

**UNIT MAINTENANCE MANUAL FOR
HULL, POWERPLANT, DRIVE
CONTROLS, TRACKS, SUSPENSION,
AND ASSOCIATED COMPONENTS**

**HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM,**

**M109A2 (EIC:3EZ)
(NSN 2350-01-031-0586)**

AND

**HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM,**

**M109A3 (EIC:3E2)
(NSN 2350-01-031-8851)**

AND

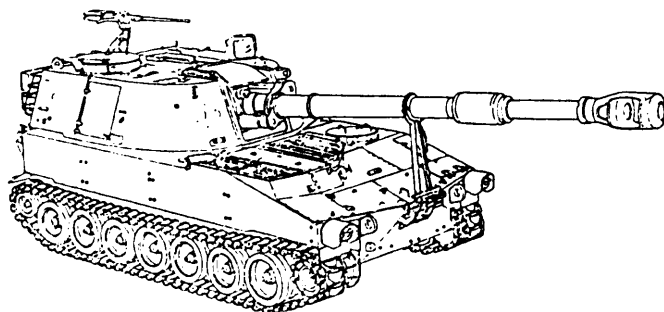
**HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM,**

**M109A4 (EIC:3E8)
(NSN 2350-01-277-5770)**

AND

**HOWITZER, MEDIUM,
SELF-PROPELLED, 155MM,**

**M109A5 (EIC:3E7)
(NSN 2350-01-281-1719)**



INTRODUCTION	1-1
GENERAL HULL MAINTENANCE	2-1
TROUBLESHOOTING	3-1
POWERPLANT	4-1
ENGINE COMPONENTS	5-1
FUEL, AIR INTAKE, AND EXHAUST SYSTEMS	6-1
COOLING SYSTEM	7-1
ELECTRICAL SYSTEMS	8-1
TRANSMISSION, TRANSFER, AND DRIVE CONTROL ASSEMBLIES	9-1
TRACKS, SUSPENSION SYSTEM, FINAL DRIVES, AND UNIVERSAL JOINTS	10-1
HULL-RELATED COMPONENTS	11-1
NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) PROTECTION EQUIPMENT	12-1
HULL STOWAGE	13-1
ENGINE AND BATTERY WINTERIZATION KIT	14-1
REFERENCES	A-1
MAINTENANCE ALLOCATION CHART (MAC)	B-1
REPAIR PARTS AND SPECIAL TOOLS LIST	C-1
EXPENDABLE AND DURABLE ITEMS LIST	D-1
ILLUSTRATED LIST OF MANUFACTURED ITEMS	E-1
TORQUE LIMITS	F-1
MANDATORY REPLACEMENT PARTS	G-1
TOOL IDENTIFICATION LIST	H-1
STE/ICE-R	I-1

This manual supersedes TM 9-2350-311 -20-1 dated 4 November 1986.
Approved for public release; distribution is unlimited.

TECHNICAL MANUAL
NO. 9-2350-311-20-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C.,29 August 1994

UNIT MAINTENANCE MANUAL
FOR HULL,POWERPLANT, DRIVE CONTROLS,
TRACKS, SUSPENSION, AND ASSOCIATED COMPONENTS

HOWITZER,MEDIUM,
SELF-PROPELLED, 155MM, M109A2(EIC: 3EZ)
(NSN 2350-01-031 -0586)
AND
HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM, M109A3 (EIC: 3E2)
(NSN 2350-01-031 -8851)
AND
HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM, M109A4 (EIC: 3E8)
(NSN 2350-01 -277-5770)
AND
HOWITZER, MEDIUM,
SELF-PROPELLED, 155 MM, M109A5 (EIC: 3E7)
(NSN 2350-01-281 -1719)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, U.S. Army Tank–automotive and Armaments Command, ATTN: AMSTA-MMAA, 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
- TACOM'S e-mail address is amsta-mmaa@cc.tacom. army.mil

This manual supersedes TM 9-2350-311 -20-1 dated 4 November 1986.
Approved for public release; distribution is unlimited.

