cab wall, 2 in bracket above left ammo rack)	EA	10
1005-00-726-5636	MACHINE GUN, CAL 50: M2 flex. w/oe (in mount on commander's cupola) (19204) 7265636  OR	EA	1
1005-00-322-9715	MACHINE GUN, CAL 50: M2 flex. w/e (19204) 7265636		
8345-00-174-6865	PANEL MARKER: aerial liaison, red on side, yellow other side, 6-ft-(1.8-m-) lg. x 2-ft-(0.6-m-) w. w/o case (in main oddment compartment, right side) (81349) MIL-P-40061	EA	2
	POT, SMOKE, HC	EA	12
	ROADWHEEL, DISC: (right and left side, exterior)	EA	2
2530-00-692-9316	SHOE, TRACK: rubber, T107 (3 above fender right side, 3 above fender left side) 8705914 Composed of:	EA	6
5306-00-695-6188	<ul style="list-style-type: none"> <li>• 12-BOLTS: track shoe end connector wedge (in forward basket under floor behind driver) (19207) 8382360</li> </ul>		
2530-00-692-9317	<ul style="list-style-type: none"> <li>• 12-CONNECTORS: track shoe end (in forward basket under floor behind driver) (19207) 8705919</li> </ul>		
2530-00-039-9153	<ul style="list-style-type: none"> <li>• 12-WEDGES: track shoe (in forward basket under floor behind driver) (19207) 8382359</li> </ul>		

Section II. ADDITIONAL AUTHORIZATION LIST-Continued.

(1) NSN	(2) Description, CAGEC, and PN	(3) U/I	(4) Qty. Recm.
5306-00-706-9543	<ul style="list-style-type: none"> <li>• 6-BOLTS: used with center guide cap 8705894 (in forward basket under floor behind driver) (19207) 7069543</li> </ul>		
2530-00-692-9314	<ul style="list-style-type: none"> <li>• 6-CAPS: track shoe center guide (in forward basket under floor behind driver) (19207) 8705894</li> </ul>		
2530-00-692-9315	<ul style="list-style-type: none"> <li>• 6-GUIDES: track shoe center (in forward basket under floor behind driver) (19207) 8705897</li> <li>• 6-LINKS: track (3 above fender right side, 3 above fender left side) 8705899</li> </ul>		
5310-01-006-2085	<ul style="list-style-type: none"> <li>• 6-NUTS: used with center guide cap 8705894 (in forward basket under floor behind driver) (96906) MS51943-18</li> </ul>		
	SIGNAL, GROUND FLARE: (in box on oddment tray, left of driver)	EA	12
	SPROCKET, DRIVE: (right and left side exterior)	EA	2
1005-00-672-1771	SUBMACHINE GUN, CAL 45, M3A1 W/E: (1 in left cab wall above access door, 1 on left side of winch cable shield) (19205) 6721771	EA	2
5180-00-177-7033	TOOL KIT, GENERAL MECHANICS: w/ box 21-in.-(533-mm-) lg., 8.5-in.-(216-mm-) w., 7.38-in.-(187-mm-) deep, MIL-B-3981, type II, class B (in rack under cal. .50 ammo rack left side) 41 -T-3534-30	EA	2
3433-01-327-4609	TORCH, CUTTING: exothermic w/case, (09687) DFP308, type II	EA	Var.

(1) NSN	(2) Description, CAGEC, and PN	(3) U/I	(4) Qty. Recm.
	TOW BAR AID: fabricated  WHEEL, TRACK SUPPORT: (right and left side, exterior)	EA	2

**APPENDIX D  
EXPENDABLE AND DURABLE ITEMS LIST**

**Section I. INTRODUCTION**

**D-1. SCOPE.** This appendix lists expendable and durable items that are needed to operate and maintain the M88A1 Medium Recovery Vehicle. This listing is for information only and is not authority to requisition listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

**D-2. EXPLANATION OF COLUMNS.**

- a. **Column 1, Item Number (Item No.).** This is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g., "Use cleaning compound [Appx. D, item 8]").
- b. **Column 2, Level.** This column identifies the lowest level of maintenance that requires the listed item (C--Operator/Crew).
- c. **Column 3, National Stock Number (NSN).** This is the NSN assigned to the item which you can use to requisition it.
- d. **Column 4, Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (PN).** This provides the other information you need to identify the item.
- e. **Column 5, Unit of Measure (U/M).** This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

## Section II. EXPENDABLE AND DURABLE ITEMS LIST.

(1) Item No.	(2) Level	(3) NSN	(4) Item Name, Description, CAGEC, and PN	(5) U/M
1	C	8040-00-273-8716	ADHESIVE BONDING: vulcanized synthetic rubber to steel, class I (81348) MMM-A-121	QT
2	C	8040-00-833-9563	ADHESIVE SEALANT, SILICONE: white, RTV, general purpose, type I MIL-A-46106A	TB
3	C		ADHESIVE, BONDING: (81349) MIL-A-1154	GL
4	C	8040-00-290-4301	ADHESIVE, RUBBER BASE, GENERAL PURPOSE: type II (81349) MIL-A-5092	GL
5	C	8040-00-152-0063	ADHESIVE, RUBBER BASE, GENERAL PURPOSE: type II (81349) MMM-A-1617	QT
6	C	8020-00-224-8024	BRUSH, ARTISTS: (81348) H-B-118	EA
7	C	8020-00-244-0153	BRUSH, ARTIST, FLAT CHISEL: (81348) H-B-241	EA
8	C	6850-00-224-6665	CLEANING COMPOUND: (81349) MIL-C-11090	CN
9	C	6850-00-224-6657	CLEANING COMPOUND, RIFLE BORE: (81349) MIL-C-372	CN
10	C	6850-00-597-9765	CLEANING SOLVENT: (81349) MIL-C-18718	GL
11	C	5350-00-221-0872	CLOTH, ABRASIVE, CROCUS (81348) P-C-458	PG
12	C	8030-00-231-2345	CORROSION PREVENTATIVE COMPOUND GR4: (81349) MIL-C-16173	GL
13	C	8030-00-062-5866	CORROSION PREVENTATIVE COMPOUND GR4: (81349) MIL-C-16173	GL

(1) Item No.	(2) Level	(3) NSN	(4) Item Name, Description, CAGEC, and PN	(5) U/M
14	C	7930-00-282-9699	DETERGENT, GENERAL PURPOSE: (81349) MIL-D-16791	GL
15	C	6810-00-356-4936	DISTILLED WATER: (80063) 6Z9250	GL
16	C	6850-00-281-1985	DRY-CLEANING SOLVENT: (81348) P-D-680	PT
17	C	8010-00-111-7930	ENAMEL, ALKYD, CAMOUFLAGE: forest green MIL-E-52798A	QT
18	C		ENAMEL, ALKYD, SEMIGLOSS: red TT-E-529D	PT
19	C		ENAMEL, ALKYD, SEMIGLOSS: white TT-E-529D	PT
20	C		ENAMEL, EPOXY, GLOSS: white (17925) MIL-C-22750	GL
21	C	6810-00-242-3645	ETHYL ALCOHOL: (81348) O-C-265	GL
22	C	9150-00-190-0904	GREASE, AUTOMOTIVE AND ARTILLERY: (81349) MIL-G-10924C	LB
23	C	5970-00-644-2636	INSULATION, TAPE, ELECTRICAL: black, pressure sensitive adhesive, plastic, 0.0085 in. (0.216 mm) thick by 0.75 in. (19.1 mm) w. (81348) HH-I-595C	RL
24	C		LACQUER, CLEAR: spray TT-L-581	CN
25	C	9150-00-231-6689	LUBRICATING OIL: general purpose, preservative (water displacing, low temperature) (81349) VV-L-800A	GL
26	C	9150-01-035-5390	LUBRICATING OIL: gear, multi- purpose, grade 90 (81349) MIL-L-2105C	GL

**Section II. EXPENDABLE AND DURABLE ITEMS LIST-  
Continued.**

(1) Item No.	(2) Level	(3) NSN	(4) Item Name, Description, CAGEC, and PN	(5) U/M
27	C		LUBRICATING OIL: internal combustion engine, preservative and break-in, type I, grade 10 MIL-L-21260C	GL
28	C		LUBRICATING OIL: internal combustion engine, preservative and break-in, type I, grade 30 MIL-L-21260C	GL
29	C		LUBRICATING OIL: contact and volatile corrosion inhibited MIL-R-46002A	GL
30	C		LUBRICATING OIL: grade 30 for above 30°F (-1°C) MIL-L-2104	GL
31	C	9150-00-402-2372	LUBRICATING OIL, ENGINE: (81349) MIL-L-46167	CN
32	C	9150-00-234-5197	LUBRICATING OIL, EXPOSED GEAR: (81348) VV-L-751	CN
33	C		LUBRICATION OIL: grade 10, for 0 to 30°F (-18 to -1°C) MIL-L-2104	GL
34	C		LUBRICATION OIL: for -25 to 0°F (-32 to -18°C) MIL-L-2104	GL
35	C		PAINT, CAMOUFLAGE: desert sand, color number 23448L MIL-E-52798, FED-STD-575A	GL
36	C		PAINT, STENCIL: lusterless white, color number 37875 MIL-E-52798, FED-STD-595	PT
37	C		PAINT, STENCIL: black, color number 37030 MIL-C-46168 or MIL-C-53039	PT

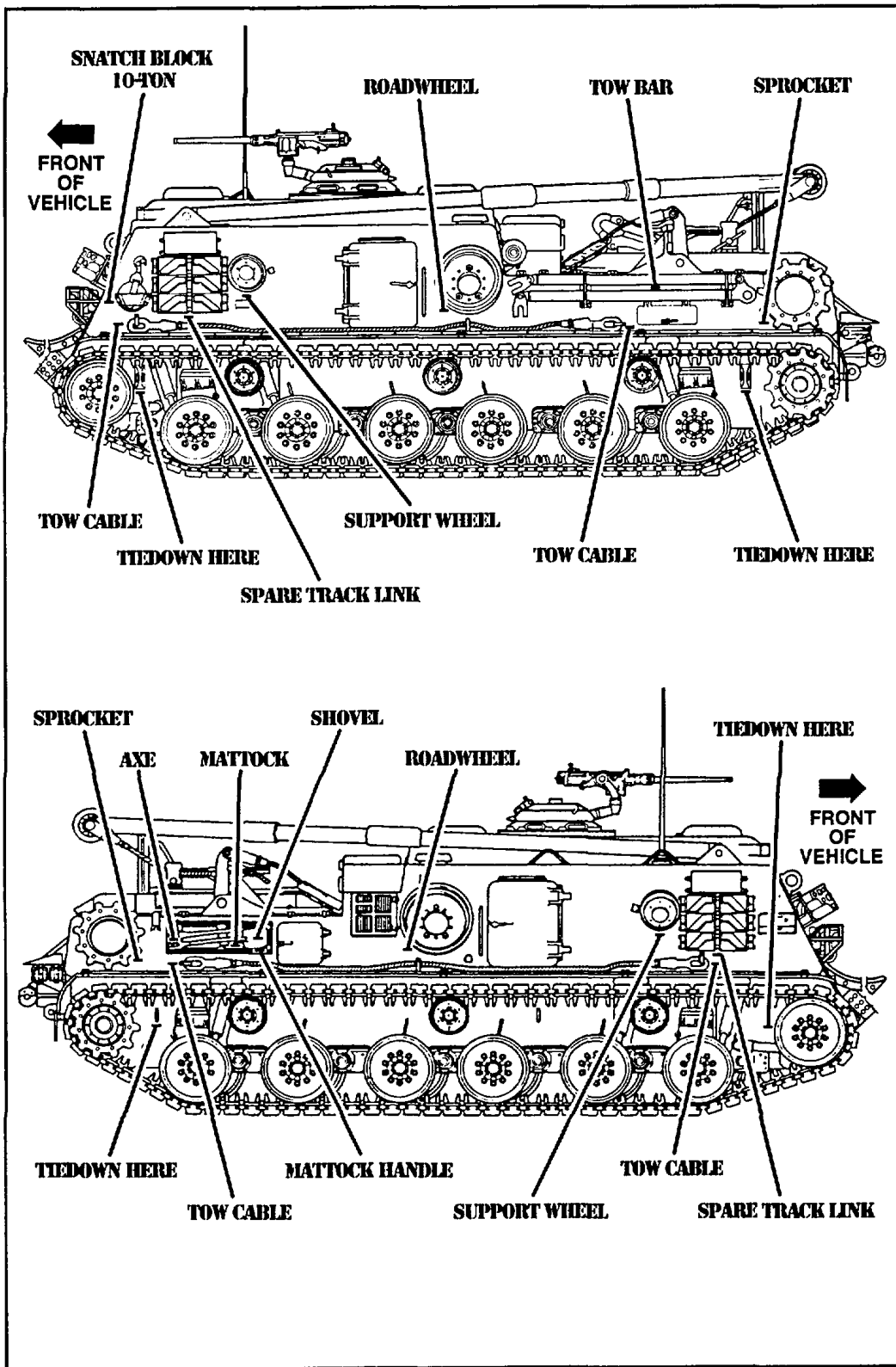


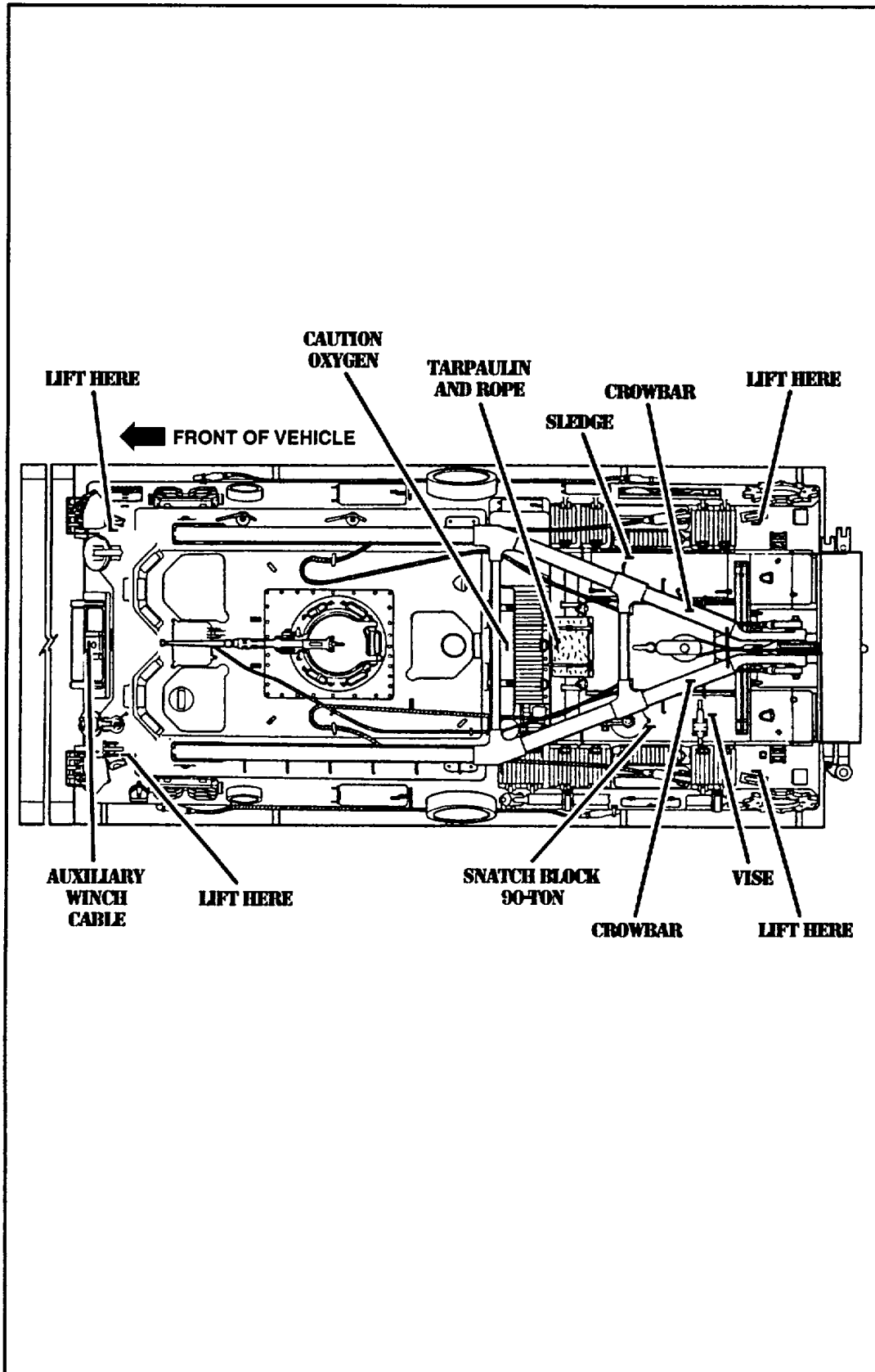
(1) Item No.	(2) Level	(3) NSN	(4) Item Name, Description, CAGEC, and PN	(5) U/M
38	C		PAPER, LENS, TISSUE: type 1, 4-in.- x 6-in.-(102-mm-x 152-mm-) sheets UU-P-313	EA
39	C		PRIMER, COATING, EPOXY: water reducible, lead and chromate free (81349) MIL-P-53030	GL
40	C	7920-00-205-3570	RAGS, WIPING COTTON: grade B, 50 lb (81348) DDD-R-30	BE
41	C		SEALANT, TAPE: (81349) MIL-T-27730	RL
42	C		SEALANT, TAPE: MIL-S-22473	RL
43	C		SEALER: (81349) MIL-S-12158	PT
44	C		SILICONE COMPOUND: (81349) MIL-S-86608	LB
45	C		SOLDER, TIN ALLOY, LEAD ALLOY: SN 60/40, form B, type S (81349) QQ-S-571E	LB
46	C		TAPE, TEFLON, THREAD SEALANT: 0.5-in.-(12.7-mm-) w. dwg. 10379740	RL
47	C		THINNER: synthetic resin enamels TT-T-306C	GL
48	C	8010-00-242-2089	THINNER: paint, mineral spirits, odorless, volatile TT-T291	GL
49	C	8010-00-165-4432	VARNISH: (81349) TT-V-121	PT
50	C	5610-00-141-7838	WALKWAY, COMPOUND, NONSLIP: forest green MIL-W-5044C	GL

**APPENDIX E**  
**STOWAGE AND SIGN GUIDE**

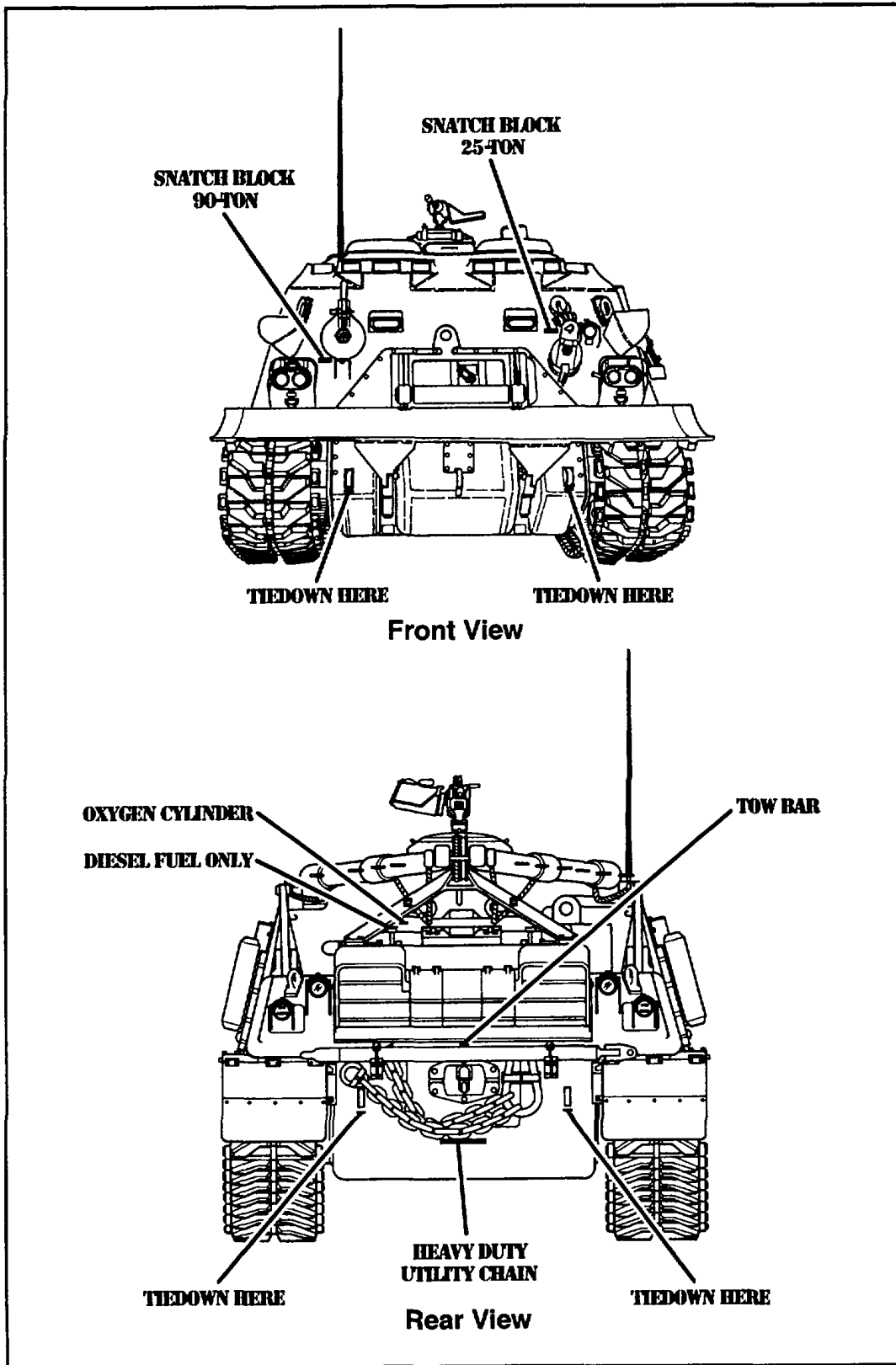
**E-1. SCOPE.** This appendix shows the location of the exterior stencils, the location and description of the labels, the location of the stowed equipment, and the location of the stowage straps required on the M88A1 Medium Recovery Vehicle. The equipment illustrated includes all Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) items.

E-2. LOCATION OF EXTERIOR STENCILS.

