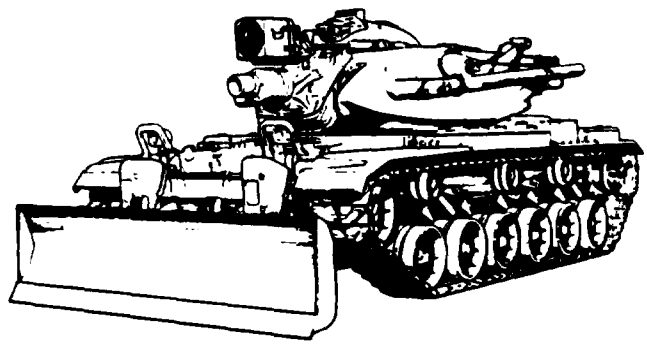
TM 9-2350-222-20-1-1

TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE
VOLUME 1 0F 5
CHAPTERS 1 THRU 3



COMBAT ENGINEER VEHICLE, FULL-TRACKED, M728
2350-00-795-1797
(HULL)

This copy is a reprint which includes current pages from Changes 1 through 6.

TA141001

HEADQUARTERS, DEPARTMENT OF THE ARMY

FEBRUARY 1981

CHANGE

NO. 7

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 15 May 1996

TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE

VOLUME 1 OF 5

CHAPTERS 1 THRU 3

COMBAT ENGINEER VEHICLE,

FULLTRACKED, M728

2350-00-795-1797
(HULL)

TM9-2350-222-20-1-1, dated 20 February 1981, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

2. New or changed information is indicated by a vertical bar in the margin of the page.

Remove Pages	Insert Pages
iii and iv	iii and iv
3-7 thru (3-9 blank)/3-10	3-7 thru 3-10
3-10.1 thru 3-10.3/(3-10.4 blank)	None
3-11 thru (3-27 Blank)/3-28	3-11 thru 3-28
3-29 thru 3-44	3-29 thru 3-44
3-44.1 thru 3-44.5/(3-44.6 blank)	None
3-45 thru 3-88	3-45 thru 3-88
None	3-89 thru 3-126

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

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
01960

DISTRIUBTION:
To be distributed in accordance with DA Form 12-37-E, block 1504, requirements for TM 9-2350-222-20-1-1.

CHANGE

NO. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D. C., 26 *April 1993*

TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE

VOLUME 1 OF 5

CHAPTERS 1 THRU 3

COMBAT ENGINEER VEHICLE,
FULL-TRACKED, M728
2350-00-795-1797
(HULL)

TM 9-2350-222-20-1-1, 20 February 1981, 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.

Remove Pages	Insert Pages
1-1 and 1-2	1-1 and 1-2
3-1 thru 3-6	3-1 thru 3-6
3-9 and 3-10	(3-9 blank)/3-10
3-53 and 3-54	3-53 and 3-54

Approved for public release; distribution is unlimited.

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

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General United States Army.
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
04051

Distribution:

To be distributed in accordance with DA Form 12-37-E, Bloc 1504, requirements for TM 9-2350-222-20-1-1.

TM 9-2350-222-20-1-1
C5

Change
No. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C.,28 May 1991

UNIT MAINTENANCE

COMBAT ENGINEER VEHICLE
FULL TRACKED, M728
NSN 2350-00-795-1797
HULL

TM 9-2350-222-20-1-1,20 February 1981, 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.

Remove Pages	Insert Pages
3-7 and 3-8	3-7 and 3-8
3-13 and 3-14	3-13 and 3-14
3-35 and 3-36	3-35 and 3-36
3-75 and 3-76	3-75 and 3-76
3-87 and 3-68	3-87 and 3-68

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

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Amy
Chief of Staff

Official:

PATRICIA P. HICKERSON
Colonel, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12–37–E, block 1504, Unit maintenance requirements for TM 9-2350-222-20-1-1..

CHANGE
NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 2 November 1988

ORGANIZATIONAL MAINTENANCE
COMBAT ENGINEER VEHICLE
(FULL TRACKED, M728)
2350-00-795-1797
(HULL)

TM 9-2350-222-20-1-1, 20 February 1981, 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	Insert Pages
d/(e blank)	d/(e blank)
3-5 thru 3-8	3-5 thru 3-8
3-35 thru 3-38	3-35 thru 3-38

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

By Order of the Secretary of the Army

CARL E. VUONO
General, United States Army
Chief Of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-37, Organizational Maintenance requirements for Vehicle, Combat Engineer, Full-Tracked, M728.

CHANGE
NO.3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., *1 April* 1986

ORGANIZATIONAL MAINTENANCE
COMBAT ENGINEER VEHICLE
FULL TRACKED, M728
(2350-00-795-1797)
(HULL)

TM 9-2350-222-20-l-l, dated 20 February 1981, 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	Insert Pages
3-7 thru 3-10.2	3-7 thru 3-10.2
3-11 thru 3-52	3-11 thru 3-52
Cover and Warning	Cover and Warning

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

By Order of the Secretary of the Army

JOHN A. WICKHAM, JR.
General United States Army
Chief of *Staff*

Official:

R.L.DILWORTH
Brigadier General United States Army
The Adjutant General

Distribution

To be distributed in accordance with DA Form 12-37, Organizational Maintenance requirements for Vehicle, Combat Engineer, Full Tracked, M728.

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 30 December *1985*

ORGANIZATIONAL MAINTENANCE
COMBAT ENGINEER VEHICLE
FULL TRACKED, M728
NSN (2350-00-795-1797)
(HULL)

TM 9-2350-222-20-1-1, 20 February 1981, 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	Insert Pages
b and c	b and c
None	d/(e blank)
i and ii	i and ii
1-9 and 1-10	1-9 and 1-10
None	2-8.1 /(2-8.2 blank)
3-1 thru 3-4	3-1 thru 3-4
3-9 and 3-10	3-9 and 3-10
None	3-10.1 thru 3-10.3 /(3-10.4 blank)
3-21 thru 3-28	3-21 thru (3-27 blank)/3-28
3-43 and 3-44	3-43 and 3-44
None	3-44.1 thru 3-44.5 /(3-44.6 blank)
3-45 *and* 3-46	3-45 and 3-46
None	DA Forms 2028-2

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

By Order of the Secretary of the Amy:

JOHN A. WICKHAM, JR.
General United States Army
Chief of Staff

Official:

MILDRED E. HEDBERG
Brigadier General United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-37, Organization Maintenance requirements for Vehicle, Combat Engineer, Full Tracked M728.

CHANGE NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *31 Aug 83*

ORGANIZATIONAL MAINTENANCE
COMBAT ENGINEER VEHICLE
FULL TRACKED, M728
NSN (2350-00-795-1797)
(HULL)

TM 9-2350-222-20-1-1, 20 February 1981 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.

Remove Pages	Insert Pages
i and ii 3-5 and 3-6 3-29 thru 3-32 3-57 thru 3-60 3-69 thru 3-72 3-75 and 3-76 3-79 and 3-80	i and ii 3-5 and 3-6 3-29 thru 3-32 3-57 thru 3-60 3-69 thru 3-72 3-75 and 3-76 3-79 and 3-80

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General United States Army
chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-37, Organizational Maintenance requirements for Vehicle, Combat Engineer, Full-Tracked: M728

WARNING

The following summary list is adapted from the warnings within this volume. However, all warnings should be observed as noted in the text.

Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

Handle charged cylinders with care. Do not jar or subject cylinders to tempatures above 140°F (60°C).

Never allow flame or sparks near battery. Battery gas (hydrogen and air) is a dangerous explosive.

Check that all personnel are clear of vehicle before traversing turret..

Driver must notify all personnel that brake check is to take place so they can be prepared for sudden stops.

Shock absorbers may be extremely hot.

Exercise caution to relieve system of high (800-1800 psi) pressure gas slowly. Gloves and eye protection should be worn. Avoid breathing vapor.

Unit commander or senior officer in charge of maintenance personnel assigned to remove and dispose of contaminated gas filters must prescribe necessary clothing (TM 10-277) to be worn during this operation. He must also prescribe necessary safety measures that must be followed including decontamination operation that must be preformed before new gas filters are installed (TM 3-220).

Do not attempt to operate vehicle if there is any chance the trouble may harm personnel or damage equipment.

setting MASTER BATTERY switch OFF will not deenergize the following circuits; 2, 14A, 49, 81, 400, 405, 415A, 459, 530, 531, 975 and 975B. When working with any of the above circuits, the battery ground straps must be disconnected.

Do not accelerate engine unless all personnel are clear of vehicle.

Do not smoke or allow flames or sparks within area while draining fuel tanks. Have manned fire extinguishers present.

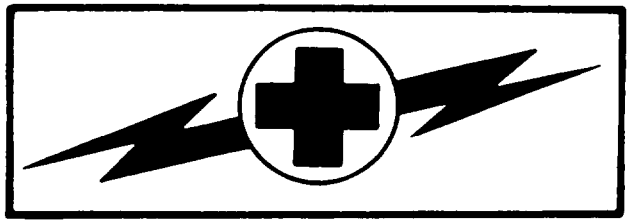
wear goggles to protect eyes from spraying fuels. Fuel pressure in primer pump pressure line may reach 200 psi.

To avoid personal injury due to high pressure grease, pressure must be reduced to zero before gage is attached to adjusting link.

To avoid personal injury due to high pressure grease, pressure must be reduced to zero before gage is removed.

To prevent screws from pulling out of box and injuring personnel, a minimum of 200 pounds must be placed atop the door before attempting to remove screws.

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point for Type #1 Dry Cleaning Solvent is 100°F (38°C) and for Type #2 is 138°F (50°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.



WARNING

CARBON MONOXIDE POISONING CAN BE DEADLY

Carbon monoxide is a colorless, odorless, deadly poisonous gas, which when breathed deprives the body of oxygen and causes suffocation. Exposure to air contaminated with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent 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 and becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to make sure of the safety of personnel whenever the personnel heater, main or auxiliary engine of any tank is operated for maintenance purposes or tactical use.

1. **DO NOT** operate heater or engine of tank in an enclosed area unless the area is **ADEQUATELY VENTILATED.**

2 **DO NOT** idle engine for long periods without maintaining **ADEQUATE VENTILATION** in personnel compartments.

3 **DO NOT** drive any tank with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.

4 **BE ALERT** at all times during tank operation for exhaust odors and exposure symptoms. If either are present, **IMMEDIATELY VENTILATE** personnel compartments. If symptoms persist, remove affected personnel from tank and treat as follows: expose to fresh air; keep warm; **DO NOT PERMIT PHYSICAL EXERCISE.**

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION.

For artificial respiration, refer to FM 21-11.

TA248166

WARNING

HIGH VOLTAGE

Used in the operation of this equipment

DEATH ON CONTACT

May result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When a technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the master battery switch and battery ground straps should be either turned off or disconnected before beginning work on the equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

Before you work around tracked vehicles, remove rings, bracelets and wristwatches. These items may be caught on projections and cause injury or may be shorted across an electrical circuit and cause severe burns and electrical shock.

For artificial respiration, refer to FM 21-11.

HOISTING OPERATIONS CAN BE DANGEROUS

During hoisting operations, make sure boom control lever is not operated or movement may cause load to fall damaging equipment or *injuring* personnel.

Technical Manual
No. 9-2350-222-20-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 20 February 1981

ORGANIZATIONAL MAINTENANCE
COMBAT ENGINEER VEHICLE
FULL TRACKED, M728
NSN (2350-00-795-1 797)
(HULL)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENT

You can help improve this manual. If you find any mistake 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 Cormmand, Attn: AMSTA-MBC, Warren, Michigan 48397-5000. A reply will be furnished to you.

TABLE OF CONTENTS
VOLUME 1

VOLUME 2

VOLUME 3

*This manual, together with TM 9-2350-222-20-1-2, 20 February 1981. TM 9-2350-222-20-1-3, 20 February 1981. TM 9-2350-222-20-1-4, 20 February 1981, and TM 9-2350-222-20-1-5, 20 February 1981, supersedes TM 9-2350-222-20,27 September 1965, including all changes.

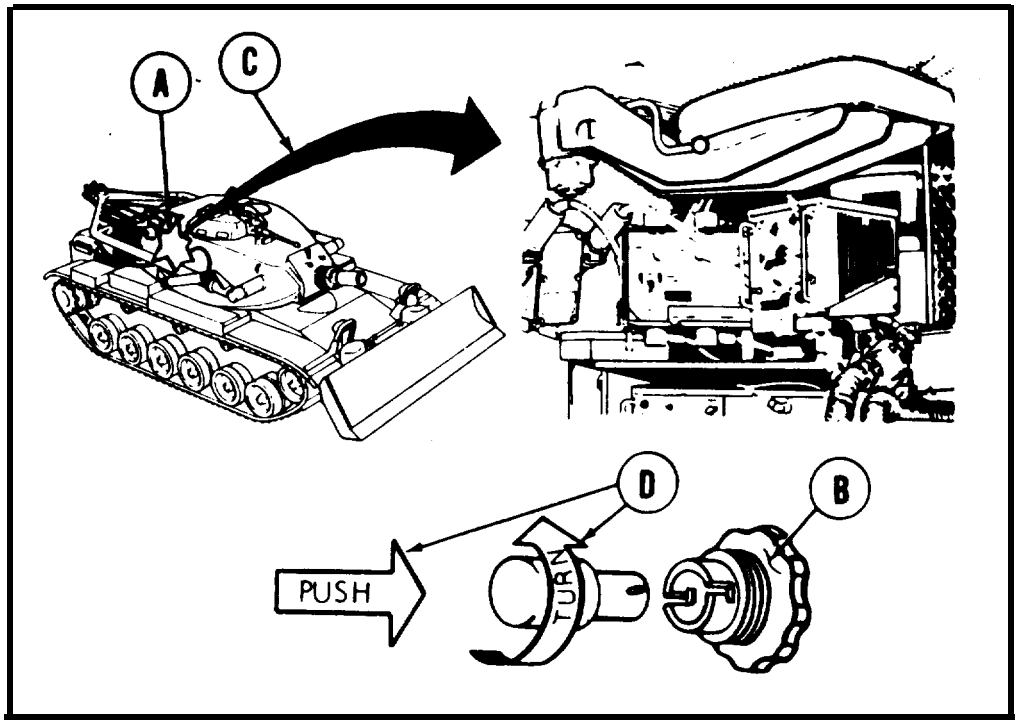
TABLE OF CONTENTS - Continued Page

VOLUME 4

VOLUME 5

HOW TO USE THIS MANUAL:

- This manual is divided into chapters.
- Chapters are by functional group code and are presented in same order as the RPSTL (Repair Parts and Special Tool List).
- Procedure indexes are on procedures that are four pages or more, and indicate how the procedure is set up, i.e., disassembly, removal, cleaning and inspection, etc.
- All references within this technical manual refer to page numbers.
- Steps are numbered and are to be performed in that order.
- Be sure to read all NOTES, WARNINGS, AND CAUTIONS.
- Locator views are included wherever necessary. These will help you locate the item for which the procedure is referencing.
- Jagged circle ( ) on locator (A) indicates a cutout and means the item is inside the vehicle.
- A ( ) symbol represents the outside surface (B) of a piece of equipment that cannot be shown in its entirety.
- Callouts are shown by a circle with a letter inside.
- Locator arrows (C) are black and mechanical motion arrows (D) are white.
- Broken leader arrow (- - - →) indicates the item is either inside or under the vehicle and cannot be seen.



HOW TO USE THIS MANUAL - Continued

- Certain sections of the manual have detailed "how to use " instructions at the beginning of the section - for example, troubleshooting.

- A maintenance information index is located in back of this manual. It is set up in alphabetical order and maintenance function, for example, disassemble, clean, inspect, repair, remove, install, assemble, and test.

- An illustrated list of manufactured items, or better known as fabricated tools, is located in back of this manual. It is nothing more than direction on how to fabricate tools that are listed throughout the manual.

- **LO 9-2350-222-12, M728 lubrication order, has been rescinded. All crew lubrication tasks have been incorporated into TM 9-2350-222-10, Appendix G, and are to be performed as required or as a part of crew PMCS. All organizational maintenance lubrication tasks have been incorporated into PMCS contained in this manual and are to be performed as required and as a part of organizational maintenance PMCS. Any reference to LO 9-2350-222-12 must be considered a reference to either TM 9-2350-222-10, Appendix G, or organizational PMCS, and must be performed in accordance with instructions provided in the applicable PMCS.**

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

SCOPE

Type of Manual: Organizational Maintenance

Model Number and Equipment Name: M728 Combat Engineer Vehicle, Full-Tracked, 165-mm Gun

Purpose of Equipment: Provide a mobile and maneuverable weapon for combat support of ground troops and vehicles. It is equipped with a hydraulically-operated bulldozer mounted to the front of the hull. A winch and a boom are mounted to the turret for lifting, carrying, and winching. The M728 vehicle is used for breaching, obstacle removal, transportation of demolition teams, and pioneering operations.

MAINTENANCE FORMS, RECORDS, AND REPORTS

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

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's)

If your M728 Combat Engineer Vehicle needs improvement, let us know. Send us a EIR. You, the user, are the only one who can tell us what you don't like about our equipment. Let us know why you don 't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to: Commander, U.S. Army Tank-Automotive Command, AMSTA-QRT, Warren, Michigan 48397-5000, We'll send you a reply,

USE OF ENGLISH AND METRIC SYSTEM UNITS

Torque values specified in this manual are expressed in pound-feet (lb-ft) or pound-inches lb-in) followed by the metric equivalent in parentheses. The metric equivalent is expressed in system international units Newton meters (N.m). The metric system and equivalents conversion table is located on inside back cover of this manual.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-6 for instructions on destruction of materiel to prevent enemy use,

ADMINISTRATIVE STORAGE

Refer to TM 740-90-1 for instructions on administrative storage.

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

a. No particular quality assurance or quality control manual pertains specifically to the M728 Combat Engineer Vehicle.

b. Defective material received through the supply system should be reported on quality Deficiency Report (QDR) SF 368. Instructions for preparing QDR's are provided in AR 702-7, Reporting of Quality Deficiency Data. QDR's should be mailed to Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-Q, Warren, MI 48397-5000. A reply will be furnished directly to you.

Section II. EQUIPMENT DESCRIPTION AND DATA

LOCATION AND DESCRIPTION OF EXTERNAL COMPONENTS

(A) FIXED FIRE EXTINGUISHER HANDLE.

Permits crew to release a first and second shot of CO2 into the engine compartment in the event of a powerplant fire.

(B) GRILLE DOORS.

Provides access to engine and powerplant.

(C) PINTLE.

Permits attaching tow bar for towing or recovery of disabled vehicles.

(D) TRACKS AND SUSPENSION.

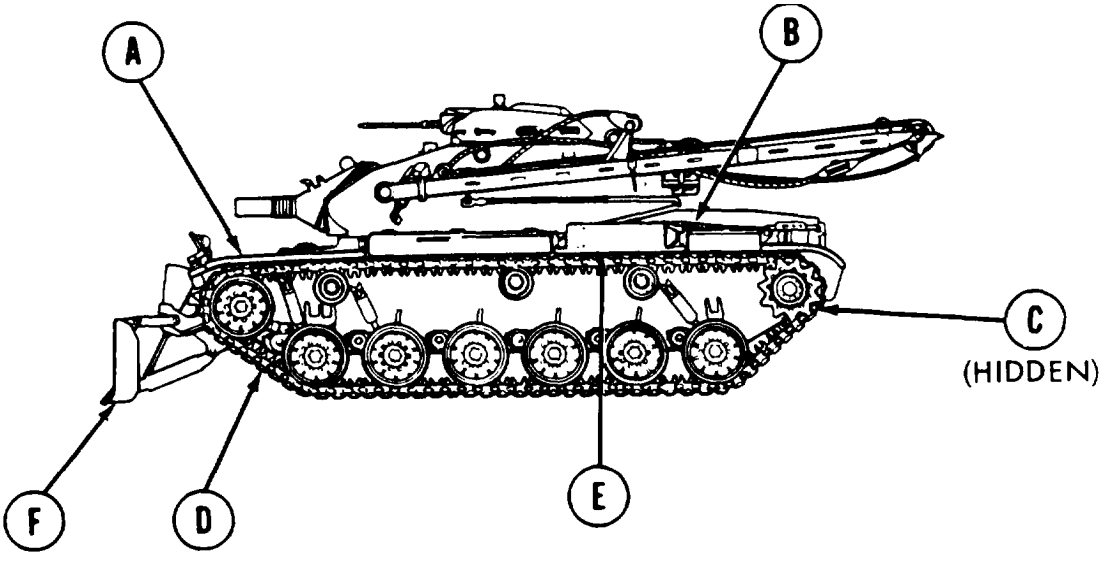
Includes transverse torsion bar type suspension which by means of individually suspended roadwheels that are supported by support arms splined to torsion bars, gives optimum riding characteristics over all types of terrain.

(E) AIR CLEANER.

Filters engine combustion air prior to delivery to engine turbocharger. Draws air through air intake screen. Removes larger dust particles in precleaned section and exhausts them by blower motor. Removes fine particles by surface-type air filter.

(F) BULLDOZER.

Earth moving capability is provided by the hydraulically operated moldboard. Two carrying hooks hold the moldboard in a raised position for vehicle travel.



LOCATION AND DESCRIPTION OF INTERNAL COMPONENTS (1 of 2)

(A) HULL-TO-TURRET INFLATABLE SEAL.

Provides a water-tight seal between hull and turret during fording operations. The driver inflates the rubber seal by using a hand pump.

(B) TRANSMISSION.

Transmits engine power to the final drives to move the vehicle. The transmission has two forward ranges, low and high, and one reverse range.

(C) UNIVERSAL JOINT.

Transmits power from transmission to final drives. There is one universal joint on each side of the transmission.

(D) ENGINE.

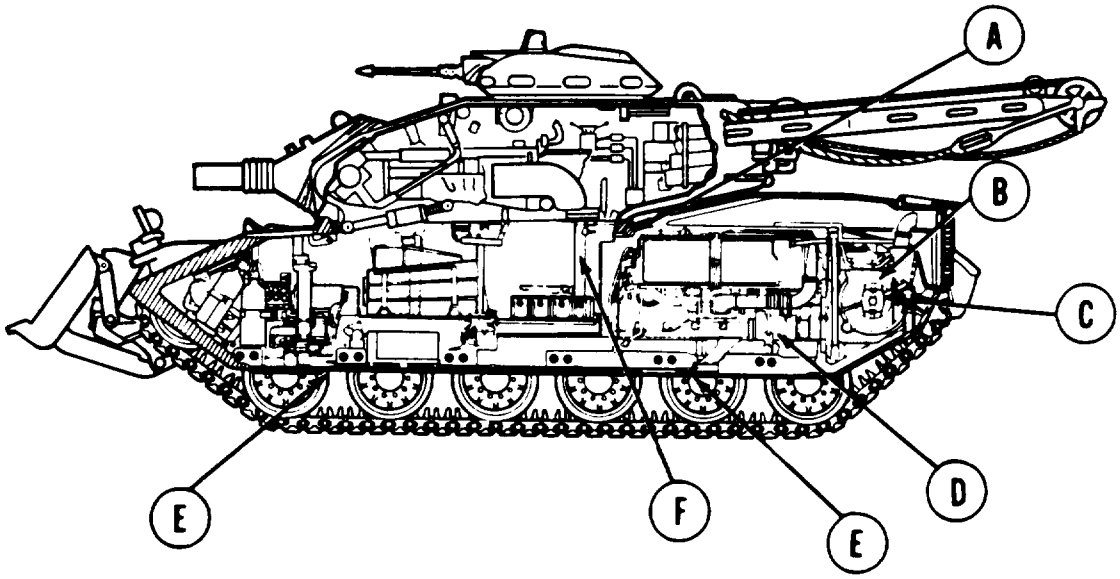
Provides power to move vehicle.

(E) HULL DRAIN VALVES.

Provides means for draining any water accumulated.

(F) ENGINE AIR CLEANER INTAKE.

Provides means of drawing air from crew compartment for air cleaners. This is usually done during fording or during operation under dusty or sandy conditions.



TA141258

LOCATION AND DESCRIPTION OF INTERNAL COMPONENTS (2 of 2)

(G) DRIVER'S CONTROL PANELS.

Provides driver with means of monitoring all systems during vehicle operation. The panels are mounted on the right hull ammunition rack.

(H) BATTERIES.

The six vehicle batteries are located on the hull floor beneath the turret platform. They supply a 24-volt power source for the vehicle electrical system.

(J) GAS PARTICULATE HEATER.

Provides driver and crew with heated, filteed air during chemical and biological warfare conditions. Each crew member is provided with a mask which is connected tothe system.

(K) FIXED FIRE EXTINGUISHER HANDLE.