TABLE OF CONTENTS

CONTENTS	PAGE
CHAPTER 1— INTRODUCTION	1-1
Section I GENERAL INFORMATION	1-5
Section II EQUIPMENT DESCRIPTION AND DATA	1-9
Section III PRINCIPLES OF OPERATION	1-17

<u>CONTENTS</u>	<u>PAGE</u>
<u>CHAPTER 2—GENERAL HULL MAINTENANCE.</u>	<u>2-1</u>
Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.	2-2
Section II SERVICE UPON RECEIPT	2-2
Section III Operational CHECKS	2-8
Section IV PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS).	2-20
Section V MAINTENANCE PROCEDURES	2-46
<u>CHAPTER 3—TROUBLESHOOTING.</u>	<u>3-1</u>
<u>CHAPTER 4—POWERPLANT.</u>	<u>4-11</u>
<u>CHAPTER 5 — ENGINE COMPONENTS</u>	<u>5-11</u>
<u>CHAPTER 6—FUEL, AIR INTAKE, AND EXHAUST SYSTEMS</u>	<u>6-1</u>
Section I FUEL SYSTEM	6-2
Section II AIR INTAKE SYSTEM	6-30
Section III EXHAUST SYSTEM	6-39
Section IV FUEL TANK HEATSHIELD	6-44
<u>CHAPTER 7—COOLING SYSTEM</u>	<u>7-1</u>
<u>CHAPTER 8—ELECTRICAL SYSTEMS</u>	<u>8-11</u>
Section I POWERPLANT ELECTRICAL SYSTEMS	8-4
Section II HULL ELECTRICAL SYSTEMS	8-34
Section III POWERPLANT AND HULL WIRING HARNESSSES	8-100
Section IV POWERPLANT AND HULL ELECTRICAL LEADS	8-166
<u>CHAPTER 9— TRANSMISSION, TRANSFER, AND DRIVE CONTROL ASSEMBLIES</u>	<u>9-1</u>
Section I TRANSMISSION AND TRANSFER ASSEMBLIES	9-2
Section II DRIVE CONTROL ASSEMBLIES	9-14
<u>CHAPTER 10 —TRACKS, SUSPENSION SYTEM, FINAL DRIVES, AND UNIVERSAL JOINTS</u>	<u>10-1</u>
Section I TRACKS	10-2
Section II SUSPENSION SYSTEM	10-21
Section III FINAL DRIVES AND UNIVERSAL JOINTS	10-51
<u>CHAPTER 11 —HULL-RELATED COMPONENTS</u>	<u>11-1</u>
Section I DRIVER'S AND CANNONEER'S SEAT ASSEMBLIES	11-2
Section II HATCHES, LATCHES, LOCKS, AND COVER PLATES	11-18
Section III TRAVEL LOCK, SPADE, FENDERS, AND TOWING PINTLE	11-44
Section IV BILGE PUMP, PERSONNEL HEATER, PERSONNEL AIR VENTILATION SYSTEM, AND FIXED FIRE EXTINGUISHER SYSTEM	11-62

CONTENTS	PAGE
CHAPTER 1 2 — NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) PROTECTION EQUIPMENT	12-1
CHAPTER 13— HULL STOWAGE	13-1
CHAPTER 1 4 — ENGINE AND BATTERY WINTERIZATION KIT	14-1
Appendix A—References.	A-1
APPENDIX B—MAINTENANCE ALLOCATION CHART(MAC)	B-1
Section I INTRODUCTION	B-2
Section II MAC	B-6
Section III TOOL AND TEST EQUIPMENT REQUIREMENTS	B-24
APPENDIX C—REPAIR PARTS AND SPECIAL TOOLS LIST	C-1
APPENDIX D—EXPENENDABLE AND DURABLE ITEMS List	D-1
Section I INTRODUCTION	D-2
Section II EXPENDABLE AND DURABLE ITEMS LIST	D-3
APPENDIX E—ILLUSTRATED LIST OF MANUFACTURED Items	E-1
APPENDIX F—TORQUE LIMITS.	F-1
APPENDIX G— MANDATORY REPLACEMENT PARTS	G-1
APPENDIX H—TOOL IDENTIFICATION LIST	H-1
APPENDIX I— SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES-REPROGRAMMABLE (STE/WICE-R)	1-1
Section I INTRODUCTION	1-2
Section II ENGINE TESTING	1-2
Section III BATTERY TESTING	1-63
INDEX	INDEX-1
FOLDOUTS—HULL ELECTRICAL SCHEMATICS (1 Thru 8)	FP-1