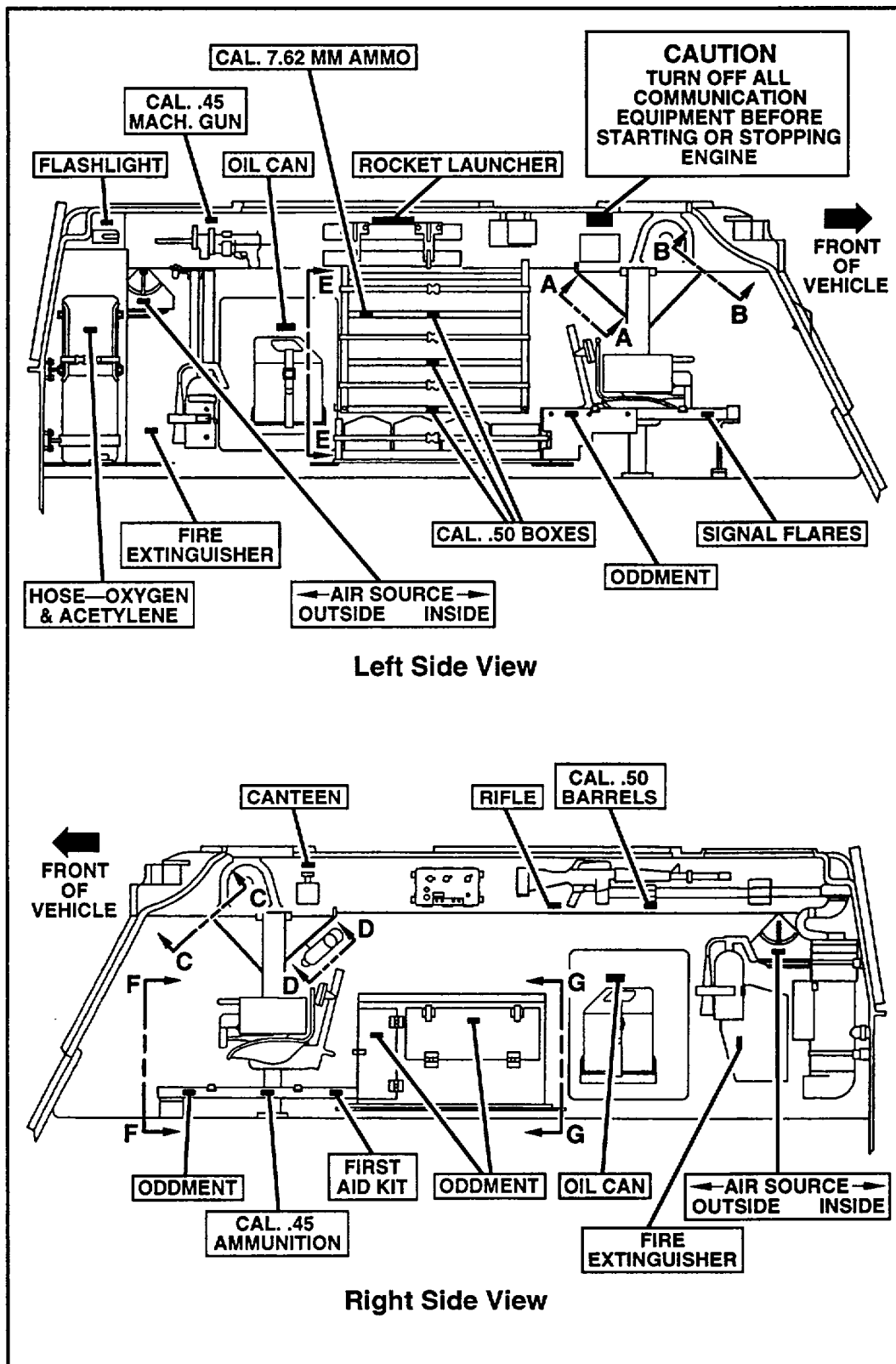




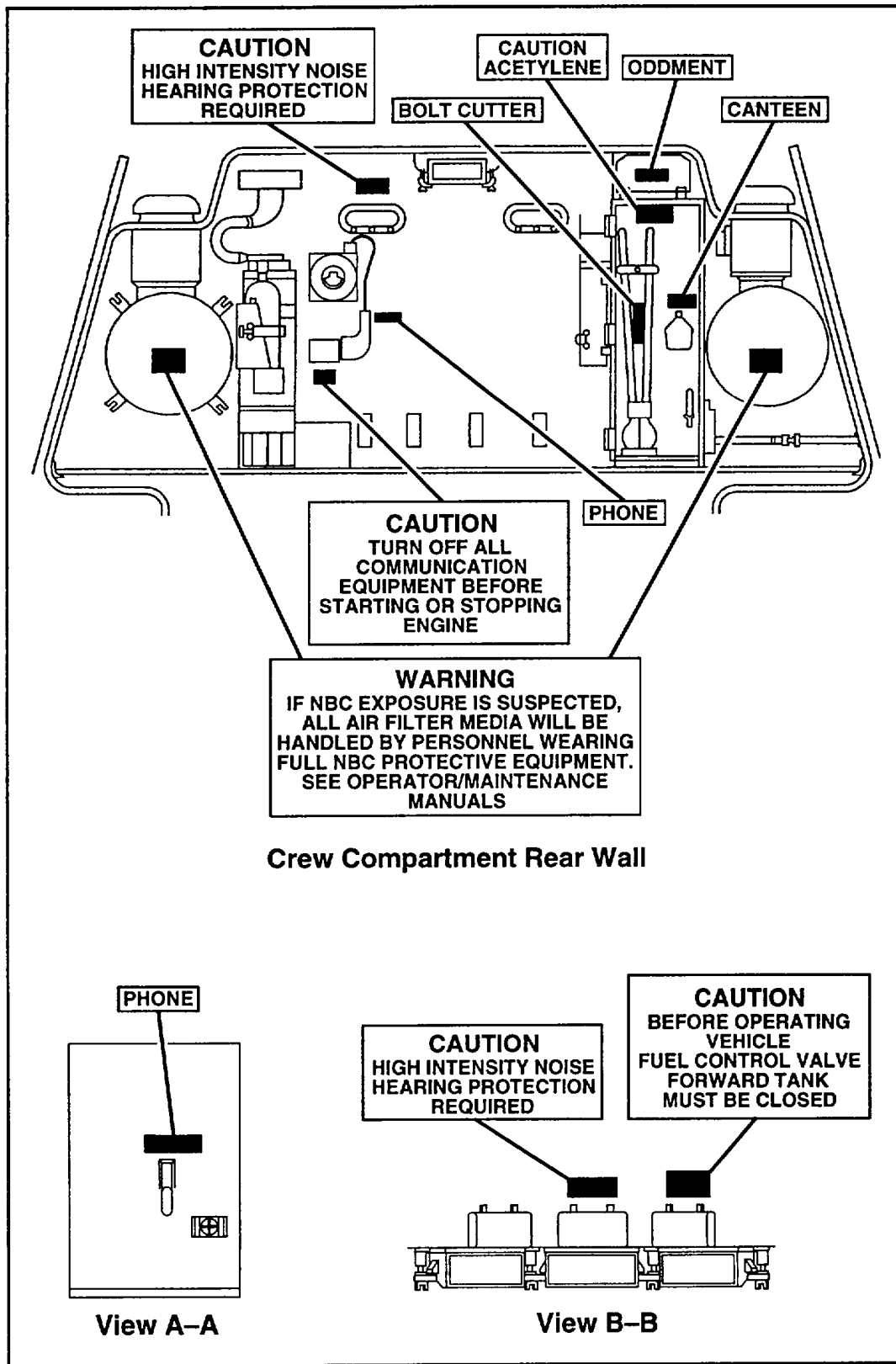
E-2. LOCATION OF EXTERIOR STENCILS-Continued.

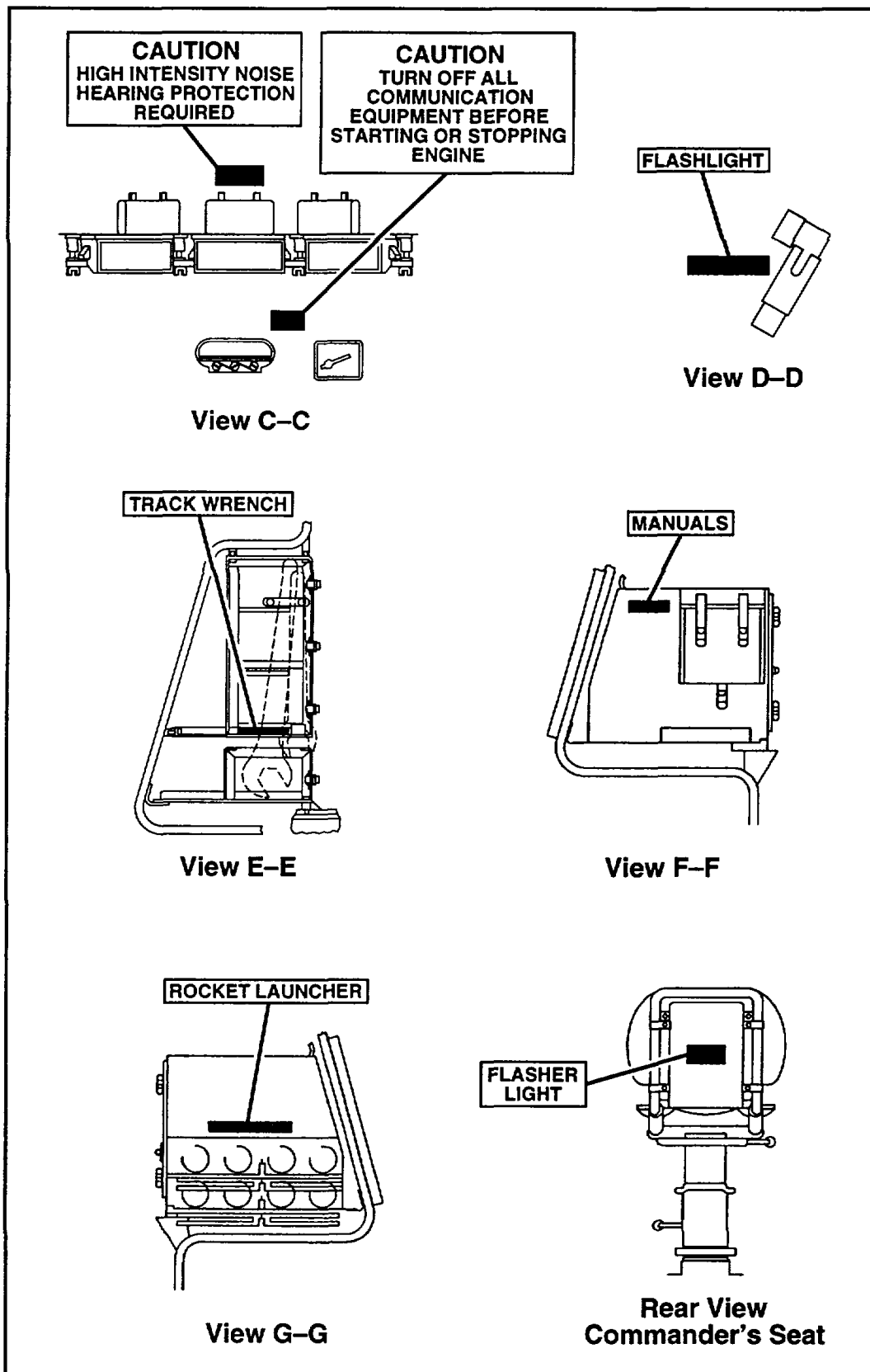


E-3. LOCATION AND DESCRIPTION OF LABELS.



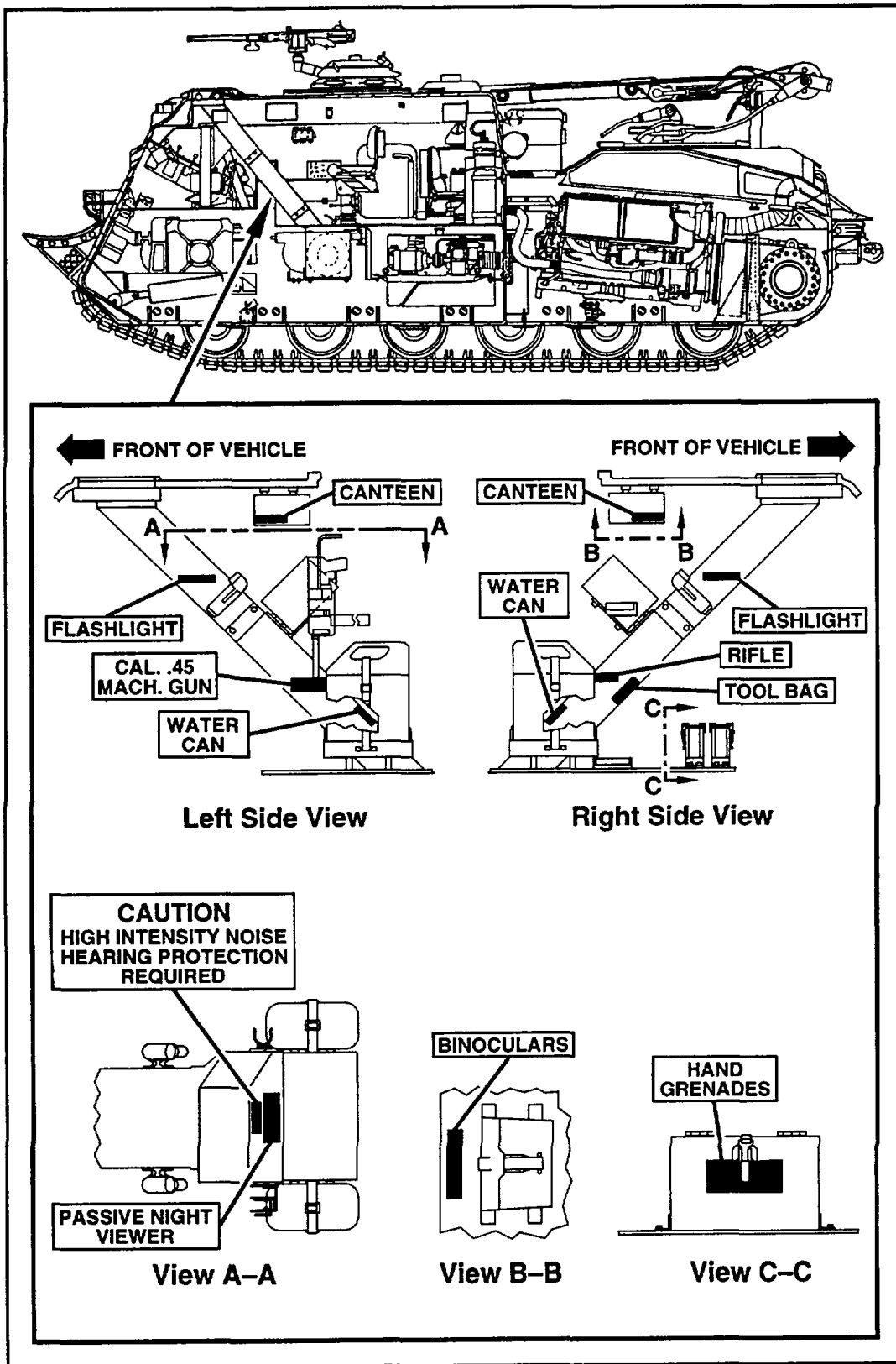
E-3. LOCATION AND DESCRIPTION OF LABELS-Continued.



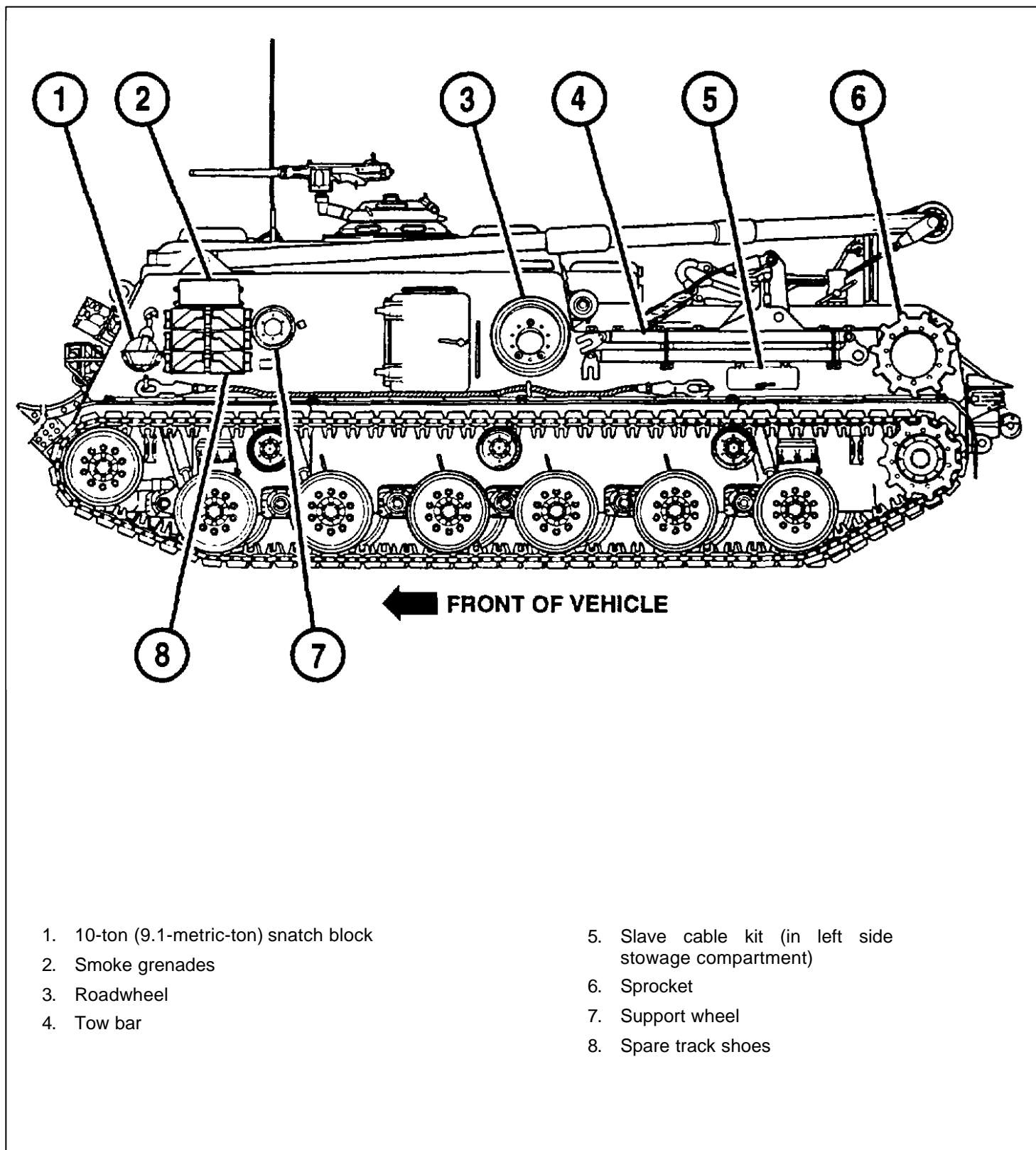




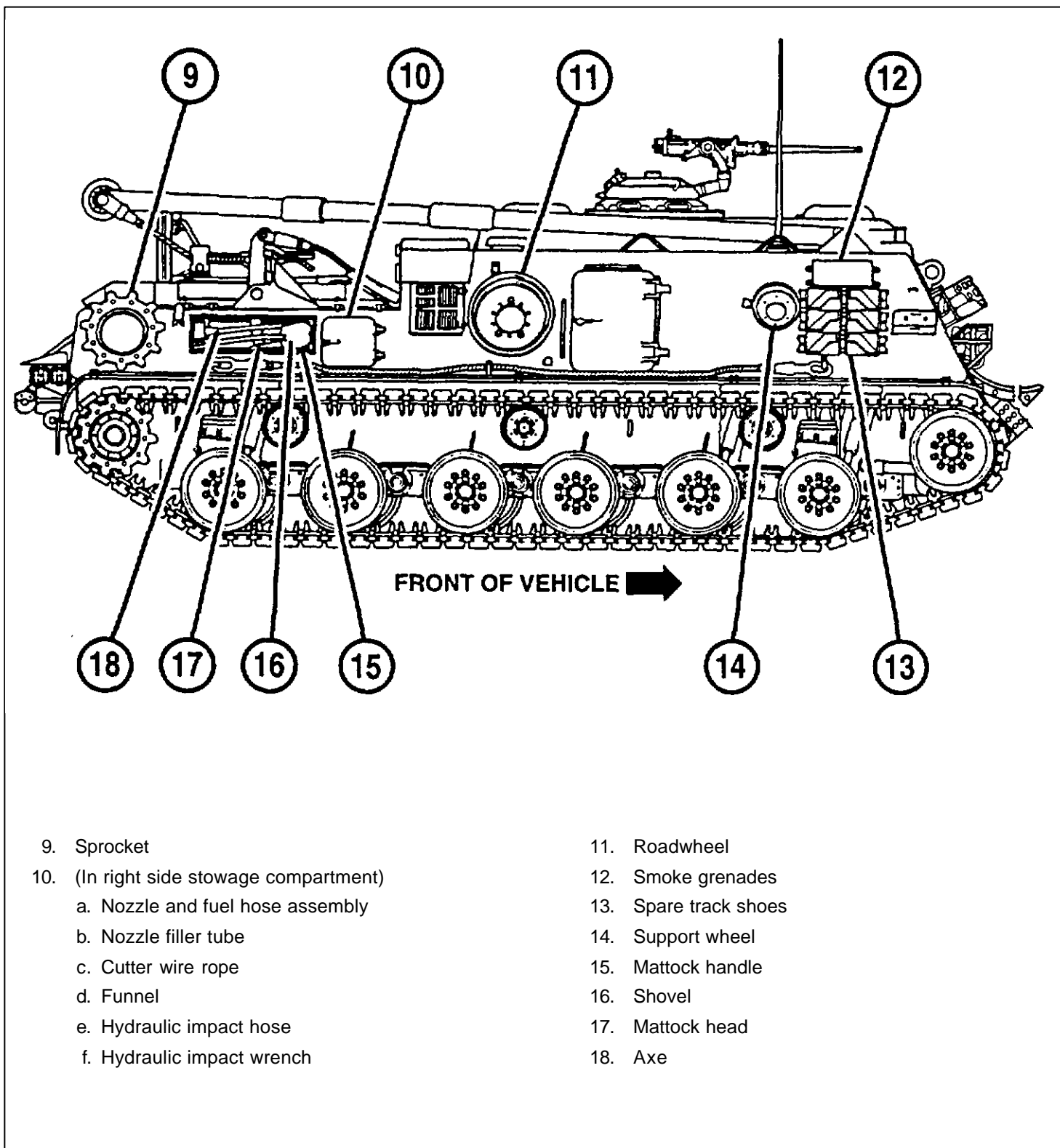
E-3. LOCATION AND DESCRIPTION OF LABELS-Continued.



E-4. LOCATION OF STOWED ITEMS (EXTERIOR).



E-4. LOCATION OF STOWED ITEMS (EXTERIOR)-Continued.