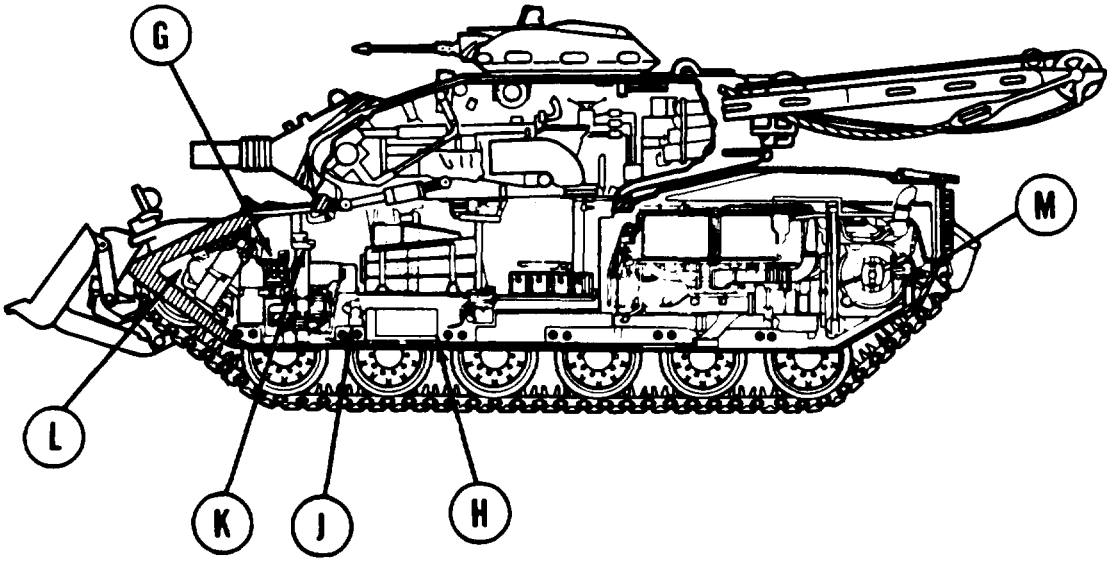
Allows operator to release a first and second shot of CO2 into the engine compartment in the event of a powerplant fire.

(L) PERSONNEL HEATER.

Provides heated air to hull and turret for crew comfort during cold temperatures. Heater is turned on by a switch located on driver's control panel.

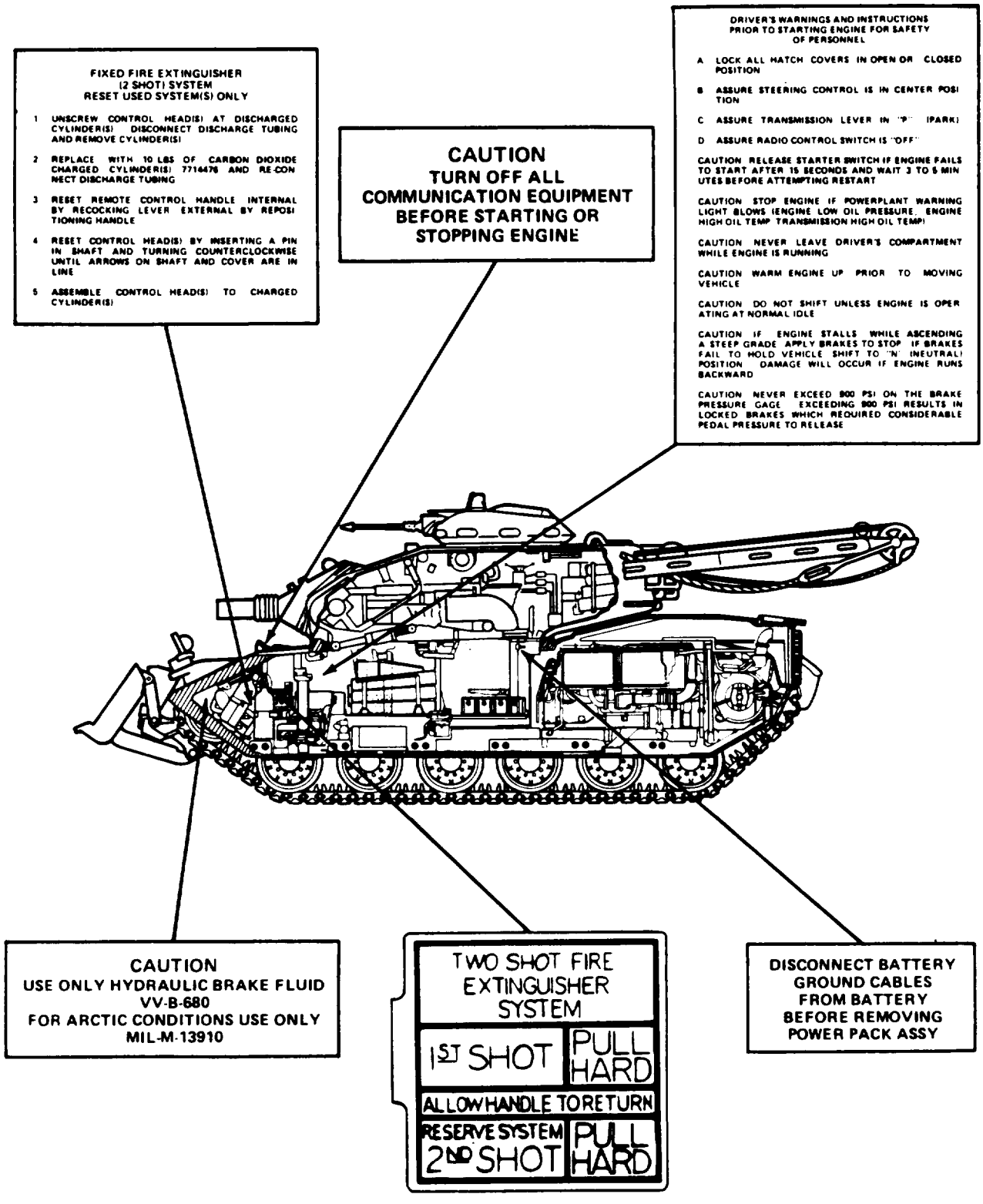
(M) HYDRAULICS.

The hydraulic pump mounted on the transmission provides pressure for the bulldozer and boom. A 50-gallon reservoir is located in the left rear of the driver's compartment.



TA141259

LOCATION OF DATA PLATES



TA141260

EQUIPMENT DATA

Engine Characteristics

Manufacturer	Teledyne Continental
Model	AVDS-1790-2A or AVDS-1790-2D
speed:	
Governed, full load	2400 rpm
Governed, no load	2550 rpm
Idle	700-750 rpm
Horsepower, gross	750 bhp at 2400 rpm
Cooling system	Engine driven fans for cylinders, transmission and engine oil coolers
Induction system	Supercharged by two exhaust driven turbochargers
Oil pressure:	
At 700 rpm idle	20 psi with SAE 30 at 180°F
At 2400 rpm full load	50 to 70 PSi with SAE 30 at 180°F
Oil temperature:	
Normal	180°F at 60°F ambient
Maximum	245°F
Lubricating oil:	
Type	LO 9-2350-222-12
Capacity	2A engine Initial fill -18 gallons (approx) Refill -13 gallons (approx) 2D engine: Initial fill -20 gallons (approx) Refill -17 gallons (approx)
Fuel:	
Type	Diesel
Grade 3	40 cetane min
Specification 3	VV-F-800
Consumption	48.5 gal/hr at 2400 rpm and 750 bhp

Transmission Characteristics

Manufacturer	Detroit Allison Diesel
Model	CD-850-6A
Type	Cross-drive with hydraulic torque converter
Suspension	3-point (attached to engine and two transmission mounts)
Oil pumps:	
Number	Two
Oil capacity	Initial fill -22.5 gallons (approx) Refill -17 gallons (approx)
Oil capacity, including coolers	25 gal (approx)
Oil filter	air-maze, double, sock-type

Fuel System Characteristics

Fuel tanks:	
Capacity (total)	385 gallons
Left tank	189 gallons
Right tank	198 gallons
Construction	Welded aluminum
Intertank isolation valve:	
Type	3-inch butterfly
Rated flow	50 gpm
Operated pressure	4.5 psi
Fuel return selector valve:	
Type	Ball rotor
Rated flow	3.7 gpm
Operating pressure	30 psi
Fuel tank electrical fuel pumps:	
Type	Impeller (indirect drive, dry motor, hermetically sealed, magnetic coupling)
Rated capacity	220 gph at 5 psi
Check valve:	
Type	Double swing-check
Operating pressure	50 psi.
Opening pressure	0.2 psi max
Primary fuel filter (disposable element)	40 micron
Fuel/water separator fuel falter (disposable inner element)	5 micron
Water separator filter (disposable outer element)	10 micron
Manifold heater fuel falter	10 micron
Purge line fuel filter	10 micron
Manifold heater solenoid valves	Fuel shutoff
Manifold heater spark plug	Gap 0.094 to 0.114 in.

Electrical System Characteristics

Air cleaner blower:	
Operating voltage	24 volts
Maximum current	7.5 amps at 77°F
Full load Speed	11,500 rpm
Air flow (cubic feet per rein)	.60 cm
Starter assembly:	
Type	Solenoid-operated, enclosed lever
Voltage	24 vdc
Maximum rated current at full load	800 amp
Batteries:	
Type	6 TN (MS35000-3)
Voltage	12
Ampere-hour rating	100
Alternator:	
Type	Teledyne Waterboro, G22 (2D engine) Lear Siegler, G22-6F (2A engine)
Voltage	Regulated between 25.8 to 30.2 vdc
output	650 amps-28 volts
Voltage Regulator:	
Type	Solid state - Bendix, Bendix 24B30-3B
Voltage	28 vdc
output	650 amps
Weight	6 lb
Special provisions	Waterproof
Headlights	
Service drive headlamp	24 v sealed beam
Blackout drive (infrared headlamp)	24 v sealed beam
Blackout drive lamp	.32 cp, 24-28 vdc
Blackout marker lamp	3 cp, 24-28 vdc
Taillights:	
Right taillight:	
Blackout drive/marker lamp	.3 cp, 24-28 vdc
Blackout stop lamp	3 cp, 24-28 vdc
Left taillight:	
Service tail lamp	3 cp, 24-28 vdc
Blackout drive/marker lamp	3 cp 24-28 vdc
service stop lamp	32 cp, 24-28 vdc
Domelight and rheostat	
Domelight	6 cp, 24-28 V and 15 cp, 24-28 V
Infrared powerpack:	
Input voltage	24 vdc

Suspension System Characteristics

Torsion bar:	
Number	12
Weight	105 lb
Diameter	2.35 in.
Length	82.25 in.
Roadwheels	
Number	12 dual
Diameter	26 in.
Tire width	5.75 in.
Surfacing	Rubber, 1.5 in. thick
Compensating idler wheels	
Number	2 dual
Diameter	26 in.
Tire width	5.75 in.
Surfacing	Rubber, 1.5 in. thick
Drive sprocket:	
Number	4 (one pair each side)
Track:	
Number	2 (one per side)
Type	T142
Width	28 in.
Guide type	Centerguide
Length (ground contact)	166.72 in.
Distance between tracks centerline	115 in.
Track pads:	
Number	320 (two per track shoe)
Thickness	2.12 in.
Height (above steel grouser)	0.89 in.
Contract area	67.1 sq. in.
Type	Rubber (replaceable)
Track shoes:	
Number	80 (each track)
Weight (per shoe assembly)	75.5 lb
Track guide type	Centerguide
Track adjusting link	
Number	2 (one per track)
Assembly type	Screw link or grease actuated
Track support rollers:	
Number	6 dual
Diameter	13.56 in.
Tire width	3.5 in.
Surfacing	Rubber, 0.75 in. thick
Shock absorber:	
Number	6 (3 per side)

Fire Extinguishers System Characteristics

Fixed:	
Type	Two shot CO2 system
Number	Three ten-pound charged bottles
First shot	One ten-pound bottle
Second shot	Two ten-pound bottles
Force required to actuate handle	55 lb maximum
Actuation time for first shot	4 sec maximum
CO2 discharge time delay	11 sec maximum
Peak CO2 concentration	70% minimum
CO2 system total discharge time	60 sec maximum
Auxiliary:	
Type	Portable CO2
Number	One five-pound unit
Location	Turret platform behind driver's seat

Personnel Heater System Characteristics

Personnel heater:	
Current consumption	Max. values
Starting	13 amp above 45°F 23 amp below 45°F
Operating 8460C24	12 amp abpve 45°F 18 amp below 45°F
Fuel	Any hydrocarbon fuel ranging from gasoline per MIL-G-3056 (use type II below 0°F) through DF1, DF2, or DFA per spec. W-F-800 down to cloud point of fuel except to -65°F when using DAF
Fuel pressure	3 to 15 psig at fuel inlet at 70°F ambient

Hydraulic System Characteristics

Hydraulic Reservoir (boom, winch, and moldboards)!
- Type oil . . . . . LO 9-2350-222-12
- Capacity
  - Fill approximate . . . . . 50 gal (189.3 liters)
  - Refill approximate . . . . . 48 gal (181.7 liters)

Moldboard:
- Controls . . . . . Hydraulic
- Rate of lift (engine speed of 1100 rpm) . . . . . 2.5 ips
- Angle of cutting edge
  - Float position . . . . . 60 degrees
  - Lowest position . . . . . 66 degrees
- Relation of cutting edge to ground level
  - Lowest position . . . . . 10 in. (254mm) below ground level
  - Highest position . . . . . 30 in. (762mm) above ground level
  - Carrying position . . . . . 29 in. (737mm) above ground level

CHAPTER 2

PRINCIPLES OF OPERATION

Section I. FUNCTIONAL DESCRIPTION

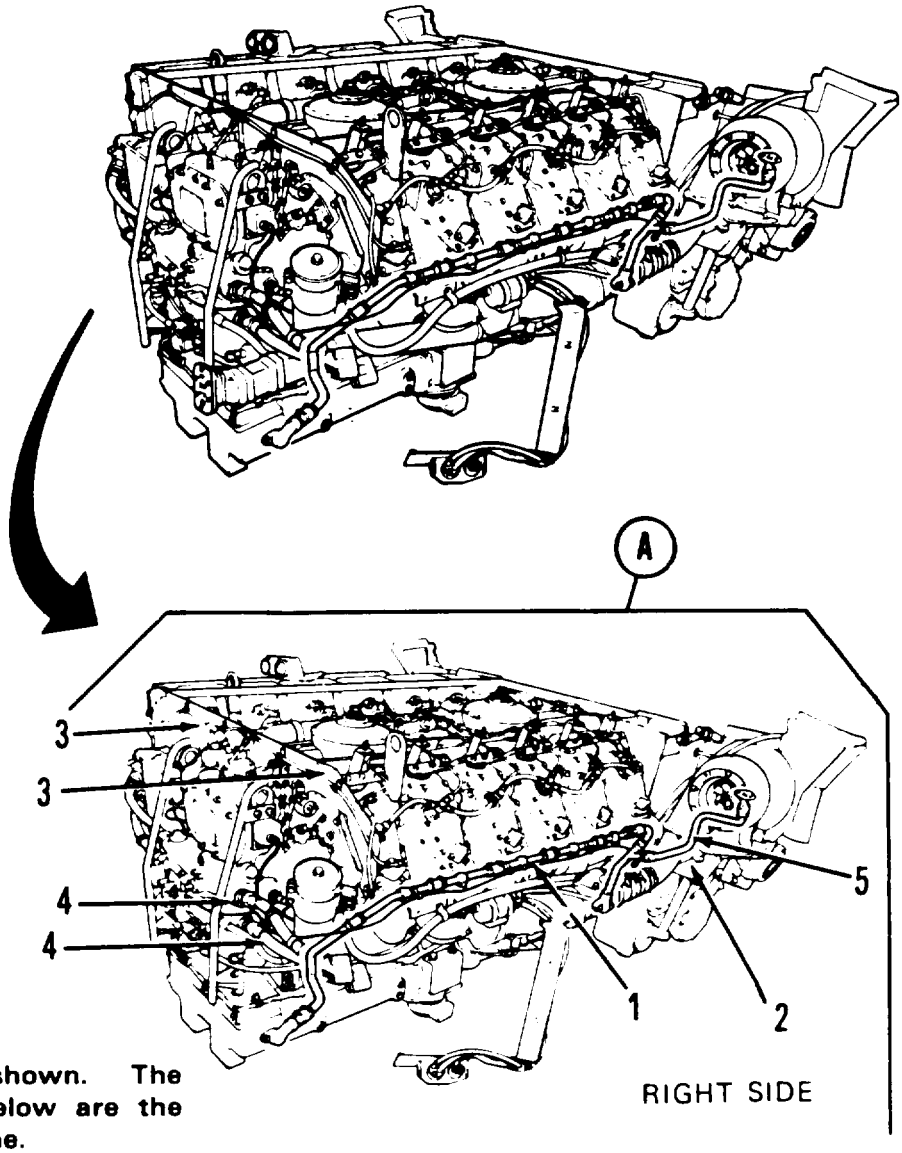
This chapter contains functional descriptions of engine and hull systems allocated to organizational maintenance, describing how the systems operate and how the systems relate to other equipment systems. Systems described in this chapter are:

Engine
Fuel system
Exhaust system
Cooling system
Electrical system
Transmission
Final drive system
Braking system
Tracks and suspension system
Steering system
Hull-Interior and exterior
Personnel heater system
Hydraulic system
Speedometer and tachometer
Fixed fire extinguisher system
Gas particulate system
Engine smoke generating system

Section II. SYSTEMS OPERATION

PRINCIPLES OF OPERATION - Continued

ENGINE. Continental Model AVDS-1790-2A, or AVDS-1790-2D, 12-cylinder, V-type, 4-cycle, air-cooled, fuel-injected, turbosupercharged diesel engine.



NOTE:

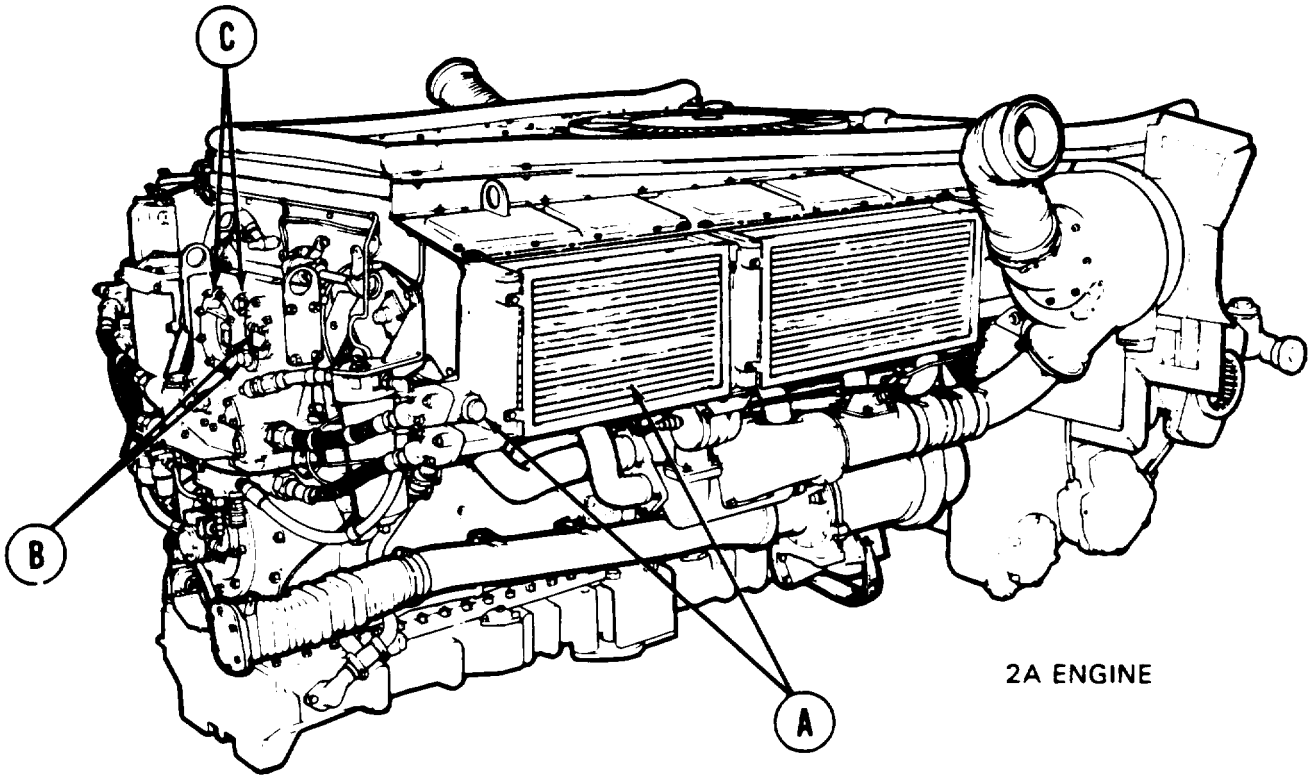
The 2D engine is shown. The components listed below are the same on the 2A engine.

(A) EXTERNAL OIL LINES AND CONNECTIONS
1. CYLINDER HEAD OIL DRAIN TUBES
2. TURBOSUPERCHARGER OIL DRAIN TUBES
3. BREATHER TUBES
4. OIL SUPPLY HOSES
5. OIL COOLER VENT HOSES

TA139947

PRINCIPLES OF OPERATION - Continued

2A ENGINE LUBRICATION SUBSYSTEM. Forced feed system, drawing oil from oil pan. Oil is forced through engine oil coolers and oil filter to engine oil galleries, bearings, turbosuperchargers, fuel injection pump, and piston cooling spray jets. A pressure relief valve returns incoming excess unfiltered oil to oil pan. Oil filter and oil cooler bypass valves permit oil to bypass filters if clogged. Engine and transmission oil cooling is accomplished by external oil coolers on sides of engine. Valves in each cooler control oil temperature.



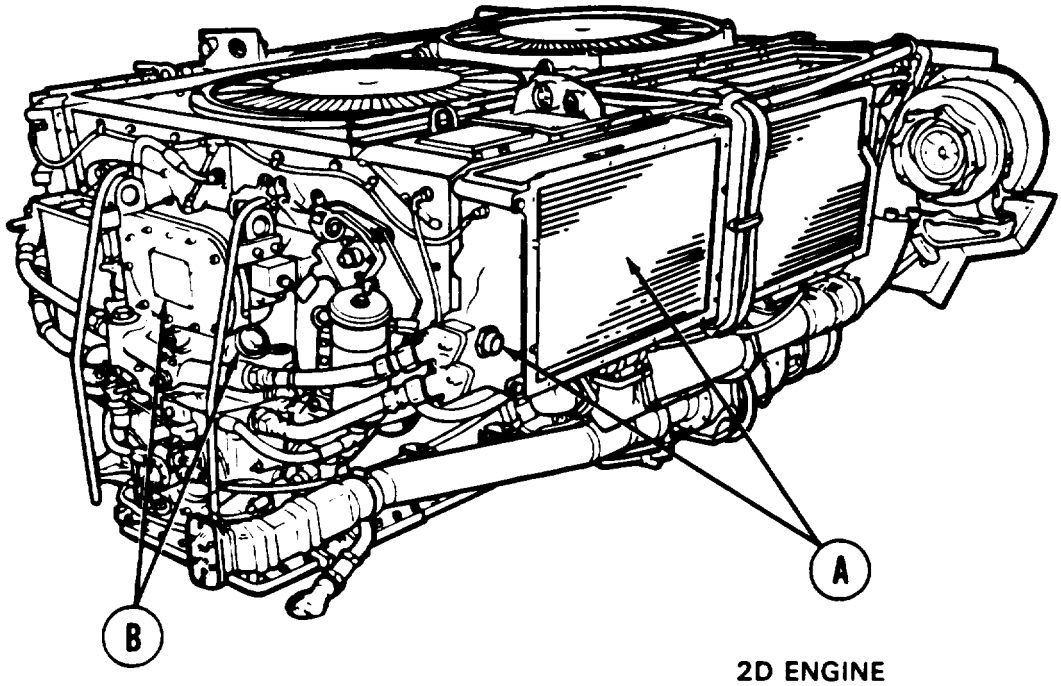
2A ENGINE

(A) OIL COOLER AND BYPASS VALVE
(B) OIL FILTER AND BYPASS VALVE
(C) AUXILIARY OIL FILTER AND BYPASS VALVE

TA139948

PRINCIPLES OF OPERATION - Continued

2D ENGINE LUBRICATION SUBSYSTEM. Forced feed system, drawing oil from oil pan. Oil is forced through engine oil coolers and oil filter to engine oil galleries, bearings, turbosuperchargers, fuel injection pump, and piston cooling spray jets. A pressure relief valve returns incoming excess unfiltered oil to oil pan. Oil filter and oil cooler bypass valves permit oil to bypass filters if clogged. Engine and transmission oil cooling is accomplished by external oil coolers on sides of engine. Valves in each coder control oil temperature.



