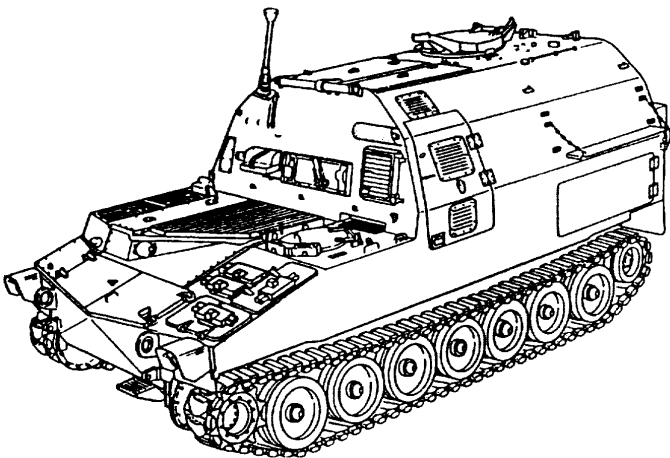


TECHNICAL MANUAL



DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE
FOR

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

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HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1993

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DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
CARRIER, AMMUNITION, TRACKED
M992A1
(NSN 2350-01-352-3021)

EIC: AE6

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

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

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

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HOW TO USE THIS MANUAL

SCOPE.

This technical manual contains Direct Support and General Support maintenance procedures for the M992A1 Carrier, Ammunition, Tracked. Chapter 1 contains general information; Chapter 2 provides general instructions and guidance for performing required maintenance functions and describes requirements for common tools and equipment, special tools and support equipment, and repair park; and Chapters 3 through 15 describe and illustrate maintenance procedures for various systems and components. Appendixes, a subject index, and electrical system and hydraulic system schematics are also contained in the manual.

INDEXING.

Four indexing procedures are used to help you locate information quickly:

- Cover index. Lists chapter titles and other important parts of the manual, with corresponding page numbers. Each chapter/part listed is boxed in, with a black outer edge that is in line with the first page of that chapter part.
- Table of contents. The table of contents starts on page i.
- Chapter indexes. Each chapter starts with a numerical listing of all procedure paragraphs in that chapter.
- Index. The alphabetically arranged subject index starts on page Index 1.

MAINTENANCE TEXT AND ILLUSTRATIONS (CHAPTERS 3 THROUGH 15).

Each chapter begins with a "General" paragraph that describes the system(s) to be covered.

Each procedures paragraph contains the following information, as appropriate:

- The tools, test equipment, or special tools required to perform the procedures are listed under the heading "Tools/Test Equipment ." Common and special tools are listed in Appendix D.
- Materials and parts that *will* be discarded during the procedure are listed under the heading "Materials/Parts." These lists do not contain items that maybe replaced if found defective during inspection. Also, these lists do not contain the item named in the paragraph title. Materials may be found in Appendix B. Mandatory replacement parts are listed in Appendix H.
- If more than one person is required to perform the procedure, the number is specified under the heading "Personnel Required."
- Procedures that must be performed on the vehicle prior to beginning the maintenance procedure are listed under the heading "Equipment Conditions."
- Technical manuals, technical bulletins, field manuals, or other reference material that may be required to perform the procedure is listed under the heading "References."

Note that the titles of publications and forms referenced anywhere in the manual are listed in Appendix A.

TEXT AND ILLUSTRATIONS.

Maintenance procedures are to be performed in the sequence shown in the text and illustrations.

Illustrations are numbered clockwise, beginning at the 12 o'clock position. Because an illustration is keyed to the text, parts that are removed sequentially may not have sequential numbers. For example:

Remove screw (4), lockwasher (6), washer (7), and bracket (5) from transmission (8).

PROBLEM SOLVING.

The best way for you to fulfill your responsibility for maintaining the equipment covered in this manual is to make maximum use of your maintenance manual. The following two sample problems illustrate ways to use the manual efficiently.

1. How do I replace the radiator fan shroud?
 - Look in the subject index for "radiator fan shroud replacement" and turn to the appropriate page.
2. An equipment condition for engine mount repair (para 3-5) is "Lower fuel tank removed (para 4-4)." How do I find out what page paragraph 4-4 begins on?

Look in the chapter index for Chapter 4 until you find paragraph 4-4, Lower Fuel Tank Replacement; then turn to the appropriate page.

IMPORTANT.

Be sure to read the entire procedures paragraph before beginning a maintenance procedure. Also, read the general information in Chapter 1 before beginning a procedure.