9. Sprocket

10. (In right side stowage compartment)

a. Nozzle and fuel hose assembly

b. Nozzle filler tube

c. Cutter wire rope

d. Funnel

e. Hydraulic impact hose

f. Hydraulic impact wrench

11. Roadwheel

12. Smoke grenades

13. Spare track shoes

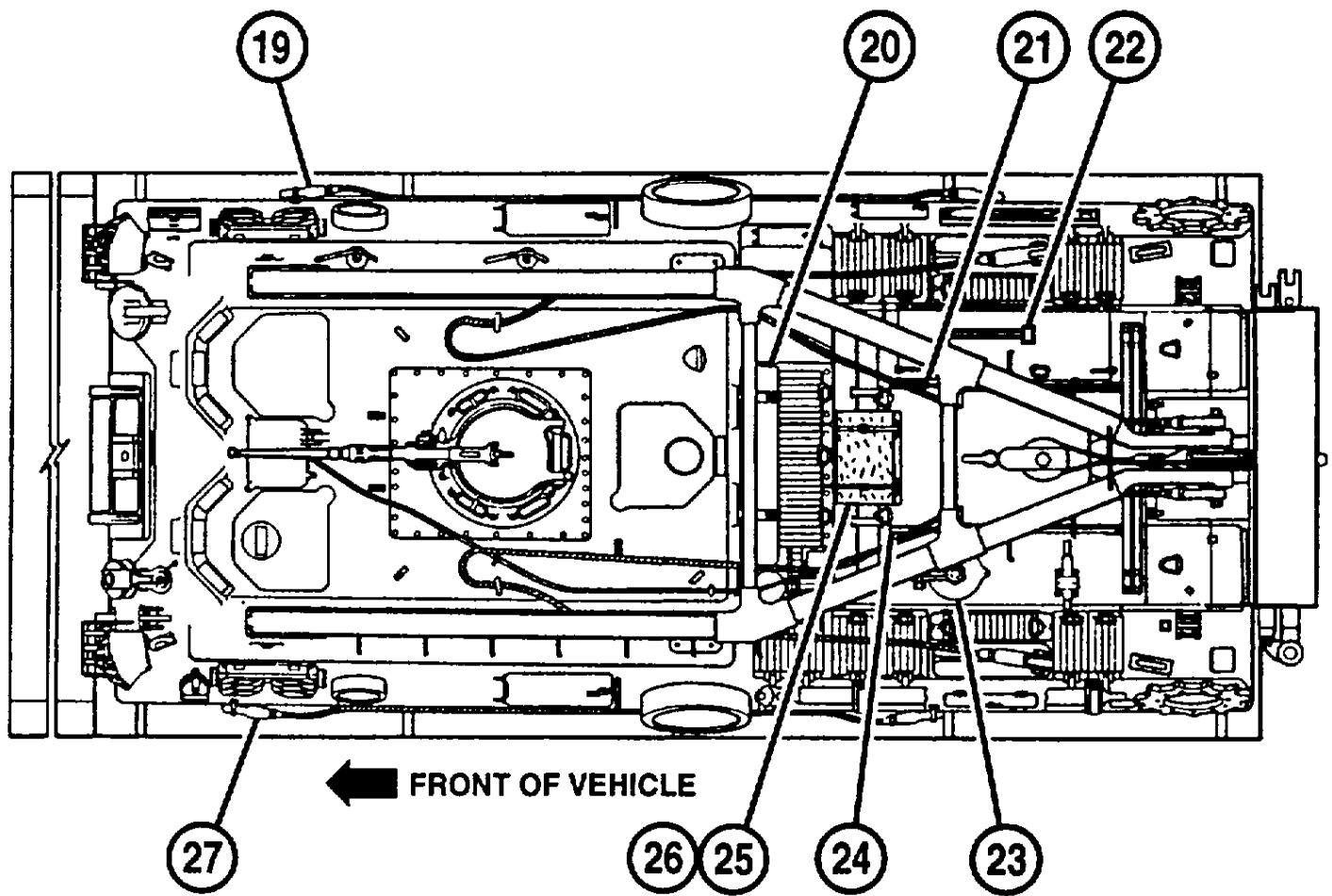
14. Support wheel

15. Mattock handle

16. Shovel

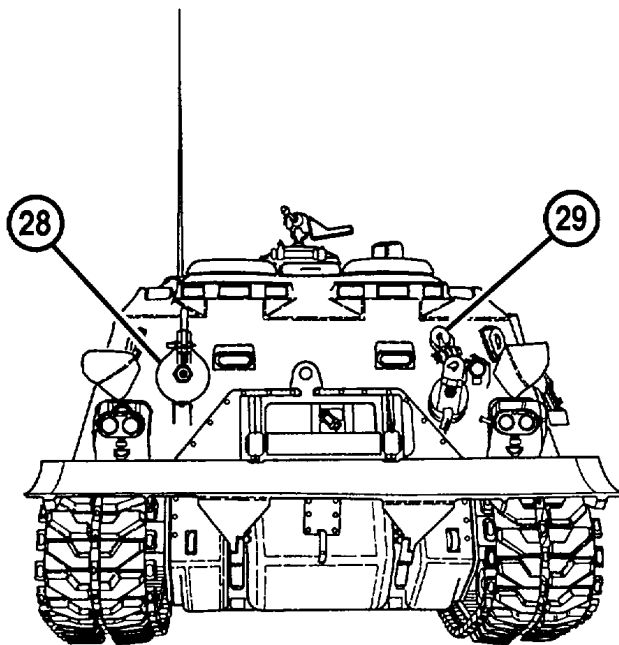
17. Mattock head

18. Axe

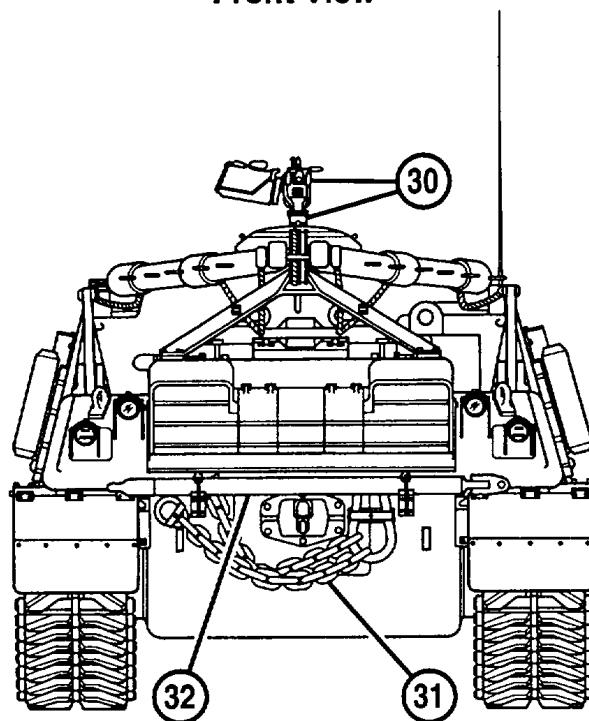


- |   |  |
|---|--|
| 19. Towing cable                          | 24. Tanker bar                           |
| 20. Oxygen cylinder                       | 25. Cotton duck paulin                   |
| 21. Tanker bar                            | 26. 100-foot (ft) (30.48-meter [m]) rope |
| 22. Sledgehammer                          | 27. Towing cable                         |
| 23. 90-ton (81.7-metric-ton) snatch block |  |

E-4. LOCATION OF STOWED ITEMS (EXTERIOR)-Continued.



Front View

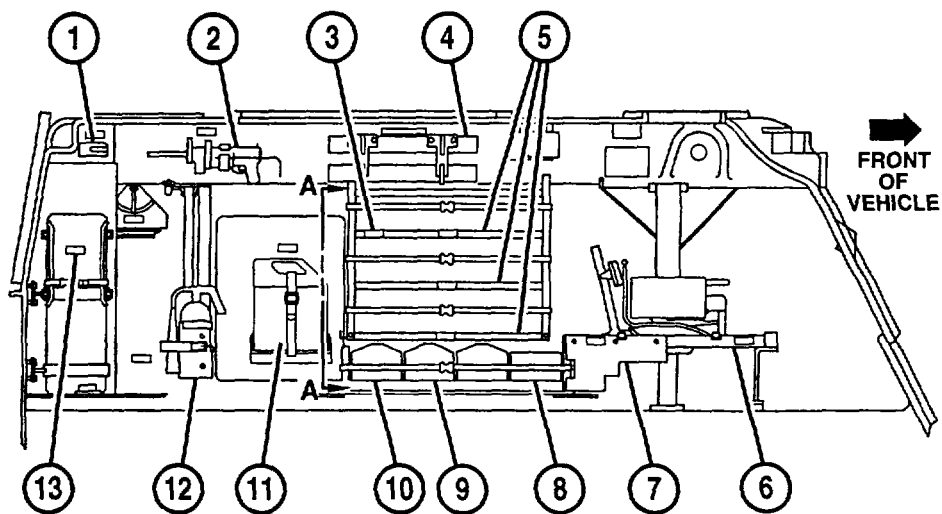


Rear View

- 28. 90-ton (81.7-metric-ton) snatch block
- 29. 25-ton (22.7-metric-ton) snatch block
- 30. Cal. .50 machine gun and mount

- 31. Towing chain
- 32. Tow bar

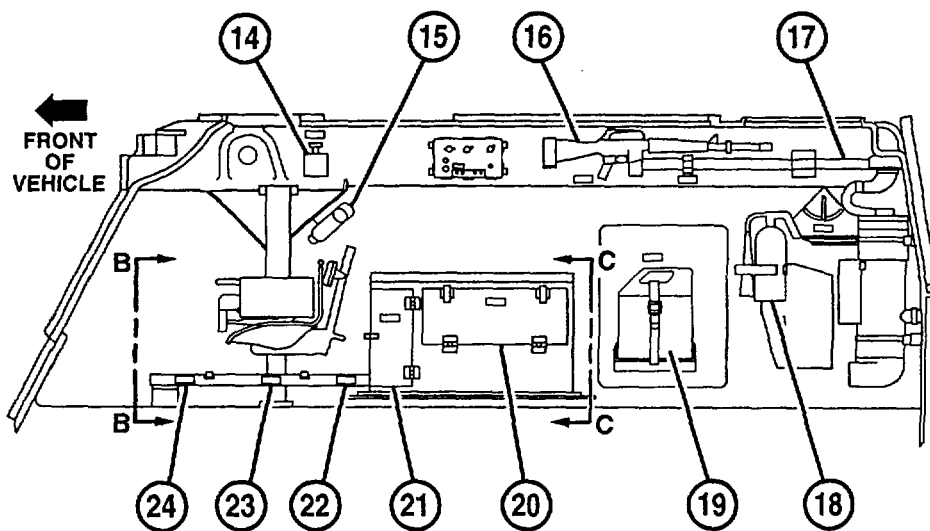
E-5. LOCATION OF STOWED ITEMS (INTERIOR).



Left Side View

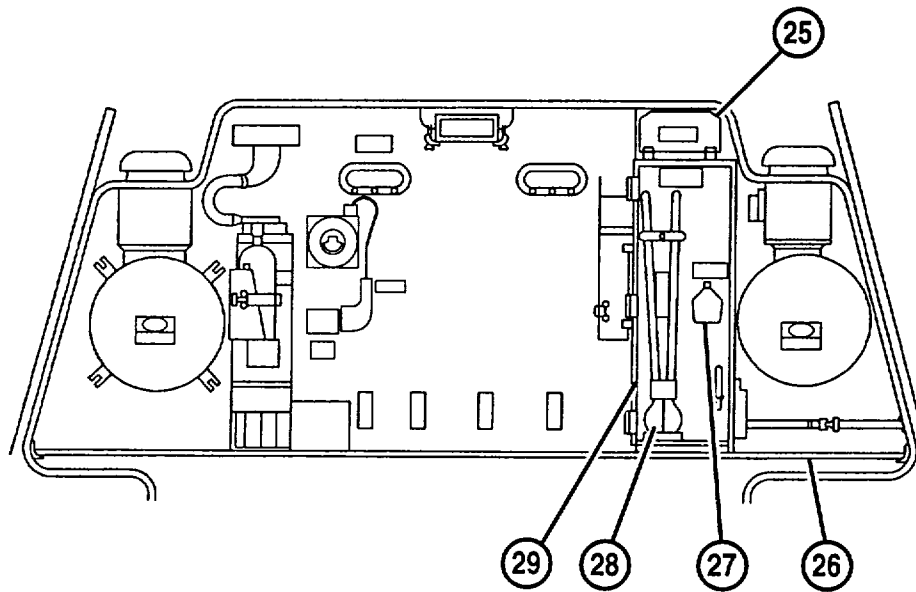
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Flashlight</li> <li>2. Cal. .45 machine gun</li> <li>3. Cal. 5.56 ammo box (2 boxes)</li> <li>4. Light Assault Weapon (LAW) rockets (2)</li> <li>5. Cal. .50 ammo box (13 boxes)</li> <li>6. Signal flares</li> <li>7. Oddments</li> </ul> | <ul style="list-style-type: none"> <li>8. 30-ton (27.2-metric-ton) hydraulic jack w/handle</li> <li>9. General mechanic's tool kit</li> <li>10. Tool box</li> <li>11. Oil can</li> <li>12. Portable fire extinguisher</li> <li>13. Welding hoses (in stowage compartment)</li> </ul> |
|--|--|

E-5. LOCATION OF STOWED ITEMS (INTERIOR)-Continued.



Right Side View

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>14. Canteen</li> <li>15. Flashlight</li> <li>16. M16 rifle</li> <li>17. Cal. .50 machine gun barrel</li> <li>18. Portable fire extinguisher</li> <li>19. Oil can</li> <li>20. Warning device kit</li> </ul> | <ul style="list-style-type: none"> <li>21. (In oddment stowage box)                             <ul style="list-style-type: none"> <li>a. Lockout blocks</li> <li>b. Leather work gloves</li> <li>c. Asbestos mittens</li> <li>d. Track end connector puller</li> </ul> </li> <li>22. First aid kit</li> <li>23. Cal. .45 ammo box</li> <li>24. Wrench set</li> </ul> |
|--|---|

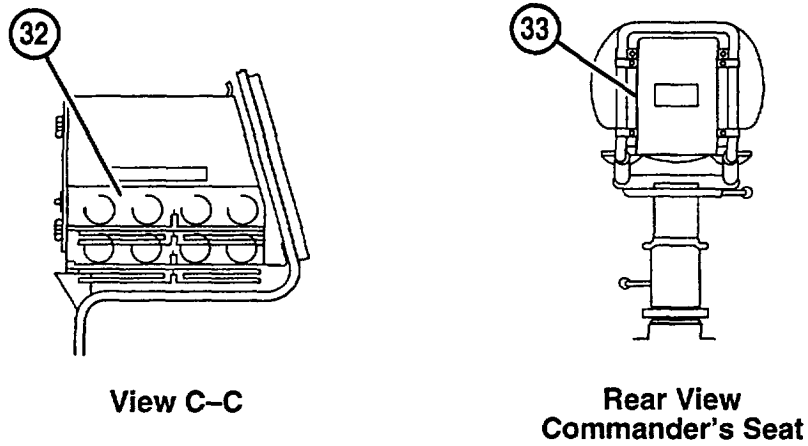
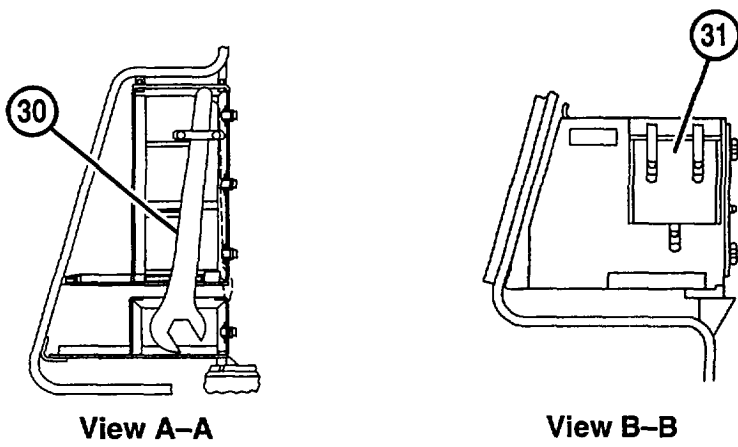


**Crew Compartment Rear Wall**

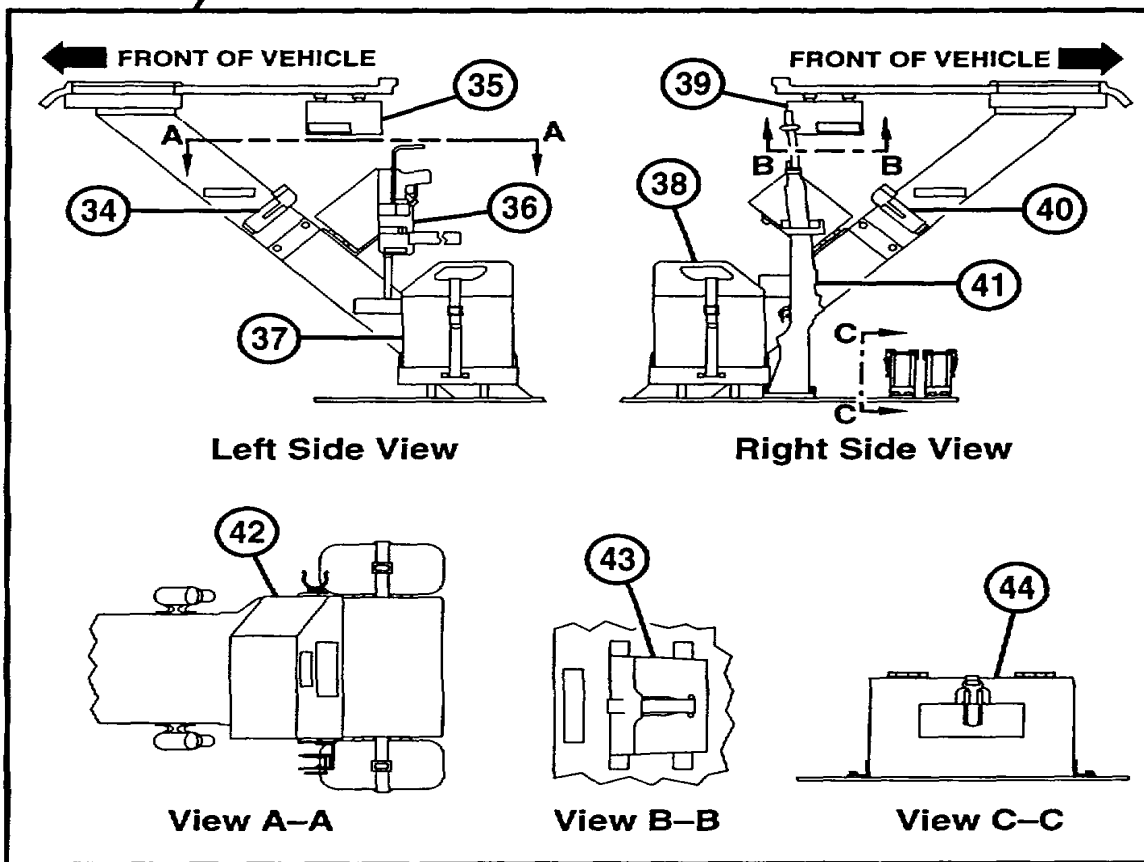
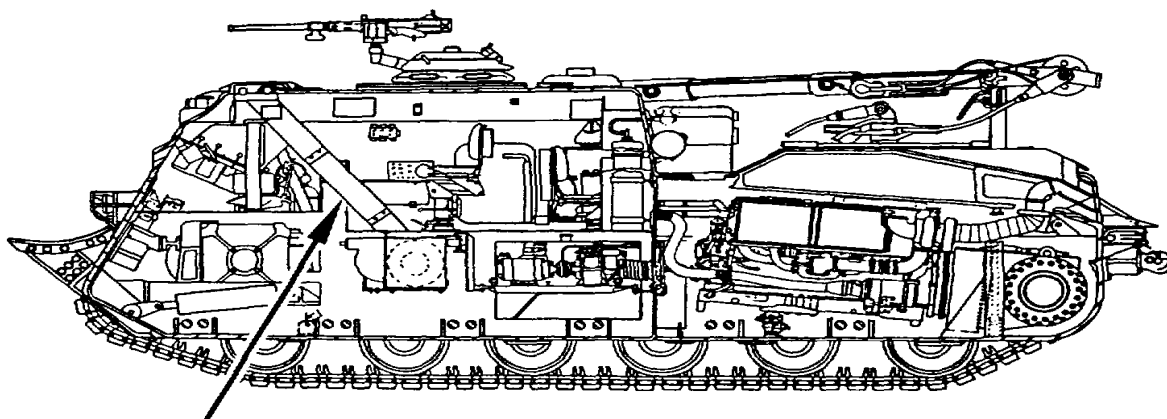
- 25. (In oddment stowage compartment)
  - a. Oxygen pressure regulator
  - b. Acetylene pressure regulator
- 26. Food rations
- 27. Canteen
- 28. Bolt cutters
- 29. Acetylene cylinder (in oddment compartment)



E-5. LOCATION OF STOWED ITEMS (INTERIOR)-Continued.



- 30. Track wrench
- 31. Manuals (in pamphlet bag)
- 32. Rocket launcher
- 33. Flasher light



34. Flashlight

35. Canteen

36. Cal. .45 machine gun

37. Water can

38. Water can

39. Canteen

40. Flashlight

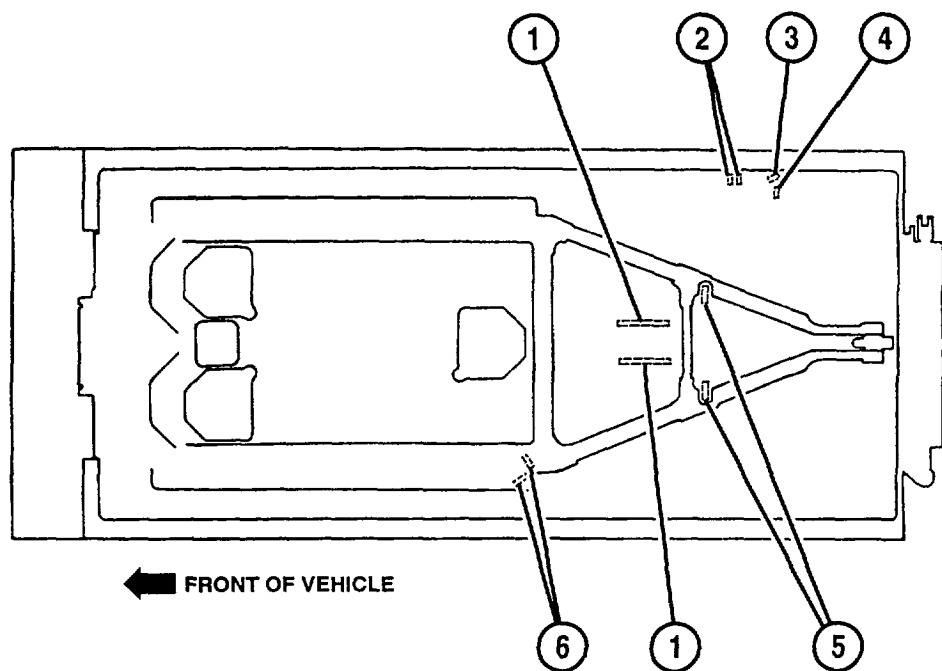
41. Rifle

42. Passive night vision viewer (in periscope stowage box)

43. Binoculars

44. Hand grenades

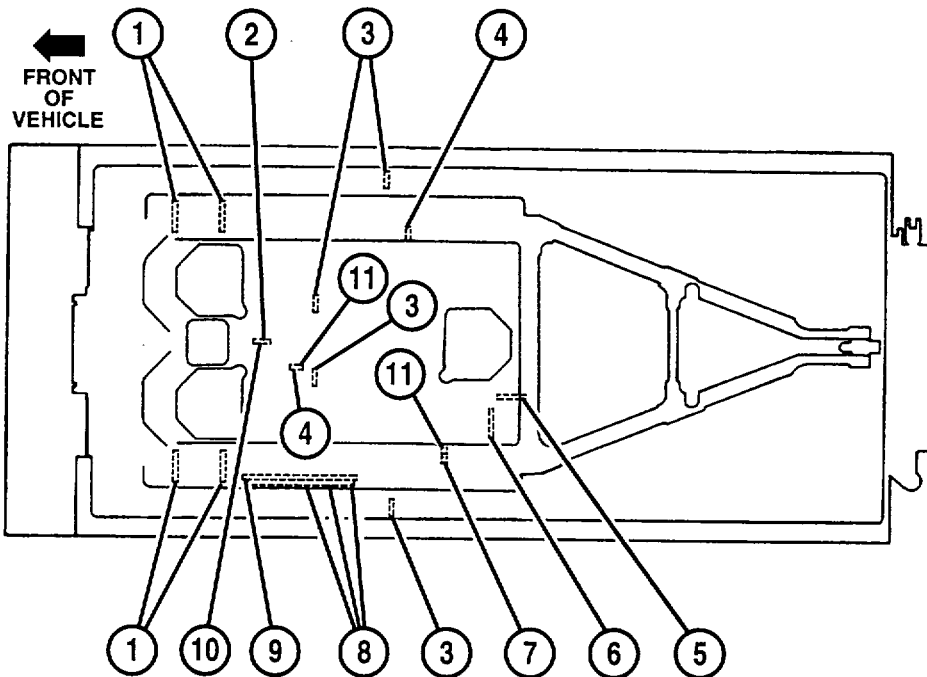
## E-6. LOCATION OF STOWAGE STRAPS (EXTERIOR).