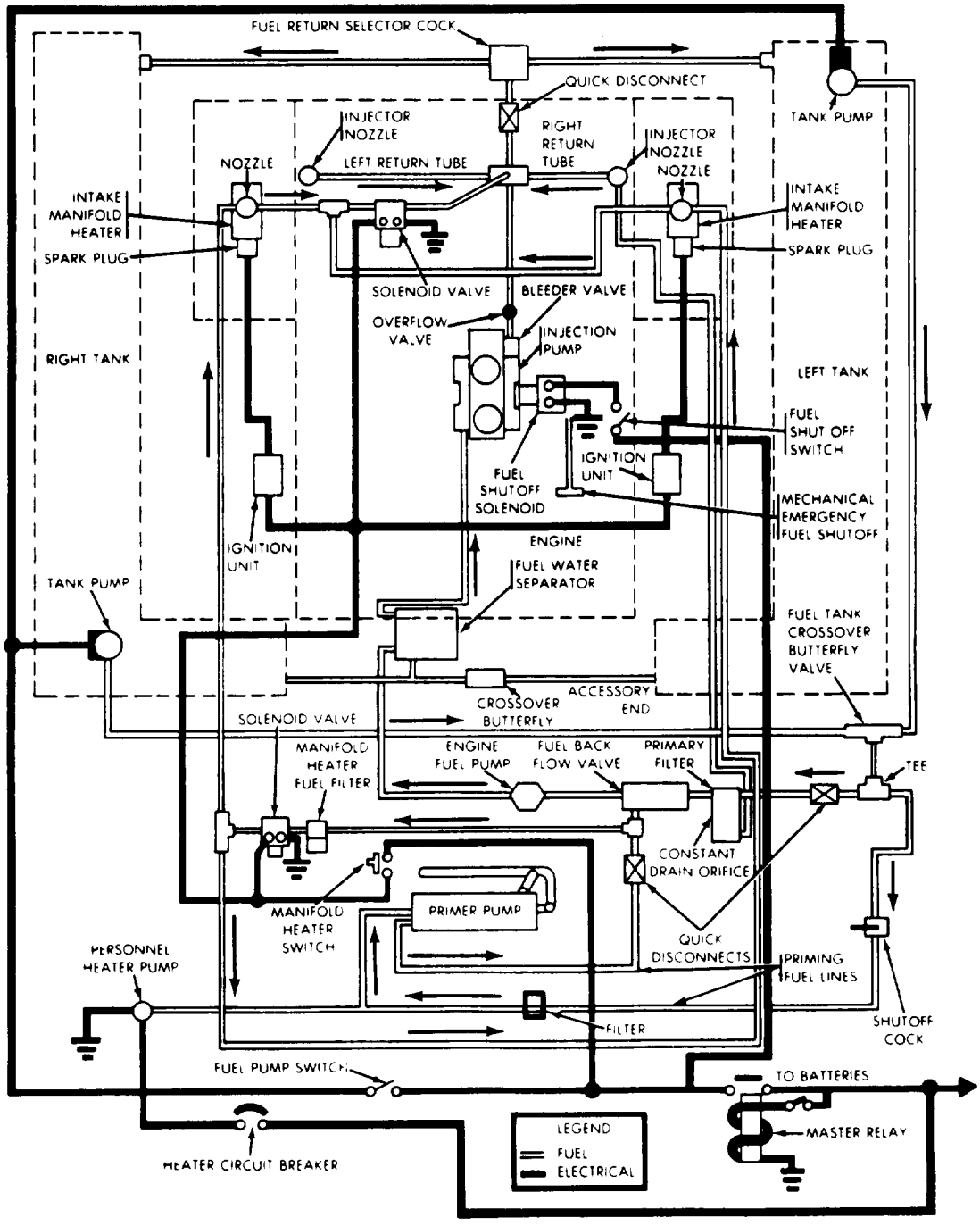
2D ENGINE

(A) OIL COOLER AND BYPASS VALVE
(B) OIL FILTER AND BYPASS VALVE

TA139949

PRINCIPLES OF OPERATION - Continued

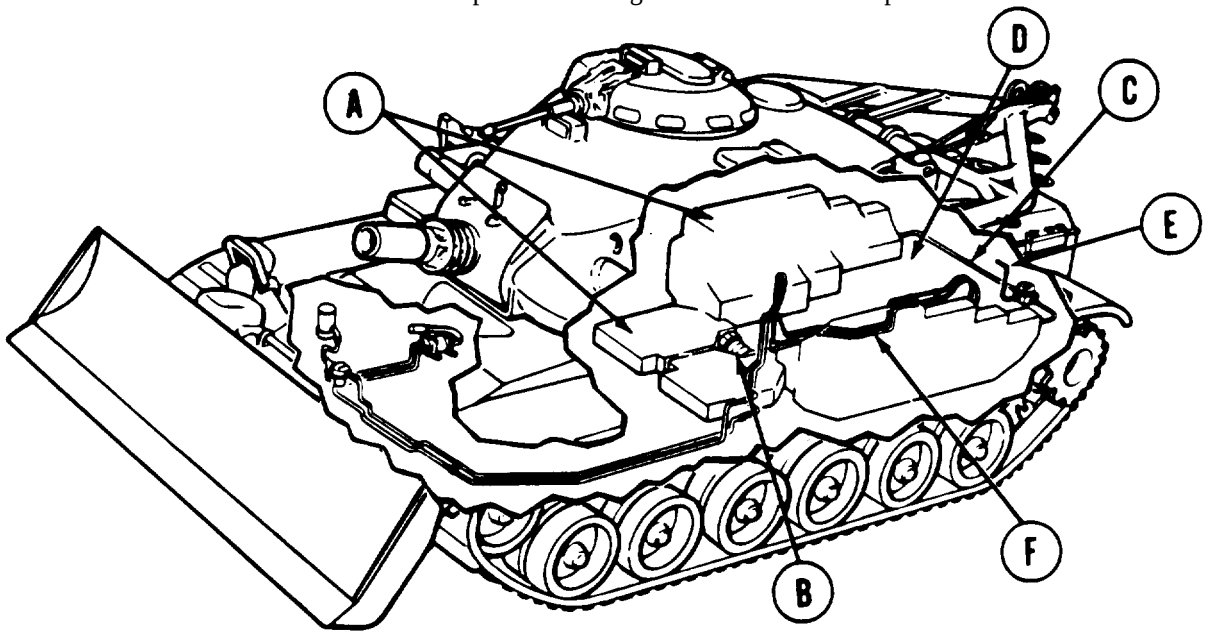
FUEL SYSTEM. Three functions: carrying fuel supply, supplying fuel to engine, supplying fuel to personnel heater and engine air intake manifold heaters. Accelerator controls and linkages are a major part of this system. For engine smoke generator system see page 2-37.

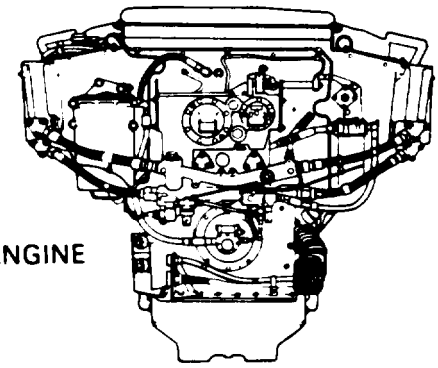


TA139950

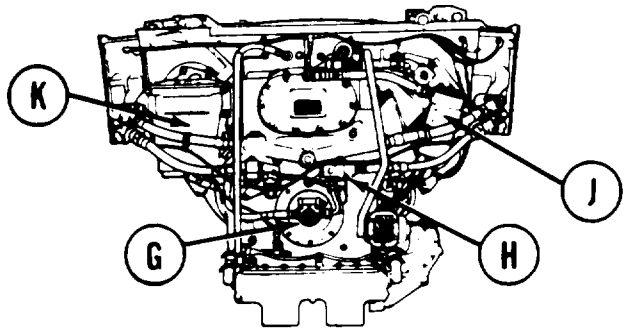
PRINCIPLES OF OPERATION - Continued

FUEL TANKS AND DISTRIBUTION SYSTEM. Two aluminum fuel tanks, one on either side of engine compartment, are interconnected by a flexible cross-feed hose fitted with a butterfly valve. Hose and valve are located beneath turret subfloor. Twelve stainless steel fuel lines carry fuel under pressure from fuel pumps on fuel tanks to fuel injector nozzles in each cylinder head. Fuel leakage from nozzles is carried through fuel return tubes on each cylinder back to fuel return system to fuel tanks. Flexible fuel hoses and tubing are interconnected to carry fuel to powerplant and personnel heater. Electric fuel pumps in each tank force fuel through fuel lines to engine fuel system. Backflow valve between engine fuel pump and primary fuel filter retains fuel in engine fuel lines when engine is shut off, Water in fuel is removed when fuel passes through the fuel-water separator.





2D ENGINE



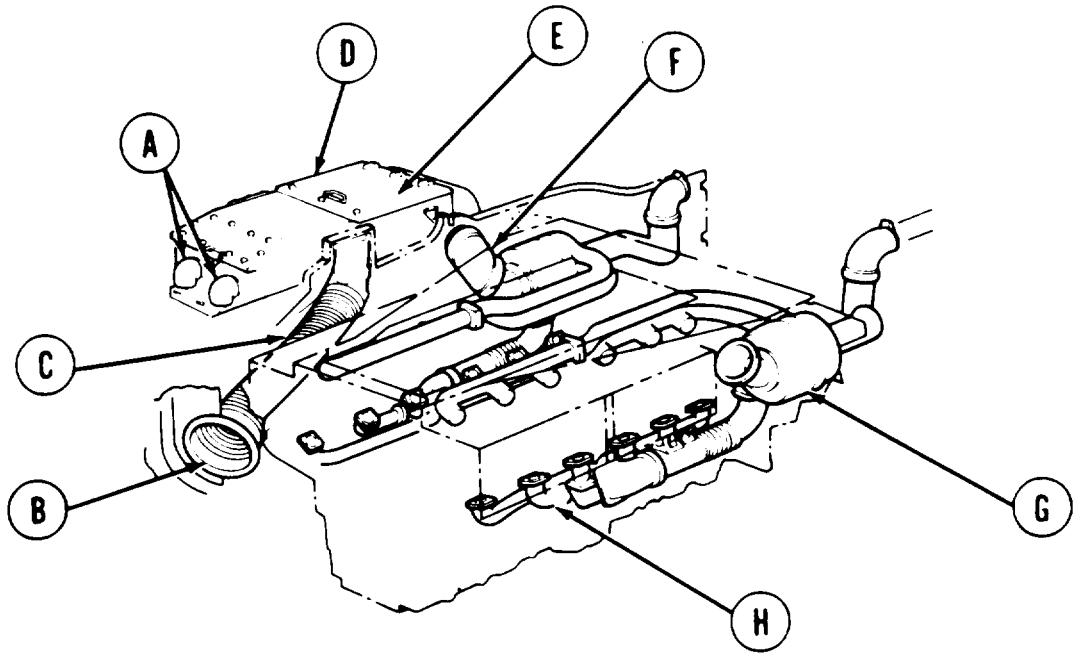
2A ENGINE

(A) FUEL TANKS
(B) CROSSOVER FEED HOSE/BUTTERFLY VALVE
(C) FUEL LINES TANKS-TO-ENGINE
(D) ENGINE FUEL SYSTEM
(E) FUEL RETURN LINES
(F) FUEL LINES
(G) ENGINE FUEL PUMP
(H) BACKFLOW VALVE
(J) PRIMARY FUEL FILTER
(K) FUEL-WATER SEPARATOR

TA139951

PRINCIPLES OF OPERATION - Continued

AIR CLEANER ASSEMBLY. Exhaust-driven turbosupercharger draws air from crew or engine compartment to air cleaners where two centrifugal fans clean air in primary separator stage. Air is drawn into dry-type, layer-filtration filters and is drawn through outlet hoses into turbosupercharger and forced into engine air intake manifolds.



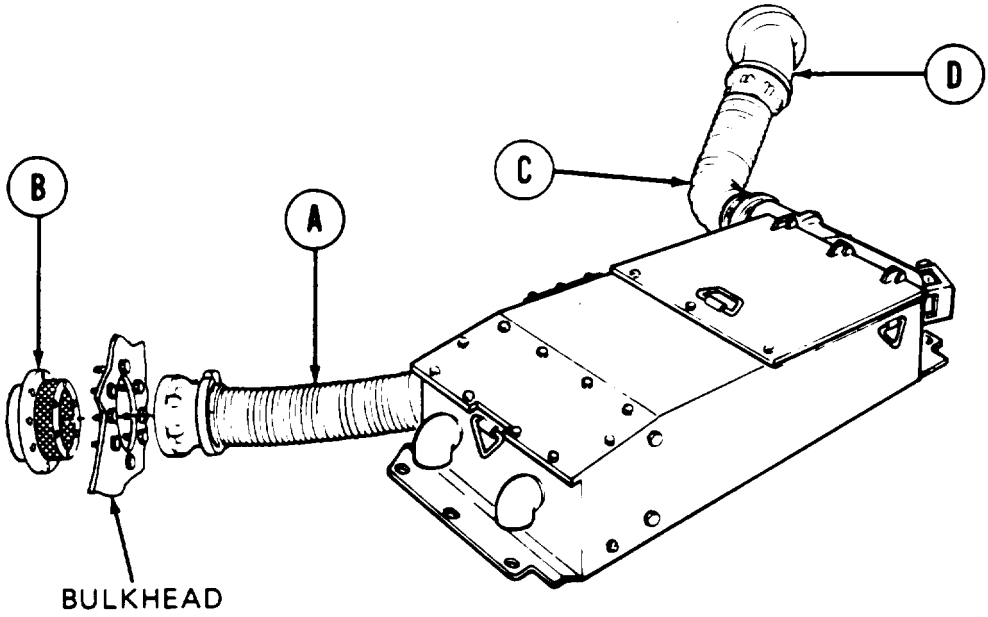
AIR INTAKE SYSTEM

(A) AIR CLEANER BLOWER FANS
(B) ENGINE AIR INTAKE
(C) AIR INTAKE HOSE
(D) AIR CLEANER
(E) DRY-TYPE FILTER UNIT
(F) AIR OUTLET HOSE ASSEMBLY
(G)TURBOSUPERCHARGER
(H) AIR INTAKE MANIFOLD

TA139952

PRINCIPLES OF OPERATION - Continued

AIR CLEANER AND SCREENS. Air cleaner intake hoses draw air from crew compartment to air cleaner through screen on reversible air intake mounted in bulkhead. Air outlet hoses direct filtered air from air cleaners to turbosuperchargers.

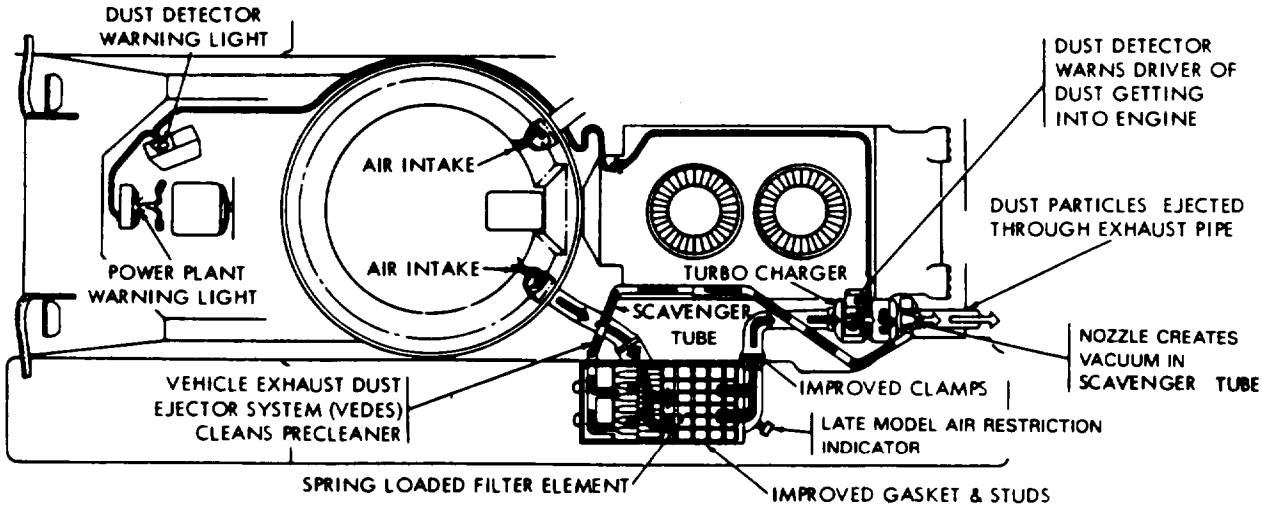


(A) AIR INTAKE HOSE
(B) REVERSIBLE AIR INTAKE
(c) AIR OUTLET HOSE
(D) AIR CLEANER TO TURBOCHARGER ELBOW

TA139953

PRINCIPLES OF OPERATION - Continued

VEHICLE EXHAUST DUST EJECTOR SYSTEM (VEDES). The vehicle exhaust dust ejector system (VEDES) replaces the air cleaner centrifugal fans. The air cleaner housing is modified to plug the fan exhaust elbows and to accommodate a tube manifold with its associated hoses, clamps, and mounting bracket installed in place of the fans. A system of dust scavenger tubes, check valves, and exhaust pipes with integral dust ejectors is mounted along each cylinder bank above and parallel to the engine and transmission oil coolers. VEDES scavenges dust from the precleaned section of the air cleaners through suction action of the exhaust ejectors.



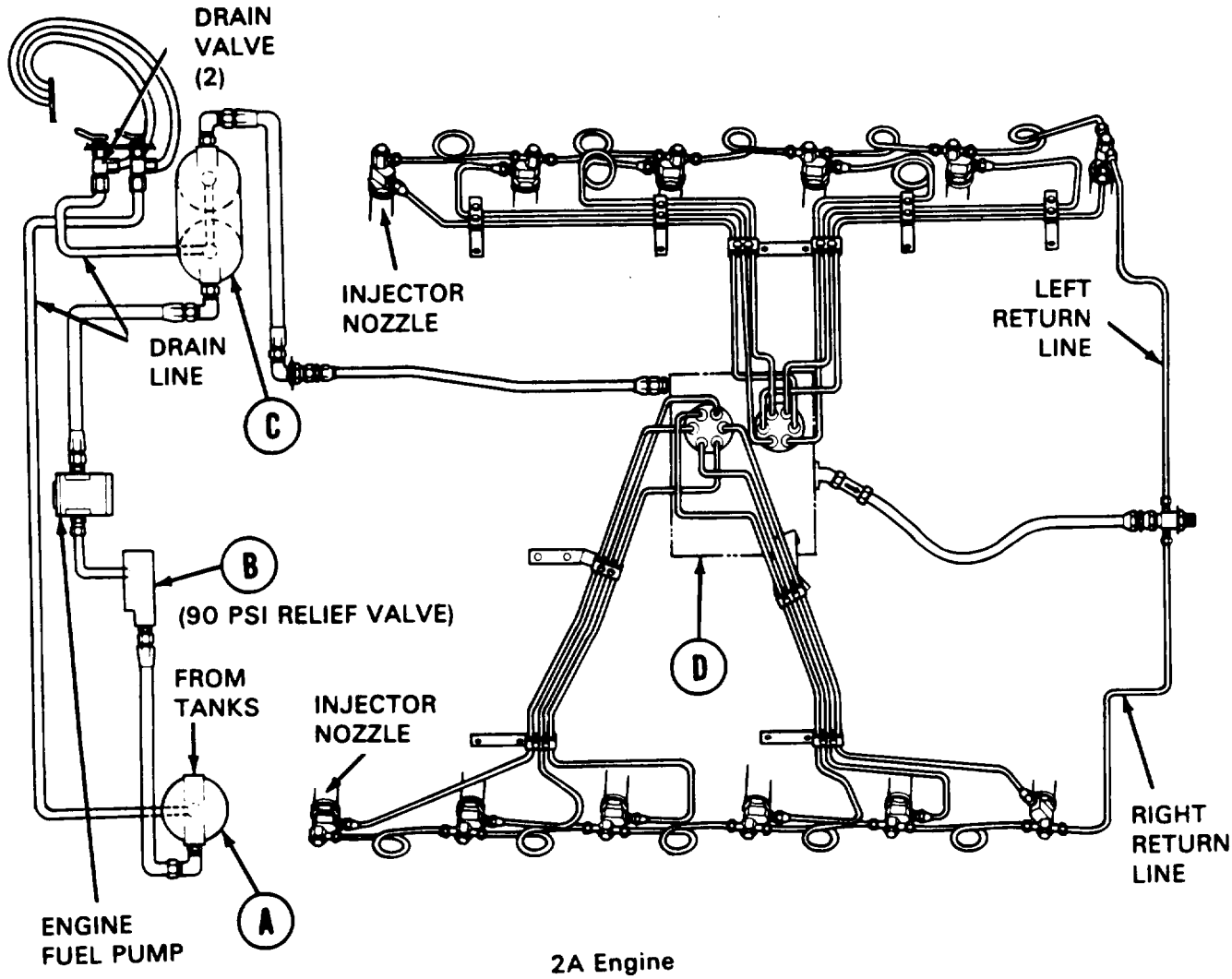
DUST DETECTOR SYSTEM. The Dust Detector System is to alert the driver when the air induction system allows dust to bypass the filter.

The Dust Detector System uses engine air induction manifold pressure to circulate air through filter strips in the dust detectors mounted in the turbosupercharger compressor housings. When the filter strip(s) become clogged, the resultant change in pressure actuates a pressure switch which illuminates the powerplant warning light and the dust detector warning light in the driver's compartment.

TA248787

PRINCIPLES OF OPERATION - Continued

ENGINE FUEL SYSTEM (2A ENGINE). Fuel flows from tanks to primary fuel filter, through main fuel check valve to engine-driven, vane-type fuel pump that increases fuel pressure to fuel injector pump. Fuel from engine fuel pump is filtered through fuel-water separator into injector fuel pump that delivers accurately measured quantities of fuel under high pressure to each cylinder.



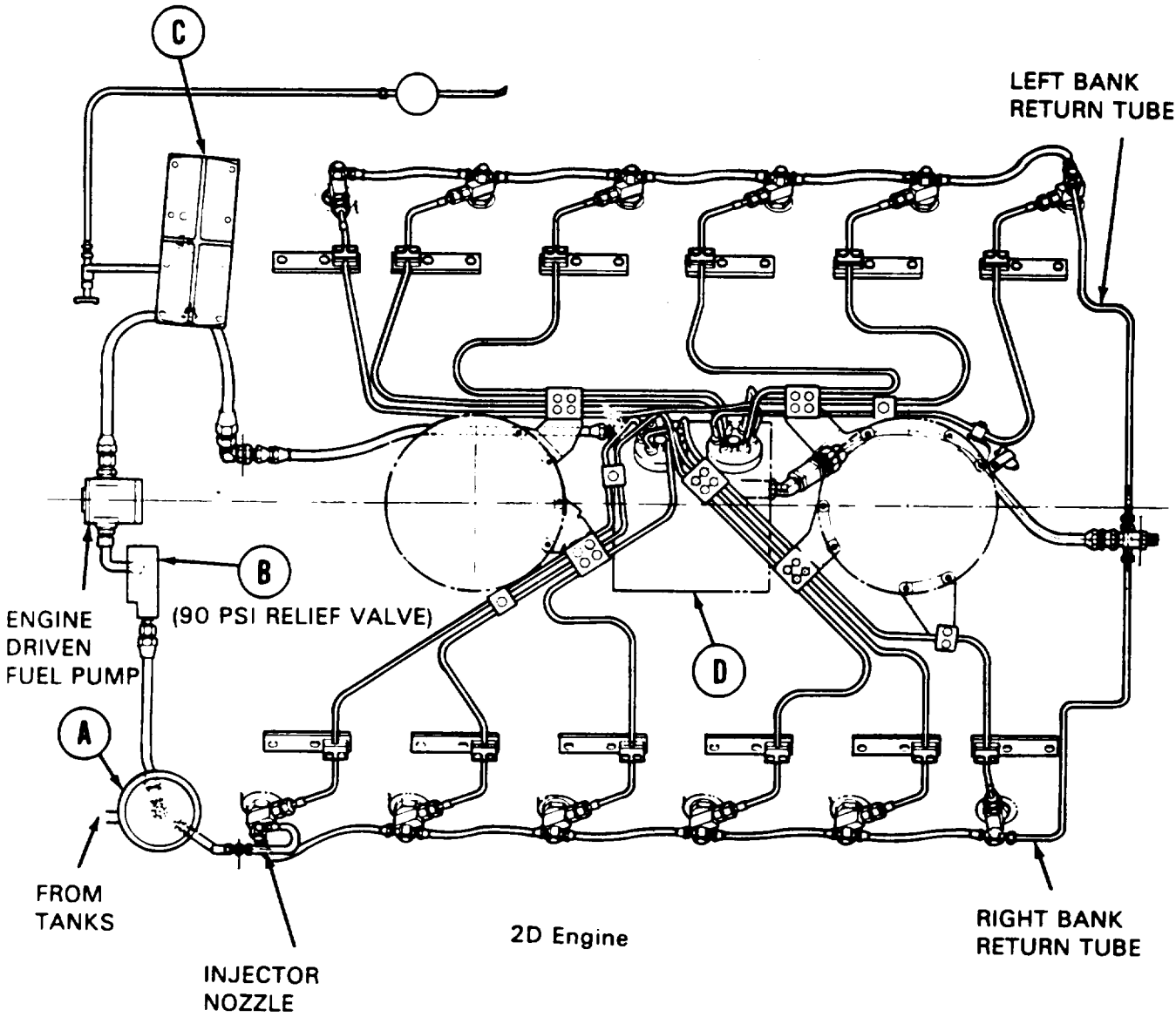
2A Engine

(A) PRIMARY FUEL FILTER
(B) MAIN FUEL CHECK VALVE
(C) FUEL-WATER SEPARATOR
(D) FUEL INJECTOR PUMP

TA139954

PRINCIPLES OF OPERATION - Continued

ENGINE FUEL SYSTEM (2D ENGINE). Fuel flows from tanks to primary fuel filter, through main fuel check valve to engine-driven, vane-type fuel pump that increases fuel pressure to fuel injector pump. Fuel from engine fuel pump is filtered through fuel-water separator into injector fuel pump that delivers accurately measured quantities of fuel under high pressure to each cylinder.