Warnings and cautions appear immediately preceding the step to which they pertain. It is important to read and thoroughly understand warnings and cautions before beginning any maintenance procedure.

Notes may precede or follow the steps to which they pertain, depending on what makes the most sense. Notes give information meant to make performing the procedure easier.

REPAIR PARTS AND SPECIAL TOOLS.

For repair parts and special tools used on this vehicle, refer to TM 9-2350-287-24P.

SAFETY SUMMARY

This safety summary contains general safety precautions and hazardous materials warnings that must be understood and applied during maintenance to protect personnel and DOD property. Portions of this summary may be repeated elsewhere for emphasis.

WARNING and CAUTION statements appear throughout this manual prior to procedures, practices, or conditions that may endanger personnel (WARNING) or cause equipment and property damage (CAUTION). A warning or caution will apply each time the related step is repeated. Before starting any task, review and understand the warnings and cautions included in the text for that task.

This manual contains procedures which may require using chemicals, solvents, paints, or other commercially available material that may pose a health or safety hazard. Refer to the "Materials/Parts" list at the beginning of a task to see which materials will be used during the task. Obtain material safety data sheets (Occupational Safety and Health Act [OSHA] Form 20 or equivalent) from the manufacturer or supplier of the material to be used. Become completely familiar with the information and manufacturer/supplier procedures, recommendations, warnings, and cautions for the safe use, handling, storage, and disposal of these materials.

Following the "General Safety Precautions" list is a list of "Hazardous Materials Warnings." These warnings are designed to warn personnel of dangers associated with hazardous materials. For each hazardous material used, a material safety data sheet is required to be provided and available for review by personnel. Consult your local safety and health staff concerning questions on hazardous chemicals, personnel protective equipment requirements, and appropriate handling and emergency procedures.

GENERAL SAFETY PRECAUTIONS

- Always use the same fastener part number (or equivalent) when replacing fasteners. Do not risk using a fastener of less quality; do not mix metric and inch (customary) fasteners. Mismatched or incorrect fasteners can result in damage, malfunction, or injury.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Make sure equipment will not move while repairing or inspecting it. For powered equipment, block or chock wheels or tracks and "red tag" the starter. Prevent a "quick fix" from becoming a quick injury.
- When adjustment or service requires a running engine, two personnel will be used, one at the controls and one at the service point. This helps prevent accidental movement of controls.
- When checking connections, do not let tools touch battery box. A direct short, arcing, tool heating to red hot, and battery explosion could result, causing injury or death to personnel.
- Sharp edges can cut hands. Use rags or a brush to lubricate.
- Do not use equipment for other than its intended use, unless authorized by the NICP/commodity command.

GENERAL SAFETY PRECAUTIONS (continued)

- Hearing protection is required for all personnel working in and around this vehicle while engine is running.
- Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit cause severe burns or electrical shock.
- Never crawl under equipment when performing maintenance unless equipment is securely blocked. Equipment may fall and cause serious injury or death to personnel.
- Keep clear of equipment when equipment is being raised or lowered. Equipment may fall and cause serious injury or death to personnel.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.
- Do not allow heavy components to swing while hanging from lifting device. Equipment may strike personnel and cause injury.
- Exercise extreme caution when working near a cable or chain under tension. A snapped cable or a swinging or shifting load may result in injury or death to personnel.
- When working on a running engine, provide shielding to exposed rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.

HAZARDOUS MATERIALS WARNINGS

- Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in a well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush with water for 15 minutes and get immediate medical attention.
- Adhesive sealant MIL-S-46163 (Loctite) can damage your eyes. Wear safety goggles/glasses when using; avoid contact with eyes. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

HAZARDOUS MATERIALS WARNINGS (continued)

- Chemical agent resistant coating (CARC) paint contains isocyanate (HDI), which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning sensation in throat and nose, and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:
 - ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.
 - DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).
 - DO NOT use CARC paint without adequate ventilation.
 - NEVER weld or cut CARC-coated materials.
 - DO NOT grind or sand painted equipment without high-efficiency air purifying respirators in use.
 - BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.
- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using the solvent; the flashpoint for type 1 is 100°F (38°C) and for type II it is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush with water and get immediate medical attention.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