Top View

1. Stowage tray strap (8690486)-80-inches-(in.-) (2032-millimeters-[mm-]) long (lg.), 1-in.-(25.4-mm-) wide (w.)
2. Pioneer kit bracket strap (8690462)--12-in.-(305-mm-) lg., 1-in.- (25.4-mm-) w.
3. Pioneer kit bracket strap (8690466)-20-in.-(508-mm-) lg., 1-in.- (25.4-mm-) w.
4. 5-lb (2.3-kg) sledge hammer strap (8690462)--12-in.-(305-mm-) lg., 1-in.-(25.4-mm-) w.
5. Crowbar strap (8690462)-12-in.-(305-mm-) lg., 1-in.-(25.4-mm-) w.
6. Gage strap (8690471)-30-in.-(762-mm-) lg., 1-in.-(25.4-mm-) w.

E-7. LOCATION OF STOWAGE STRAPS (INTERIOR).



Top View

1. Oddment tray strap (8690495)--120-in.-(3048-mm-) lg., 1-in.- (25.4-mm-) w.
2. Binocular bracket strap (7326942)--14-in.-(356-mm-) lg., 1-in.- (25.4-mm-) w.
3. Water and oil can strap (8690527)--54-in.-(1372-mm-) lg., 1.5-in.- (38.1-mm-) w.
4. Cal. .50 spare barrel strap (8690462)--12-in.-(305-mm-) lg., 1-in.- (25.4-mm-) w.
5. Acetylene hose strap (8690470)--28-in.-(711 -mm-) lg., 1-in.- (25.4-mm-) w.
6. Ration boxes strap (8690479)--54-in.-(1372-mm-) lg., 1-in.- (25.4-mm-) w.
7. Cal. .45 machine gun strap (8684030)--9.25-in.-(235.0-mm-) lg., 1-in.- (25.4-mm-) w.
8. Cal. .50 ammo rack strap (8690486)--80-in.-(2032-mm-) lg., 1-in.- (25.4-mm-) w.
9. Tool box rack strap (8690536)--88-in.-(2235-mm-) lg., 1.5-in.- (38.1-mm-) w.
10. Binocular bracket strap (7326943)--10.62-in.-(269.7-mm-) lg., 1-in.- (25.4-mm-) w.
11. Cal. .45 machine gun strap (8684028)--3.25-in.-(82.6-mm-) lg., 1-in.- (25.4-mm-) w.

## APPENDIX F LUBRICATION INSTRUCTIONS

### F-1. GENERAL STATEMENTS.

- a. **Scope.** This Appendix provides lubrication instructions, procedures, and information on the authorized lubricants, lubrication intervals, and Army Oil Analysis Program (AOAP) for the M88A1 Medium Recovery Vehicle.
- b. **Lubrication Intervals and Interval Symbols.** The lubrication instructions found in this appendix are presented in grouped sequence by interval. The following lubrication symbols are used to indicate how often the lubrication services will be performed.

D-Daily  
M-Monthly  
S-Semiannually

- c. **Maintenance Level.** The maintenance level for all lubrication services in this appendix is Operator/Crew.
- d. **Exceptional Operational Requirements.** Lubricate more often to compensate for abnormal and extreme conditions. High or low temperatures, prolonged periods of high rate operation, continued operation in sand, dust, or exposure to moisture may quickly destroy the protective qualities of the lubricant.

- e. Before performing lubrication checks or services, observe the following:

(1) NEVER:

- (a) Use incorrect lubricant.
- (b) Use too much lubricant.

(2) ALWAYS:

- (a) Clean grease fittings before lubrication.
- (b) Use this appendix as a guide.
- (c) Lubricate after fording.
- (d) Ensure vehicle is level prior to checking fluid levels.

**F-1. GENERAL STATEMENTS-Continued.**

f. **Abbreviations.** Abbreviations for the various lubricants used in this appendix are provided below.

OE/HDO	Lubricating Oil, Internal Combustion Engine (ICE), Tactical Service (MIL-L-2104) (Appx. D, item 30)
OEA	Lubricating Oil, ICE, Arctic (MIL-L-46167) (Appx. D, item 31)
PL-S	Lubricating Oil, General Purpose, Preservative (VV-L-800) (Appx. D, item 25)
CW	Lubricating Oil, Chain, Wire Rope, Exposed Gear (VV-L-751) (Appx. D, item 32)

g. **Parts Cleaning.**

**WARNING**

**Dry-cleaning solvent, type II, used to clean parts, is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (59°C).**

Use dry-cleaning solvent P-D-680 (Appx. D, item 16) to clean parts.

h. **Corrosion Control.** Follow corrosion control procedures as indicated (see para. 1-3).

**F-2. OIL FILTER STATEMENT.** When AOAP service is not available, change oil and filters at the direction of the AOAP laboratory.

Always use table F-1, Expected Temperature Lubrication Requirements, to determine seasonal lubrication requirements. When changing engine and transmission oil due to seasonal requirements, always change the filters.

Sound Maintenance practice dictates that AOAP is not a maintenance substitute, but is used as an effective maintenance diagnostic tool. Therefore, if 12 months have elapsed since the last AOAP or seasonally directed oil and filter change, the oil and filters will be changed.

**F-3. LUBRICATION INSTRUCTIONS.** On-condition (OC) oil sample intervals shall be applied unless changed by the AOAP laboratory. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer than usual operating hours. The hard time intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Hardtime intervals will be applied in the event AOAP laboratory support is not available.

Table F-1. Lubricant Table for M88A1 Medium Recovery Vehicle.

Lubricant/ Component	Capacity	Temperature Range (For Arctic Operation, Refer to FM 9-207)			Interval
		Above 15°F (-90C)	-10 to +40°F (-23 to +4°C)	-65 to 0°F (-54 to -18°C)	
OE/HDO or OEA Main Winch Cable	As Required	OE/HDO- 10	OE/HDO-10	OEA	
Transmission	17 gal. (64.35 L)				
Main Engine Crankcase	16.5 gal. (62.45 L)	OE/HDO- 30	OE/HDO-10	OEA	
APU Chaincase	1 qt. (0.95 L)				
APU Crankcase	3.5 qt. (3.31 L)				
PLS All Oil Can Points	As Required	ALLTEMPERATURES			
CW Main Winch Cable	As Required	CW-IIC	CWIIB	CWIIA	

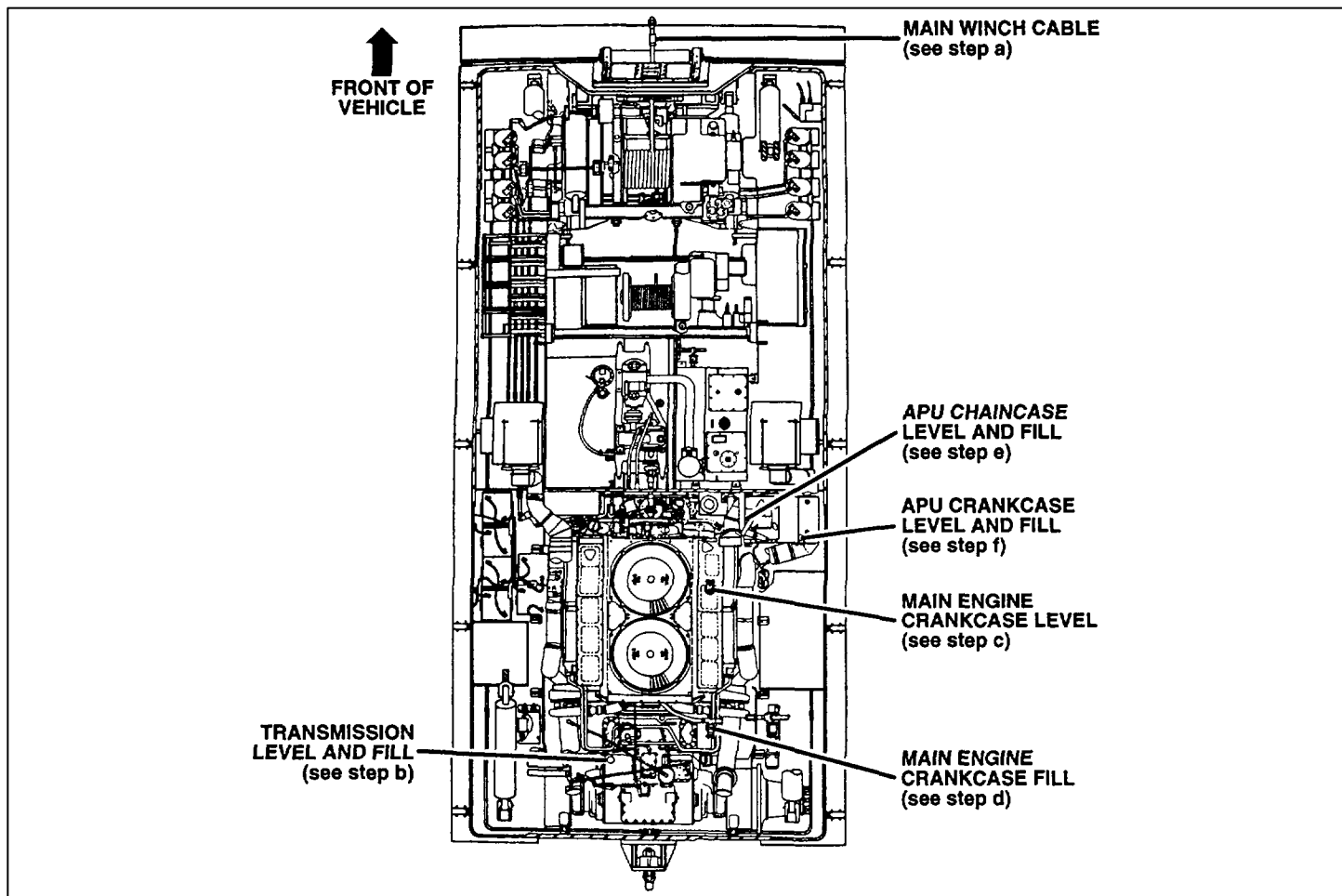
**WARNING**

**Do not lubricate the following: personnel heater motor, ventilating blower motor, and auxiliary power unit air cleaner.**

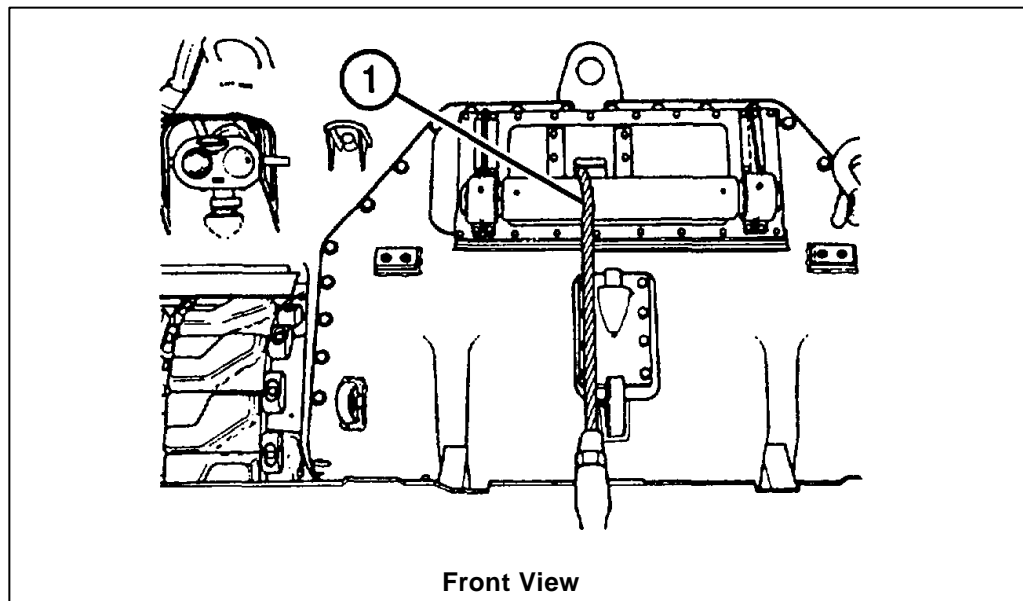
**NOTE**

- **Always install dust caps on fittings after lubrication procedures.**
- **Clean parts with dry-cleaning solvent, type II (SD-2), or equivalent.**
- **The illustration and the steps that follow cover the lubrication procedures to be done daily.**

F-3. LUBRICATION INSTRUCTIONS-Continued.



- a. Main Winch Cable (1). If main winch has been used, clean and oil cable in accordance with table F-1.

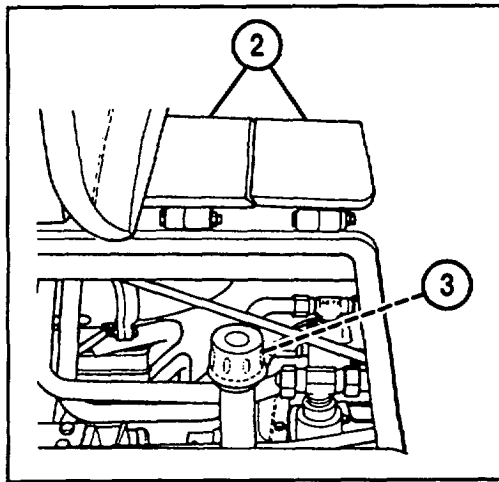




**b. Transmission Level and Fill.****NOTE**

If the transmission has been drained, add 17 gallons (64 liters [L]) of oil in accordance with table F-1 before checking level gage.

- (1) Open engine transmission access doors (2).
- (2) Check transmission oil level. Remove gage rod (dipstick) (hidden) (3), clean, and reinsert. Remove dipstick again. If oil shows on dipstick, it is safe to start engine. If oil does not show on dipstick, add oil in accordance with table F-1 until visible on dipstick.



- (3) Start engine (see para. 2-10b) and allow engine to run at 1200 to 1600 rpm for 2 to 3 minutes.

**WARNING**

**Transmission will be hot after operation. Use caution when reaching into engine/transmission compartment.**

- (4) Stop engine. Wait 3 to 5 minutes and check oil level again.
- (5) Add oil until dipstick (3) reads between ADD and FULL.
- (6) Reinsert dipstick (3) and close engine transmission access doors (2).

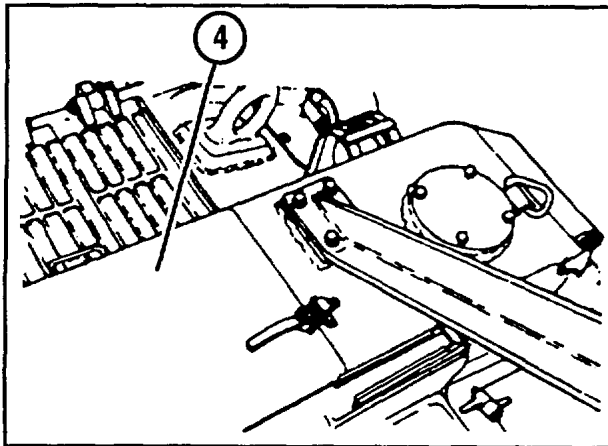
F-3. LUBRICATION INSTRUCTIONS-Continued.

c. Main Engine Crankcase Level.

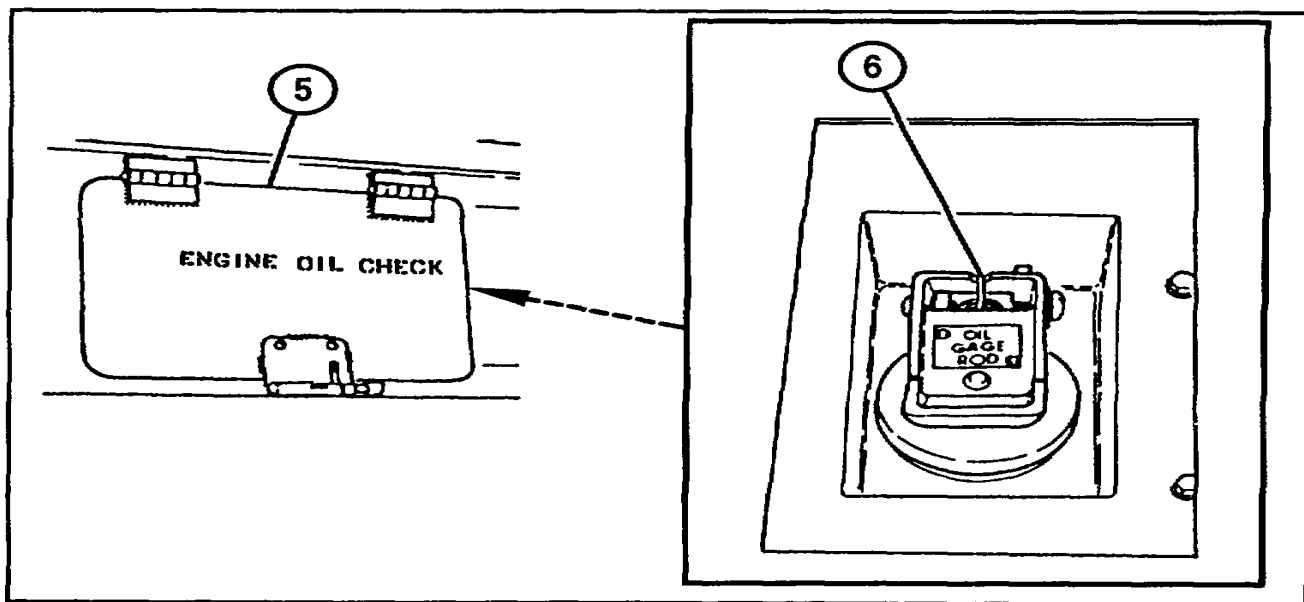
NOTE

if the main engine crankcase has been drained, add 16.5 gallons (62 L) of engine oil before checking level gage.

- (1) Open engine deck door (4).

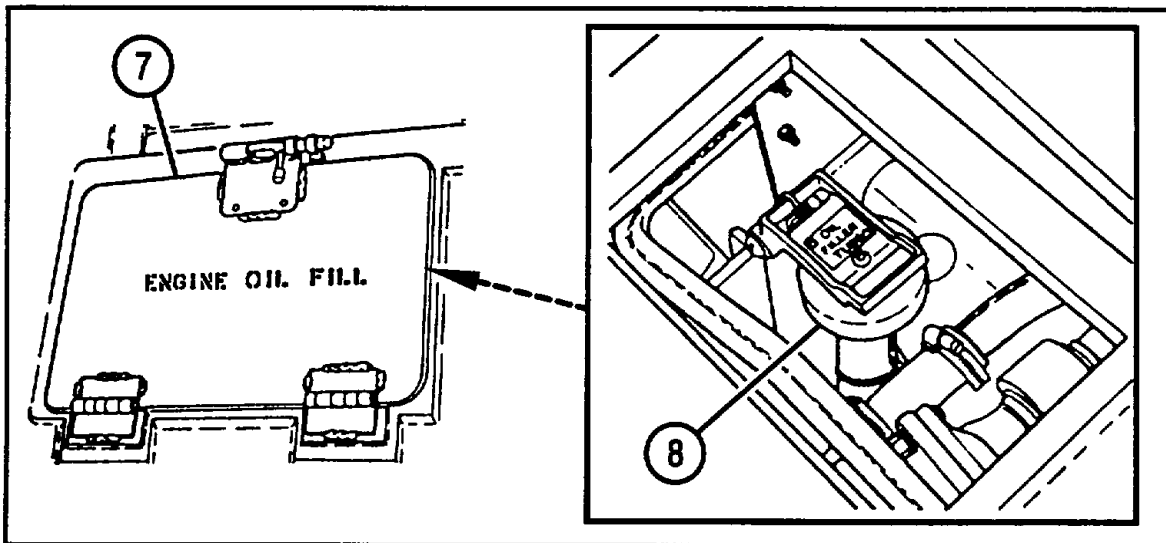


- (2) Open engine oil check door (5) and ensure oil level is above ENGINE STOPPED, SAFE TO START mark on dipstick (6). Fill if necessary (see para. F-3d).



**d. Main Engine Crankcase Fill.**

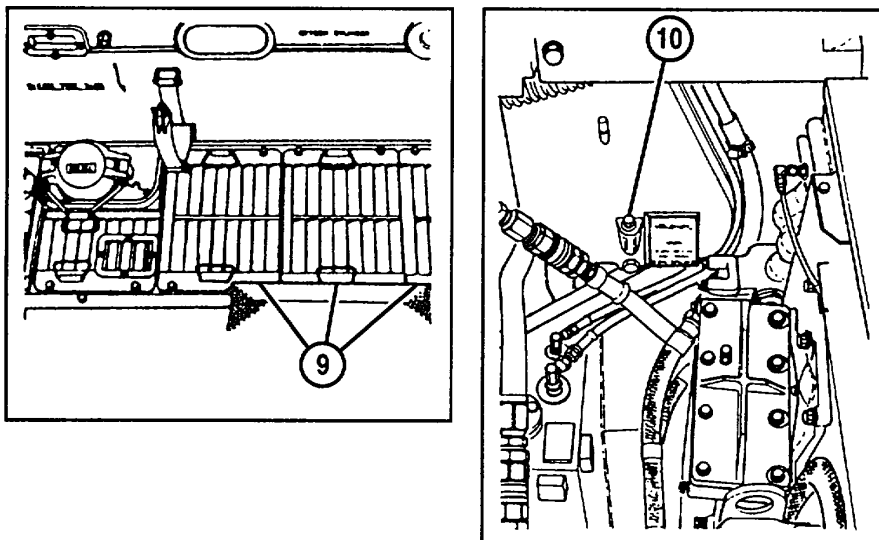
- (1) If necessary open engine oil fill access door (7) and add oil in oil filler tube (8).



- (2) Start engine (see para. 2-10b) and allow to run for 5 to 6 minutes at 1000 to 2000 rpm. Reduce engine idle to 675 to 725 rpm and add oil to bring level up to full mark.

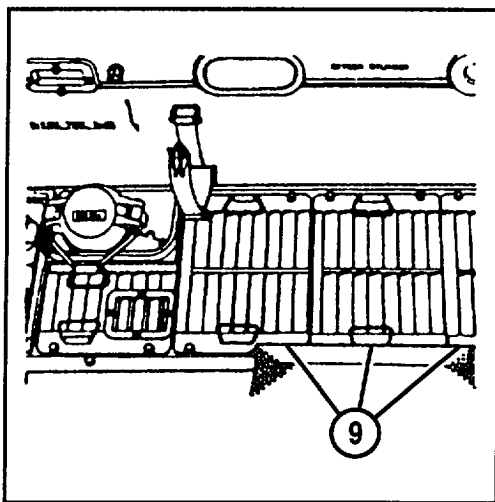
**e. APU Chaincase Fill and Level.**

- (1) Remove front engine deck grilles (9)
- (2) Ensure that oil at fill hole reaches bottom threads of filler plug (10). Add oil (see tab. F-1) if necessary and reinstall filler plug.