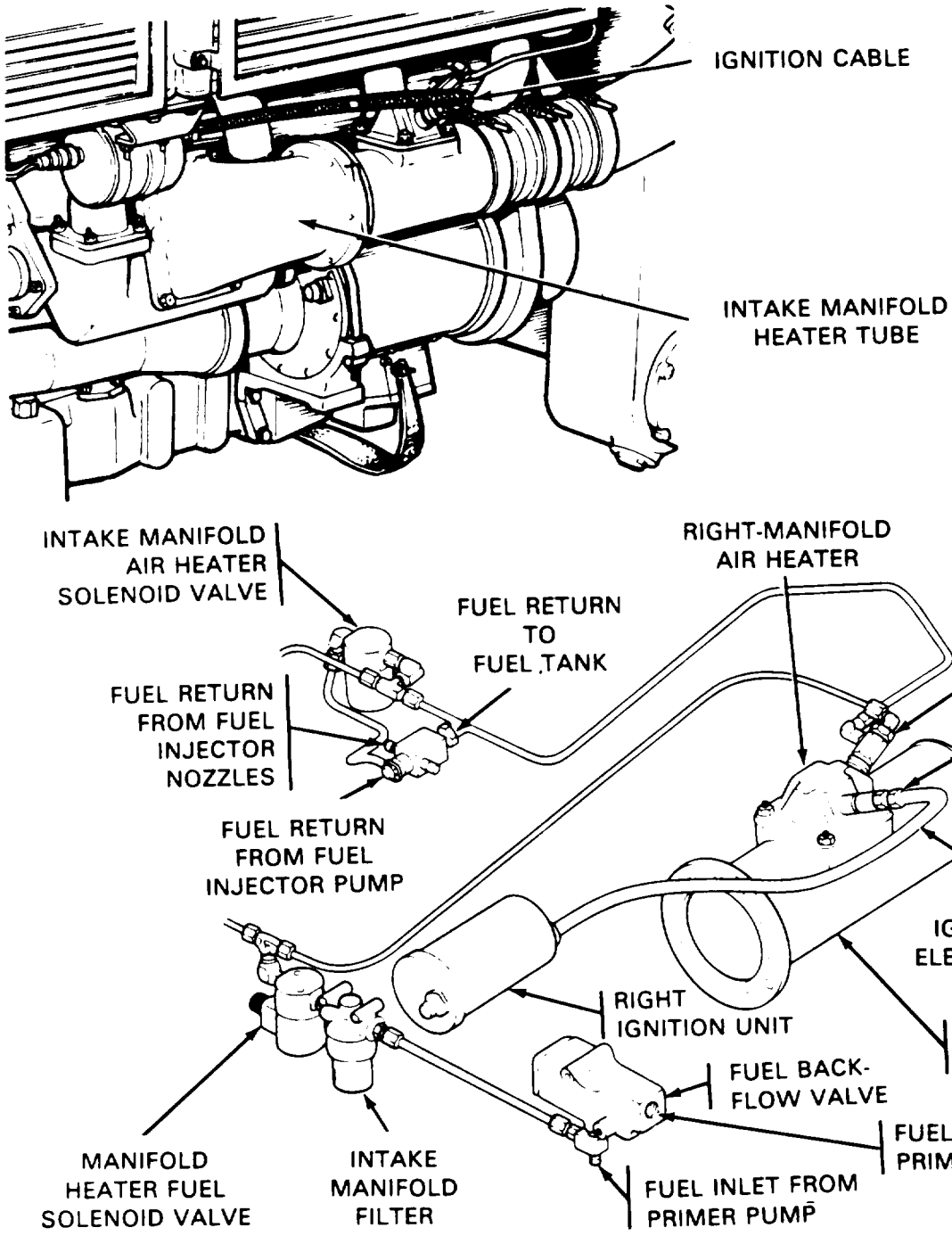


(A) PRIMARY FUEL FILTER
(B) MAIN FUEL CHECK VALVE
(C) FUEL-WATER SEPARATOR
(D) FUEL INJECTOR PUMP

TA139955

PRINCIPLES OF OPERATION - Continued

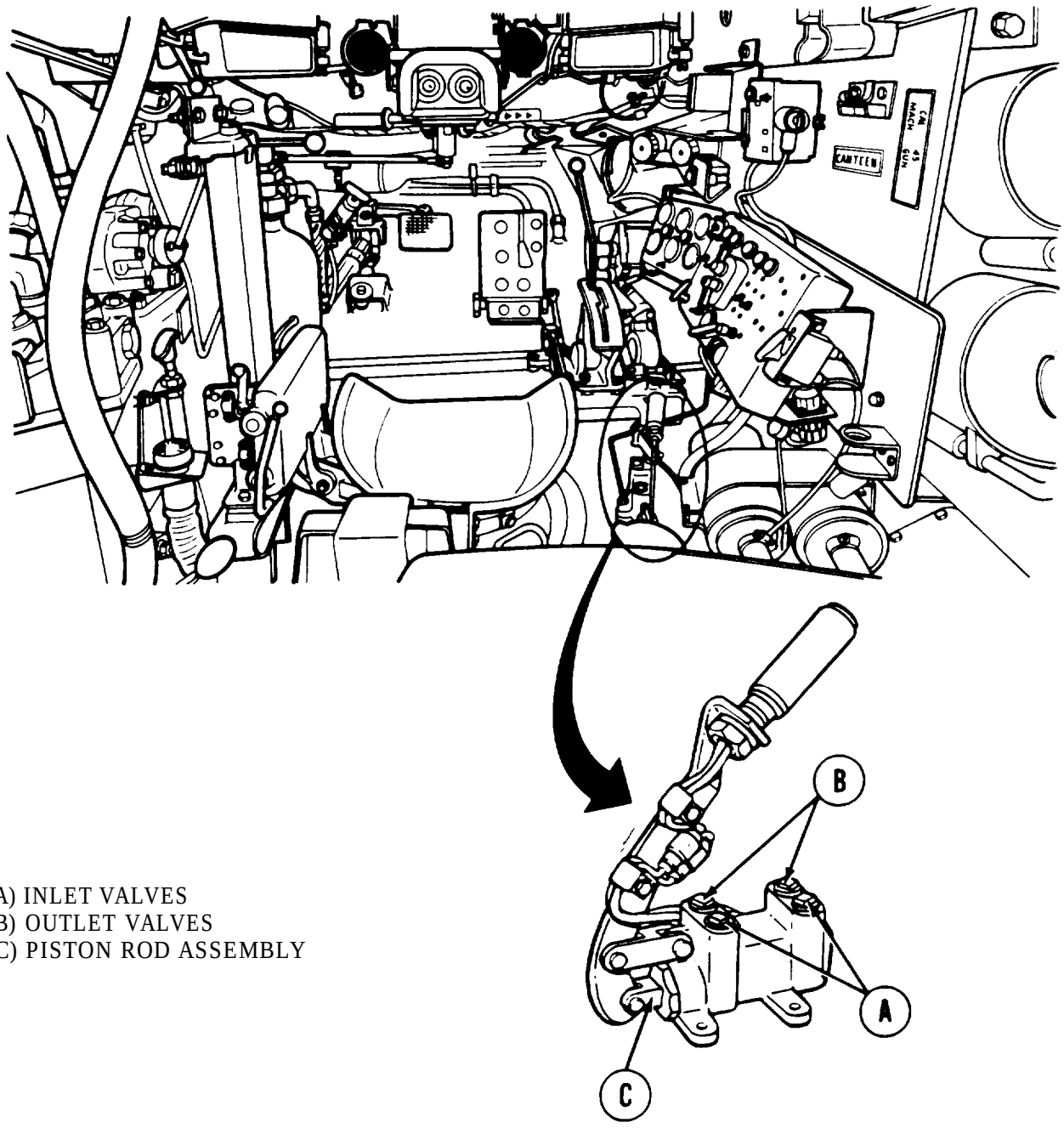
MANIFOLD HEATER. Mainfold heater fuel system uses plastic and steel tubing to supply fuel from the primer pump pressure fuel line through the manifold heater fuel filter and manifold fuel heater solenoid valve to manifold heater nozzles. Excess fuel from nozzles is returned through intake manifold air heater solenoid valve to engine fuel return system. Heaterds mounted on intake manifolds use a spark plug to ignite and burn pressurized engine fuel to provide heated air for cold weather starting.



TA139956

PRINCIPLES OF OPERATION - Continued

PRIMER PUMP. Provides pressurized fuel into engine fuel lines by driver-operated manual pump. Primer pump has two inlet and two outlet valves and a piston rod assembly that draws fuel from fuel lines and forces fuel from pump into manifold heater fuel lines. Pump also purges fuel system of air. . Air is forced into fuel tanks. Button on pump handle activates the spark plug on manifold heater system to ignite fuel in heater.

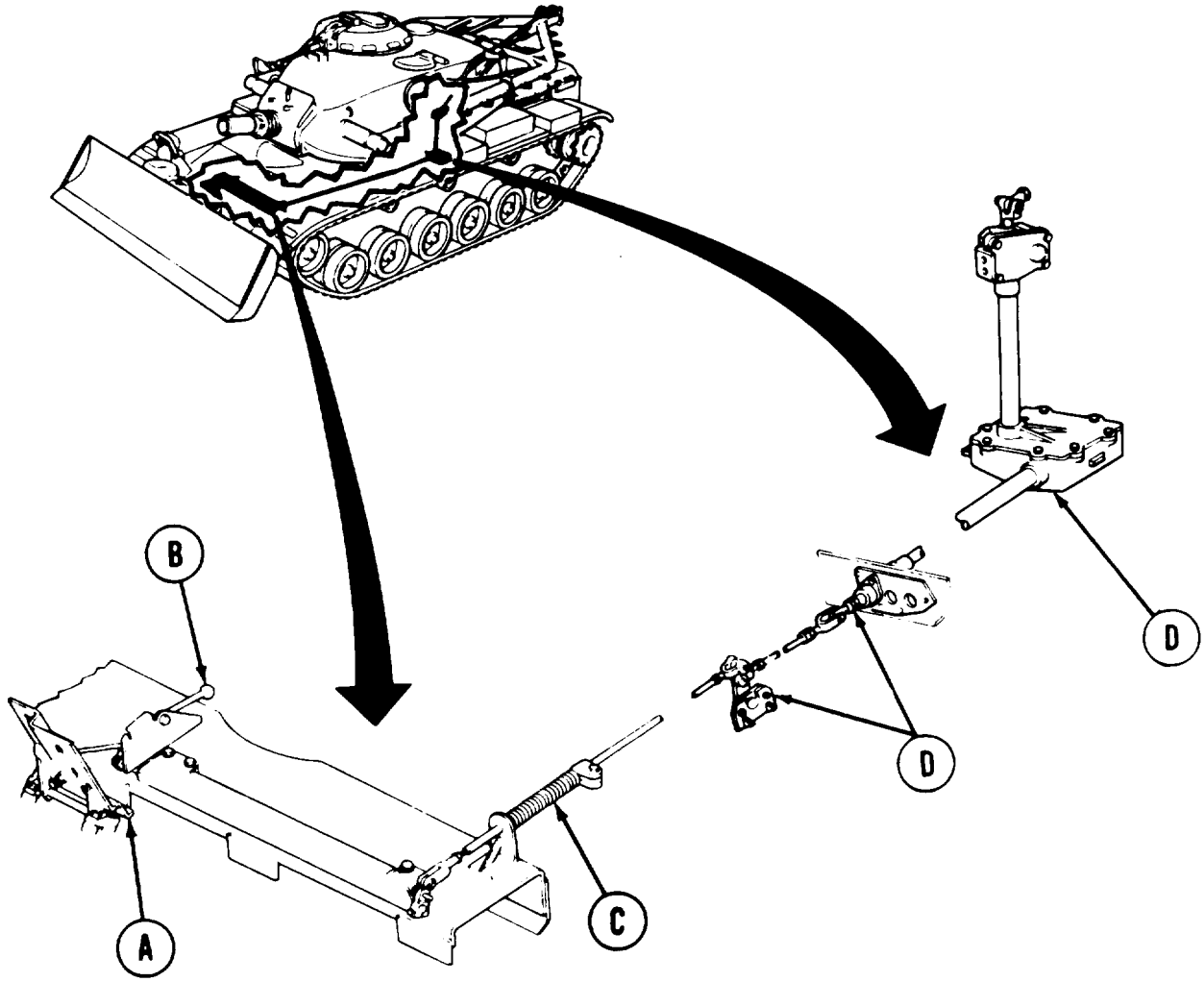


(A) INLET VALVES
(B) OUTLET VALVES
(C) PISTON ROD ASSEMBLY

TA139957

PRINCIPLES OF OPERATION - Continued

ACCELERATOR CONTROLS. Engine speed is controlled by accelerator control pedal and manual control lever connected to engine by a series of mechanical linkage. Manual control lever holds setting of control pedal. Accelerator linkage passes along hull floor and is connected with a yoke to an eye connection on engine accelerator linkage. Adjustable return spring, mounted on accelerator linkage, returns pedal to up position when pedal or manual control lever is released.

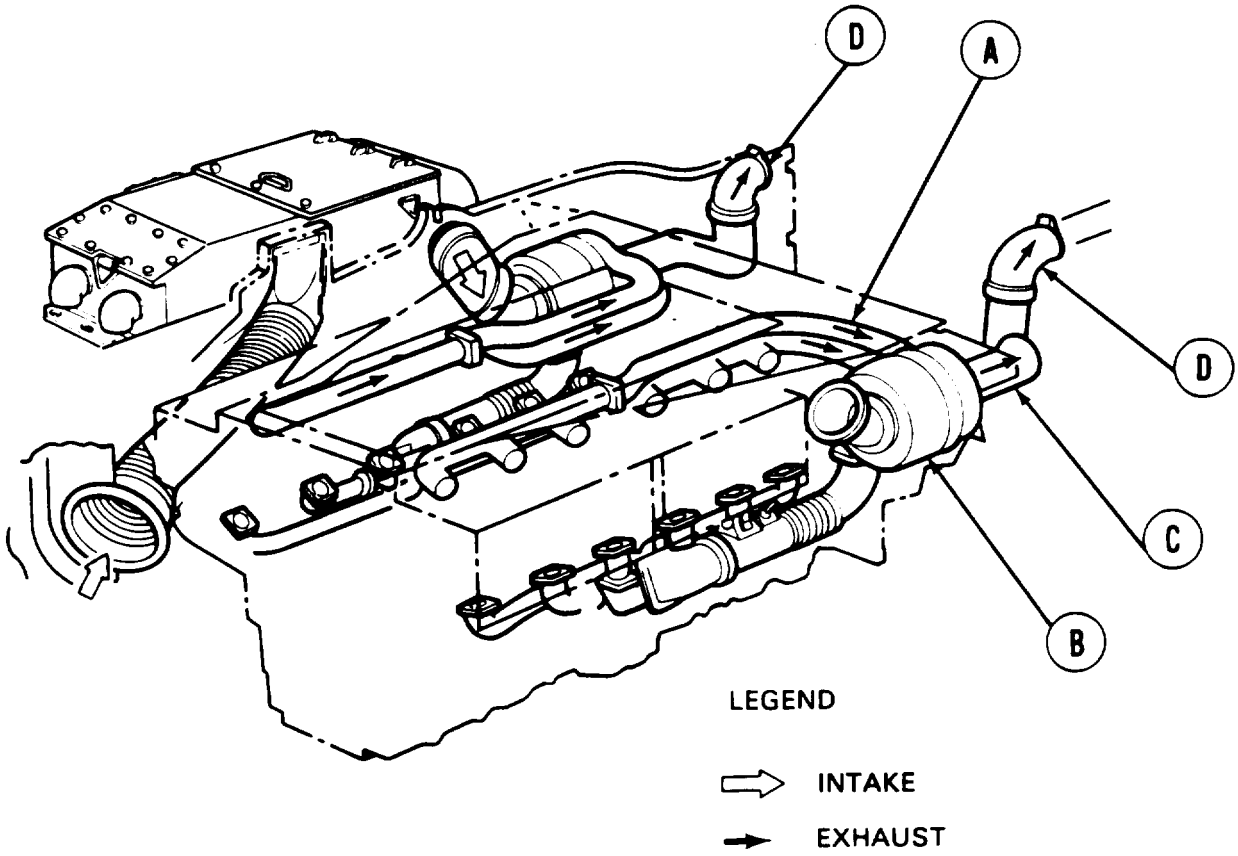


(A) ACCELERATOR PEDAL
(B) MANUAL CONTROL LEVER
(c) RETURN SPRING
(D) ACCELERATOR LINKAGE

TA139958

PRINCIPLES OF OPERATION - Continued

EXHAUST SYSTEM. Exhaust gases from cylinders travel through a pair of exhaust manifolds into exhaust-driven turbosuperchargers. Gases are expelled into a pair of exhaust pipe assemblies that conduct gases upward through transmission shroud into outlet elbows, out engine exhaust doors and away from vehicle.



EXHAUST SYSTEM

(A) EXHAUST MANIFOLD
(B) TURBOSUPERCHARGER
(C) EXHAUST PIPE
(D) EXHAUST OUTLET ELBOW

TA139959

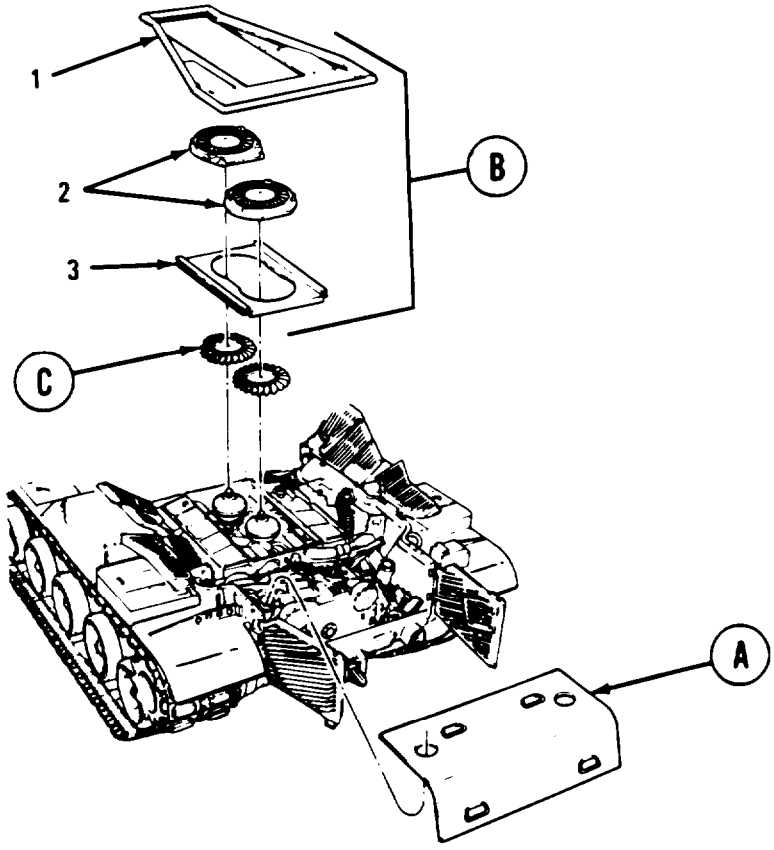
PRINCIPLES OF OPERATION - Continued

COOLING SYSTEM. Air for cooling is drawn into engine compartment through air intake grille doors by two engine-mounted fans which draw air through engine and transmission oil coolers, over cylinder fins, and discharge air vertically from engine shroud. Baffles and deflectors on cooling fan shroud direct air flow across cylinders.

(A) TRANSMISSION SHROUD. Insulated sheet metal assembly fitting over top and rear portions of transmission.

(B) ENGINE SHROUD. Sheet metal assembly covering top of engine, guides hot air from engine cooling fans toward rear of vehicle.

(C) COOLING FANS. Mounted on oil-driven centrifugal clutch and disk towers on engine, fans draw air through engine and transmission oil cooler cores to cool circulated oil. Fans draw air over baffles and deflectors on engine and shroud to direct air flow across cylinders. Fans also force hot air and exhaust gases through exhaust doors.



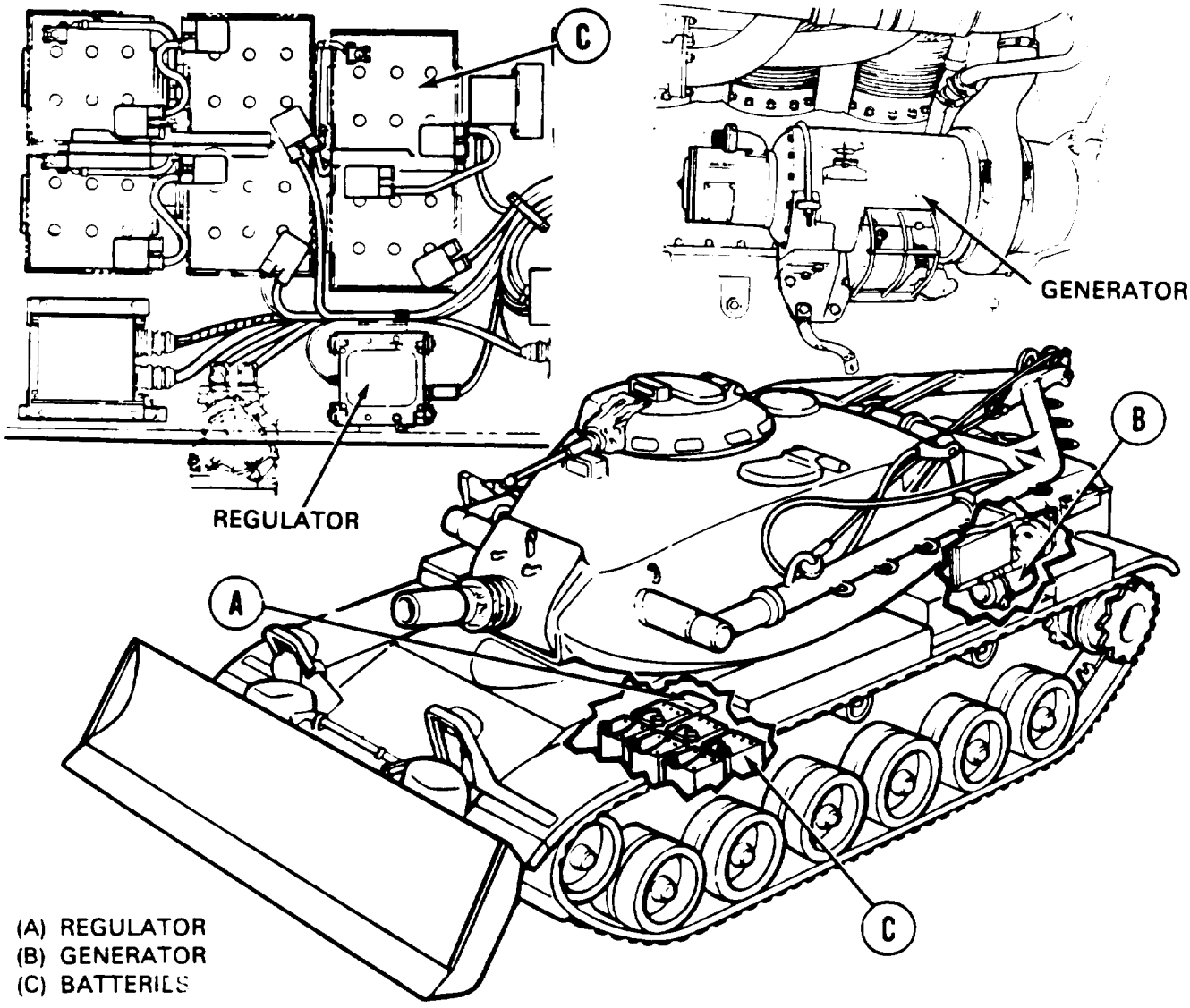
(A) TRANSMISSION SHROUD
(B) ENGINE SHROUD
1. ENGINE SHROUD
2. FAN HOUSING AND BAFFLES
3. DIESEL ENGINE SHROUD
(C) COOLING FANS

TA139960

PRINCIPLES OF OPERATION - Continued

ELECTRICAL SYSTEM. An interrelated system of electrical components, consisting of starting system; charging system (batteries and generating system); lighting, including infrared lighting; electrical controls and gages; warning lights, switches, and transmitters; and various relays, circuit breakers, switches, and receptacles, all interconnected by wiring harnesses, cables, and leads located throughout vehicle hull and on engine and transmission. Repair of harnesses and powerplant wiring is limited to replacement of faulty connectors and to substitution of jumper wires for defective harness wires.