HOW TO USE THIS MANUAL

GENERAL

This manual contains unit maintenance instructions for the M109A2/M109A3/M109A4/M109A5 Howitzers' hull and hull-related components.

The front matter in this manual consists of a cover index, general warnings, and a table of contents.

This manual is divided into 14 chapters and 9 appendixes. 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, eight schematics, DA Form 2028-2, and a metric conversion chart.

a. 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 performing any maintenance on the howitzer.

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

b. Chapters

Chapter 1 provides general information, equipment description, and principles of operation of the howitzer.

Chapter 2 provides general unit maintenance instructions for the hull including Preventive Maintenance Checks and Services (PMCS).

Chapter 3 covers troubleshooting the howitzer.

Chapter 4 provides unit maintenance instructions for removing the powerplant.

Chapter 5 provides unit maintenance instructions for the engine.

Chapter 6 provides unit maintenance instructions for the fuel, air intake, and exhaust systems.

Chapter 7 provides unit maintenance instructions for the engine cooling system.

Chapter 8 provides unit maintenance instructions for the hull electrical systems.

Chapter 9 provides unit maintenance instructions for the transmission, transfer, and drive control assemblies.

Chapter 10 provides unit maintenance instructions for the tracks, suspension system, final drives, and universal joints.

Chapter 11 provides unit maintenance instructions for hull-related components.

Chapter 12 provides unit maintenance instructions for the Nuclear, Biological, and Chemical (NBC) protection equipment.

Chapter 13 provides unit maintenance instructions for hull stowage equipment. The location for stowage of Basic Issue Items (BII) is also included in this chapter.

Chapter 14 provides unit maintenance instructions for the engine and battery winterization kit.

c. Appendixes

Appendix A provides titles of documents and publications referenced in this manual.

Appendix B provides the Maintenance Allocation Chart (MAC) and special tools list.

Appendix C provides a repair parts and special tools list reference.

Appendix D provides a list of the expendable and durable items necessary to perform the unit maintenance procedures.

Appendix E provides an illustrated list of manufactured items.

Appendix F provides wet torque limits for screws and fastener information.

Appendix G provides a list of the mandatory replacement parts necessary to perform the unit maintenance procedures.

Appendix H provides a tool identification list of common tools necessary to perform the unit maintenance procedures.

Appendix I provides a general overview of Simplified Test Equipment for Internal Combustion Engines — Reprogrammable (STE/ICE-R) equipment and operations.

d. Alphabetical Index

The alphabetical index is located after the last appendix and provides an alphabetical listing of information contained in this manual.

e. Schematics

There are eight electrical schematics in the form of foldouts located at the end of 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. Metric Conversion Chart

The metric conversion chart converts English measurements to metric equivalents. Measurements in this manual are provided in both English and metric units.

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 howitzer.

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.

INITIAL SETUPS

Before starting a task, you must obtain all the tools, supplies, and personnel listed in the initial setup. Be sure to read the task before performing the maintenance. If any other tasks are referenced, you must go to the initial setup page for each of those tasks to find out what tools, supplies, and personnel will be needed.

LOCATIONAL TERMS

The terms “front,” “rear,” “left,” and “right” are used to indicate where items are located on the howitzer. These locations are from the viewpoint of standing behind the howitzer and facing it.

REFERENCING

In this manual, internal referencing is done by chapter, appendix, paragraph, section, or task. For example, (para 8-15) refers you to Chapter 8, paragraph 15.