Paragraph Number	Paragraph Title	Page Number
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1-2	Maintenance Forms, Records, and Reports	1-1
1-3	Destruction of Army Materiel To Prevent Enemy Use	1-1
1-4	Preparation for Storage or Shipment	1-1
1-5	Quality Assurance	1-2
1-6	Official Nomenclature, Names, and Designations	1-2
1-7	Reporting Equipment Improvement Recommendations (EIRs)	1-2
1-8	Warranty Information	1-2
1-9	Safety, Care, and Handling	1-3
1-10	Corrosion Prevention and Control (CPC)	1-3

1-1. SCOPE

- a. Type of manual: Direct and General maintenance.
- b. Model number and equipment name: M992A1 Carrier, Ammunition, Tracked.
- c. Purpose of equipment: Provide overland transport of 155-millimeter projectiles and propelling charges from ammunition supply points to self-propelled howitzers in the field.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA Pam 738-750, The Army Maintenance Management System; DA Pam 738-751, Functional Users Manual for the Army Maintenance for the Army Maintenance Management System-Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-6 for procedures on destruction of military vehicles. Destruction of munitions is covered in TM 750-244-5-1 (conventional ammunition) and TM 43-0002-33 (improved conventional munitions).

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Refer to TM 9-2350-287-20-1 for procedures on preparation of the M992A1 for storage or shipment.

1-5. QUALITY ASSURANCE.

No specific quality assurance manual pertains to the M992A1.

Defective material received through the supply system should be reported on an SF Form 368, Product Quality Deficiency Report. Instructions for preparing the reports are provided in AR 702-7, Reporting of Quality Deficiency Data. Mail your completed form directly to:

Commander
U.S. Army Tank-Automotive Command
ATTN: AMSTA-QRT
Warren, MI 48397-5000

1-6. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.

Nomenclature in this manual was chosen in accordance with the terms used for provisioning as they appear in the repair parts and special tools list (RPSTL) and maintenance allocation chart (MAC) for Unit maintenance on the M992A1.

A few tools and hull components are, however, referred to by names more common than those in the RPSTL. In many cases, the more common name is a shorter name for the same component.

Nomenclature Cross-Reference

Manual Nomenclature

Adapter
Bracket
Front hull slope plate
Hook
Hose or hose assembly
Lockwire
Master relay
Side hull slope plate
Spring
Tube
Wiring harness

Official Nomenclature

Straight pipe adapter
Rotating eye bracket
Armor plate
Strap fastener loop
Hose assembly, nonmetallic
Nonelectrical wire
Relay and housing assembly
Door support plate
Adjustable door spring
Metallic bent tube
Branched wiring harness

1-7. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

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

1-8. WARRANTY INFORMATION.

The M992A1 is not warranted.

1-9. SAFETY, CARE, AND HANDLING.

For information on general safety precautions and regulations, review the warning summary at the front of this manual and the safety summary that follows the table of contents. Observe all warnings and cautions that appear in the maintenance procedures.

1-10. CORROSION PREVENTION AND CONTROL (CPC).

Corrosion prevention and control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with the rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using an SF Form 368. Use of key words such as "corrosion," "rust," "deterioration," and "cracking" will ensure that the information is identified as a CPC problem.

The form should be submitted to the address specified in DA Pam 738-750.

Section II. EQUIPMENT DESCRIPTION AND DATA

Paragraph Number	Paragraph Title	Page Number
1-11	Equipment Characteristics, Capabilities, and Features	1-4
1-12	Location and Description of Major Components	1-5
1-13	Differences Between Models	1-11
1-14	Equipment Data	1-13
1-15	Equipment Configuration	1-16

1-11. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

Purpose

The M992A1 is a field artillery ammunition support vehicle comparable in speed, mobility, and survivability to current field artillery weapons (M1 09A6 self-propelled howitzer class).

Capabilities

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

Features

- Ammunition handling equipment that includes a hydraulically operated conveyor assembly, two projectile rack assemblies, canister stowage compartments, and related components.
- Remote start diesel-powered auxiliary power unit (APU) for continuous operation of electrical and hydraulic systems without use of the main engine.