CHARGING SYSTEM. 28-volt, 300-ampere oil-cooled generator produces direct current electrical output through voltage regulator to batteries. Regulator acts as reverse current relay preventing current flow back to generator when battery voltage exceeds generator output. Series parallel connected batteries supply direct current electrical power to master relay and starter relay.

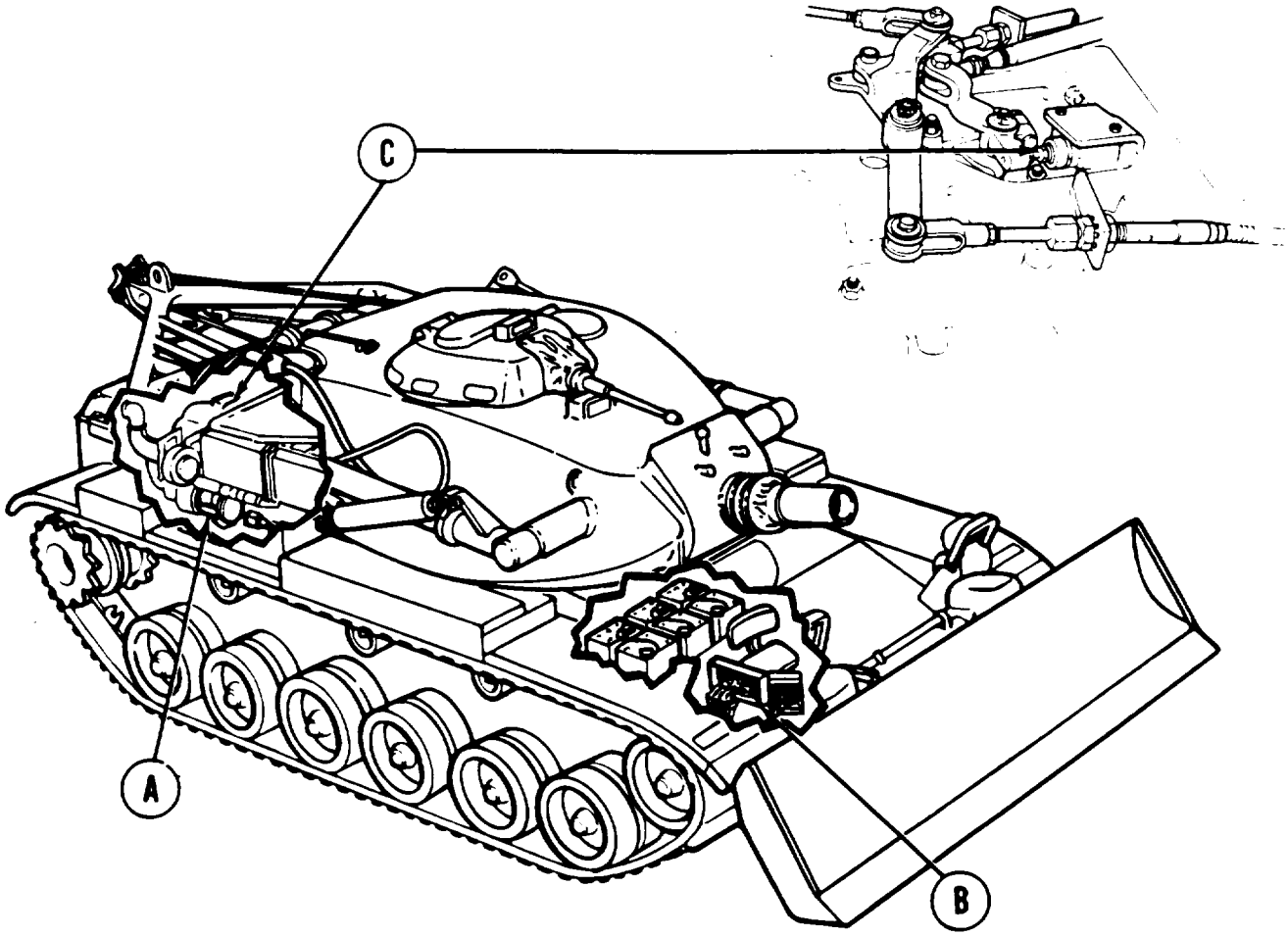


CHARGING SYSTEM

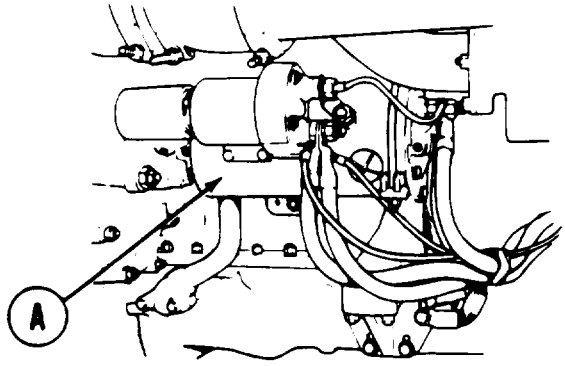
TA139961

PRINCIPLES OF OPERATION - Continued

STARTING SYSTEM. Heavy-duty solenoid-operated starter is actuated by a starter button on the master control panel. Starter will not activate if neutral shift switch on transmission is not actuated by shifting linkage. Starter low-voltage relay solenoid prevents energizing starter when battery voltage is below 11.75 volts.



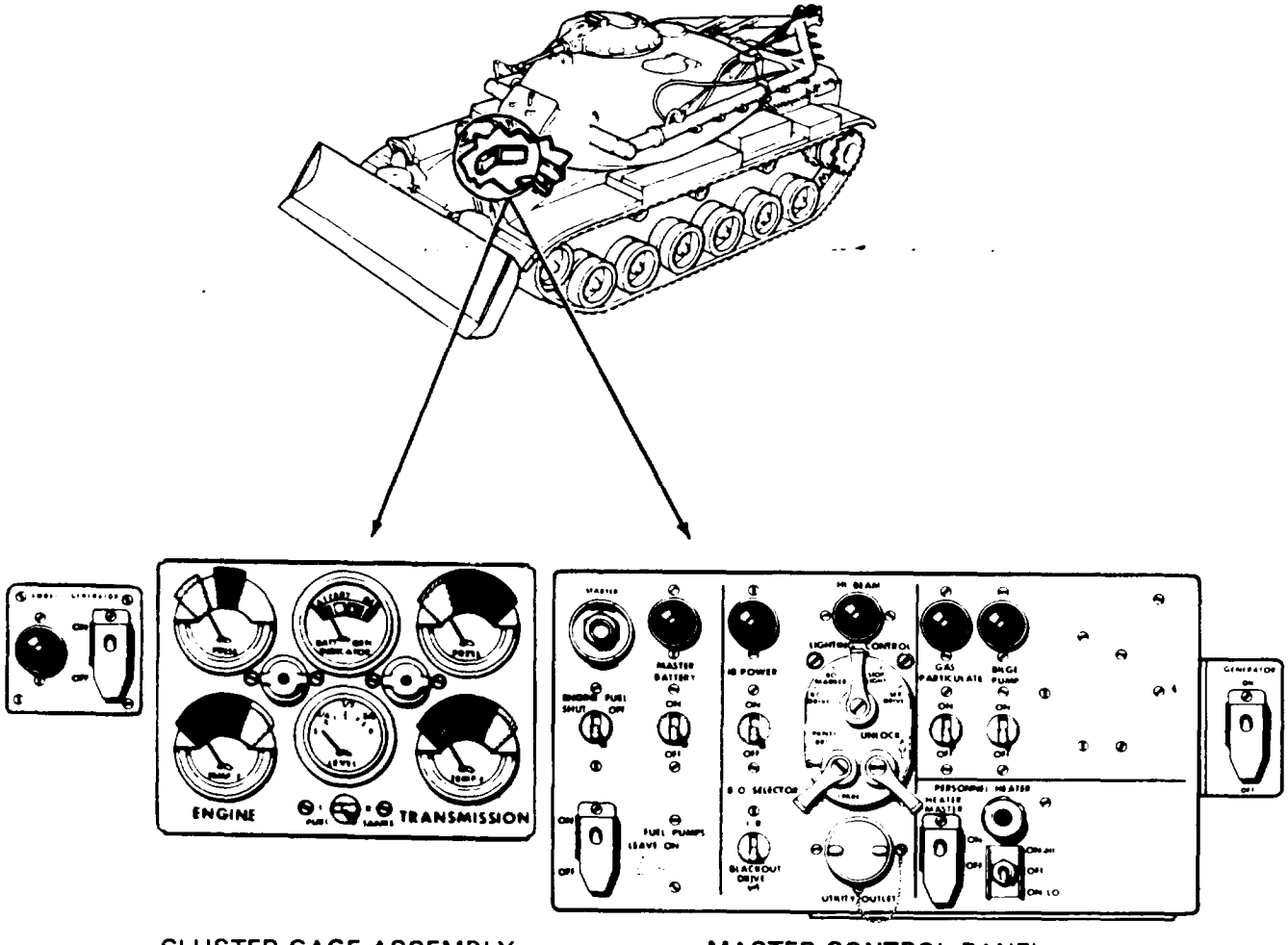
(A) STARTER AND LOW VOLTAGE RELAY SOLENOID
(B) STARTER SWITCH
(C) NEUTRAL SHIFT SWITCH



TA139962

PRINCIPLES OF OPERATION - Continued

INDICATORS, GAGES, AND CONTROLS. Master control panel contains switches, indicator lamps, and automatic-reset circuit breakers to control operation of various systems in hull. Cluster assembly contains engine and transmission oil temperature and pressure indicators, battery-generator indicator, fuel level indicator, fuel tank level switch, and indicator lights. Variable resistance type transmitters in engine and transmission oil systems provide electrical signals to drive oil temperature and pressure indicators. Mechanically actuated rheostats, connected to fuel level circuit in fuel tanks, vary electrical current to fuel tank indicator.

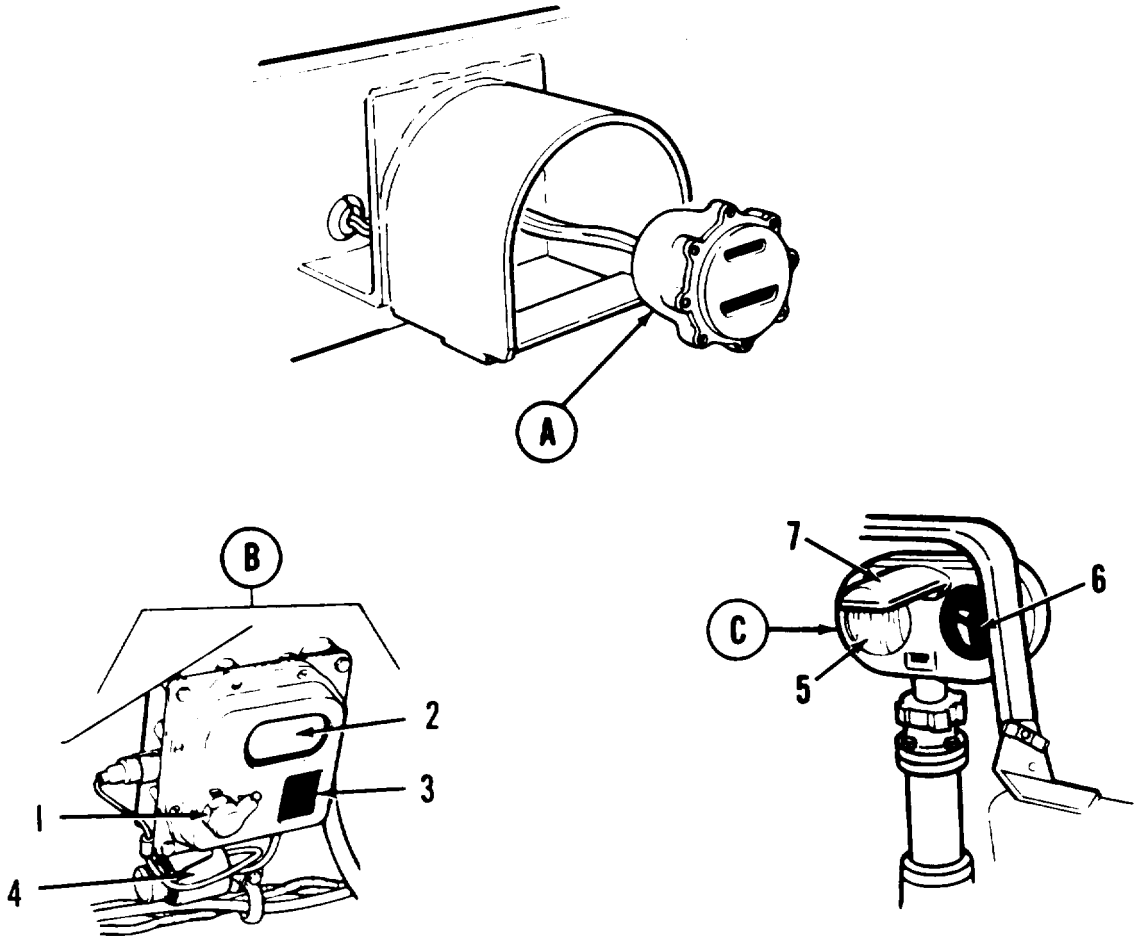


CLUSTER GAGE ASSEMBLY MASTER CONTROL PANEL

TA139963

PRINCIPLES OF OPERATION - Continued

LIGHTING SYSTEM. Headlight assemblies have service drive and infrared-filtered blackout lamps and marker lamps. Service drive and stop lamps are in left taillight and blackout lamps are in both right and left taillights. Domelight is controlled by a three-position switch to select white or red light and turn domelight off. A resistor controls brightness of domelight.

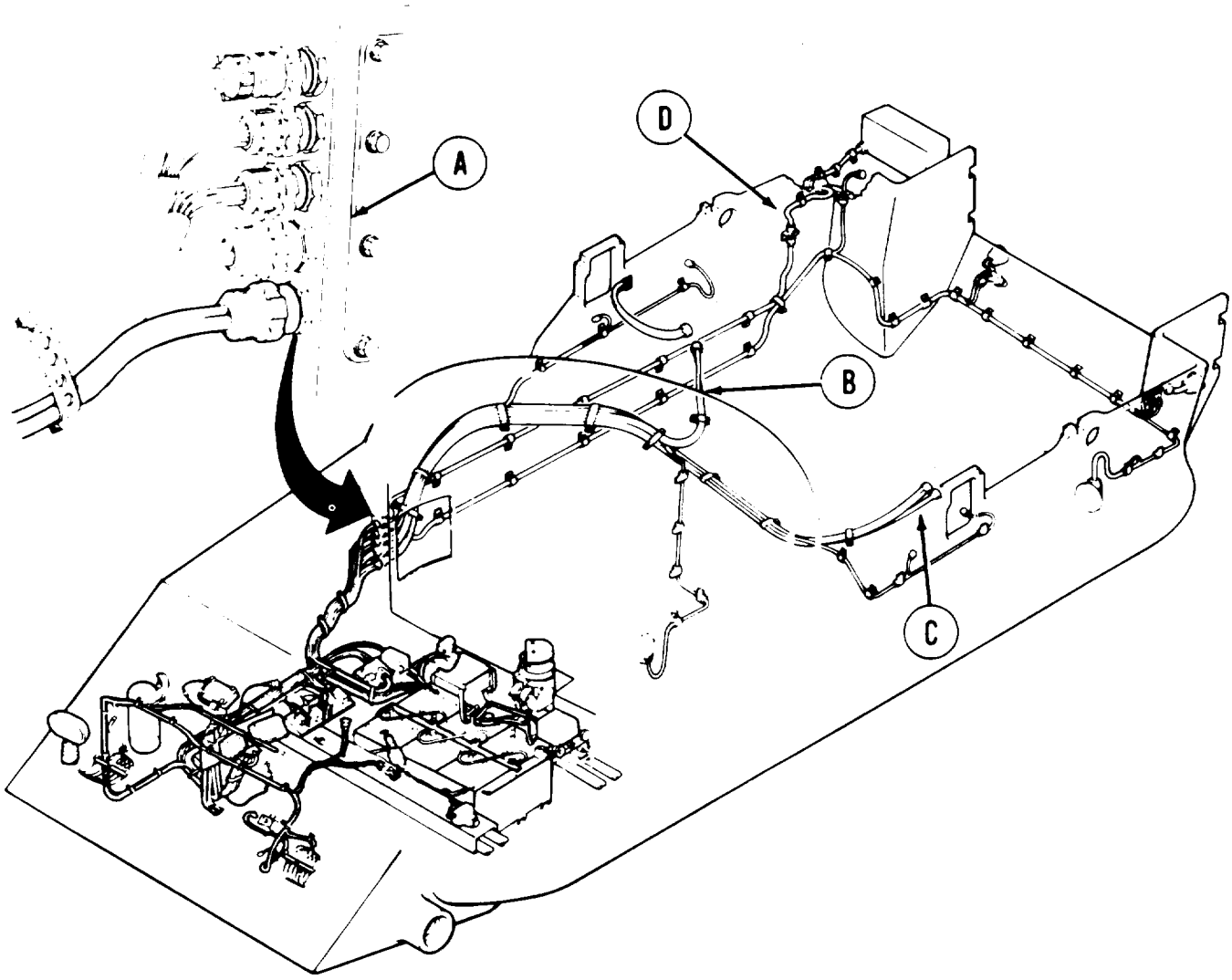


(A) TAILLIGHT-STOPLIGHT-BLACKOUT LIGHT ASSEMBLY
(B) DOMELIGHT
1. THREE-POSITION SWITCH
2 WHITE LIGHT
3. RED LIGHT
4. DOMELIGHT RESISTOR
(C) HEADLIGHT ASSEMBLY
5 DRIVING LAMP
6. RED LENS (INFRARED)
7. BLACKOUT LIGHT

TA139964

PRINCIPLES OF OPERATION - Continued

HULL WIRING HARNESSES/CONNECTORS. Various electrical components, including interphone system, are interconnected by wiring harnesses, cables, and lead terminated in most instances by plug-in connectors and couplings. Wiring harnesses between crew and engine compartments are terminated at connector mounting plate on right side of hull interior. Wiring harness connectors at top of engine permit quick disconnecting of starting and charging systems from powerplant.

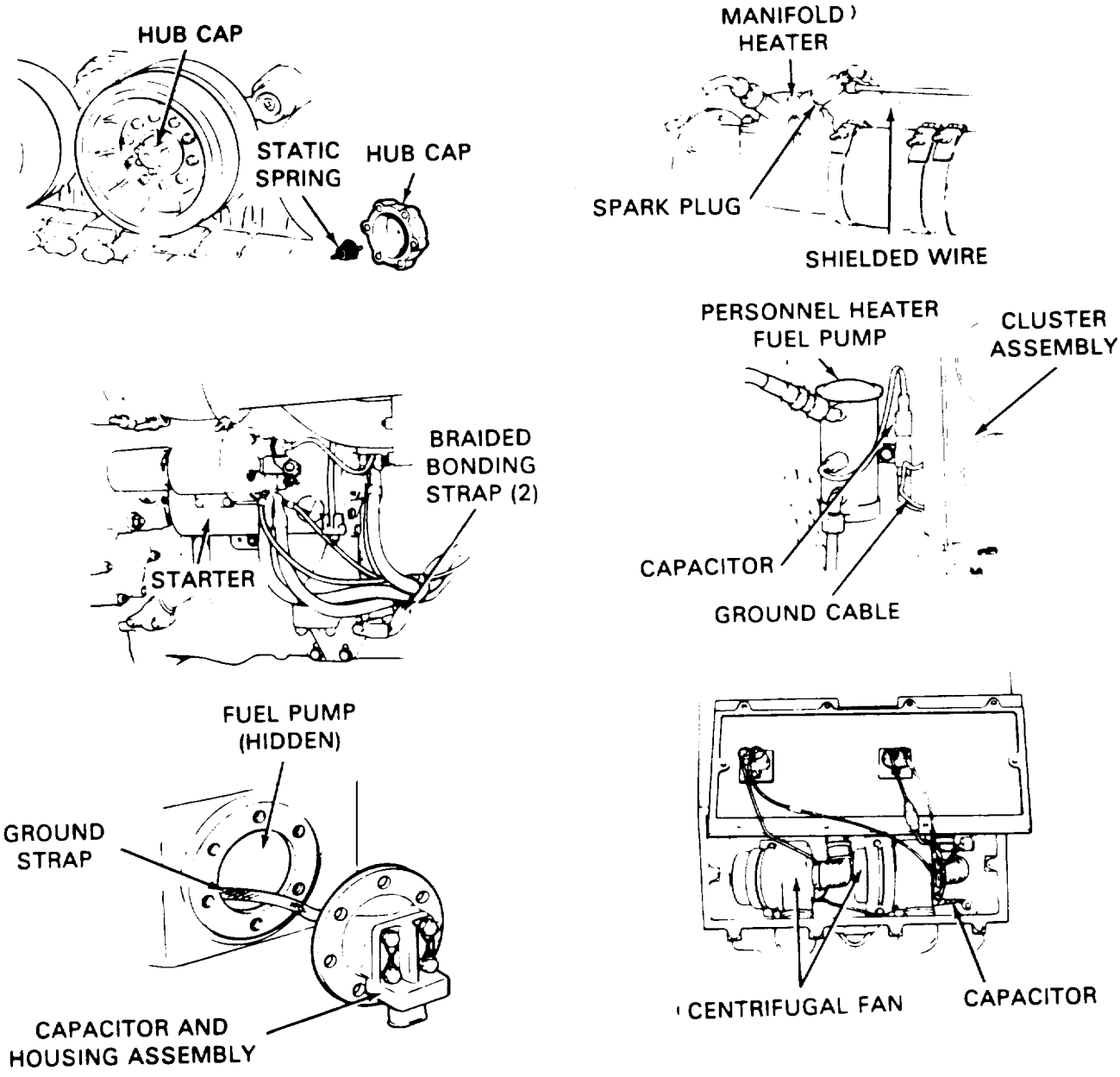


(A) BULKHEAD CONNECTORS
(B) STARTING HARNESS
(C) GENERATOR/ALTERNATOR HARNESS
(D) INTERPHONE HARNESS

TA139965

PRINCIPLES OF OPERATION - Continued

RADIO INTERFERENCE SUPPRESSION. Stray currents must be prevented from building up between components and wiring harnesses in order to eliminate radio interference. Stray currents, if allowed to build up and spark (arc to a ground), will cause noise in, and possibly disrupt, radio communications. Electrical currents can also produce signals that may interfere with vehicle equipment sensitive to small changes in power or, in extreme cases, give off signals strong enough to give away location of vehicles Interference is eliminated by providing low resistance paths to ground for stray currents and by using shielded wiring. Low resistance components include capacitors, tooth-type lockwashers, grounding springs, and braided bonding straps (ground straps).



TA139966

PRINCIPLES OF OPERATION - Continued

TRANSMISSION. Cross-drive transmission is controlled by driver with steering and shifting controls and brake pedal. Transmission hydraulic torque converter multiplies engine torque providing automatically variable torque output through planetary gear sets and hydraulically operated clutches and bands to final drive units, sprockets, and tracks. Cooled oil from transmission oil cooler is forced through transmission clutches and bands, through torque converter, acts as driving force in torque converter and lubricates entire transmission. Common oil reservoir supplies all systems.

(A) TRANSMISSION ADJUSTMENT. Adjustments are made to mechanical linkages and valves on exterior of engine.