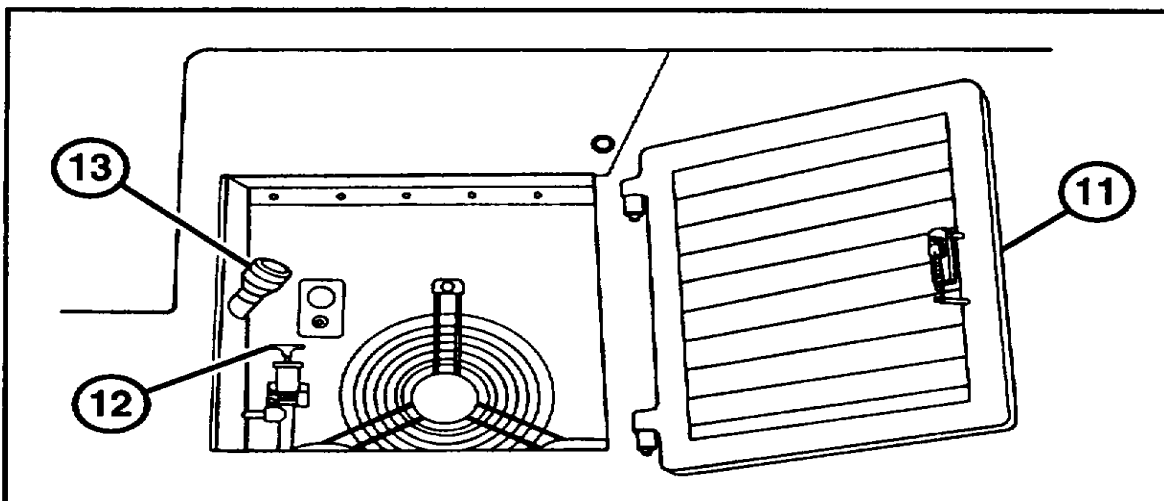


**F-3. LUBRICATION INSTRUCTIONS-Continued.**

- (3) Install front engine deck grilles (9).

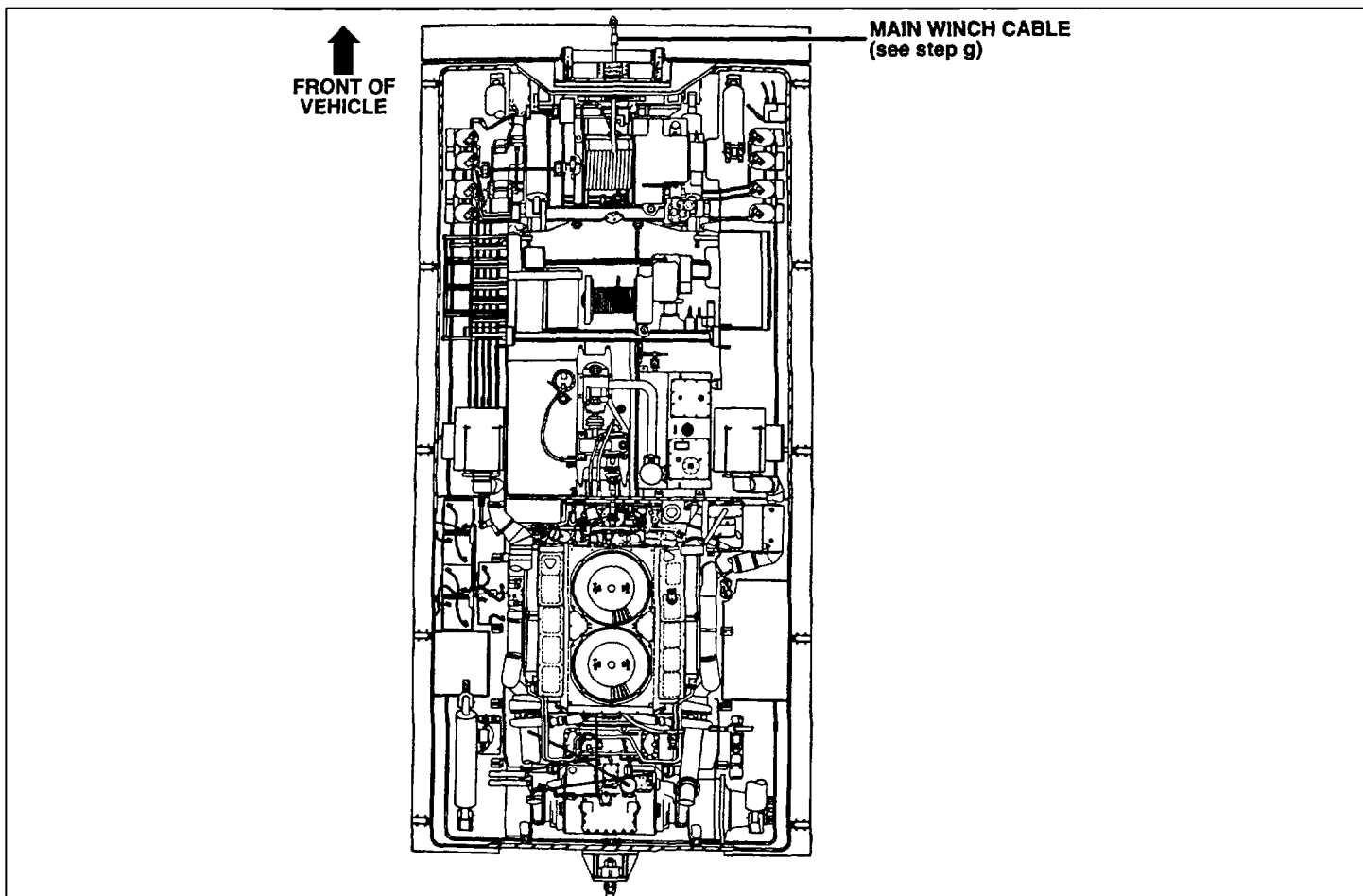
**f. APU Crankcase Level and Fill.**

- (1) Open APU access door (11) and remove bayonet gage (12). Clean bayonet gage with a clean rag (Appx. D, item 40) and reinstall.
- (2) Remove bayonet gage (12) and observe oil level indicated. If oil level is below full (F) mark, remove filler cap (13) and add oil as necessary.
- (3) Install filler cap (13), bayonet gage (12), and close side access door (11).

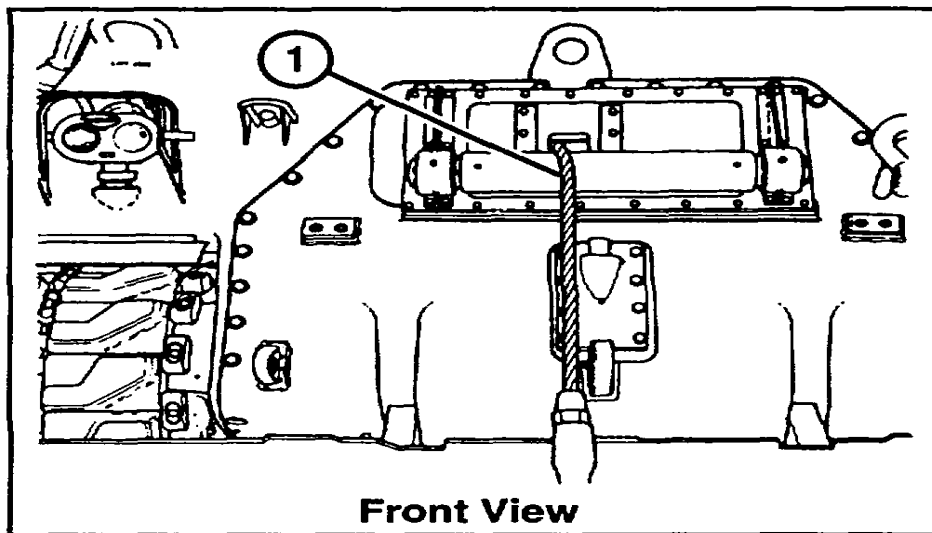


NOTE

The illustration and the steps that follow cover the lubrication procedure to be done monthly.



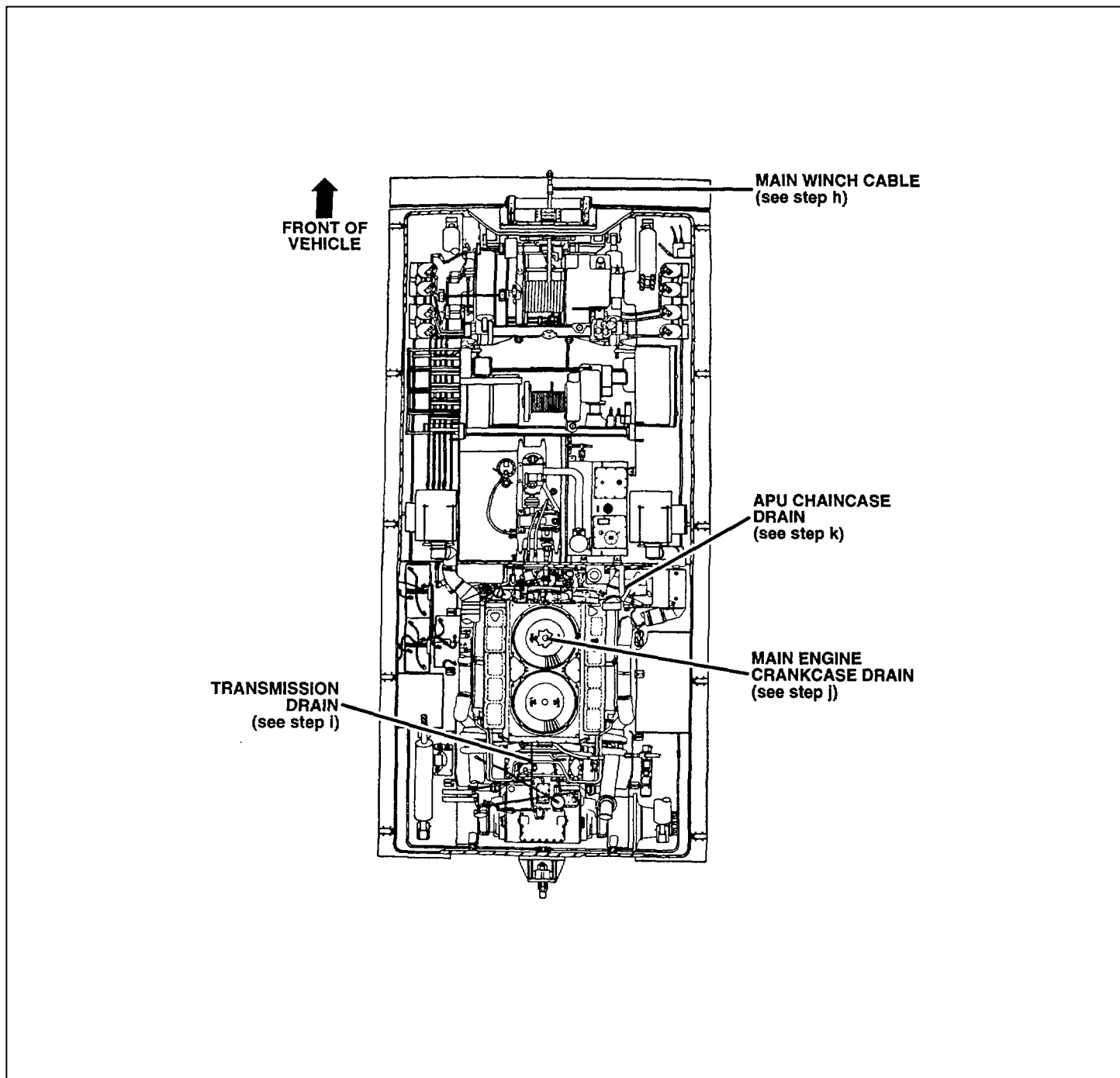
- g. Main Winch Cable.** Completely unwind cable (1) and clean it. Lubricate cable (see tab. F-1).



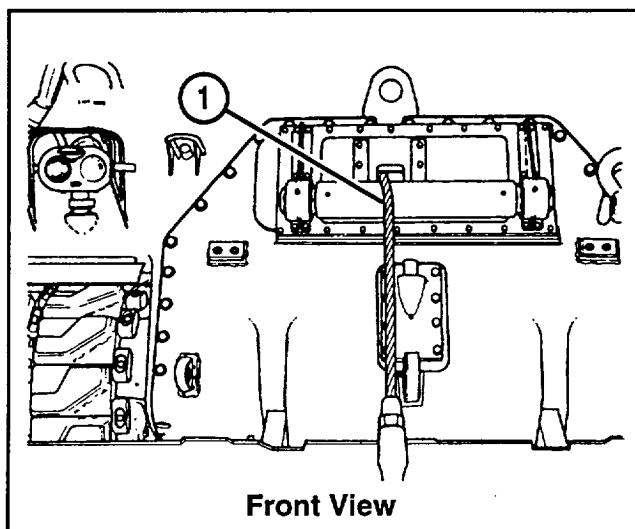
F-3. LUBRICATION INSTRUCTIONS-Continued.

NOTE

The illustration and the steps that follow cover the lubrication procedures to be done semiannually or at irregular intervals (in accordance with the AOAP laboratory).



- h. Main Winch Cable.** If winch has not been used since last semiannual service, completely unwind and clean cable (1). Brush soak cable with OE and wipe to remove excess oil. Rewind cable.



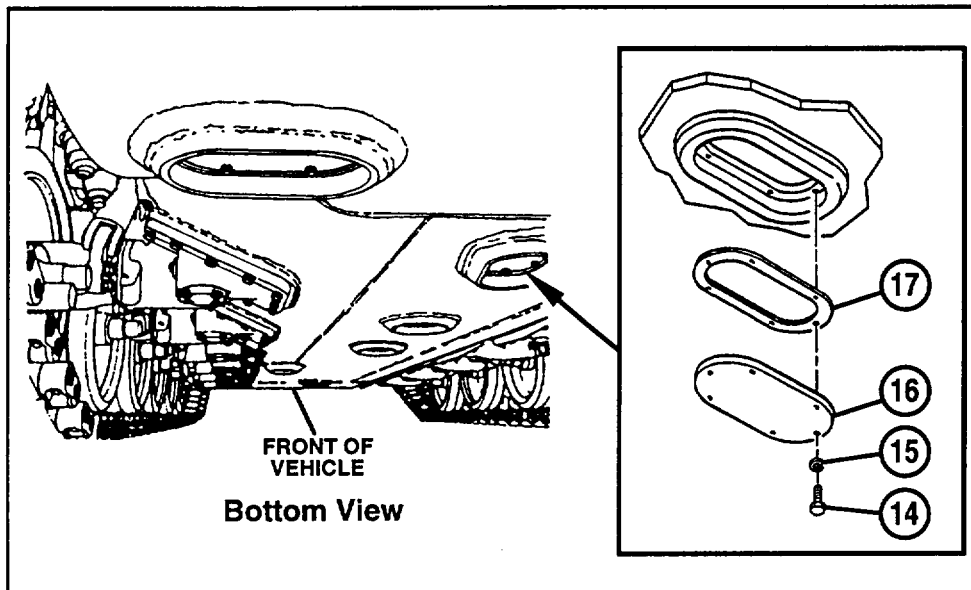
- i. Transmission Drain.**

**NOTE**

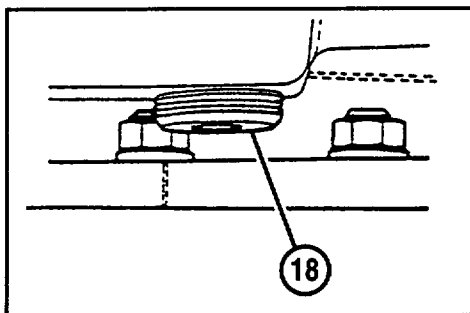
- Drain transmission oil only when hot after operation.
- New transmissions are filled with preservative oil which should be drained after 100 miles (161 km) (or 10 hours) of operation and again after 500 miles (805 km). Refill with proper grade of lubricant (see tab. F-1).
- Periodically, a sample of oil shall be sent to the AOAP laboratory for analysis. Oil is to be drained after every 25 hours of operation or every 30 days, whichever comes first (refer to TB 430210). If laboratory is not available, hard time intervals will apply.
- When AOAP laboratory support is not available, drain and refill transmission oil at 1500 miles (2414 km) or semiannually.
- Coordinate any seasonal change of oil weight with this service.

**F-3. LUBRICATION INSTRUCTIONS-Continued.**

- (1) Remove six bolts (14) and six lockwashers (15) from transmission drain plate (16) and remove transmission plate and gasket (17).



- (2) Remove drain plug (18) and drain transmission oil.



- (3) Clean drain plug (18) with dry-cleaning solvent (Appx. D, item 16). Install drain plug after transmission is fully drained.
- (4) Install new gasket (17), drain plate (16), six new lockwashers (15), and six bolts (14).

**NOTE**

**If transmission is to be flushed, notify unit maintenance.**

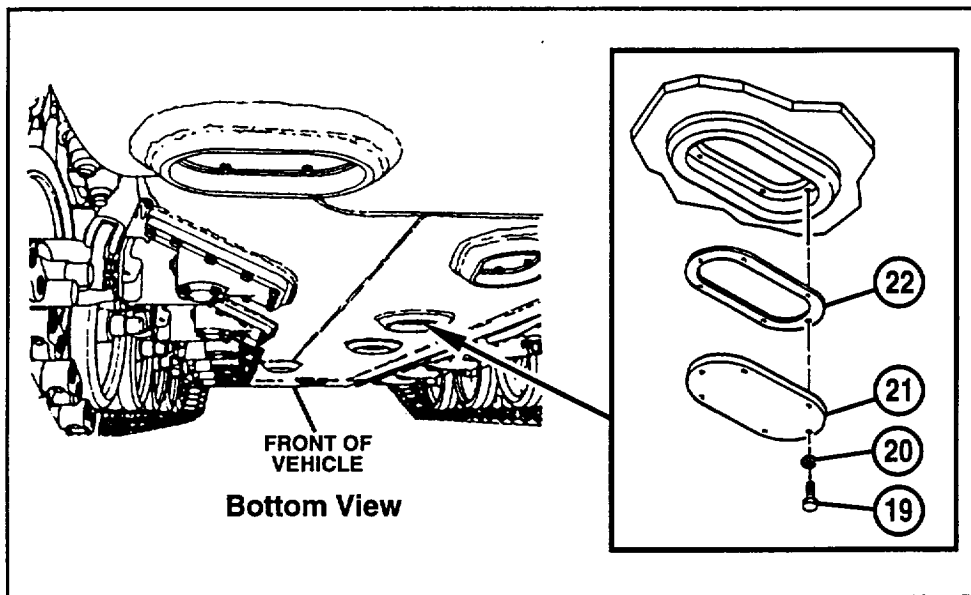


j. Drain Main Engine Crankcase.

**NOTE**

- Drain engine oil only when hot after operation.
- Periodically, a sample of oil shall be sent to the AOAP laboratory for analysis. Oil is to be drained after every 25 hours of operation or every 30 days, whichever comes first (refer to TB 430210). If laboratory is not available, hard time intervals will apply.
- When AOAP laboratory support is not available, drain and refill transmission oil at 1500 miles (2414 km), 150 hours, or semiannually if OE/HDO is used (750 miles [1207 km], 75 hours, or quarterly if OEA is used).
- Coordinate any seasonal change of oil weight with this service.
- Ensure vehicle is on level ground.

- (1) Remove oil cooler vent cap screw and open oil filter drain valve.
- (2) Remove six screws (19) and six lockwashers (20) from engine drain plate (21) and remove drain plate and gasket (22).

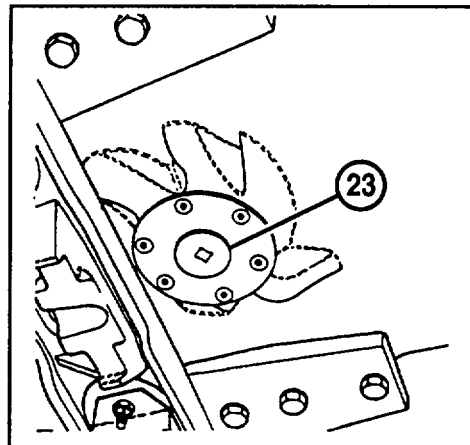


**F-3. LUBRICATION INSTRUCTIONS-Continued.**

- (3) Remove main engine drain plug (23) and drain engine oil.

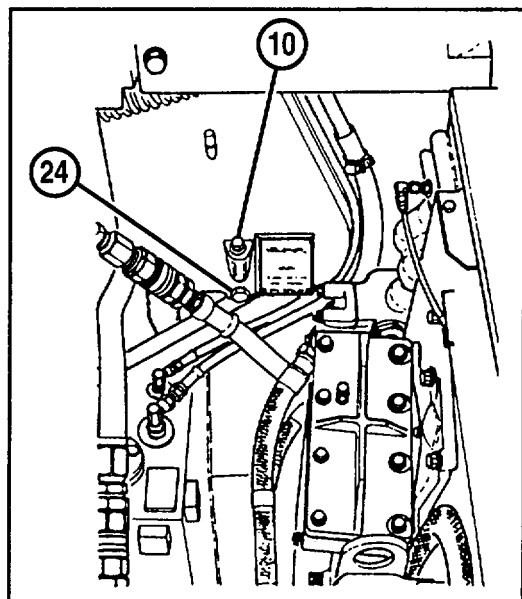
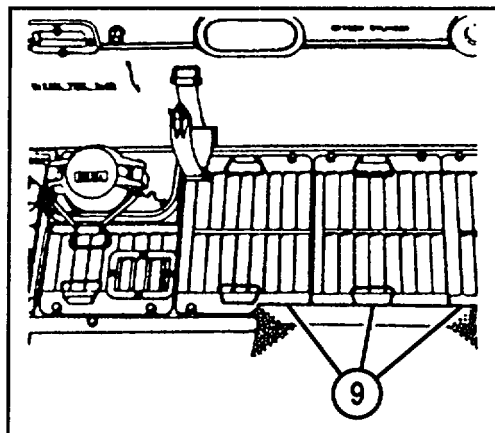
**NOTE**

- Drain engine oil only when hot after operation.
- Coordinate any seasonal change of oil weight with this service.