Referencing outside this manual is done by the military document or publication number. For example, (TM 9-2350-311-10) refers you to that manual.

LOCATING INFORMATION

This manual provides five ways to locate information quickly:

The cover index lists most frequently used major divisions by name and starting page number.

The table of contents.

The chapter and appendixes indexes list data and information covered within those chapters.

The malfunction index (Chapter 3) provides a quick guide to troubleshooting malfunctions.

The alphabetical index provides an alphabetical listing of information contained in this manual.

CHAPTER 1

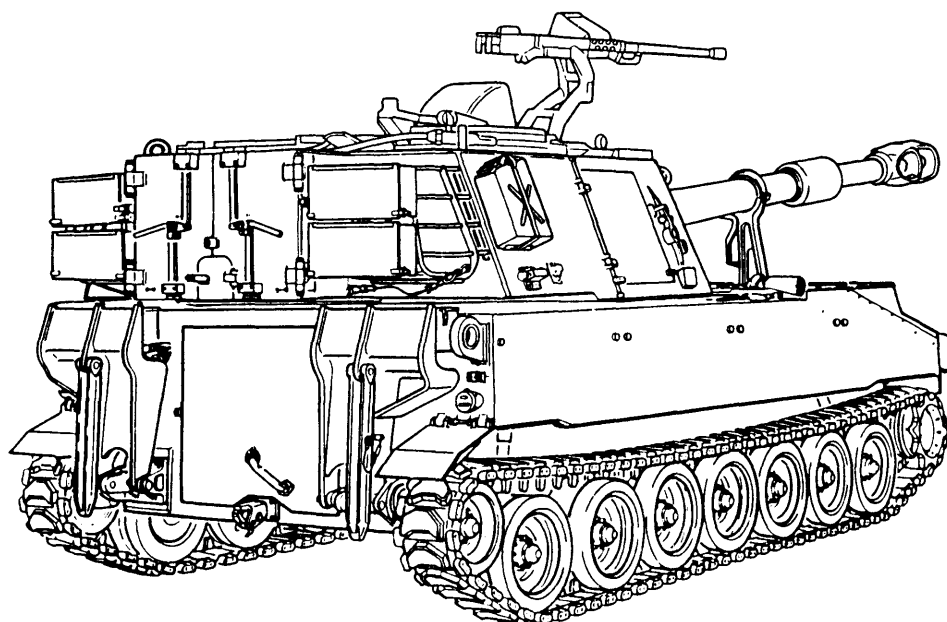
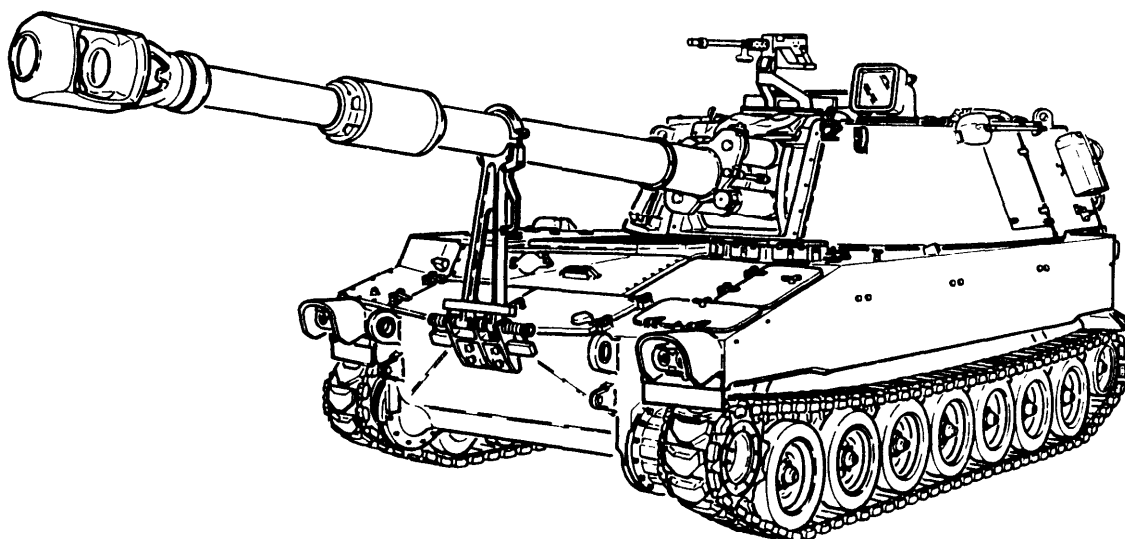
INTRODUCTION