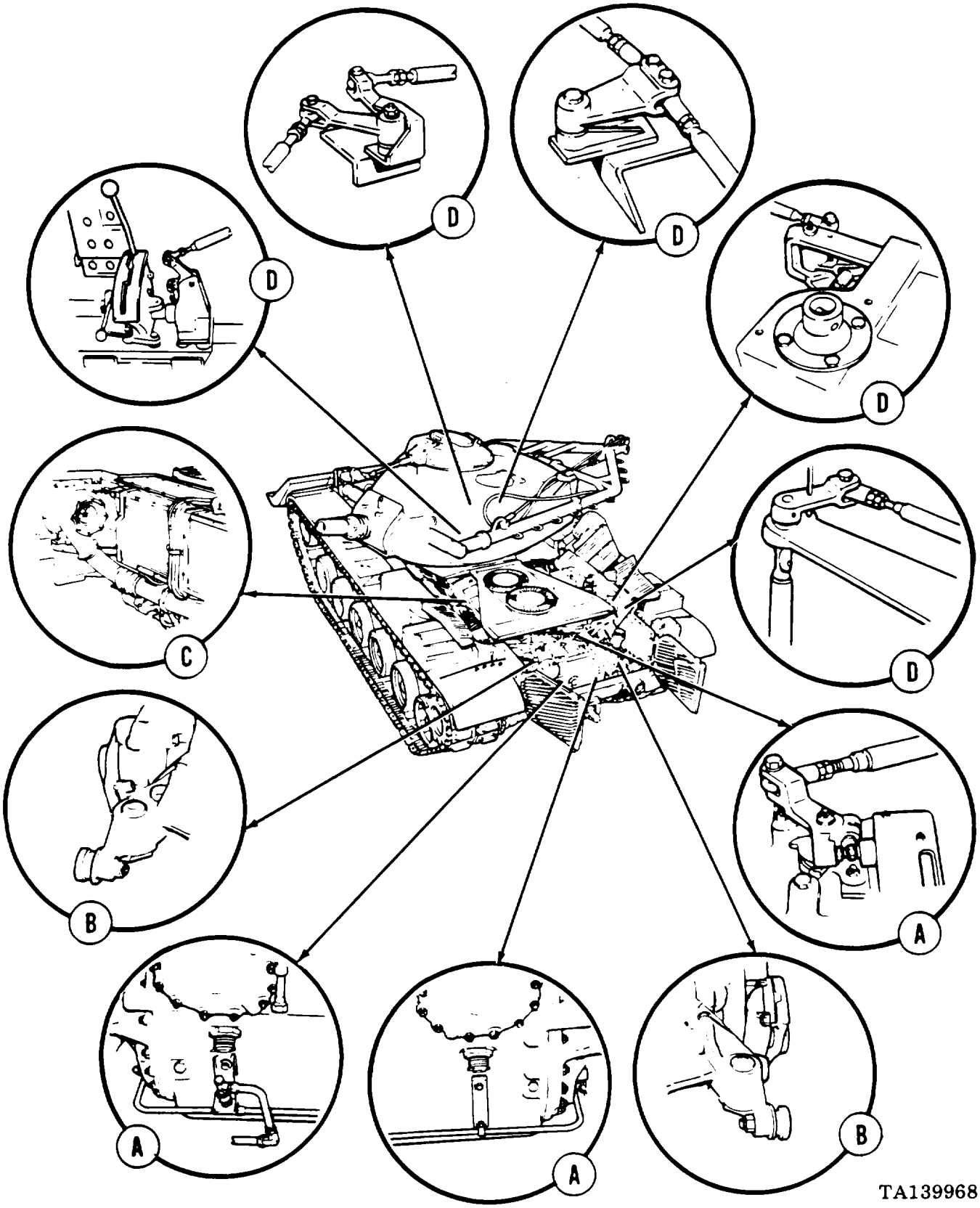
(B) TRANSMISSION MOUNTS. Located on each side of transmission serve as powerplant installation guides and mounts.

(C) TRANSMISSION OIL COOLER. Oil flowing through oil coolers on each side of engine is cooled by air drawn in by engine cooling fans. Cooled oil flows through main oil supply line, and flow control thermostats in coolers stop oil circulation until oil is at operating temperature.

(D) SHIFTING CONTROLS. Shifting controlled by shift lever through system of mechanical links to transmission shift valve that hydraulically controls transmission driving range servosystems.

TA139967

PRINCIPLES OF OPERATION - Continued



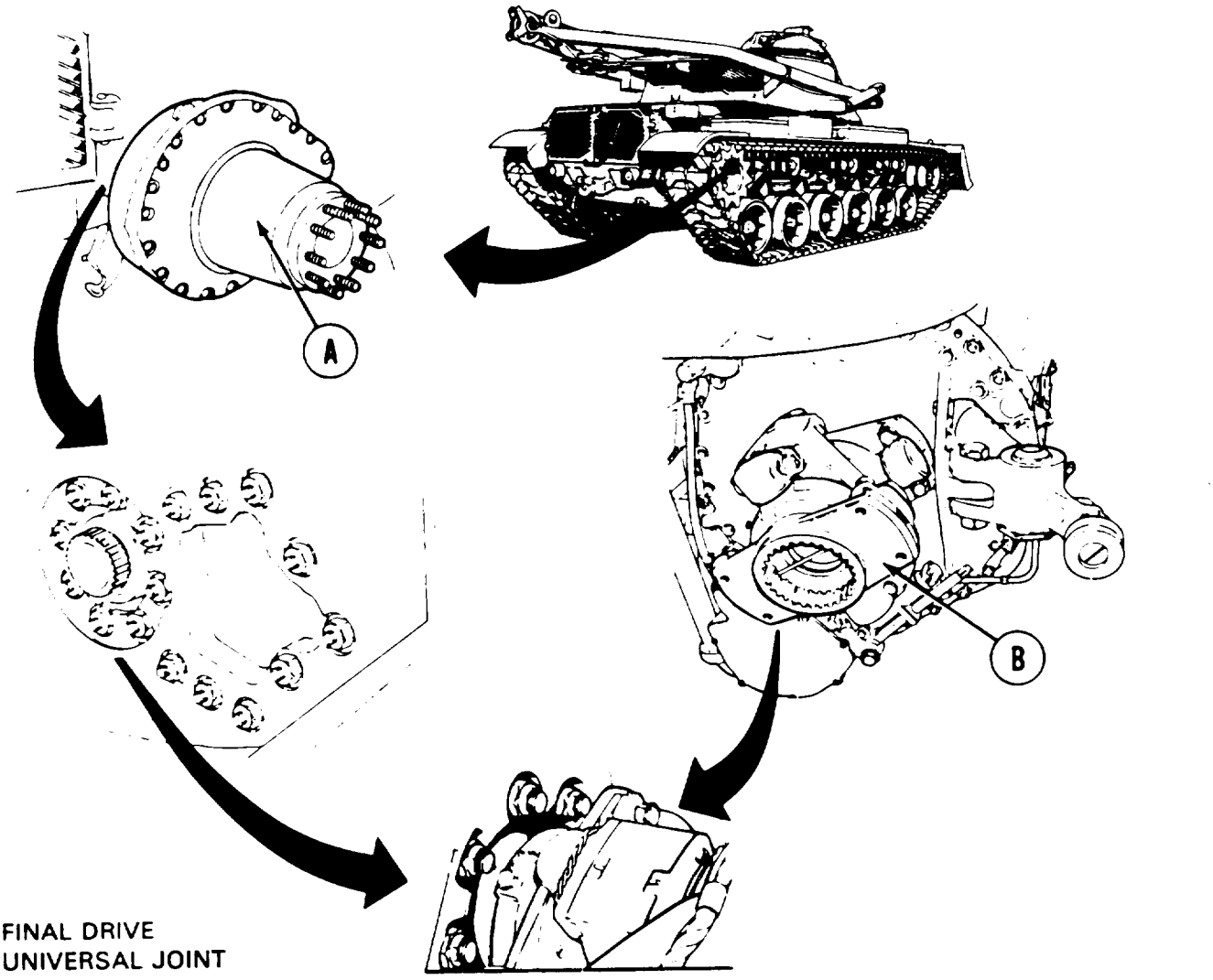
TA139968

PRINCIPLES OF OPERATION - Continued

FINAL DRIVE AND COUPLING (UNIVERSAL JOINT). Power from two transmission output flanges is transmitted through universal joints and two final drive units and sprockets.

(A) FINAL DRIVE. Identical single-stage, 5.08:1 gear ratio, speed reduction units. Gears operate in closed housing and are splash lubricated. Input pinion gear shaft is mated to universal joint by removable adapter. External teeth on adapter fit into internal splines in universal, and hollow shaft of adapter is splined to mate with final drive input gear shaft in final drive unit.

(B) UNIVERSAL JOINT. Compensate for up to 7° misalinement of transmission with final drive. Splined flange connects with final drive adapter on transmission. Universal joint is bolted to transmission output flange.



(A) FINAL DRIVE
(B) UNIVERSAL JOINT

TA139969

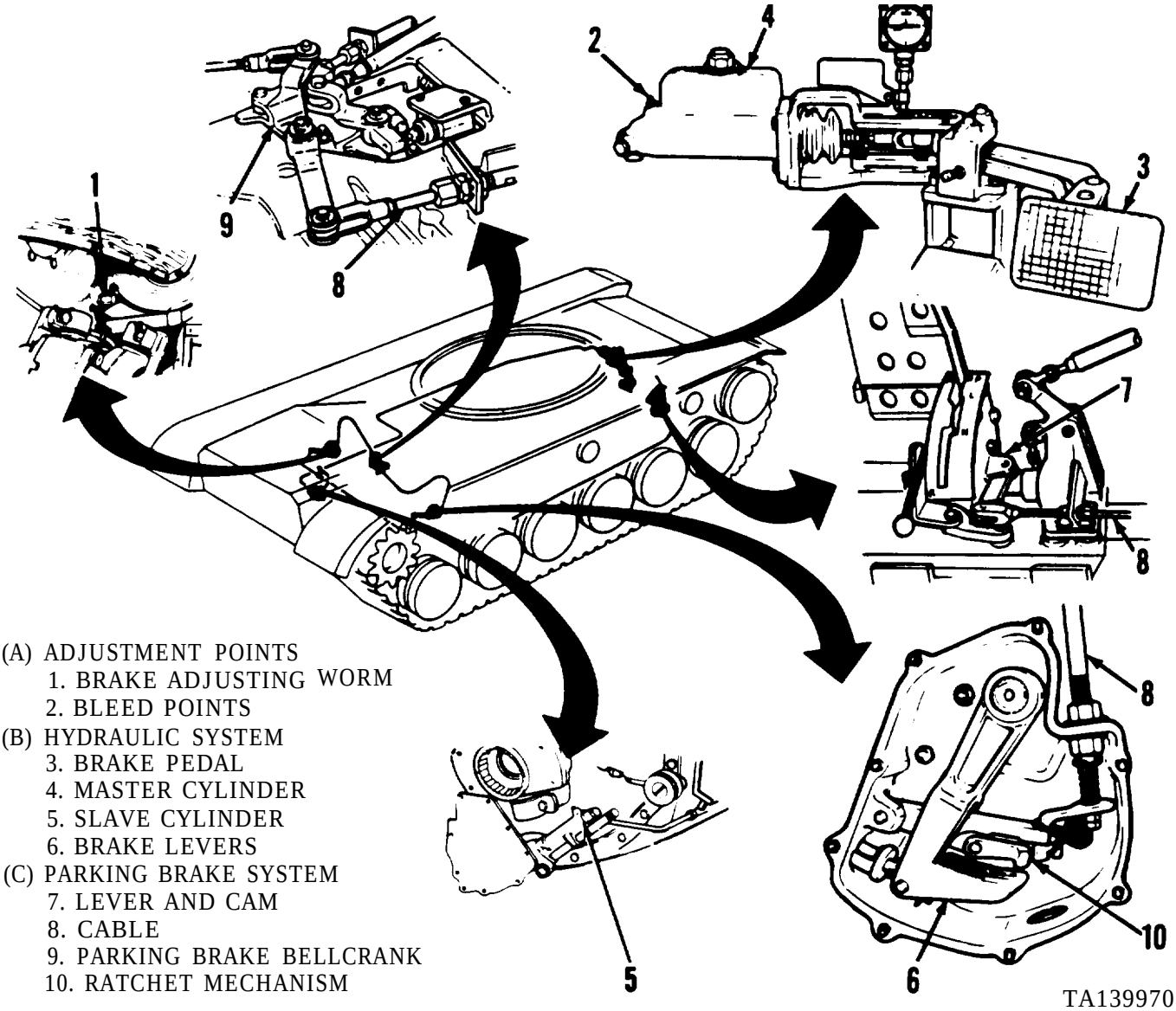
PRINCIPLES OF OPERATION - Continued

BRAKE SYSTEM. Consists of brake control pedal connected to hydraulic brake for stopping and mechanical locking arrangement for parking.

(A) ADJUSTMENT. Brake adjusting worm on transmission end covers is used when linkages have been disturbed. Adjusting brakes is done by bleeding hydraulic system at master cylinders and slave cylinders, or by adjusting braking controls and linkages on transmission.

(B) HYDRAULIC SYSTEM. Brake pedal mechanically linked to master cylinder forces hydraulic fluid through lines to two hydraulic slave cylinders on transmission that applies force to brake levers attached to brake apply shafts on transmission.

(c) PARKING BRAKE SYSTEM. Lever and cam attached to shifting pedestal actuates cable to transmission fittings which lock brake levers by means of ratchet mechanism when shifting lever is moved into park (P) position.

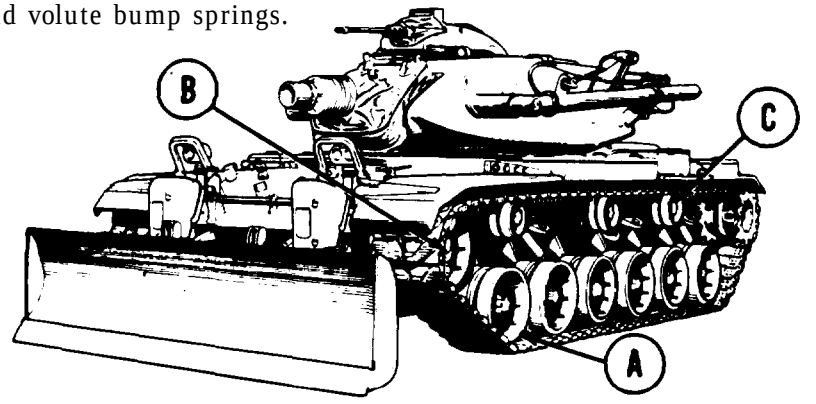


(A) ADJUSTMENT POINTS
1. BRAKE ADJUSTING WORM
2. BLEED POINTS
(B) HYDRAULIC SYSTEM
3. BRAKE PEDAL
4. MASTER CYLINDER
5. SLAVE CYLINDER
6. BRAKE LEVERS
(C) PARKING BRAKE SYSTEM
7. LEVER AND CAM
8. CABLE
9. PARKING BRAKE BELLCRANK
10. RATCHET MECHANISM

TA139970

PRINCIPLES OF OPERATION - Continued

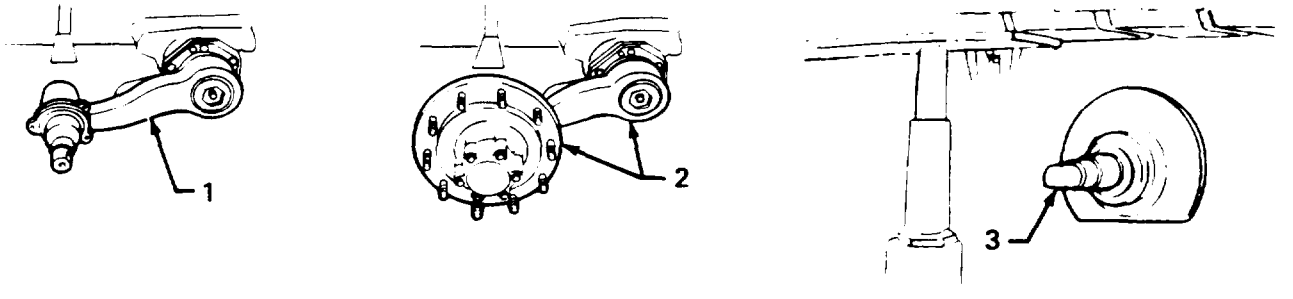
TRACKS AND SUSPENSION SYSTEM. Major components of the track and suspension system are track, track support rollers, compensating idler wheels, roadwheels, track drive sprockets and hub, torsion bars and anchors, compensating roadwheel and idler arms, track adjusting link, direct action shock absorbers and volute bump springs.



(A) ROADWHEELS AND SUSPENSION. Twelve forged steel roadwheels, dual-mounted on six hubs, carry vehicle weight on upper surface of lower track span. Space between dual-mounted wheels is running channel for track alining centerguides. Roadwheel arms 1, 2, and 6 bear shock absorber mounts. Each arm is sprung with torsion bars.

(B) COMPENSATING IDLER WHEELS. Identical to and interchangeable with roadwheels, serves as track alining channel for centerguides and maintains track tension by means of track adjusting link connected to roadwheel number one and idler arm which forces idler wheel forward or rearward to maintain constant tension on unloaded free portion of the track.

(C) TRACK SUPPORT ROLLERS. Three dual-mounting track support rollers on each side of vehicle support upper track span between sprockets on drive hub and compensating idler wheels. One track support roller also drives the speedometer.

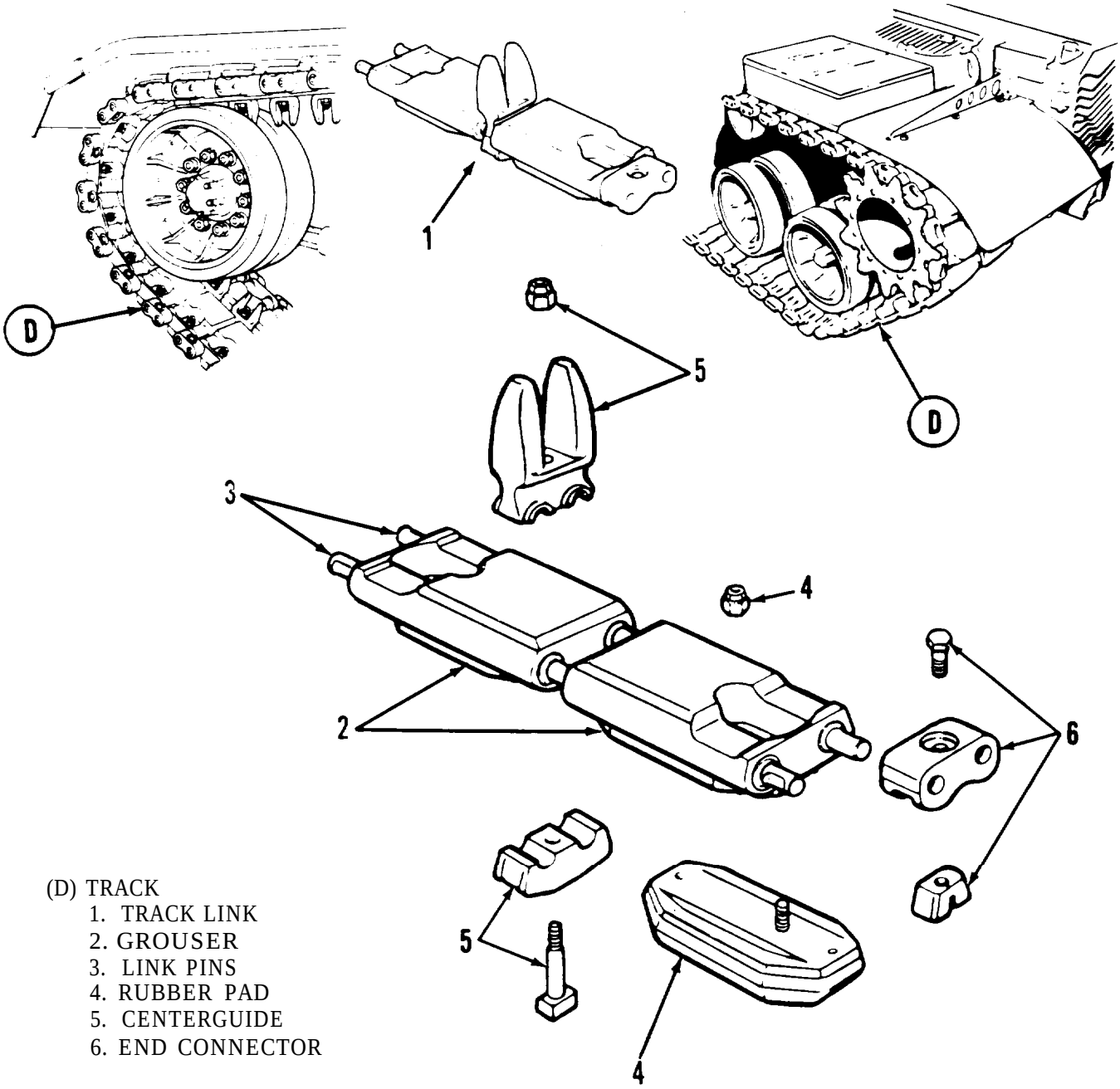


(A) ROADWHEELS
1. ROADWHEEL ARMS
(B) COMPENSATING IDLER WHEELS
2. HUB AND ARM
(C) TRACK SUPPORT ROLLERS
3. AXLES

TA139971

PRINCIPLES OF OPERATION - Continued

(D) TRACK. Composed of 80 track links fastened together with end connectors and steel centerguides. Each link consists of two grousers, two link pins, and two rubber pads. Alinement maintained by 80 centerguides riding between dual track support rollers, dual-compensating idler wheels, dual roadwheels and through channel in track drive sprocket hub. End connectors on both sides of track form track driving chain as they pass around drive sprocket.



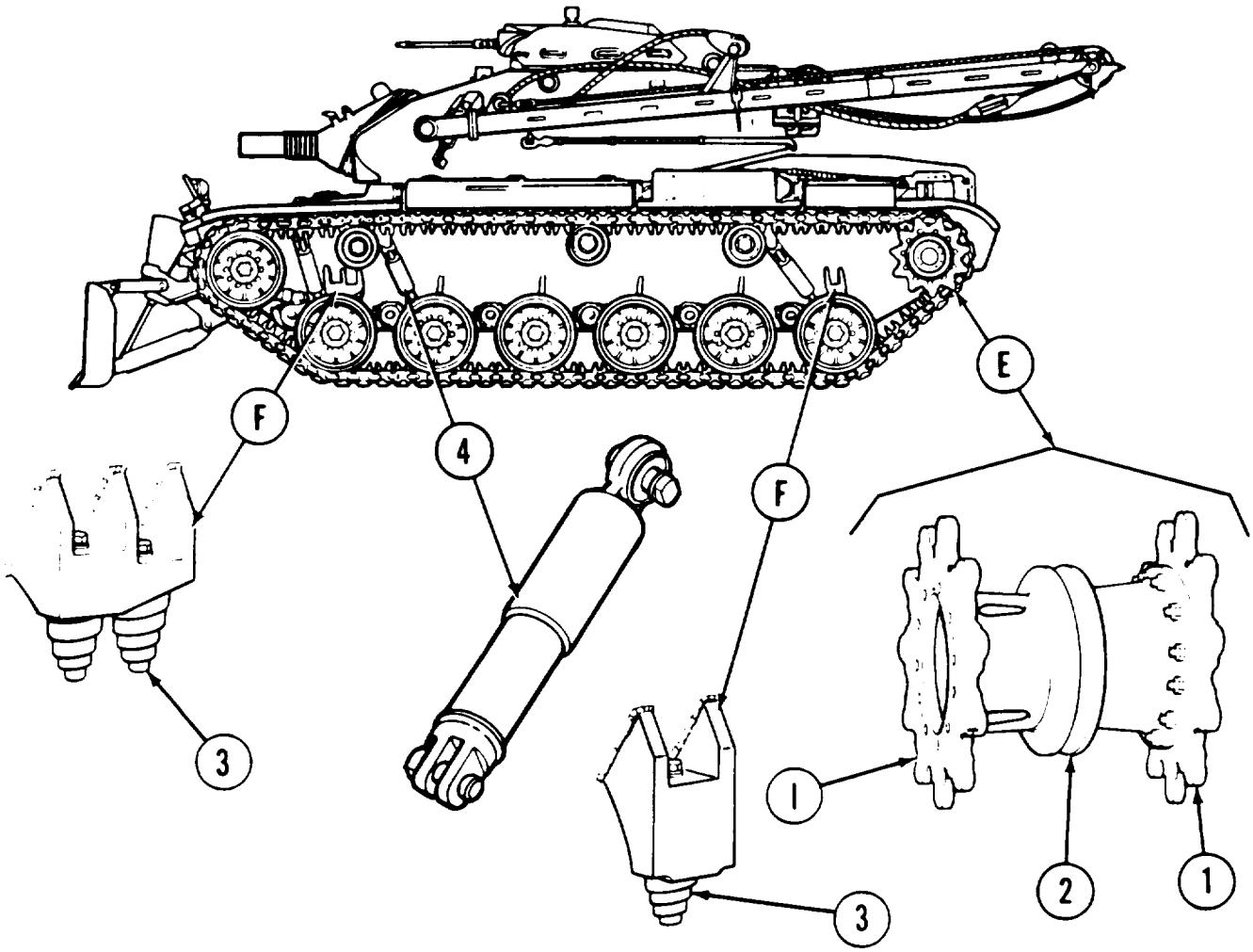
(D) TRACK
1. TRACK LINK
2. GROUSER
3. LINK PINS
4. RUBBER PAD
5. CENTERGUIDE
6. END CONNECTOR

TA139972

PRINCIPLES OF OPERATION - Continued

(E) TRACK DRIVE SPROCKETS AND HUB. Hub transmits torque from final drive output shafts on each side of vehicle hull to sprockets bolted to hub. Sprockets mesh with end connectors on inner and outer edges of track to move track forward over track support rollers and roadwheels.

(F) VOLUTE BUMP SPRINGS AND SHOCK ABSORBERS. Bump springs mounted at roadwheels 1 and 6 on both sides of hull cushion roadwheel arms into bump stops welded to hull when arm displaced to full upward travel. Shock absorbers, connected to roadwheel arms 1, 2, and 6, dampen bounce and return cycles of roadwheel arms when driving over uneven surfaces.