**k. Drain APU Chaincase.**

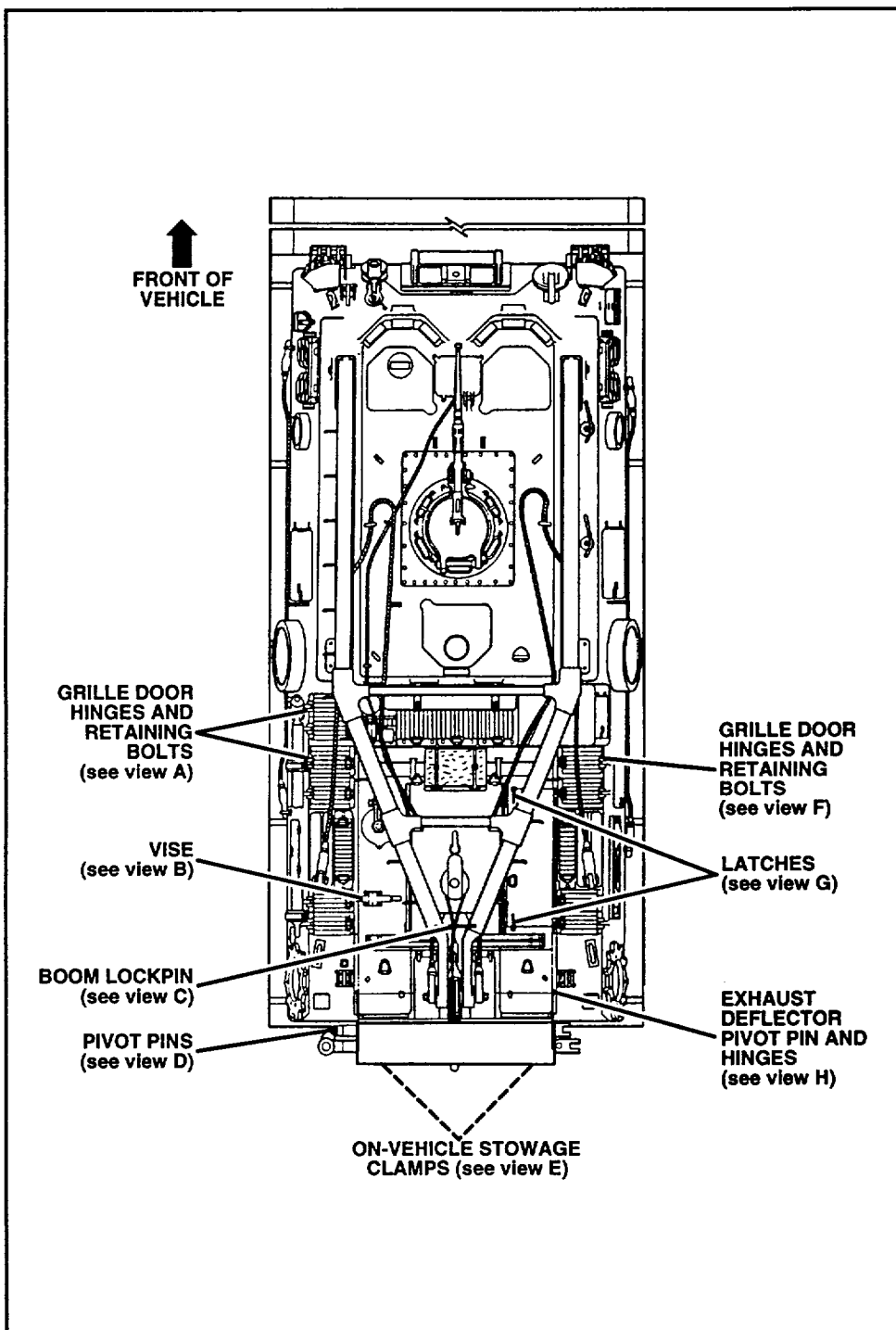
- (1) Remove front engine access grilles (9).
- (2) Remove drain plug (24) and drain oil.
- (3) Clean drain plug (24) with dry-cleaning solvent (Appx. D, item 16).
- (4) After oil has drained, install drain plug (24).
- (5) Remove filler plug (10) and add 1 quart (0.95 L) of oil in accordance with table F-1.
- (6) Check chaincase oil level (see para. F-3e).



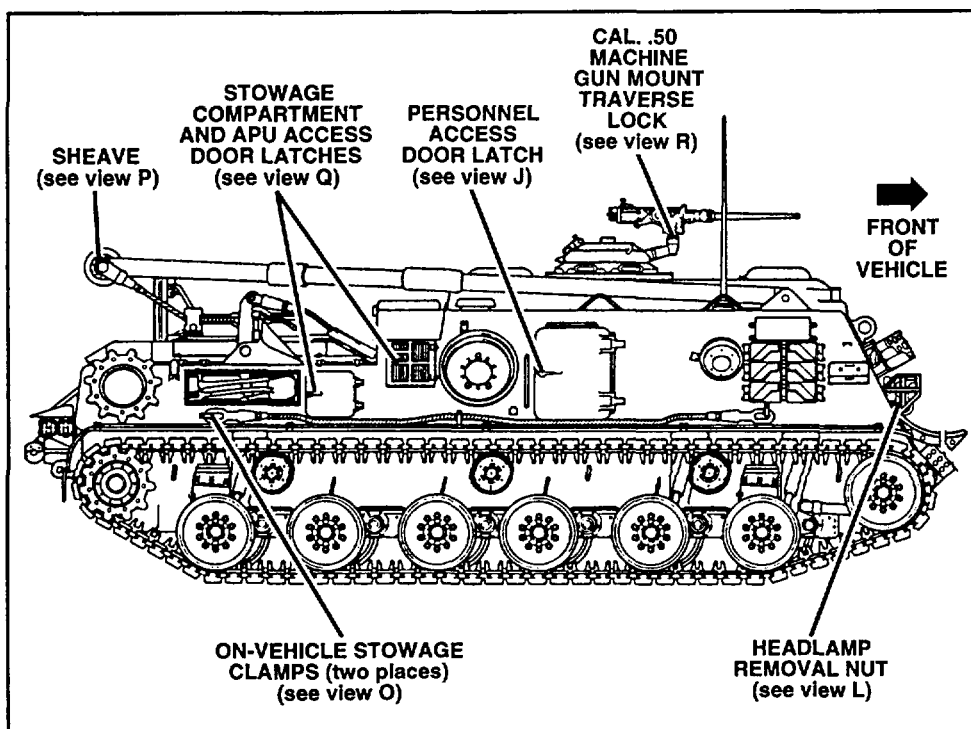
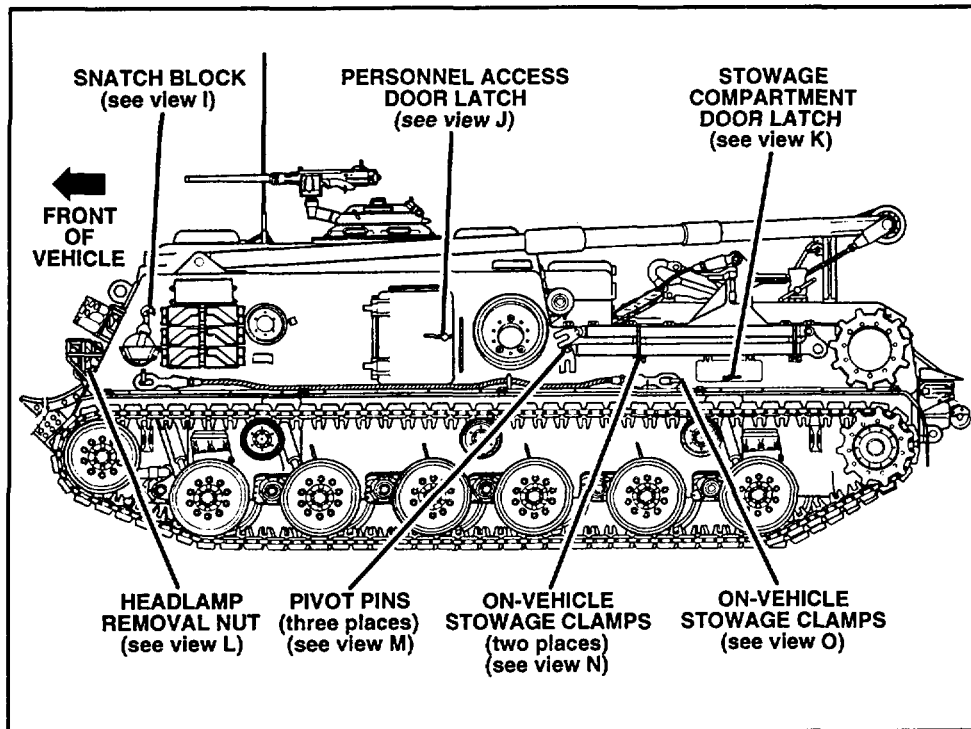
**NOTE**

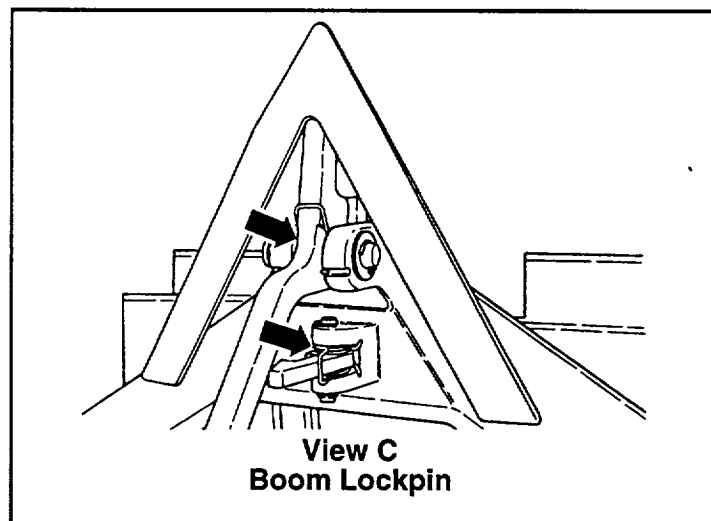
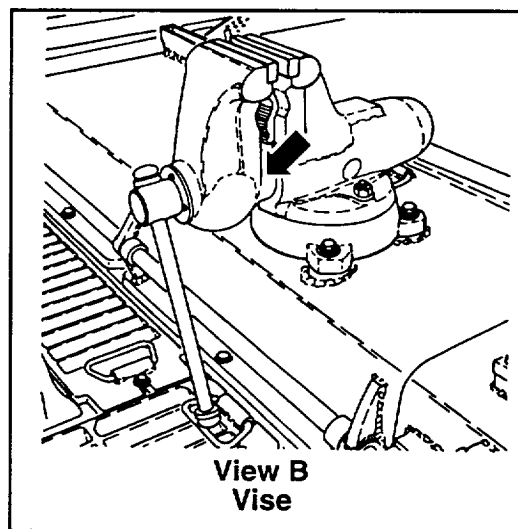
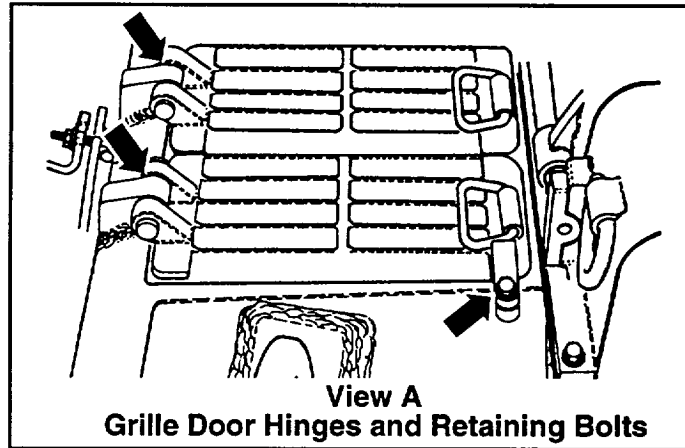
If the APU chaincase has been drained, add 1 quart (0.95 L) of oil before checking level gage.

I. **Exterior Oil Can Points.** Lubricate areas shown (monthly) in accordance with table F-1.

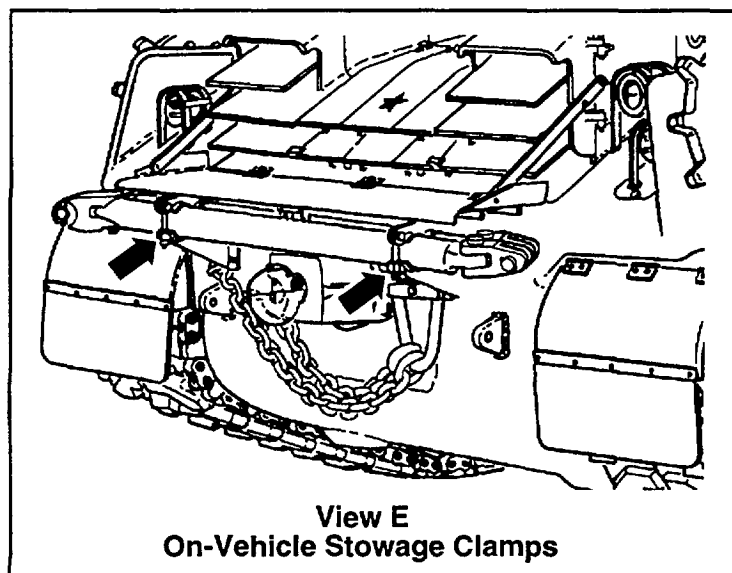
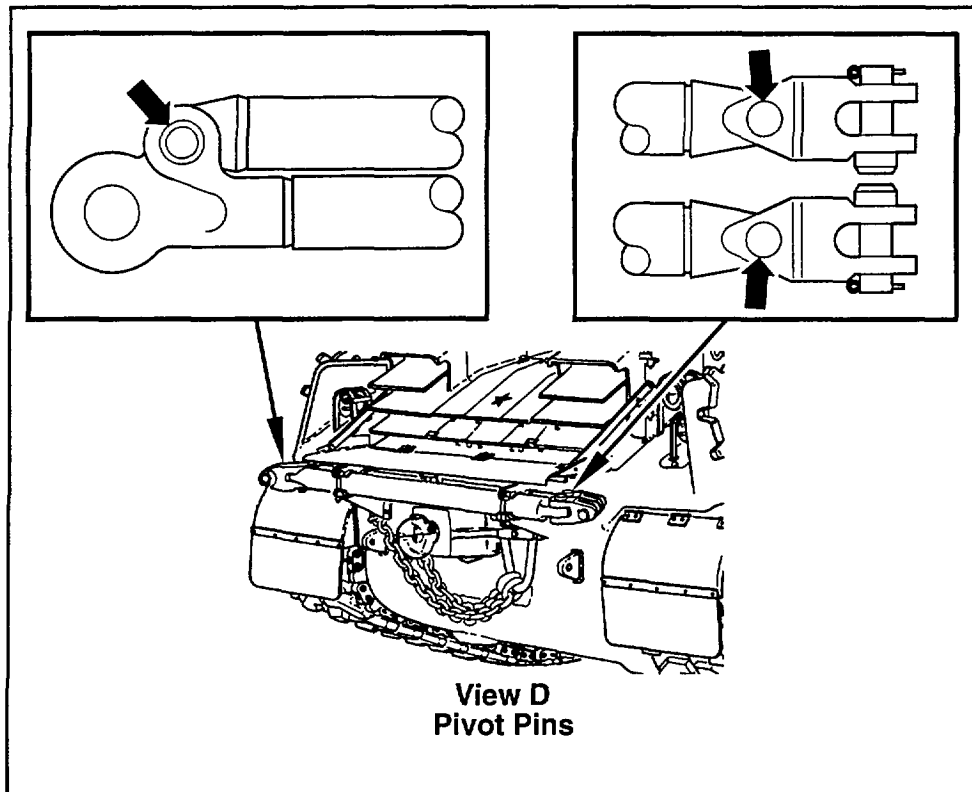


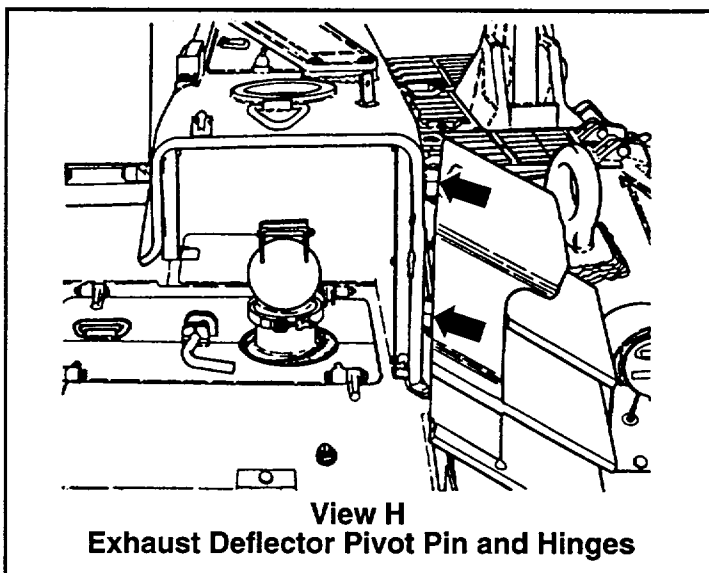
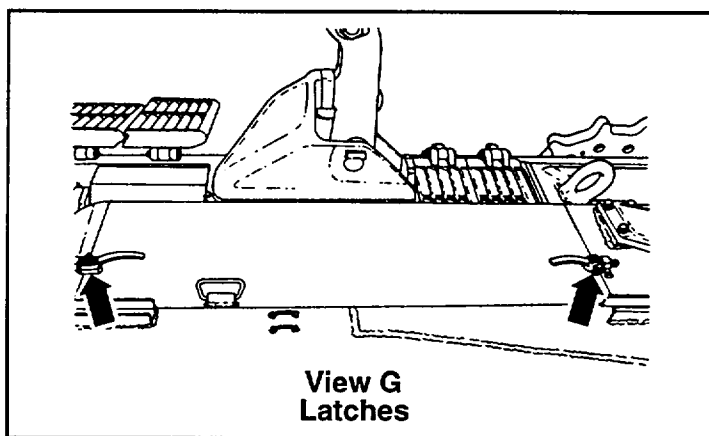
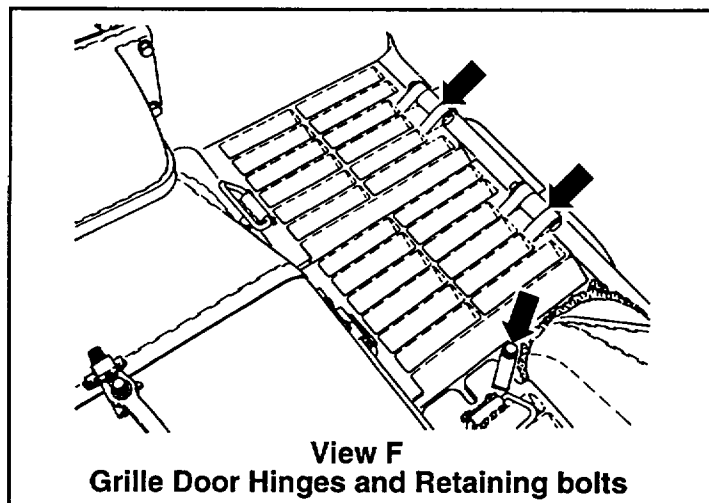
F-3. LUBRICATION INSTRUCTIONS-Continued.



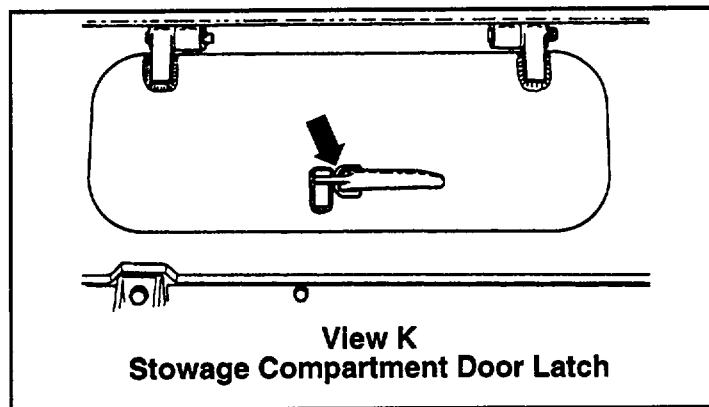
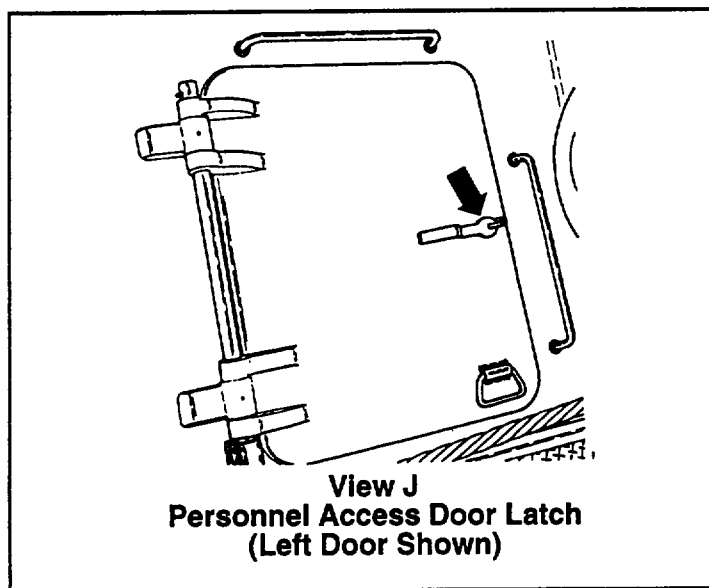
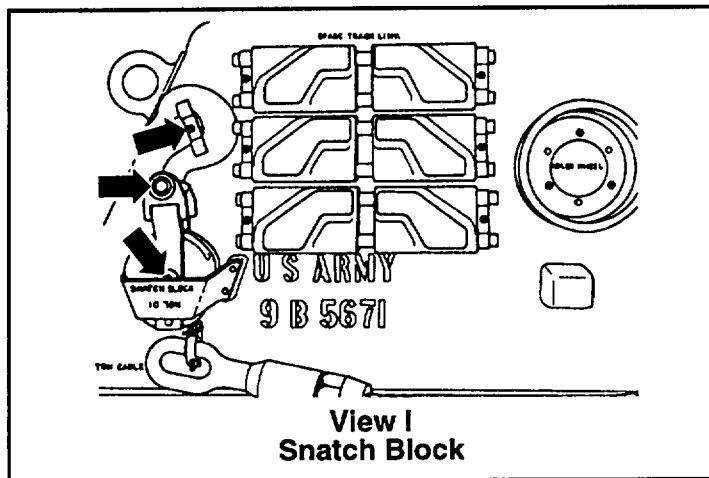


F-3. LUBRICATION INSTRUCTIONS-Continued.