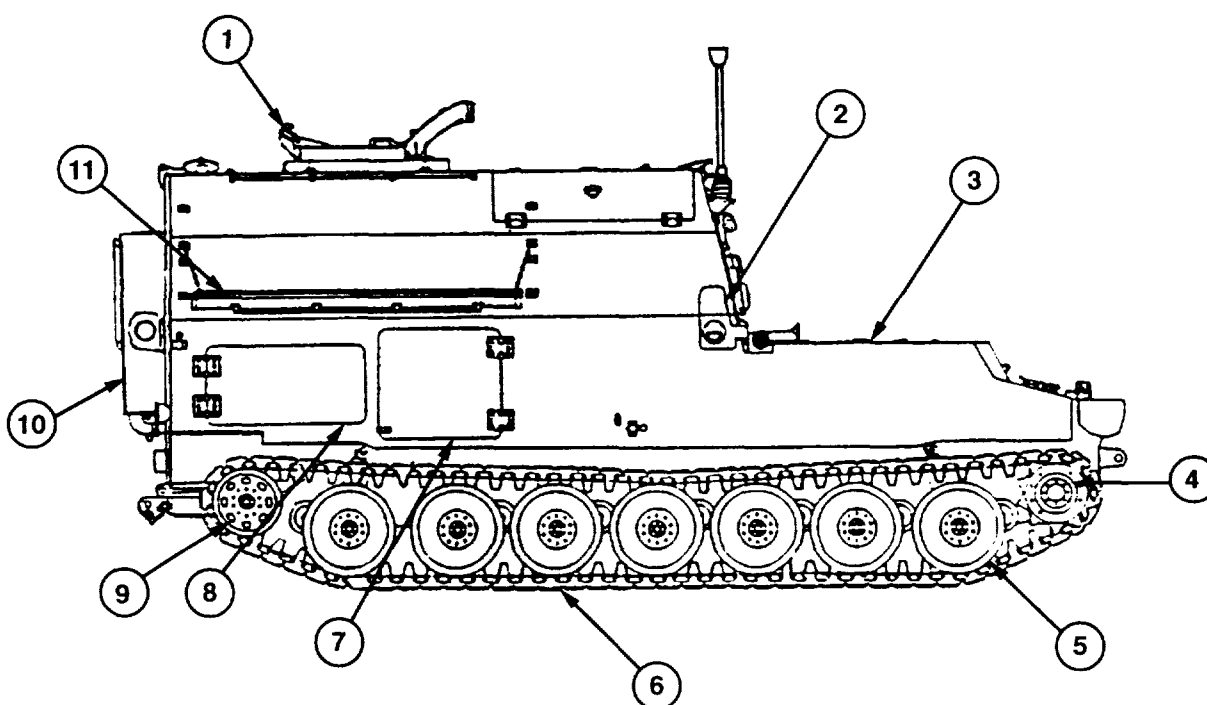
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- Upper rear door that, when opened, provides overhead ballistic protection between M992A1 and supported howitzer. Two small doors in upper rear door allow operation of conveyor with upper rear door closed.
- Side doors, on both sides of vehicle, that provide access for personnel and for the loading of propellant-charge canisters and copperhead projectiles into canister compartments.
- On-board nuclear, biological, and chemical (NBC) agent detection and protection system.
- Crew seating for three, plus driver's seat and commander's seat.
- Simplified test equipment for the internal combustion engine (STE/ICE).

Change 1 1-4

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

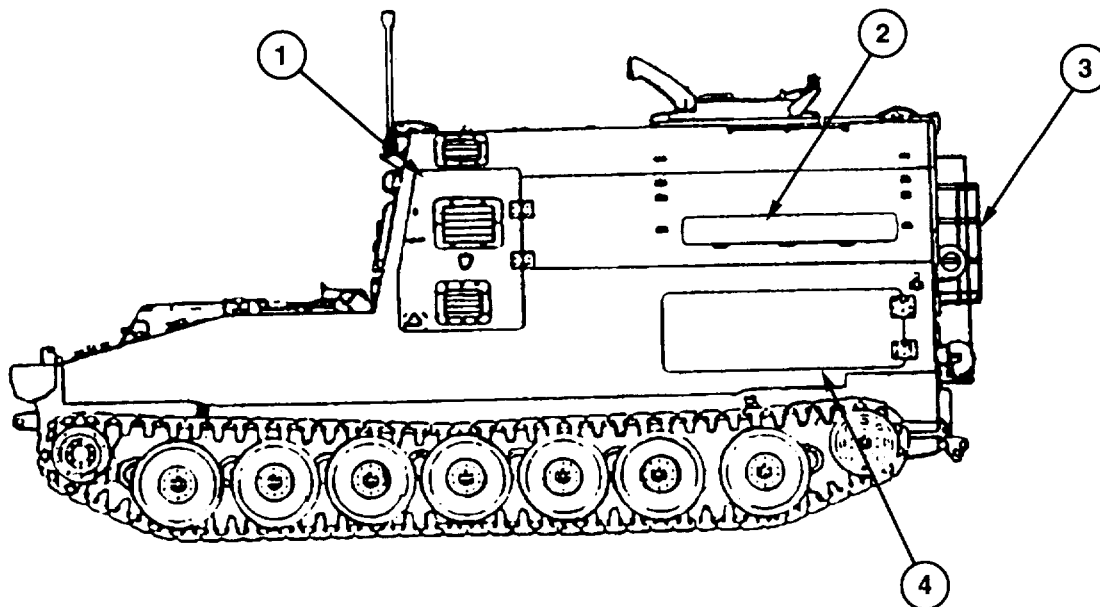
1. Commander's cupola
2. Fuel fill access door
3. Hull
4. Drive sprocket (one on each side)
5. Roadwheel (seven sets of two on each side)
6. Track (one on each side)
7. Personnel side door
8. Canister side door
9. Idler wheel (one set of two on each side)
10. Crew automatic fire extinguishing system (AFES) fire extinguisher box assembly
11. Duffle bag stowage rack