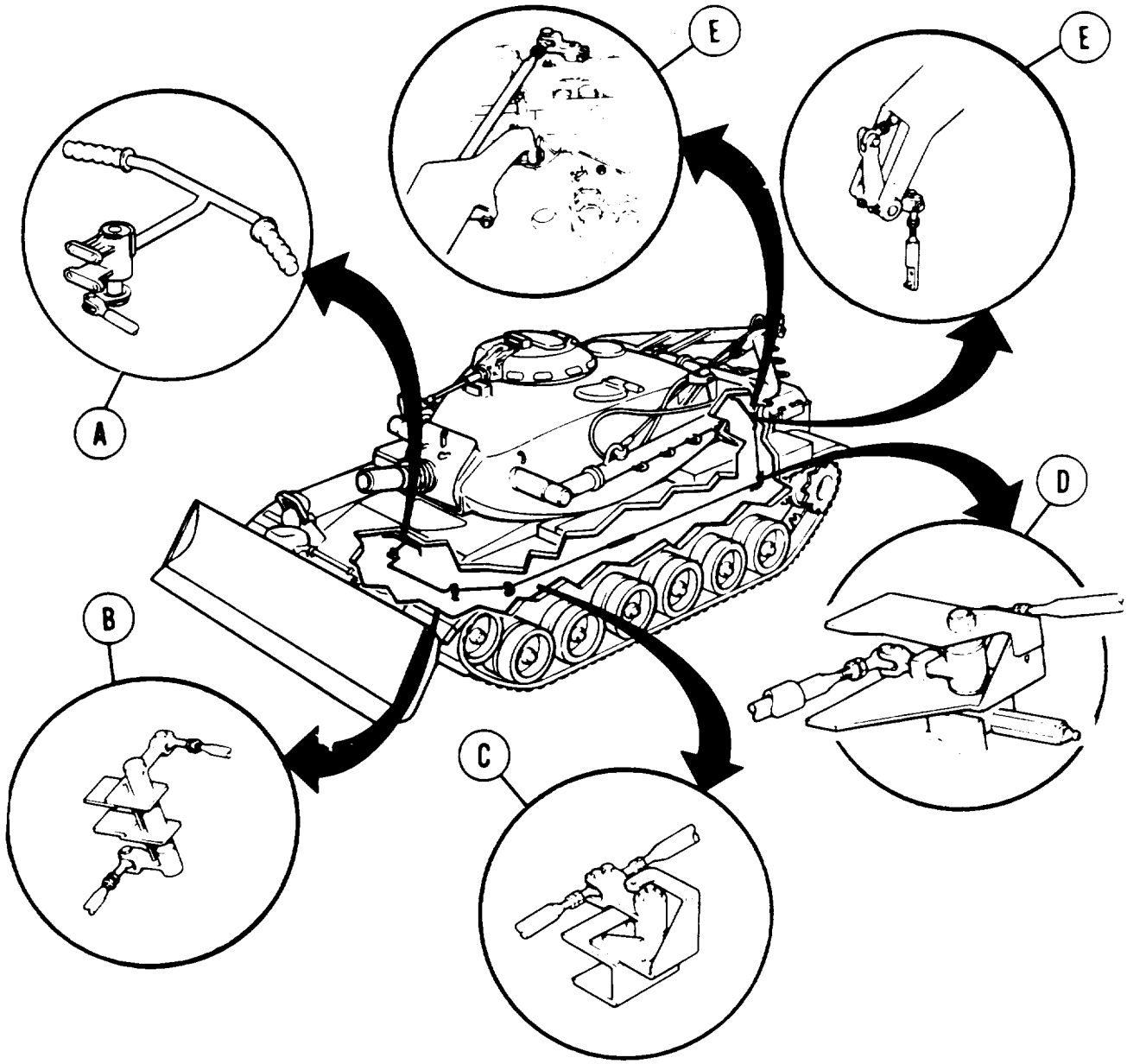
(E) TRACK DRIVE SPROCKETS AND HUB
1. SPROCKETS
2. HUB

(F) VOLUTE BUMP SPRINGS AND SHOCK ABSORBERS
3. BUMP SPRINGS
4. SHOCK ABSORBERS

TA139973

PRINCIPLES OF OPERATION - Continued

STEERING SYSTEM. Steering control is through a T-bar handle connected to transmission by linkage passing down left side of hull interior, connecting steering handle with steer valve shaft assembly. Transmission controls track drive through hydraulic clutches and bands. Adjusting points on steering controls are at steering rod ends, clevises and linkages located in driver's compartment, engine compartment, and on transmission.



(A) STEERING HANDLE AND MOUNT ASSEMBLY
(B) STEERING CONTROL LEVER ASSEMBLY
(C) STEERING CONTROL LINK ASSEMBLY
(D) STEERING CONNECTING LINK AND SHIELD ASSEMBLY
(E) ENGINE COMPARTMENT STEERING CONTROL LINK ASSEMBLY

TA139974

PRINCIPLES OF OPERATION - Continued

HULL-EXTERIOR. This section describes towing hooks and pintle, gun travel lock, hull access covers, fenders and stowage boxes, hull body covers and hatches, hull-turret inflatable seal, periscope and night viewer hatches, driver's hatches, and handset box.

(A) TOWING HOOKS AND PINTLE. Towing cables can be attached to front or rear-mounted hooks so vehicle can be towed or used to tow another vehicle. Towing pintle, mounted on rear of vehicle, used to attach towing bar to tow another vehicle.

(B) HULL ACCESS COVERS. Provide access to various interior hull openings so maintenance work can be done on vehicle parts.

(C) FENDERS AND STOWAGE BOXES. Stowage boxes are mounted to fenders and provide storage space for vehicle equipment and tools.

(D) HULL BODY COVERS AND HATCHES. Covers and hatches provide openings into hull from outside for maintenance, brake and transmission adjustment, and drainage.

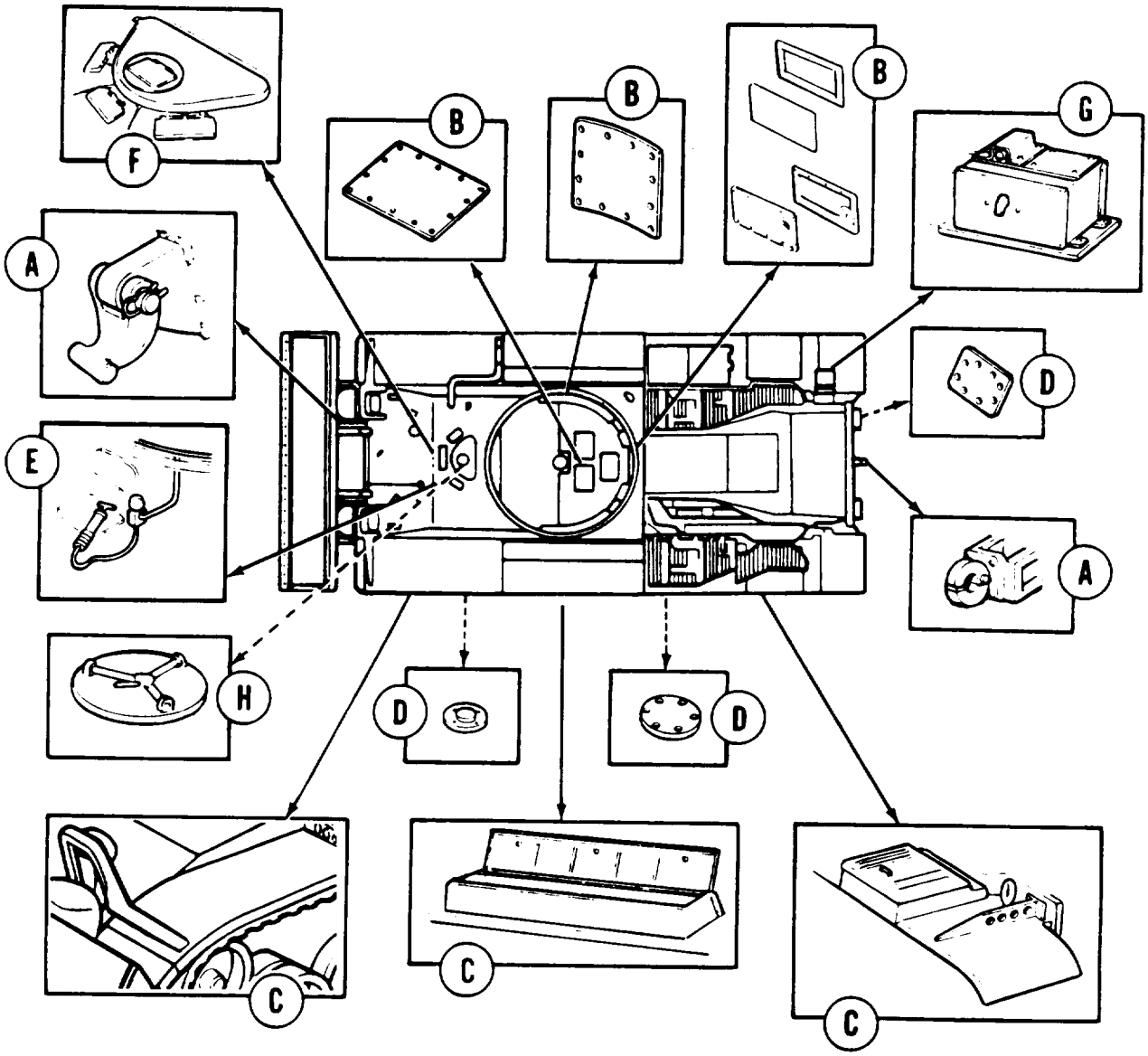
(E) HULL-TURRET INFLATABLE SEAL. Provides a positive seal in hull and turret race to keep water out during water fording operations. Controls for inflating and checking pressure in ,seal are mounted in driver's compartment,

(F) DRIVER'S AND PERISCOPE HATCHES, Driver's escape hatch located beneath driver's seat allows for exit in emergencies. A single-action dump handle and mechanism dumps the hatch. Driver's hatch is steel casting fitted with latch assembly and driver's night viewer mount. Hatch arm slides on grooved shaft attached to hull roof, Hatch mechanism consists of grooved shaft, internal torsion bar, shaft end housings, and torsion bar anchors. Torsion bar, inside shaft, exerts force on shaft to lift driver's hatch to hold in open position. Hatch is pulled clear of hatch opening by sliding hatch along arm until hatch engages support bracket mounted on inside top right of hatch opening. When hatch arm reaches end of shaft, a spring- loaded latch in hatch arm sleeve hooks onto shaft end housing to lock hatch in open position. Driver's hatch has night viewer mount in center of hatch. Mount has spring-loaded door that swings away to mount night viewer in hatch. Three spring-loaded periscope doors are mounted on top of hull around driver's hatch.

(G) EXTERNAL HANDSET BOX. Outside intercommunication set is housed in protective metal box located on right rear fender of vehicle. Unit has signal light mounted on top of box.

TA139975

PRINCIPLES OF OPERATION - Continued

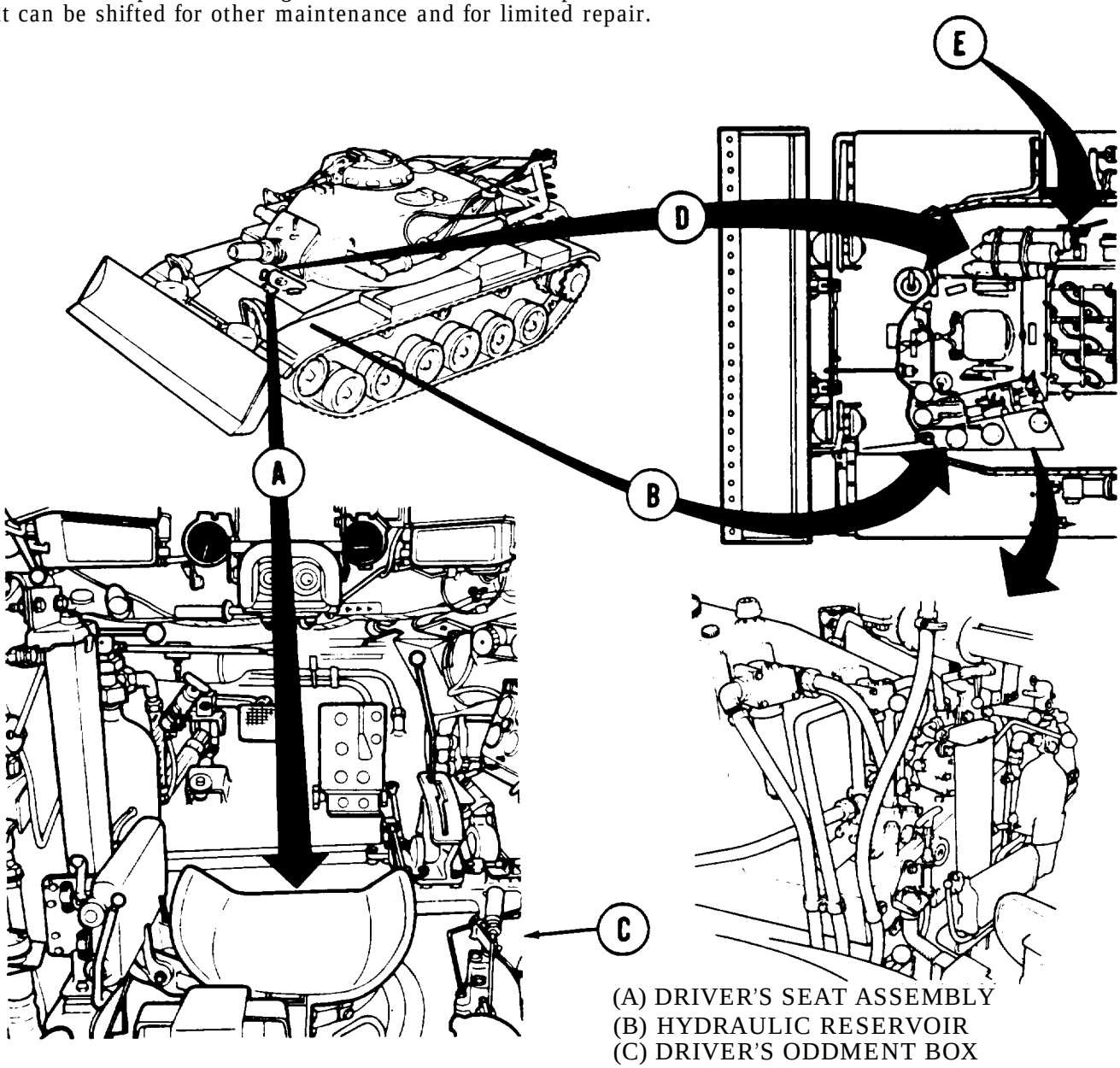


(A) TOWING HOOKS
(B) HULL ACCESS COVERS
(C) FENDERS AND STOWAGE BOXES
(D) HULL BODY COVERS AND HATCHES
(E) HULL-TURRET INFLATABLE SEAL
(F) DRIVER'S PERISCOPE HATCH
(G) EXTERNAL HANDSET BOX
(H) DRIVER'S ESCAPE HATCH

TA139976

PRINCIPLES OF OPERATION - Continued

HULL INTEROR. Driver's seat is mounted on a support column on which entire seat assembly slides up and down. Seat can be adjusted forward and backward, and up and down, and seat back can be adjusted for comfort. Seat assembly has an emergent y handle that dumps seat to let driver get out of vehicle through escape hatch. Seat cushion and backrest are padded with foam rubber and covered with coated cloth. Backrest is easily removed. Entire seat assembly, including support column, is easily removed. Driver's compartment carries a periscope stowage box, mounted on right side of right ammunition rack. The hydraulic reservoir and controls for the moldboard and boom are located on the left side of the driver. An oddment box for rations and odds and ends, is mounted under master control panel. An ammunition rack located on left side of driver, can be removed only by support maintenance personnel. Organizational maintenance personnel can disconnect rack from hull wall so it can be shifted for other maintenance and for limited repair.



(A) DRIVER'S SEAT ASSEMBLY
(B) HYDRAULIC RESERVOIR
(C) DRIVER'S ODDMENT BOX
(B) AMMUNITION RACK
(E) PERISCOPE STOWAGE BOX

TA139977

PRINCIPLES OF OPERATION - Continued

PERSONNEL HEATER SYSTEM. Provides heated air for vehicle crew. Circulates air through vehicle in air duct system, Air flow speed is constant. Heater switch has two heater selections; low and high.

(A) PERSONNEL HEATER. Combustion type heater, burns same fuels as engine in a sealed heat exchanger. Combustion air and air to be heated supplied by two separate blowers on a single blower motor. Combustion air fan blows air into primary and secondary combustion air openings where air flows around circular channel in combustion chamber. Combustion products are exhausted to outside through flexible metal hose coupled through hull to metal exhaust tube mounted on right front fender.

(B) FUEL SYSTEM. Fuel flows from personnel heater fuel pump in driver's compartment to heater where fuel flow is regulated by solenoid-actuated fuel control valve on top of heater case. Fuel control valve is controlled by personnel heater switch on master control panel.

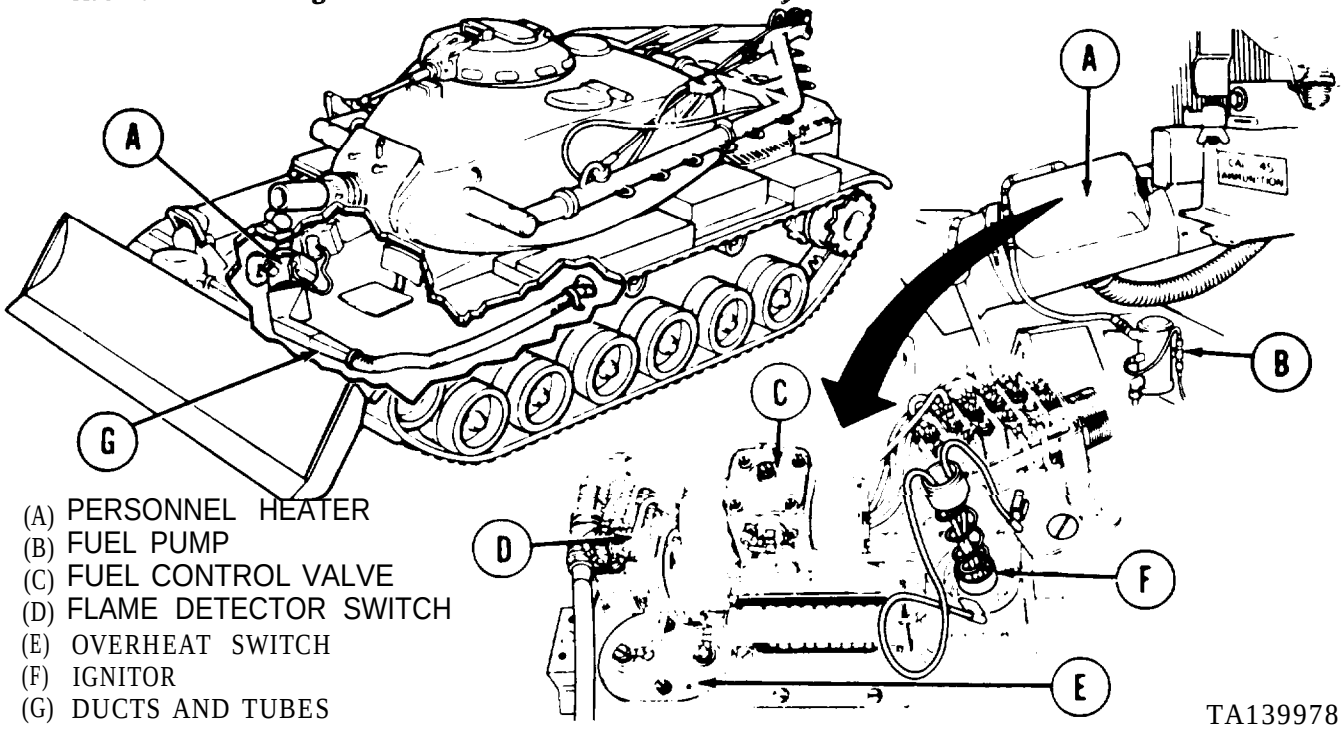
(C) IGNITION CONTROL. Fuel enters through two standpipes on heater and is ignited in combustion chamber by glow-plug-type igniter. Electric heating element in fuel control valve preheats fuel for cold-weather starts.

(D) FLAME DETECTOR SWITCH. Shuts off heater motor after flame in heater is established and permits blower to operate at higher speed.

(E) OVERHEAT SWITCH. Safety switch to shut off fuel flow when heater temperature exceeds safe maximum limits.

(F) IGNITOR. A glow plug-type igniter, ignites fuel in combustion chamber.

(G) DUCTS AND TUBES. Ventilating air blower forces air through slots in heat exchanger and circulates air through a duct and transition box assembly.



(A) PERSONNEL HEATER
(B) FUEL PUMP
(C) FUEL CONTROL VALVE
(D) FLAME DETECTOR SWITCH
(E) OVERHEAT SWITCH
(F) IGNITOR
(G) DUCTS AND TUBES

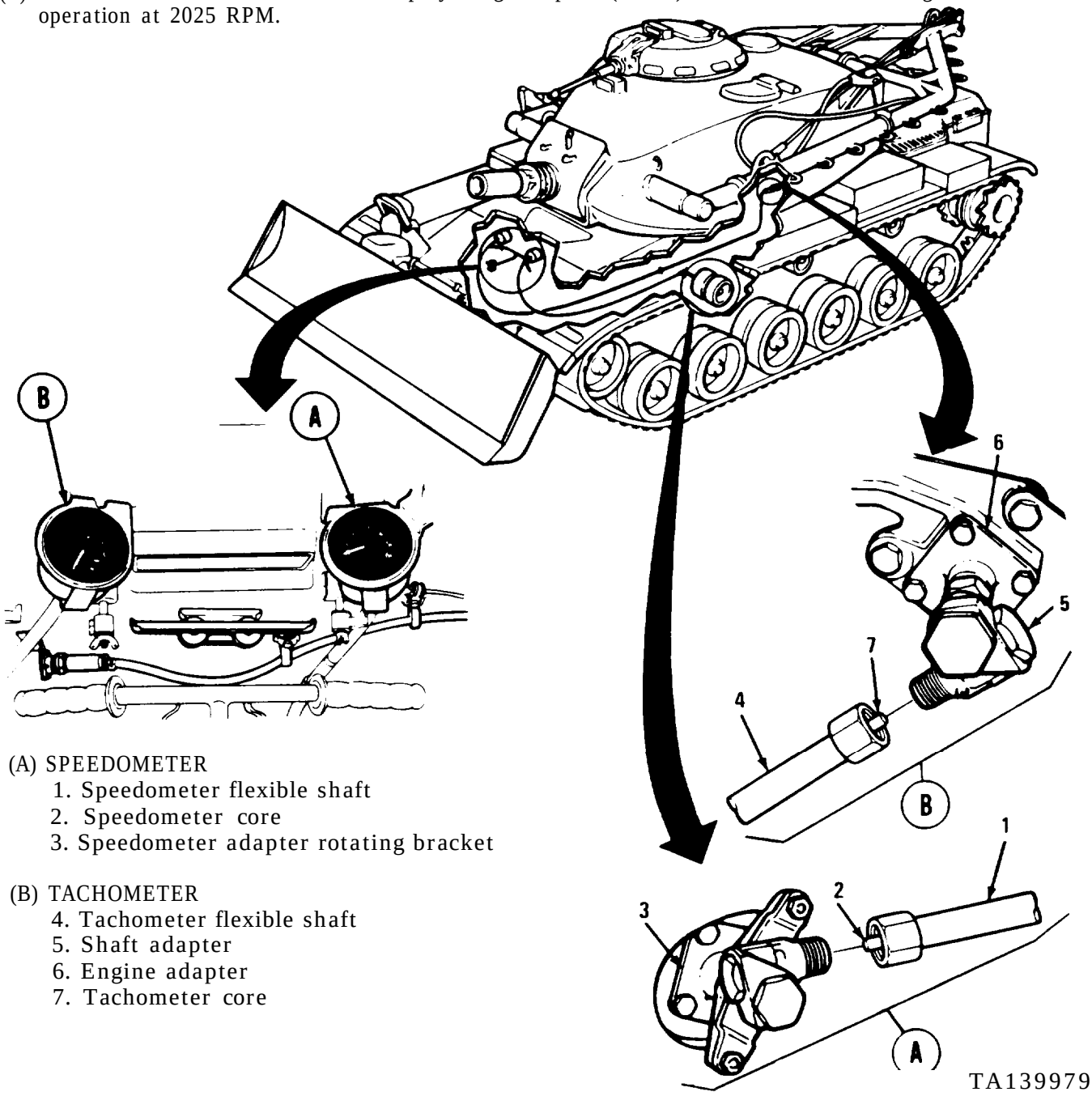
TA139978

PRINCIPLES OF OPERATION - Continued

SPEEDOMETER AND TACHOMETER. Speedometer-odometer and tachometer-hours meter mount on hull roof in front of driver. Speedometer-odometer driven by shaft in left front track support roller through right-angle drive adapter driven by shaft rotating with hubcap. Tachometer-hour meter driven through flexible shaft attached to engine adapter on accessory end of engine.