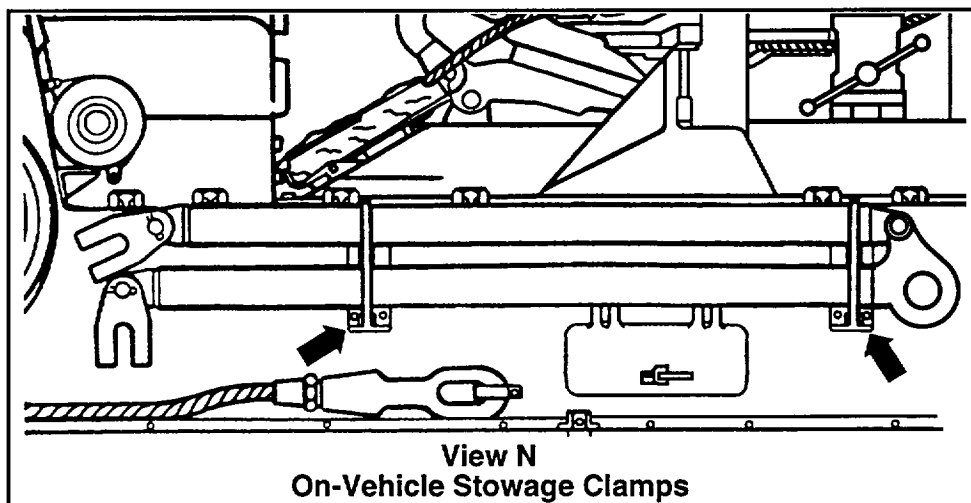
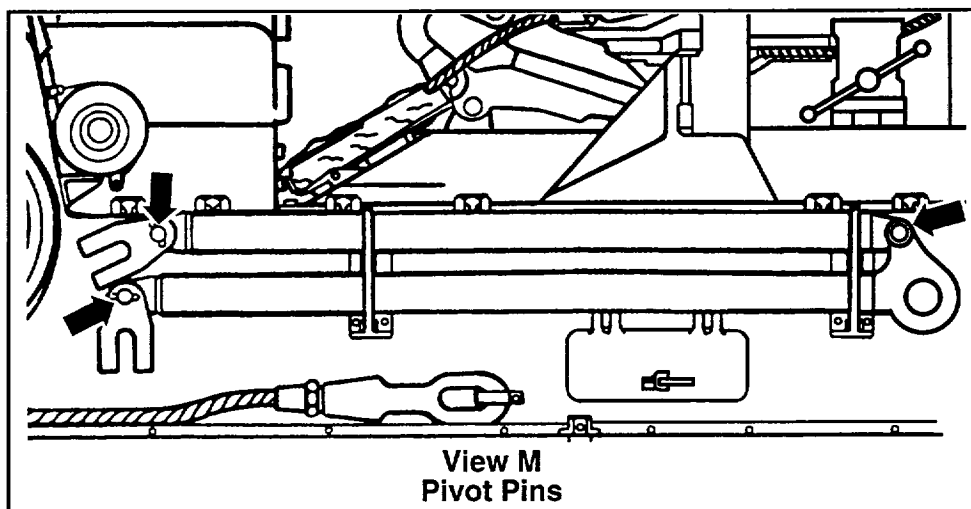
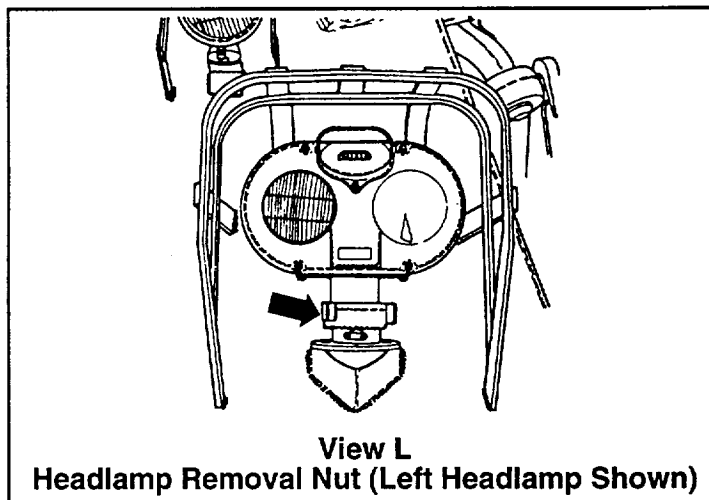




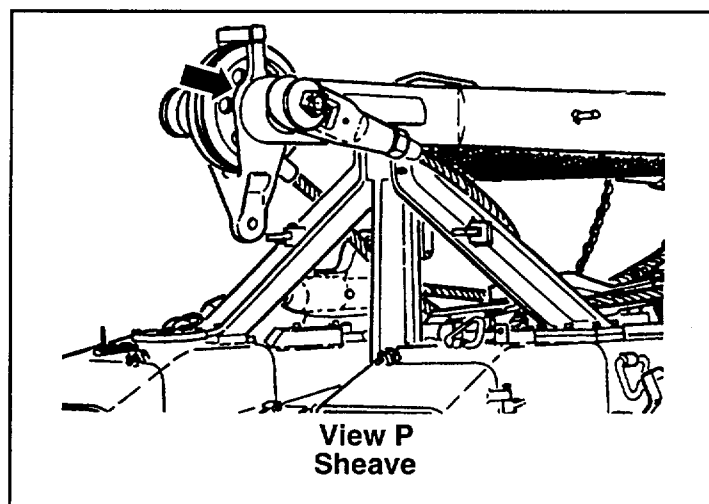
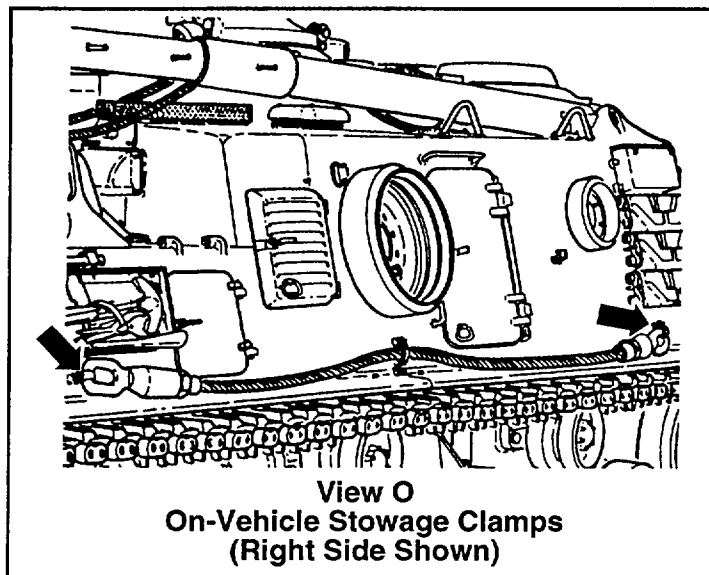
F-3. LUBRICATION INSTRUCTIONS-Continued.

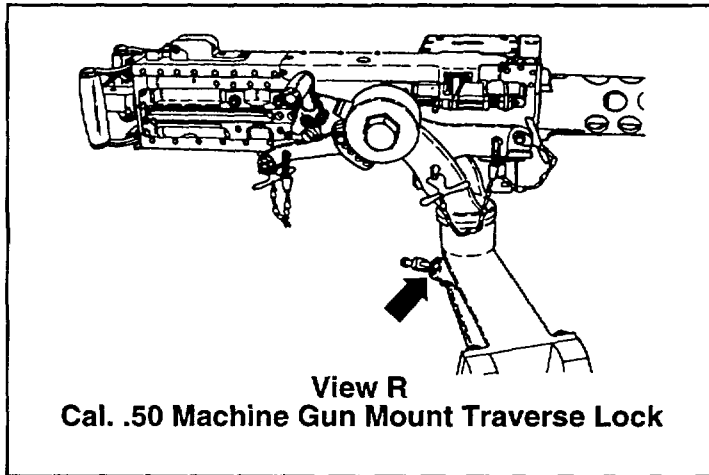
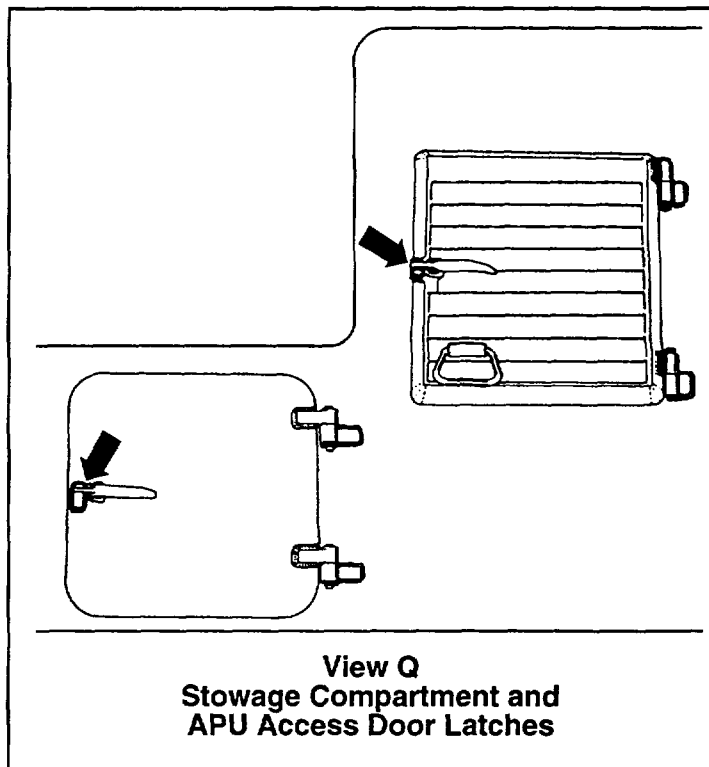




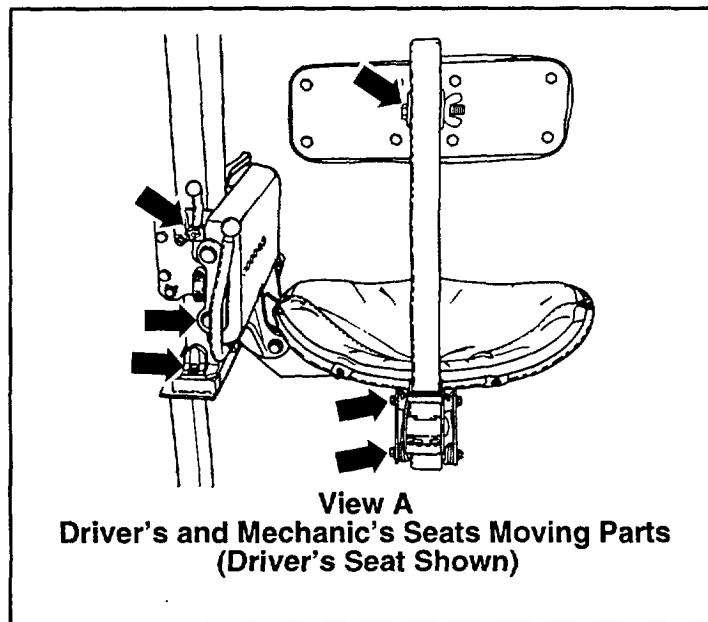
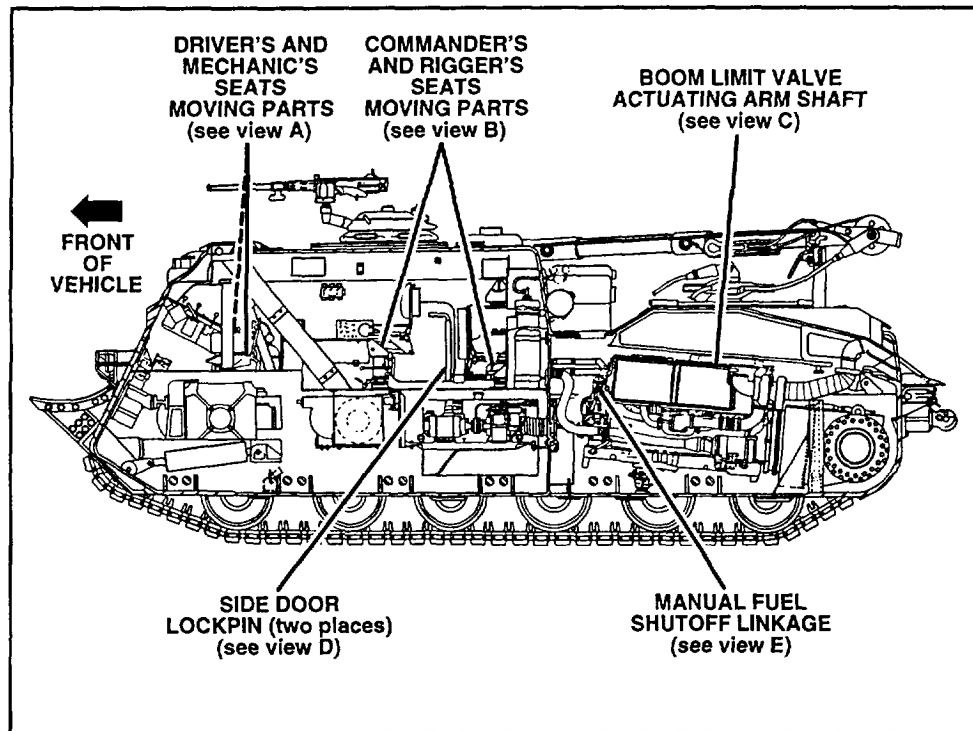


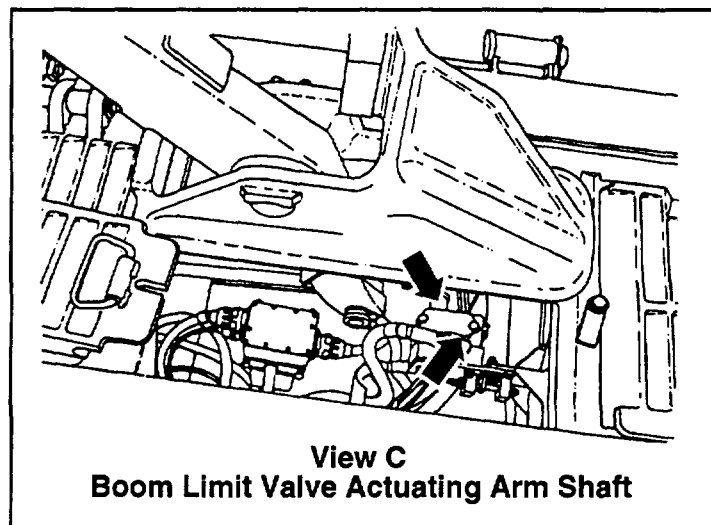
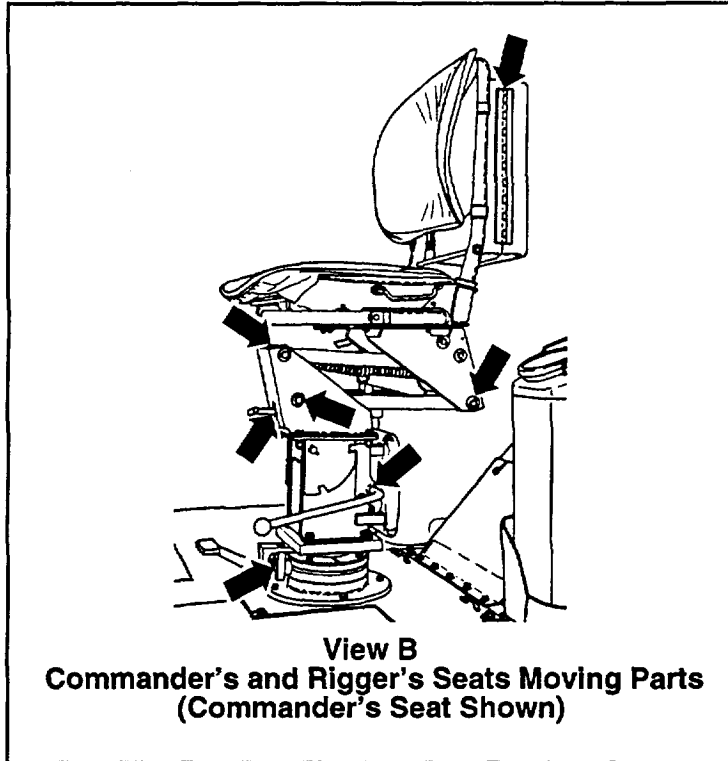
F-3. LUBRICATION INSTRUCTIONS-Continued.



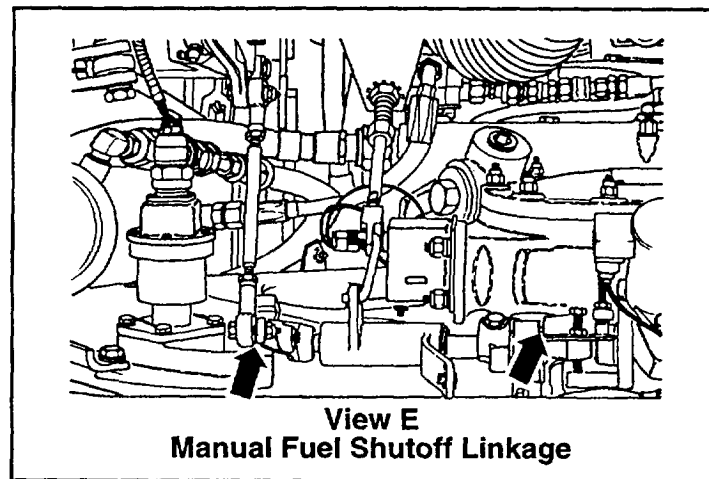
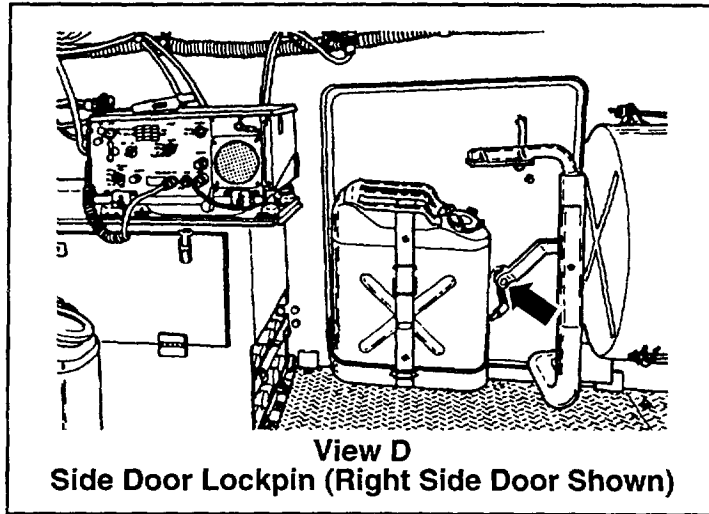


F-3. LUBRICATION INSTRUCTIONS-Continued.





F-3. LUBRICATION INSTRUCTIONS-Continued.



INDEX

Subject	Page
<b>A</b>	
AAL .....	C-1
Abbreviations .....	1-2, B-2, F-2
Accelerator pedal description .....	2-16
Accelerator pedal location .....	2-2
Accelerator PMCS .....	2-54
Accessories control panel description .....	2-8
Acetylene compartment door location .....	2-29
Acetylene cylinder and regulator valve replacement .....	3-55
Acetylene plug location .....	2-26
Acetylene regulator valve and gages location .....	2-37
Additional Authorization List .....	C-1
After-fording maintenance .....	4-4
Air cleaner air control handle location .....	2-31
Air cleaner air control handle operating procedures .....	2-149
Air cleaner, main engine .....	3-48
Air cleaners PMCS .....	2-55, 2-58
Air intake screen .....	3-48
Air purifier, M2A2 .....	2-191
AM1780/VRC(9), communication amplifier location and description .....	2-21
Ammo bins, M239 smoke grenade system .....	2-167
Ammunition .....	2-170
Ammunition stowage rack location and description .....	2-22
AN/VIC-1(V) intercommunication set operation .....	2-158
AN/VVS-2(V)1A periscope .....	3-40
AN/W S-2(V)1A periscope PMCS .....	2-91
AN/VVS-2(V)1A periscope location .....	2-27
APU access door latches oil can point .....	F-23
APU air filter housing location and description .....	2-24
APU air filter maintenance .....	3-52
APU chaincase drain plug location .....	2-36
APU chaincase oil fill location .....	2-36
APU chaincase lubrication instructions .....	F-7, F-14
APU compartment door location .....	2-35
APU compartment door operating procedures .....	2-155
APU CONTROL BOX description .....	2-7
APU CONTROL BOX location .....	2-2
APU crankcase oil drain valve location .....	2-36
APU emergency fuel shutoff valve location .....	2-36
APU emergency winch control valve location .....	2-28
APU emergency winch control valve location and description .....	2-20
APU fuel filters location .....	2-36
APU GEN switch location and description .....	2-7
APU malfunctions .....	3-14
APU oil filler tube location .....	2-35

**Subject** **Page**

**A-Continued**

APU oil level gage location ..... 2-35

APU operation ..... 2-173

APU PMCS ..... 2-85

APU principles of operation ..... 1-15

APU START switch location and description ..... 2-7

Assembly and preparation for use ..... 2-96

Auxiliary equipment data ..... 1-13

Auxiliary equipment maintenance ..... 4-1

Auxiliary equipment operation ..... 2-158

Auxiliary hydraulic system malfunctions ..... 3-13

Auxiliary Power Unit (APU) operation ..... 2-173

**B**

Basic Issue Items List ..... B-1

B.O. marker light lamp ..... 3-47

B.O. SELECTOR switch location and description ..... 2-9

Batteries PMCS ..... 2-82

BATTERY GENERATOR indicator location and description ..... 2-14

Bil list ..... B-1

BILGE PUMP indicator light location and description ..... 2-8

BILGE PUMP switch location and description ..... 2-8

Bilge pump malfunctions ..... 3-17

Blower malfunction, ventilating ..... 3-15

Blower operation, ventilating ..... 2-185

Bolt cutter location and description ..... 2-24

BOOM operating lever location and description ..... 2-4

BOOM SAFETY control lever location and description ..... 2-4

Boom latch location ..... 2-35

Boom limit valve actuating arm shaft traverse lock oil can points ..... F-25

Boom lockpin oil can points ..... F-17

Boom malfunctions ..... 3-12

Boom operation ..... 2-133

Boom PMCS ..... 2-54, 2-57

Boom cable capacities ..... 2-143

Brake pedal description ..... 2-17

Brake pedal location ..... 2-2

Brake PMCS ..... 2-53

**C**

Cable capacities, main winch ..... 2-147

Cable lubrication instructions, main winch ..... F-4, F-9, F-10

Cable capacities, boom ..... 2-143

Cal. .45 machine gun location and description ..... 2-22

Cal. .50 machine gun and mount maintenance ..... 3-44

Cal. .50 machine gun mount traverse lock oil can point ..... F-23



Subject	Page
Cal. .50 machine gun operation.....	2-127
Cal. .50 machine gun PMCS.....	2-50, 2-66
Cal. .50 machine gun, spare barrel location and description.....	2-21
Cal. .50 principle of operation.....	1-16
Carrier communications equipment radio PMCS.....	2-50
Checking engine operation.....	2-104
Classification of fluid leaks.....	2-46
COEI list.....	B-1
Commander's air purifier control switch location and description.....	2-22
Commander's controls and equipment location and description.....	2-22
Commander's cupola controls location and description.....	2-23
Commander's cupola controls operating procedures.....	2-149
Commander's interphone control box location and description.....	2-22
Commander's seat control operating procedures.....	2-148
Commander's seat dumping handle location and description.....	2-23
Commander's seat height control location and description.....	2-23
Commander's seat horizontal adjustment location and description.....	2-23
Commander's seat rotating foot pedal location and description.....	2-23
Commander's seat tilt handle location and description.....	2-23
Commander's seat traverse lock oil can points.....	F-25
Communication amplifier, AM1780/VRC(9), location and description.....	2-21
Communication equipment operation.....	2-158
Communications systems maintenance.....	4-1
Compensating idler wheel assembly PMCS.....	2-74
Components of End Items List.....	B-1
Controls PMCS.....	2-54
Corrosion prevention and control.....	F-2
CPC.....	1-1
Crankcase lubrication instructions, main engine.....	F-6, F-13
Crew compartment floor access plates and doors.....	2-42
Crew compartment floor access plates and doors location.....	2-42
Crossing class 60 bridge, armored vehicle launched.....	2-119
Cupola PMCS.....	2-65

---

**D**

---

Data, vehicle.....	1-11
Decals.....	2-155
Deep water fording kit installation inspection.....	4-3
Deep water fording kit operation.....	2-160
Deep water fording principles of operation.....	1-16
Destruction of Army materiel to prevent enemy use.....	1-1
Dimmer switch description.....	2-16
Dimmer switch location.....	2-2
Dischargers, M239 smoke grenade system.....	2-165
Dome light (commander's) location and description.....	2-22
Dome light (driver's) description.....	2-19
Dome light (driver's) location.....	2-2

**Subject**

**Page**

**D-Continued**

Dome light (mechanic's) location and description.....	2-21
Dome light lamp.....	3-46
Dome light operating procedures.....	2-153
Dozing (earthmoving and leveling).....	2-132
Drain valve lever description.....	2-16
Drain valve lever location.....	2-2
Drain valve lever operating procedures.....	2-152
Drain valve operations PMCS.....	2-80
Driver's controls and instruments location.....	2-2
Driver's hatch control description.....	2-19
Driver's hatch control location.....	2-2
Driver's instrument panel PMCS.....	2-51
Driver's interphone control box description.....	2-18
Driver's interphone control box location.....	2-2
Driver's seat controls operating procedures.....	2-148
Driver's seat description.....	2-16
Driver's seat PMCS.....	2-61
Driver's seat traverse lock oil can points.....	F-24
Driving precautions.....	2-117