**RIGHT-SIDE VIEW**

Change 1 1-5

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

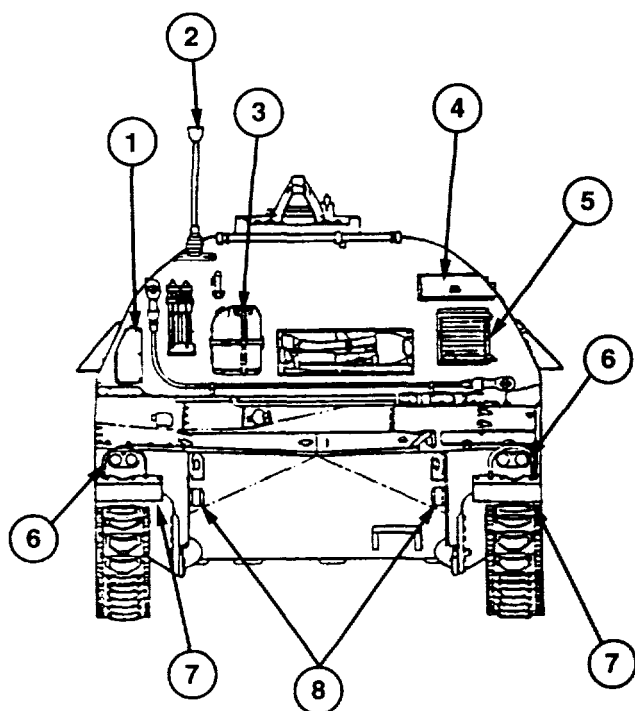
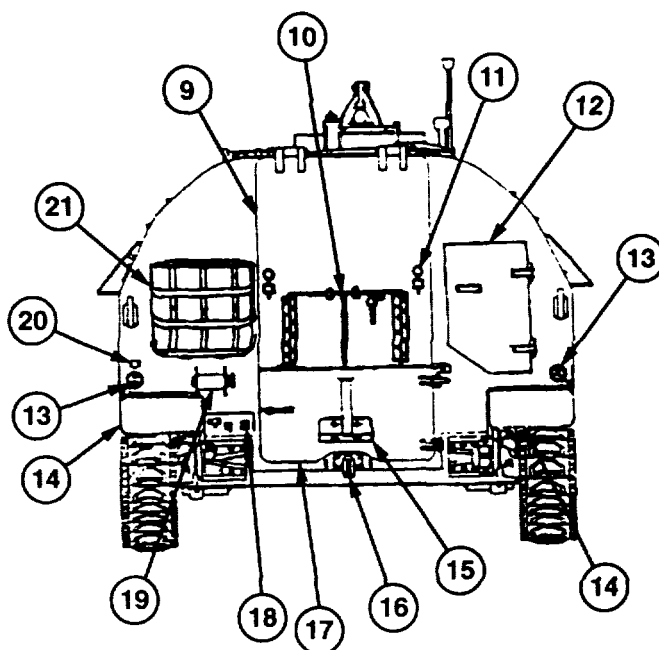
1. APU door
2. Duffle bag stowage rack
3. Stowage rack
4. Canister door/copperhead projectiles