GENERAL

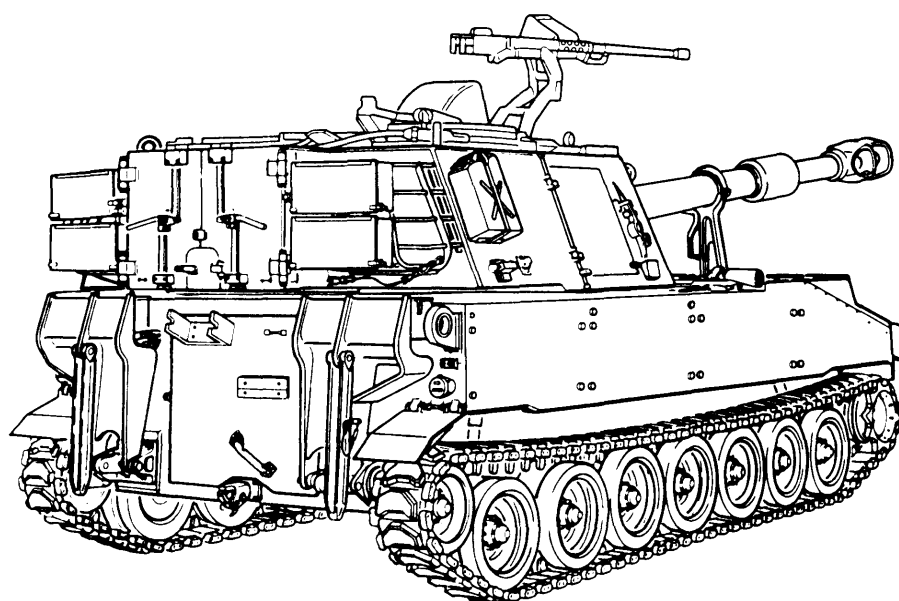
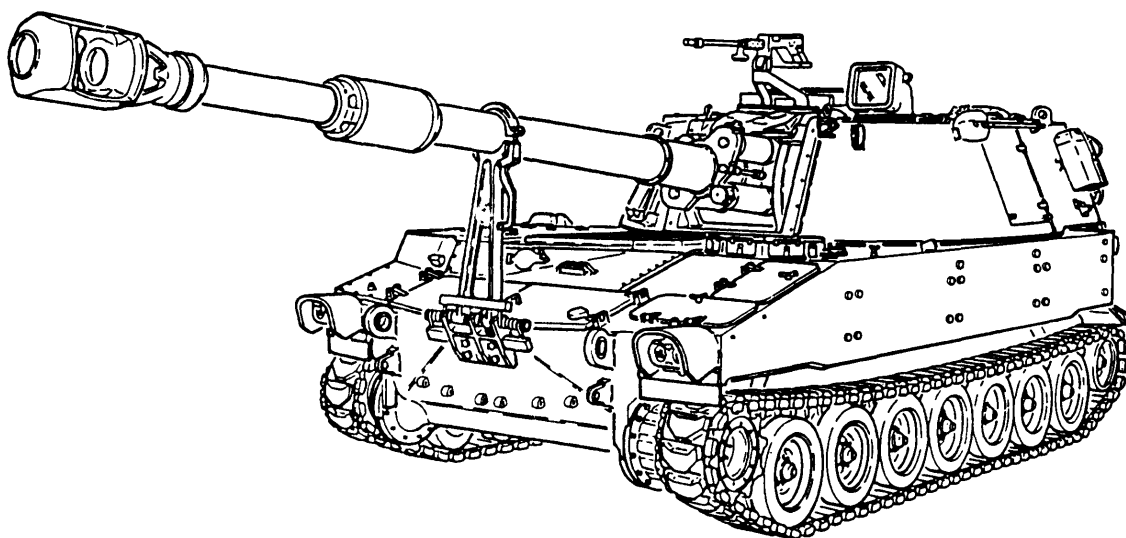
This chapter provides information to familiarize the mechanic with the M109A2/M109A3/M109A4/M109A5 Medium, Self-Propelled Howitzers' hull, powerplant, drive controls, tracks, suspension, and other hull-related components. The familiarization is provided through a physical description of major components that the mechanic at unit level is required to inspect, service, replace, or repair.