**E**

Earth moving and leveling (dozing).....	2-132
Emergency procedures.....	2-203
Engine compartment PMCS.....	2-59
Engine deck door secure bolt and latch operating procedures.....	2-155
Engine deck door secure bolt location.....	2-32
Engine deck door secure latch location.....	2-32
ENGINE FUEL SHUTOFF switch location and description.....	2-9
Engine hand throttle description.....	2-17
Engine hand throttle location.....	2-3
Engine malfunctions.....	3-6
ENGINE OIL CHECK access door location.....	2-32
ENGINE OIL CHECK location.....	2-33
ENGINE OIL FILL access door location.....	2-33
Engine OIL FILLER TUBE location.....	2-33
Engine oil level PMCS.....	2-60
ENGINE OIL PRESSURE gage location and description.....	2-7
Engine oil sampling valve location.....	2-40
ENGINE oil temperature gage location and description.....	2-14
Equipment characteristics, capabilities, and features.....	1-5
Equipment data.....	1-11
Equipment description.....	1-5
Exhaust deflector pivot pin and hinges oil can points.....	F-19
Exhaust smoke generating system.....	2-171
Exhaust smoke generating system PMCS.....	2-86
Exhaust smoke generating system principle of operation.....	1-16

Subject	Page
Expendable and durable items list .....	D-1
Extreme cold weather conditions.....	2-195
Extreme cold weather maintenance.....	3-57
Extreme cold weather operation.....	2-196
Extreme hot weather conditions .....	2-201
Extreme hot weather maintenance.....	3-58

---

**F**

---

Filter element replacement .....	3-48
Final drive PMCS .....	2-70
Fire extinguisher (external) handle PMCS.....	2-47
Fire extinguisher (left wall) pull handles location, fixed.....	2-29
Fire extinguisher cylinder control lever location, fixed .....	2-28
Fire extinguisher location and description, fixed .....	2-22
Fire extinguisher location and description, portable .....	2-24
Fire extinguisher operation, portable .....	2-186
Fire extinguisher outside pull handles location, fixed .....	2-27
Fire extinguisher principles of operation.....	1-16
Fire extinguisher system operation, fixed .....	2-187
Fire extinguishers PMCS, fixed .....	2-47
Fire extinguishers PMCS, portable .....	2-48
Fixed fire extinguisher (left wall) pull handles location.....	2-29
Fixed fire extinguisher cylinder control lever location .....	2-28
Fixed fire extinguisher location and description .....	2-22
Fixed fire extinguisher outside pull handles location .....	2-27
Fixed fire extinguisher system operation .....	2-187
Fixed fire extinguishers PMCS .....	2-47
Floor access plates and doors, crew compartment .....	2-42
Flow regulator control principle of operation.....	1-16
Flow regulator handle location .....	2-34
Fluid leaks, classification of .....	2-46
Fording.....	2-202
Forms and records, maintenance.....	1-1
FUEL CONTROL VALVE location and description .....	2-24
FUEL CONTROL VALVES location.....	2-41
FUEL CONTROL VALVES operating procedures.....	2-150
Fuel level gage-for front and rear tanks location and description .....	2-15
Fuel level sending unit and fuel pump access door location .....	2-42
FUEL PUMP CONTROL location .....	2-34
FUEL PUMP switch location and description.....	2-9
Fuel shutoff cable PMCS .....	2-61
FUEL SHUTOFF switch location and description.....	2-7
Fuel tank fill cover location .....	2-26
FUEL TANK selector switch location and description.....	2-15

Subject	Page
<b>G</b>	
Gage panel description.....	2-14
Gage panel location.....	2-3
Gas-particulate filter unit location and description, M8A3.....	2-24
Gas-particulate filter unit malfunctions, M8A3 .....	3-16
Gas-particulate filter unit operation, M8A3 . .....	2-189
Gas-particulate filter unit PMCS, M8A3.....	2-94
Gas-particulate filter unit principle of operation.....	1-16
General information.....	1-1
General vehicle controls location.....	2-26
Generator blower air intake grille location and description.....	2-24
Generator blower PMCS.....	2-53
GENERATOR OUT indicator light location and description, main engine.....	2-8
GENERATOR switch location and description, main engine.....	2-8
Glossary.....	1-3
Grenades, smoke, UKL8A1 .....	2-168
Grille door hinges and retaining bolts oil can points .....	F-17, F-19
<b>H</b>	
Hatch control, driver's.....	2-2
Hatch control operating procedures.....	2-150
Headlamp removal nut oil can point.....	F-21
HEATER control box location, PERSONNEL .....	2-3
Heater air control handle location, personnel .....	2-31
Heater design, optional.....	2-149
Heater location and description, personnel .....	2-24
Heater malfunctions, personnel.....	3-15
Heater operation, personnel.....	2-185
Heater PMCS, personnel.....	2-94
HIGH AIR TEMP light location and description.....	2-7
HIGH BEAM indicator description.....	2-18
HIGH BEAM indicator location.....	2-3
Hinge and bracket assembly location .....	2-31
HOIST WINCH operating lever location and description.....	2-6
HOIST WINCH SHIFT lever location and description.....	2-6
Hoist winch drain valve access door location .....	2-42
Hoist winch fill and level, main winch drain valve access door location.....	2-42
Hoist winch oil drain valve location .....	2-39
Hoist winch oil level indicator location.....	2-39
Hoist winch oil level PMCS .....	2-62
Hoist winch operation.....	2-142
Hoist winch PMCS .....	2-54, 2-57, 2-94
Horn button description .....	2-19
Horn button location .....	2-2
Hull access plates PMCS .....	2-80
Hydraulic connections access door location.....	2-42
Hydraulic controls description .....	2-4

Subject	Page
Hydraulic filter gage, mechanical fill level indicator, and drain valve access door location.....	2-42
Hydraulic hose connection access plate location.....	2-42
Hydraulic hose connection access plates location.....	2-42
Hydraulic impact wrench operation.....	2-183
Hydraulic oil high temperature switch and oil temperature transmitter location.....	2-38
Hydraulic oil tank drain access door location.....	2-42
Hydraulic oil tank drain valve location.....	2-39
Hydraulic oil tank fill and oil level indicator access plate location.....	2-42
Hydraulic oil tank oil level indicator and fill location.....	2-38
Hydraulic reservoir oil level PMCS.....	2-62
Hydraulic spade locking release button description.....	2-17
Hydraulic system PMCS, main.....	2-54
Hydraulic system, preparing for operation.....	2-127
Hydraulics control panel location.....	2-2

---

I

---

Impact wrench operation, hydraulic.....	2-183
Information, general.....	1-1
Initial adjustments, checks, and self-test (normal conditions).....	2-96
Inspection of deep water fording kit installation.....	4-3
Instruction plates.....	2-155
Instrument panel light lamp.....	3-46
Intercommunication set operation, AN/VIC-1(V).....	2-158
Interphone control box location.....	2-30
Interphone control box location, driver's.....	2-2

---

J

---

Jack (vehicle) and utility chain storage access door location.....	2-42
Jack operation, vehicle.....	2-189
Jack principle of operation, vehicle.....	1-16

---

L

---

Labels location and description.....	E-5
Lamp replacement.....	3-46
Lamp, B.O. marker light lamp.....	3-47
Lamp, dome light.....	3-46
Lamp, instrument panel light.....	3-46
Latches oil can points.....	F-19
LAW rocket (mechanic's) location and description.....	2-21
LAW rocket stowage trays location.....	2-30
LAW rocket stowage trays operating procedures.....	2-152
LAW rockets (commander's) location and description.....	2-22
Lenses.....	3-35
Light system malfunctions.....	3-13

Subject	Page
<b>L-Continued</b>	
Lights PMCS .....	2-81
Location and description of major components .....	1-5
Lockout blocks.....	2-144
LOW OIL PRESS light location and description.....	2-7
Lubrication instructions .....	F-1
<b>M</b>	
M14 rifle (optional) location and description .....	2-21
M16 rifle location and description .....	2-21
M17 periscope .....	3-36
M17 periscope location and description .....	2-3, 2-18, 2-20, 2-24
M17 periscope PMCS .....	2-86
M239 smoke grenade arming box location .....	2-30
M239 smoke grenade arming switch location and description .....	2-22
M239 smoke grenade launcher controls PMCS .....	2-64
M239 smoke grenade launcher maintenance.....	4-5
M239 smoke grenade system ammo bins .....	2-167
M239 smoke grenade system dischargers .....	2-165
M239 smoke grenade system malfunctions .....	3-17
M239 smoke grenade system operation .....	2-164
M239 smoke grenade system principle of operation .....	1-16
M24 periscope .....	3-38
M24 periscope head assembly.....	3-40
M24 periscope night check PMCS.....	2-87
M24A1 periscope location.....	2-27
M2A2 air purifier .....	2-191
M8A3 gas-particulate filter unit location and description.....	2-24
M8A3 gas-particulate filter unit malfunctions .....	3-16
M8A3 gas-particulate filter unit operation.....	2-189
M8A3 gas-particulate filter unit PMCS .....	2-94
Machine gun and mount maintenance, cal. .50 .....	3-44
Machine gun location and description, cal. .45 .....	2-22
Machine gun mount PMCS .....	2-65
Machine gun mount traverse lock oil can point, cal 50 .....	F-23
Machine gun operation, cal 50 .....	2-127
Machine gun PMCS, caliber .50.....	2-50, 2-66
Machine gun spare barrel location and description, cal. .50 .....	2-21
MAIN WINCH operating lever location and description .....	2-4
MAIN WINCH SHIFT lever location.....	2-2
MAIN WINCH SHIFT lever location and description.....	2-6
Main engine air cleaner.....	3-48
Main engine crankcase lubrication instructions.....	F-6, F-13
Main engine GENERATOR OUT indicator light location and description.....	2-8
Main engine GENERATOR switch location and description .....	2-8
Main hydraulic system PMCS .....	2-54, 2-57
Main winch cable capacities .....	2-147

Subject	Page
Main winch cable lubrication instructions . . . . .	F-4, F-9, F-10
Main winch fill and level access plate location.....	2-42
Main winch oil drain valve location.....	2-38
Main winch oil level indicator location.....	2-38
Main winch oil level PMCS.....	2-63
Main winch operation.....	2-145
Main winch PMCS.....	2-54, 2-57, 2-94
Maintenance after fording.....	3-59
Maintenance after operation on unusual terrain.....	3-60
Maintenance forms and records.....	1-1
Maintenance of auxiliary equipment.....	4-1
Maintenance of communications systems.....	4-1
Maintenance procedures.....	3-19
Maintenance under unusual conditions.....	3-57
Major components, location and description of.....	1-5
Malfunction index.....	3-3
Manual fuel shutoff handle description.....	2-17
Manual fuel shutoff handle location.....	2-3
Manual fuel shutoff linkage traverse lock oil can points.....	F-26
Manual spade locking release handle description.....	2-17
MASTER switch location and description.....	2-9
Master switch indicator light location and description.....	2-9
Master warning light location and description.....	2-14
MECH TRANSMISSION OIL PRESSURE warning light location and description.....	2-14
Mechanic's controls and instruments location and description.....	2-20
Mechanic's hatch control location and description.....	2-20
Mechanic's interphone control box location and description.....	2-20
Mechanic's seat traverse lock oil can points.....	F-24
Mechanic's vision blocks location and description.....	2-20
Mechanical transmission oil drain valve location.....	2-40
Mechanical transmission oil level indicator and fill location.....	2-40
Mechanical transmission oil level PMCS.....	2-63
Mechanics air purifier control switch location and description.....	2-21
Miscellaneous driver's controls and indicators description.....	2-16
Miscellaneous operating procedures.....	2-148
Miscellaneous principles of operation.....	1-16
MX7778A/GRC suppressor operation.....	2-160

---

**N**

---

Name plates.....	2-156
NIGHT VIEWER receiver light system description.....	2-19
NIGHT VIEWER receiver light system location.....	2-2
Nomenclature cross-reference list.....	1-1
Nos. 1 and 2 roadwheel assembly PMCS.....	2-74

**Subject**

**Page**

---

**O**

---

Oddment compartment location and description .....	2-21
Oil can points (exterior) .....	F-15
Oil cans location and description .....	2-21
Oil filter statement .....	F-2
OIL PRESSURE gage location and description, ENGINE .....	2-7
On-vehicle stowage clamps oil can points.....	F-18, F-21, F-22
Operating doors .....	2-154
Operating instructions .....	2-1
Operating procedures.....	2-120
Operation on unusual terrain .....	2-202
Operation under unusual conditions .....	2-195
Operation under usual conditions .....	2-96
Operator's controls and indicators description and use .....	2-2
Optional heater design .....	2-149
Oxygen and acetylene hoses location and description.....	2-24
Oxygen cylinder and regulator valve replacement .....	3-53
Oxygen cylinder strap location.....	2-26
Oxygen regulator valve and gages location.....	2-37

---

**P**

---

Panel lamp assembly location and description .....	2-14
Parts cleaning.....	F-2
Performance, vehicle.....	1-12
Periscope data.....	1-13
Periscope head assembly, M24 .....	3-40
Periscope location and description, M17.....	2-3, 2-18, 2-20, 2-24
Periscope location, AN/VVS-2(V)1A .....	2-27
Periscope location, M24 or M24A1.....	2-27
Periscope night check PMCS, M24/M24A1.....	2-87
Periscope PMCS, AN/VVS-2(V)1A .....	2-91
Periscope PMCS, M17 .....	2-86
Periscope, AN/VVS-2(V)A .....	3-40
Periscope, M17.....	3-36
Periscope, M24.....	3-38
PERSONNEL HEATER control box description.....	2-18
PERSONNEL HEATER control box location.....	2-3
Personnel access door latch oil can point .....	F-20
Personnel door right side location .....	2-29, 2-32
Personnel door right side operating procedures .....	2-154
Personnel heater air control handle location.....	2-31
Personnel heater air control handle operating procedures .....	2-149
Personnel heater location and description.....	2-24
Personnel heater malfunctions.....	3-15
Personnel heater operation.....	2-185
Personnel heater PMCS .....	2-94



Subject	Page
Personnel heater principle of operation.....	1-16
Personnel seats location.....	2-42
Personnel side doors PMCS.....	2-84
Pintle tow lugs PMCS.....	2-68
Pivot pins oil can points.....	F-18, F-21
PMCS.....	2-44
Portable fire extinguisher location and description.....	2-24
Portable fire extinguisher operation.....	2-186
Portable fire extinguishers PMCS.....	2-48
POWER control lever location and description.....	2-4
PREHEAT switch location and description.....	2-7
Preparation for movement.....	2-193
Preparing hydraulic system for operation.....	2-127
Prestating instructions.....	2-96
Principles of operation.....	1-14
Purge pump handle description.....	2-17
Purge pump handle location.....	2-3
Push button unit location.....	2-30
Putting vehicle in motion.....	2-110

---

**R**

---

Radio communications set location.....	2-28
Radio interference suppression system malfunctions.....	3-14
Rear grille doors PMCS.....	2-83
Reporting Equipment Improvement Recommendations (EIRs).....	1-1
Rifle location and description, M14 (optional).....	2-21
Rifle location and description, M16.....	2-21
Rigger's controls and indicators location and description 2-24.....	2-24
Rigger's hatch control location and description.....	2-24
Rigger's intercom control box location and description.....	2-24
Rigger's lights location and description.....	2-24
Rigger's outside spotlight control.....	2-153
Rigger's seat location and description.....	2-24
Rigger's seat traverse lock oil can points.....	F-25
Rigger's spotlight remote control location and description.....	2-24
Rigger's troublelight location and description.....	2-24
Rigger's troublelight operating procedures.....	2-154
Right side personnel door operating procedures.....	2-154
Roadwheel arms PMCS.....	2-73
Roadwheel assemblies PMCS.....	2-72, 2-74
Roadwheel idler and support roller hubs PMCS.....	2-70

---

**S**

---

Safety cap location.....	2-26
Seats location, personnel.....	2-42
Sheave oil can point.....	F-22
Shock absorbers PMCS.....	2-70

Subject	Page
<b>S-Continued</b>	
Side door lockpin traverse lock oil can point.....	F-26
Sign guide.....	E-1
Slave cable PMCS.....	2-83
Slave starting main engine.....	2-105
Smoke grenade arming box location, M239.....	2-30
Smoke grenade arming switch location and description, M239.....	2-22
Smoke grenade launcher controls PMCS, M239.....	2-64
Smoke grenade launcher maintenance, M239.....	4-5
Smoke grenade system ammo bins, M239.....	2-167
Smoke grenade system dischargers, M239.....	2-165
Smoke grenade system malfunctions, M239.....	3-17
Smoke grenade system operation, M239.....	2-164
Smoke grenades, UKL8A1.....	2-168
Snatch block assemblies PMCS.....	2-66
Snatch block oil can points.....	F-20
Spade locking release handle location.....	2-3
SPADE operating lever location and description.....	2-4
Spade operation.....	2-131
Spade PMCS.....	2-56
Spare barrel for cal. .50 machine gun location and description.....	2-21
Speedometer location and description.....	2-14
START button location and description.....	2-9
Starting main engine (normal conditions).....	2-102
Starting main engine by towing.....	2-108
Starting system malfunctions.....	3-9
Steering instructions.....	2-113
Steering wheel description.....	2-19
Steering wheel location.....	2-2
Steershift PMCS.....	2-54
Stencils, exterior location.....	E-2
Stopping main engine.....	2-118
Stopping vehicle.....	2-116
Stowage compartment door (left side) location.....	2-27
Stowage compartment door oil can point.....	F-20
Stowage compartment oil can point.....	F-23
Stowage guide.....	E-1
Stowage straps (exterior) location.....	E-18
Stowage straps (interior) location.....	E-19
Stowed items (exterior) location.....	E-9
Stowed items (interior) location.....	E-13
Suppressor operation, MX7778A/GRC.....	2-160
Suspension inspection.....	3-19
Suspension malfunctions.....	3-16
Swimming.....	2-202
Switch panel description.....	2-9
SYSTEM SELECTOR control lever location and description.....	2-4

**Subject** **Page**

---

**T**

---

Tachometer location and description ..... 2-14

Tool box location and description ..... 2-22

Top hatches PMCS ..... 2-84

Torsion bars for roadwheels PMCS ..... 2-76

Tow bars PMCS ..... 2-69

Tow cables PMCS ..... 2-69

Tow chain PMCS ..... 2-68

Tow pintle PMCS ..... 2-83

Towing cable stowage attachment location ..... 2-26

Towing operations ..... 1-14, 2-120

Towing pintle location ..... 2-26

Towing speeds ..... 2-121

Track adjusting links PMCS ..... 2-76

Track disconnect ..... 3-22

Track fixtures/components bilge pump stowage access door location ..... 2-42

Track inspection ..... 3-19

Track installation ..... 3-28

Track link adjusting wrench location and description ..... 2-22

Track removal ..... 3-27

Track shoe replacement ..... 3-25

Track shoes PMCS ..... 2-78

Track support rollers and hubs PMCS ..... 2-71

Track tension adjustment ..... 3-21

Track tension PMCS ..... 2-79

Tracks malfunctions ..... 3-16

Transmission lubrication instructions ..... F-5, F-11

Transmission malfunctions ..... 3-11

Transmission oil fill and level location ..... 2-33

Transmission oil level PMCS ..... 2-60

Transmission oil level PMCS, mechanical ..... 2-63

TRANSMISSION oil pressure gage location and description ..... 2-14

Transmission oil sampling valve location ..... 2-40

TRANSMISSION oil temperature gage location and description ..... 2-14

Transmission shift lever description ..... 2-16

Transmission shift lever location ..... 2-2

Transmission shift selection ..... 2-110

Troubleshooting procedures ..... 3-3

---

**U**

---

UKL8A1 smoke grenades ..... 2-168

Unusual environment/weather conditions ..... 2-195

Unusual terrain operation ..... 2-202

USAREUR safety lighting description ..... 2-12

USAREUR turn signal location and description ..... 2-10

Utility power receptacle location and description ..... 2-8

**Subject**

**Page**

---

**V**

---

Vehicle data..... 1-11

VEHICLE EXHAUST SMOKE system description ..... 2-19

VEHICLE EXHAUST SMOKE system location..... 2-2

Vehicle exterior PMCS ..... 2-47

Vehicle jack operation..... 2-189

Vehicle performance ..... 1-12

Vehicular lights switch description ..... 2-11

Vehicular lights switch location and description ..... 2-9

VENT BLOWER switch location and description ..... 2-8

Ventilating blower malfunction..... 3-15

Ventilating blower operation..... 2-185

Vise oil can point..... F-17

Vision blocks location and description, mechanic's ..... 2-20

Vision blocks, driver's ..... 2-3, 2-18

Vision devices ..... 3-35

---

**W**

---

Water cans location and description ..... 2-22

Winch cable capacities, main..... 2-147

Winch cable lubrication instructions, main..... F-4, F-9, F-10

Winch compartment light mount plate location ..... 2-42

Winch fill and level access plate location, main ..... 2-42

WINCH LT switch location and description..... 2-8

Winch oil drain valve location, hoist..... 2-39

Winch oil drain valve location, main..... 2-38

Winch oil level indicator location, hoist..... 2-39

Winch oil level indicator location, main..... 2-38

Winch oil level PMCS, hoist ..... 2-62

Winch oil level PMCS, main..... 2-63

WINCH operating lever location and description, HOIST..... 2-6

WINCH operating lever location and description, MAIN ..... 2-4

Winch operation, main..... 2-145

Winch PMCS, hoist..... 2-54, 2-57, 2-94

Winch PMCS, main..... 2-54, 2-57, 2-94

WINCH SHIFT lever location and description, HOIST..... 2-6

WINCH SHIFT lever location and description, MAIN..... 2-6

Winches malfunctions ..... 3-12

Wrench operation, hydraulic impact ..... 2-183

**By Order of the Secretary of the Army:**

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

Official:



JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*  
04630

DISTRIBUTION: To be distributed in accordance with the initial distribution for IDN 370944 requirements for TM 9-2350-256-10.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

TM 9-2350-256-10

PUBLICATION DATE

31 March 1998

PUBLICATION TITLE DS & GS RPSIL FOR

ENGINE: MODEL AVDS-1790-8CR

BE EXACT... PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
4-1	4		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Item #4, part number should be 10921477

SAMPLE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN JOE DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

**SOMETHING WRONG** WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

TM 9-2350-256-10

PUBLICATION DATE

31 Mar 98

PUBLICATION TITLE

DS & GS RPSTL for Engine:  
Model AVDS-1790-8CR

BE EXACT PIN-POINT WHERE IT IS

PAGE NO

PARA-GRAPH

FIGURE NO

TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM 2028-2  
1 JUL 79

PREVIOUS EDITIONS ARE OBSOLETE.  
AMSMC OP-103-85

P.S. --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

THIS SIGNATURE LINE

FILL IN YOUR  
UNITS ADDRESS



DEPARTMENT OF THE ARMY



OFFICIAL BUSINESS

NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**

FIRST CLASS

PERMIT NO. 82

ROCK ISLAND IL

POSTAGE WILL BE PAID BY ROCK ISLAND ARSENAL



DIRECTOR  
ARMAMENT AND CHEMICAL ACQUISITION  
AND LOGISTICS ACTIVITY  
ATTN: AMSTA-AC-NMLI  
ROCK ISLAND IL 61201-9948

TEAR ALONG PERFORATED LINE