LEFT-SIDE VIEW

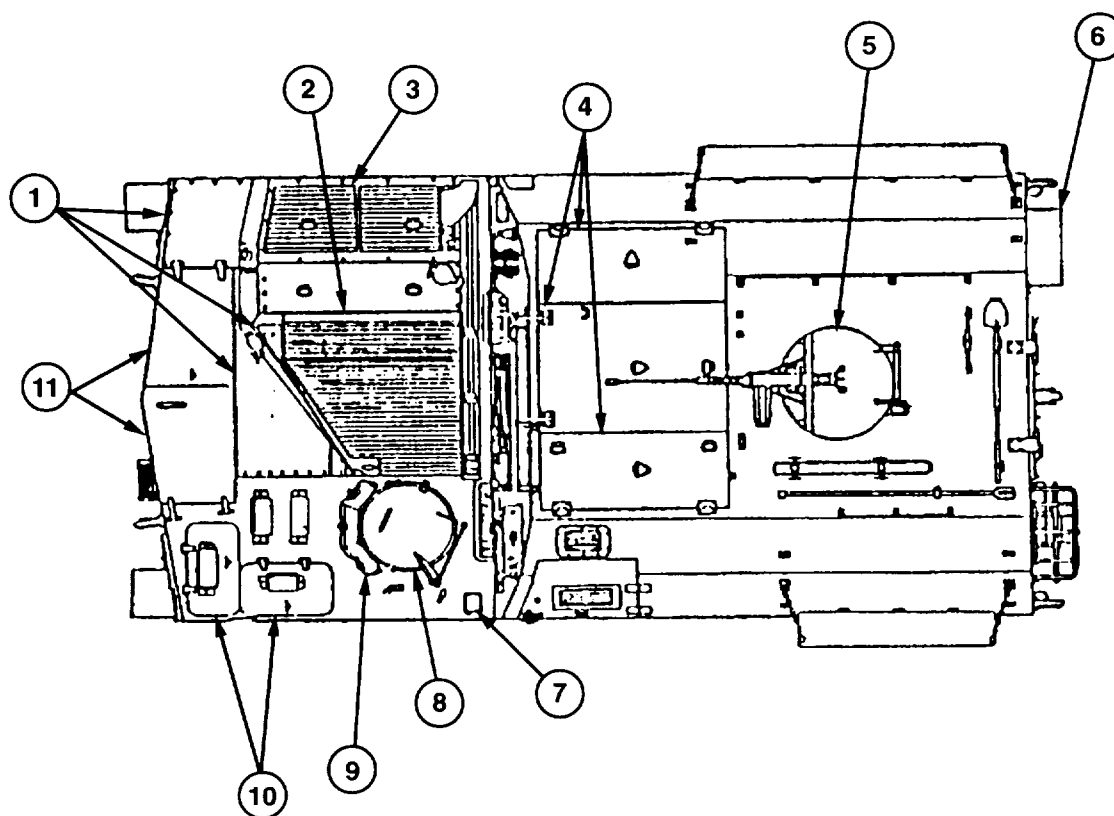
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

1. Fuel fill filter access plate
2. Global positioning system (GPS) antenna assembly
3. Water can stowage
4. APU muffler
5. APU air inlet door
6. Headlights
7. Fenders
8. Towing lugs
9. Upper rear door
10. Upper rear door small doors
11. Small door latches
12. Crew AFES fire extinguisher box assembly
13. Taillights
14. Fenders
15. M13 decontamination apparatus
16. Tow pintle
17. Lower rear door
18. NBC terminals, NATO intervehicle slave connector, and trailer receptacle
19. Telephone handreel
20. Telephone terminals
21. Stowage rack