CONTENTS

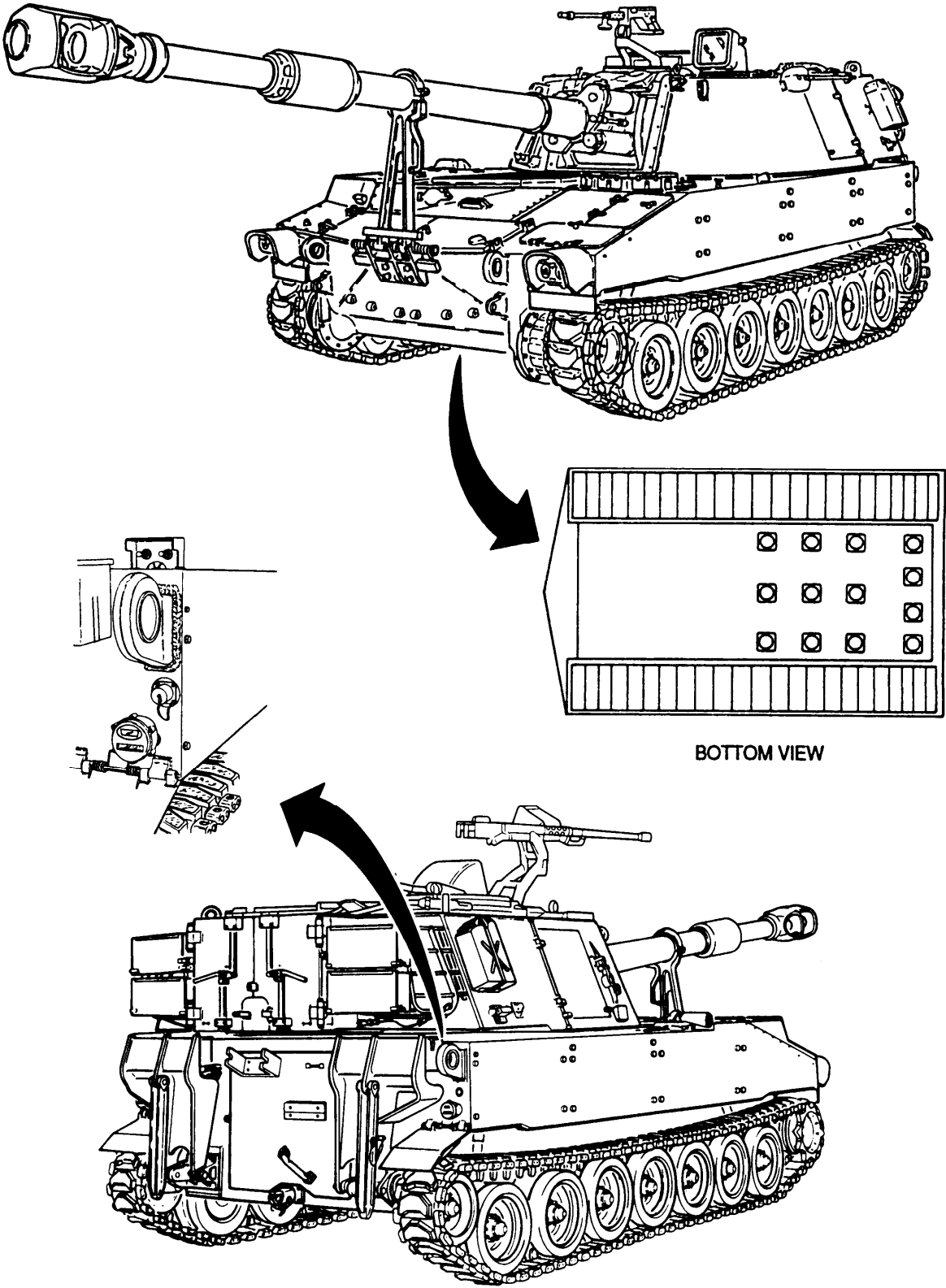
	<u>PAGE</u>
Section I GENERAL INFORMATION	1-5
1-1 SCOPE	1-5
1-2 MAINTENANCE FORMS, RECORDS, AND REPORTS	1-5
1-3 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE	1-5
1-4 PREPARATION FOR SHIPMENT AND STORAGE.	1-6
1-5 QUALITY ASSURANCE (QA)	1-6
1-6 OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS	1-6
1-7 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs)	1-7
1-8 WARRANTY INFORMATION	1-7
1-9 SAFETY, CARE, AND HANDLING	1-7
1-10 CORROSION PREVENTION AND CONTROL (CPC)	1-8
1-11 NUCLEAR HARDNESS	1-9
1-12 SECURITY MEASURES FOR ELECTRONIC DATA	1-9
Section II EQUIPMENT DESCRIPTION AND DATA	1-9
1-13 CAPABILITIES AND FEATURES	1-9
1-14 LOCATION OF MAJOR COMPONENTS	1-10
1-15 DIFFERENCES BETWEEN MODELS.. . . .	1-14
1-16 EQUIPMENT DATA	1-15
Section III PRINCIPLES OF OPERATION	1-17
1-17 EQUIPMENT OPERATION AND DESCRIPTION.	1-18