**FRONT VIEW****REAR VIEW**

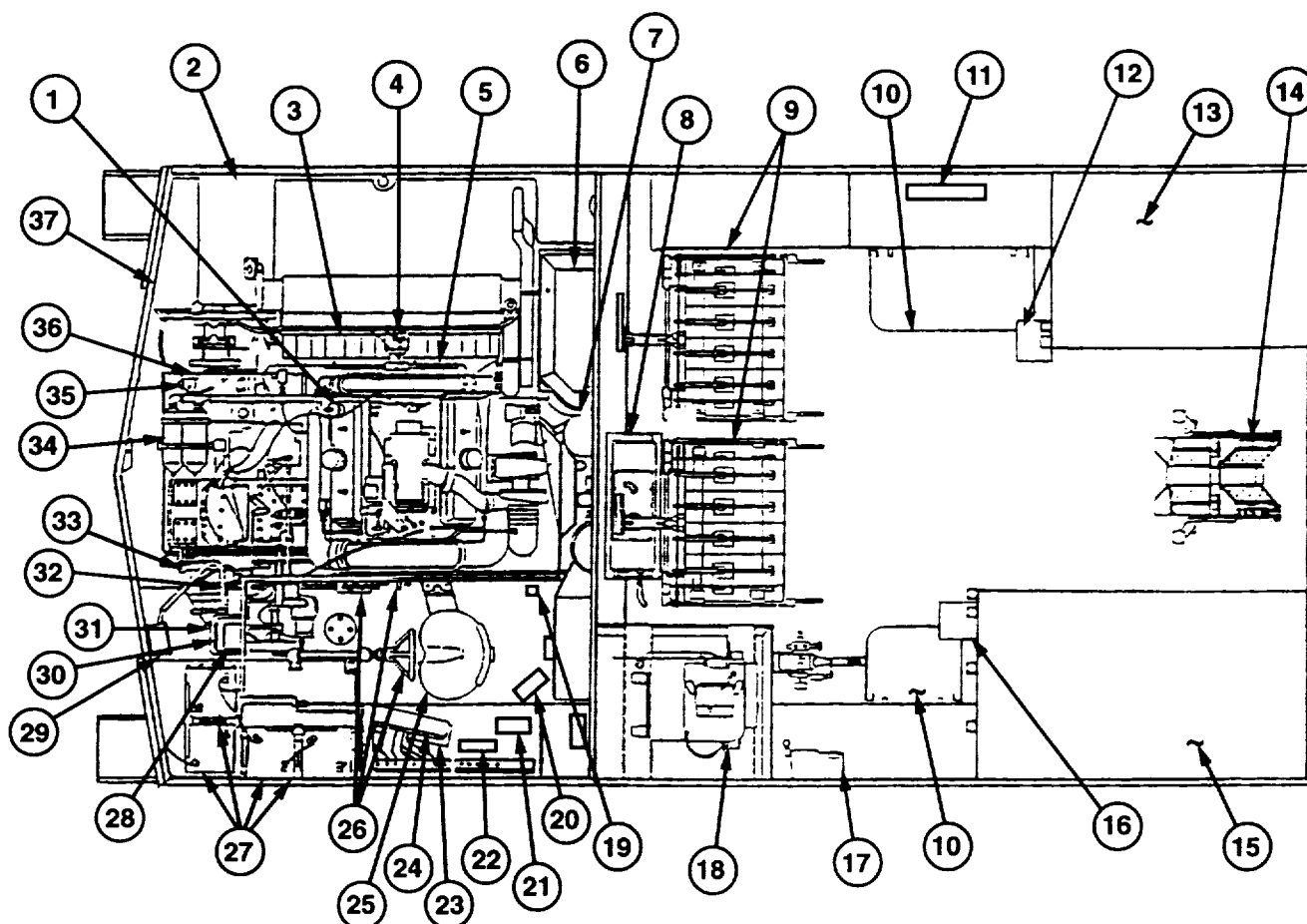
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

1. Engine deck access plates
2. Engine access cover
3. Air intake grille
4. Top doors
5. Commander's cupola
6. Crew AFES fire extinguisher box assembly
7. AFES manual discharge system (AFES/MDS) lanyard cable pull handle
8. Driver's hatch
9. Driver's periscope assembly
10. Battery access covers
11. Transmission access covers

**TOP VIEW**

Change 1 1-8

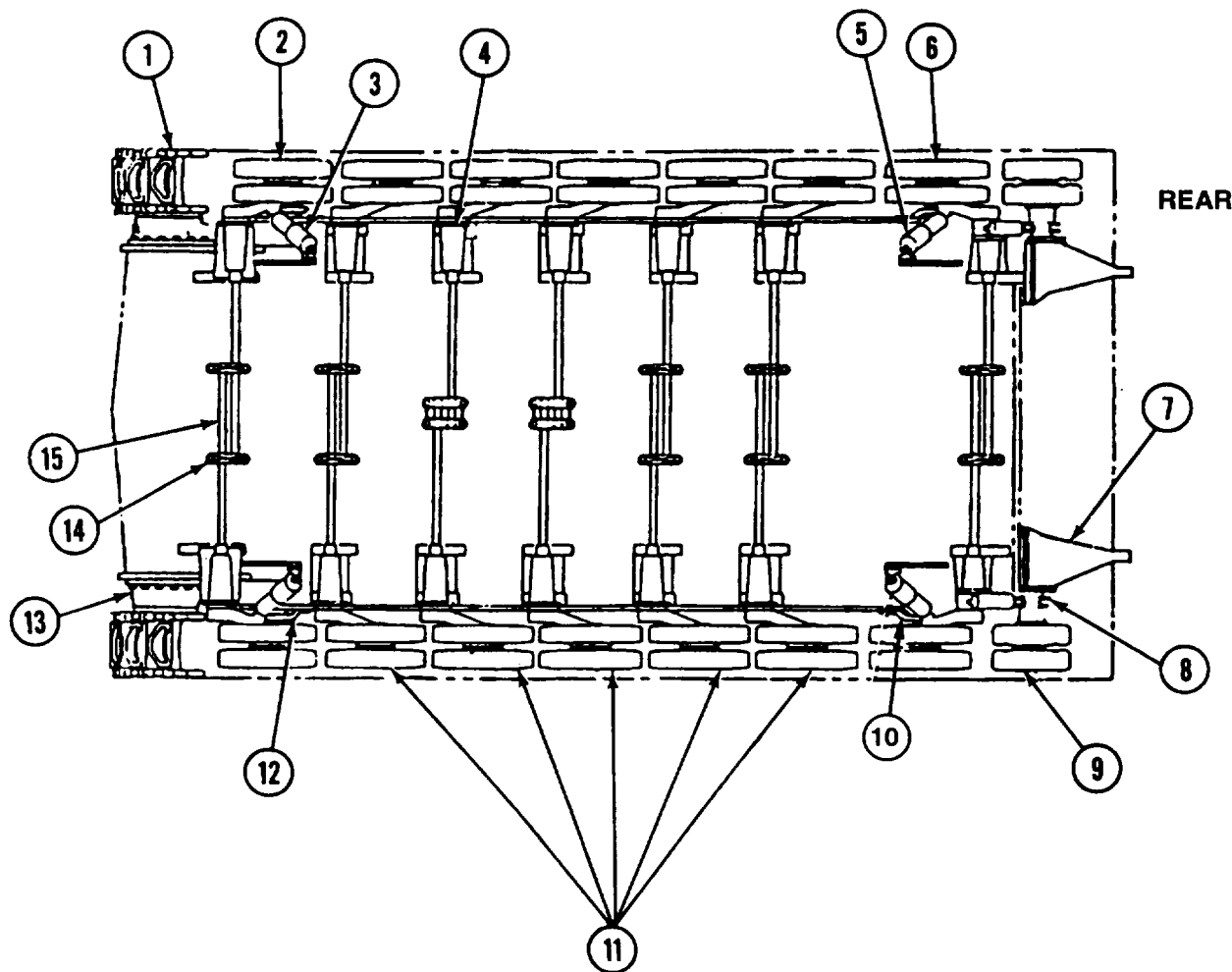
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).



- | | |
|---|--|
| 1. Engine | 19. Air cleaner restriction indicator |
| 2. Fuel tanks and pumps | 20. Personnel heater control box |
| 3. Radiator | 21. AFES/MDS actuator assembly |
| 4. Generator (alternator) | 22. Engine AFES T/A panel |
| 5. Fan assembly | 23. Driver's compartment NATO slave receptacle |
| 6. Air cleaner | 24. Main and portable instrument panels |
| 7. Personnel heater | 25. Driver's seat |
| 8. Hydraulic fluid reservoir | 26. Driver's controls |
| 9. Projectile rack assemblies | 27. Batteries |
| 10. Crew seats | 28. Voltage regulator |
| 11. Crew AFES test and alarm (T/A) panel | 29. Bilge pump relay |
| 12. Precision lightweight global positioning system (GPS) receiver (PLGR) | 30. Rectifier |
| 13. Right canister compartment shelf assembly | 31. Starter relay |
| 14. Conveyor assembly | 32. Master relay |
| 15. Left canister compartment shelf assembly | 33. Secondary fuel filter |
| 16. Mounted water ration heater (MWRH) | 34. Engine oil filters |
| 17. Hydraulic control panel | 35. Primary fuel filter |
| 18. APU | 36. Transmission |
| | 37. Coolant surge tank |

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

1. Drive sprockets (one set of two on each side)
2. No. 1 roadwheels (one set of two on each side)
3. Front shock absorbers (one on each side)
4. Roadwheel arms and hubs (seven on each side)
5. Rear shock absorbers (one on each side)
6. No. 7 roadwheels (one set of two on each side)
7. Idler wheel housings (one on each side)
8. Idler arms and hubs (one on each side)
9. Idler wheels (one set of two on each side)
10. Bump stop brackets (rear)
11. Intermediate roadwheels (five sets of two on each side)
12. Bump stop brackets (front)
13. Final drive housings (one on each side)
14. Torsion bar anchors (seven on each side)
15. Torsion bars (seven on each side)



Change 1 1-10