M109A2



M109A3



BOTTOM VIEW

M109A4/M109A5

SECTION 1. GENERAL INFORMATION

1-1 SCOPE

This maintenance manual contains instructions for unit-level maintenance of M109A2/M109A3/M109A4/M109A5 Howitzers' hull, powerplant, drive controls, tracks, suspension, and other hull-related components.

When the nature of the repair, modification, or adjustment is beyond the scope of facilities of unit maintenance, the supporting unit should be informed so trained personnel with the correct tools and equipment may be provided, or other instructions issued.

Replacement or adjustment of parts or major assemblies that are normally support maintenance operations maybe done at unit maintenance in an emergency if permission is obtained from the responsible commander. A replacement part or assembly, a tool needed for work, and any special instructions should be obtained from the supporting maintenance unit.

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 (TAMMS); DA PAM 738-751, Functional Users Manual for The Army Maintenance Management System — Aviation (TAMMS-A); or AR700-138, Army Logistics Readiness and Sustainability.

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285, US Army Accident Investigation Report, in accordance with AR 385-40. Explosive ammunition malfunctions will be reported in accordance with AR 75-1.

1-3 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Destruction of the vehicle, armament, and equipment, when subject to capture or abandonment in a combat zone, will be undertaken by the using army only when the unit commander decides such action is necessary in accordance with orders of, or policy established by, the Army commander.

Read TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use, for information on destruction of all mechanical equipment. In general, destruction of essential components, followed by burning, will usually be sufficient to render the vehicle, armament, and equipment useless. Time is usually critical.

Materiel must be damaged so that it cannot be restored to usable condition by either repair or cannibalization. If a lack of time or personnel prevents destruction of all parts, give priority to destruction of parts hardest to replace. It is important that the same parts be destroyed on all vehicles to prevent construction of one complete vehicle from several damaged ones.

All items of sighting and fire control instruments and equipment, especially telescopes, gunner's quadrants, and binoculars, are costly and difficult to replace. They should be conserved whenever possible. If you cannot carry them with you, destroy them by smashing with your sledgehammer, pick, or mattock. Throw the pieces in all directions.