(A) SPEEDOMETER-ODOMETER. Displays speed and mileage driven.

(B) TACHOMETER-HOUR METER. Displays engine speed (RPMs) and clock hours on engine based on operation at 2025 RPM.



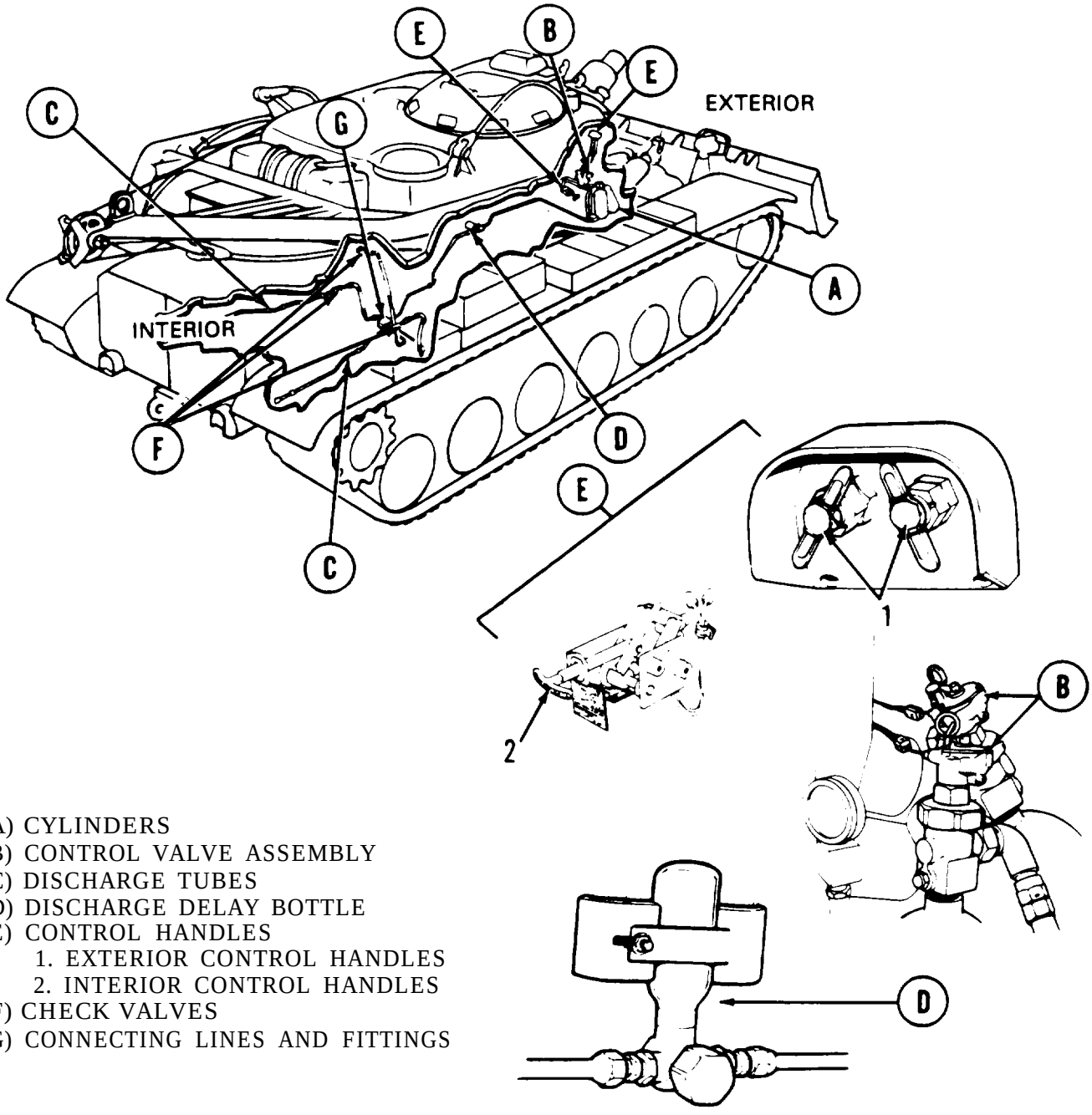
(A) SPEEDOMETER
1. Speedometer flexible shaft
2. Speedometer core
3. Speedometer adapter rotating bracket

(B) TACHOMETER
4. Tachometer flexible shaft
5. Shaft adapter
6. Engine adapter
7. Tachometer core

TA139979

PRINCIPLES OF OPERATION - Continued

FIXED FIRE EXTINGUISHER SYSTEM. Mounted to left front of driver's seat, system is a two-shot system. First shot, discharges one CO2 cylinder; second shot discharges remaining two CO2 cylinders. Discharge tubes permit extinguishing fires in engine compartment. Charge flows through tubes to discharge delay bottle to left rear of left ammunition rack. At a predetermined time, discharge delay valve opens to allow charge to flow through check valves and out of perforated tubing on fuel tanks. Exterior control handles on left front of hull permit operation from outside vehicle. Interior handles are located to left of driver's seat at eye level.



(A) CYLINDERS
(B) CONTROL VALVE ASSEMBLY
(C) DISCHARGE TUBES
(D) DISCHARGE DELAY BOTTLE
(E) CONTROL HANDLES
    1. EXTERIOR CONTROL HANDLES
    2. INTERIOR CONTROL HANDLES
(F) CHECK VALVES
(G) CONNECTING LINES AND FITTINGS

TA139980

PRINCIPLES OF OPERATION - Continued

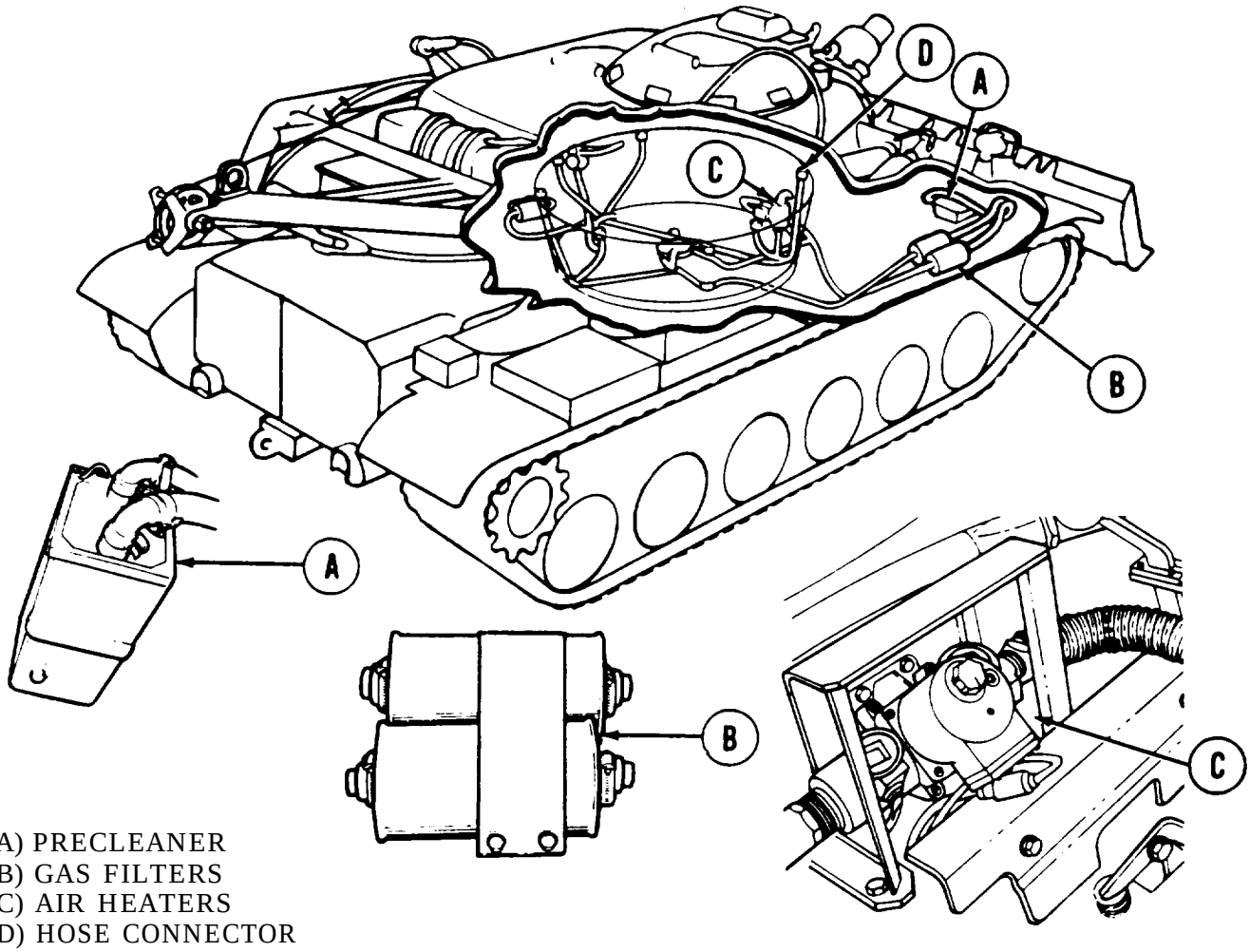
GAS PARTICULATE AIR-FILTER SYSTEM, M13A1. Mounted in right side of driver's compartment with hose connections to driver and through turret slipring to each crewmember's station. Provides purified, filtered, and if necessary, heated air to each crewmember within the vehicle.

(A) PRECLEANED AND PARTICULATE FILTER ASSEMBLY, M1A1-19. Consists of a 20-CFM particulate filter (M19), housing, and bracket assembly Air flows through tubes from 20-CFM-particulate filter to two 10-CFM gas filters (M18).

(B) GAS FILTER, M18. Two 10-CFM gas filters give final filtration to air before flowing to crew.

(C) FILTER UNIT ELECTRIC AIR HEATER, M3. Air flowing from M18 gas filters passes through individually adjustable air heaters to orifice connectors.

(D) ORIFICE CONNECTOR ASSEMBLY AND HOSES. Quick disconnect hose socket permits connection of M25 protective masks to the gas particulate air filter system.

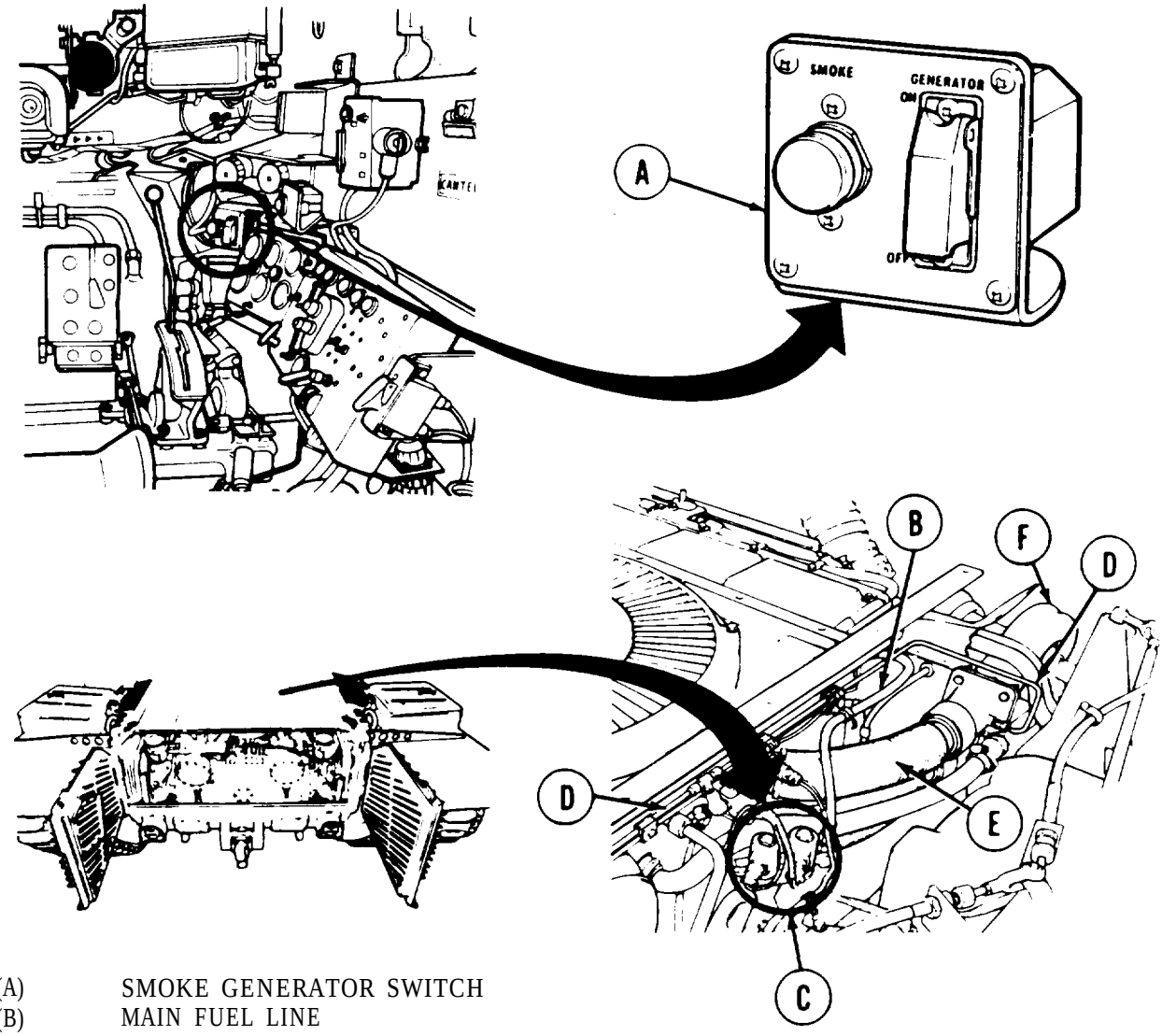


(A) PRECLEANER
(B) GAS FILTERS
(C) AIR HEATERS
(D) HOSE CONNECTOR

TA139981

PRINCIPLES OF OPERATION - Continued

ENGINE SMOKE GENERATING SYSTEM. Smoke generating system provides vehicle with smoke screen capability to improve combat effectiveness. Smoke generating system is controlled by a switch on cluster gage panel and receives power through air cleaner blower motor relay. Fuel regulated by two solenoid valves at rear of powerplant, is provided to system from main fuel lines into right and left bank upper exhaust pipes where fuel passes through turbosupercharger, and finally exhausted through exhaust tubes as dense, white smoke.

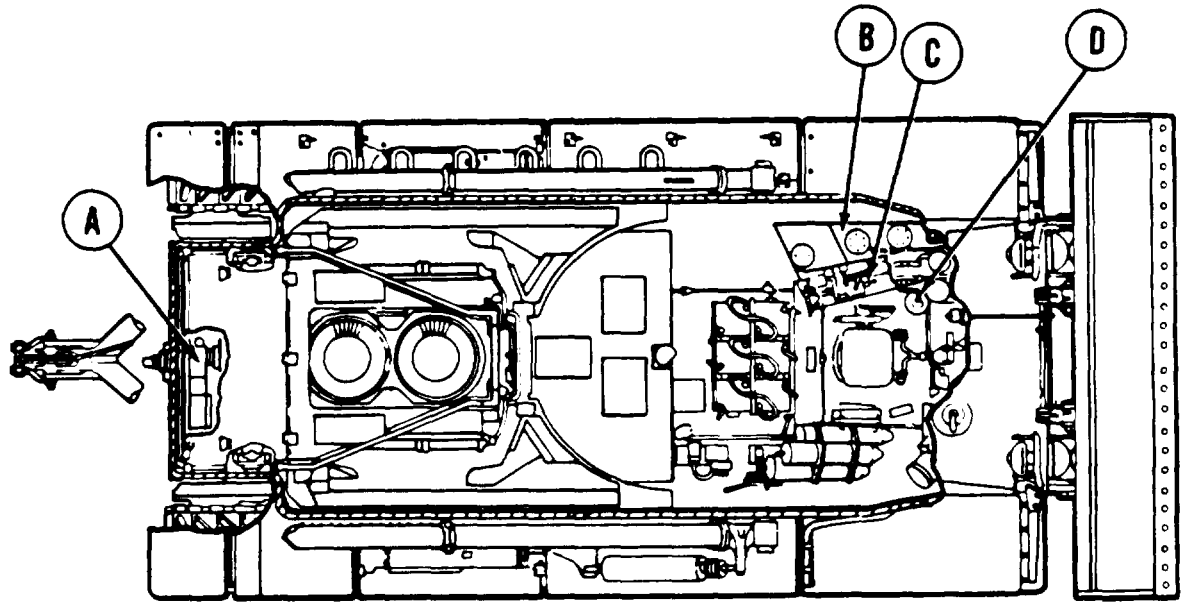


(A) SMOKE GENERATOR SWITCH
(B) MAIN FUEL LINE
(C) FUEL SOLENOID VALVES
(D) FUEL OUTPUT TUBES
(E) EXHAUST PIPE
(F) TURBOSUPERCHARGER

TA139982

PRINCIPLES OF OPERATION - Continued

HYDRAULIC SYSTEM. Hydraulic pressure for operation of the moldboard and boom is provided by the hydraulic pump located on the transmission at the rear of the vehicle. The hydraulic reservoir stores approximately 50 gallons of oil to be used by the system. Operation of either the boom or moldboard is determined by the position of the selector valve. The selector valve also has a neutral position that can be selected when operation of the boom or moldboard is not required. Raising or lowering of the moldboard is controlled by the driver by the moldboard control valve.



(A) DRIVE, CLUTCH AND HYDRAULIC PUMP
(B) HYDRAULIC RESERVOIR
(C) SELECTOR CONTROL VALVE
(D) MOLDBOARD CONTROL VALVE

TA139983

CHAPTER 3

HULL MAINTENANCE INSTRUCTIONS

Section 1. REPAIR PARTS, SPECIAL TOOLS, TESTING, MEASURING, DIAGNOSTIC EQUIPMENT (TMDE) AND SUPPORT EQUIPMENT

COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools for organizational maintenance are listed and illustrated in TM 9-2350-222-20P-1, which is the authority for requisitioning replacement.

ENGINE

1.	Mechanical Puller (2 required) (5379997)	Remove fan drive oil seal retainer
2.	Fan Rotor Hub Spacer (2 required) (10882651)	Perform fan rotor hub oil leak check
3.	Open End Wrench (8761568)	Remove and install starter mounting nuts
4.	(Deleted)	
4.1	Box Wrench (10935476)	Remove and install generator mounting nuts

TRANSMISSION

5.	Socket Wrench Socket (7003946)	Adjust servoband screw locknut

SUSPENSION

6.	Axle Remover Adapter (12304246)	Remove track support roller axle (used w/Puller, 5573615)
7.	Roadwheel Arm Adapter (7080285)	Remove roadwheel arm and track adjusting link (used w/Puller, 5573615)
8.	Puller and Pump (12285479)	Remove track end connectors
9.	Remover and Replacer (12326059)	Remove shock absorber vehicle mounting yoke bushing (used w/Handle, Item 12)
10.	Bearing Cup Handle (7083883)	Remove and install bearing cups (used w/Remover and Replacers, Items 15, 16, and 7082863)
11.	Roadwheel Arm Lifter (7010355)	Remove and install roadwheels
12.	Handle (12326060)	Remove shock absorber vehicle mounting yoke bushing (used w/Bushing Tool, Item 9)
13.	Final Drive Hub Remover (8390335)	Replace track drive sprocket tapered bushings
14.	Deleted	
15.	Remover and Replacer (7082834)	Remove and install track support roller wheel or compensating idler wheel hub outer bearing cup (used w/Handle, Item 10)
16.	Remover and Replacer (7082876)	Remove and install road wheel hub or compensating idler hub inner bearing cup (used w/ Handle, Item 10)
16.1	Dial Pressure Gage (12310644)	Check grease actuated track adjusting link pressure
16.2	Track Connecting Fixture (12252120)	Install track
16.3	Track Components Torquing Tool Kit (PD704)	Remove and install track components

17.	Bearing Tool Assembly (12325917)	Remove No. 1 left and right roadwheel arm bearing
18.	Removal and Replacer Tool (11645917)	Remove and install track adjusting link pin (used w/slide hammer puller, 5573615)
19.	Oil Seal Replacer (7078977)	Install compensating arm spindle or roadwheel arm spindle inner bearing oil seal (used w/remover and replacer handle, 7082881)
20.	Oil Seal Replacer (7078973)	Install roadwheel arm Support spindle outer bearing oil seal (used w/remover and replacer handle, 7082881)
21.	Oil Seal Replacer (7082882)	Install track support roller inner bearing oil seal
22.	Oil Seal and Retainer Replacer (8708188)	Install compensating idler arm oil seal and retainer assembly
23.	Wire Rope Assembly (8366458)	Remove and install final drive hub and sprocket assembly
24.	Replacer (11654533)	Remove shock absorber bearings
25.	Deleted	
26.	Plug Wrench (7078976)	Remove roadwheel arm torsion bar end plug
27.	Spanner Wrench (12257561)	Remove and install roadwheel track support roller or compensating idler wheel bearing adjusting nuts
28.	Sprocket Gage (8708388)	Check final drive sprocket wear
29.	Wear Gage (10873933)	Check track end connector wear
29.1	Bearing Driver (12290993)	Remove and install track adjusting compensating link assembly or roadwheel arm bearings
29.2	Spanner Wrench (12284929)	Remove and install roadwheel arm spindle nut

POWERPLANT

30. Ground Hop Kit (Powerplant Tests) (12304135) Consisting of:	Test powerplant while removed from vehicle
Duffel Bag (2 required) (MIL-B-829)	Store ground hop filter, hose, and clamp
Coupling Clamp (2 required) (8711310)	Secure ground hop filter hose to engine
Brake Applicator Tool (2 required) (10933755)	Stall test on engine and/or transmission
Hose Clamp (2 required) (11669683)	Secure ground hop filter to hose
Hose Assembly (2 required) (11591103)	Main fuel line and fuel injector return line
Hose Assembly (2 required) (12271067)	Ground hop filter
Hose Assembly (11591102)	Primer fuel line
Hose Assembly (12258071)	Hydraulic brakes
Electrical Lead (10864170)	Electrical power (ground)
Cable Assembly (10864166)	Electrical power (accessories)
Cable Assembly (10864166-1)	Electrical power (starter)
Cable Assembly (11674344)	Electrical power (alternator)
Electrical Lead (8366463)	Electrical power (generator)
Ground Hop Filter (12270979)	Filter air during tests
Tachometer Assembly (Fabricated, fig. 2, Appendix F)	Measure RPM during tests

POWERPLANT

31. Engine and Transmission Sling (12257229)	Remove and install powerplant and grille doors
32. Oil Cooler Cleaner (11641959)	Clean oil coolers with cleaning solution
33. Deleted	
34. Remover Tool (10933782)	Remove transmission mounting bracket resilient mount
34.1. V-Pack Cleaner Assembly (12326132)	Clean air cleaner filter elements

HYDRAULIC SYSTEM

35. Pressure Test Kit (12304196) Consisting of:	
Pressure Gage Assembly (12304154)	Test winch, boom, bulldozer hydraulic systems
Case Assembly (11669748)	

MISCELLANEOUS

36. Hatch Torque Adapter (11655766)	Apply torque to driver's hatch torsion bar
37. Center Punch (Fabricated, Figure F-9, Appendix F)	Stake pin in final drive quick-disconnect clamp

Section II. SERVICE UPON RECEIPT

GENERAL

This section contains information on services to be performed upon receipt of the vehicle from the issuing organization. Where practicable the crew will assist in the described services. For service to be performed on the vehicle turret components, refer to TM 9-2350-222-20-2.

INSPECTION AND SERVICING

a. Inspect vehicle for damage.

b. Check inventory components with assistance of issuing organization against packing list.

c. Check packing list against Basic Issue Items List (TM 9-2350-222-10) to be sure that all indicated items have been received.

d. Record all missing items.

INSTALLATION AND SETUP

a. Make sure that grade of engine oil installed, as indicated on processing tag (DD Form 1397), is of the grade specified by LO) 9-2350-222-12 for temperature in your area.

b. Check oil level in engine and transmission. Service as required (LO 9-2350-222-12).

c. Start engine (TM 9-2350-222-10). Check for fuel and oil leaks. If leaks are observed, shut down engine and repair leaks.

d. Perform Preventive Maintenance Checks and Service (PMCS), Subsection II WEEKLY (Hull) (TM 9-2350 222-l0).

CORROSION INSPECTION

a. During normal semi-annual inspection, check all parts and surrounding areas for corrosion. Corrosion damaged is divided into the following stages.

Stage 1. Red, black and white corrosion deposits on surface, etching and pitting. Base metal is sound.

Stage 2. Powdered, granular or scaled condition. Base metal is sound.

Stage 3. Surface condition and corrosion deposits are similar to Stage 2, except that metal in the corroded area is unsound and small pin holes may be present.

Stage 4. No metal remains at point of severest corrosion. Corrosion holes in the area or metal is completely missing.

b. Corrosion areas in Stages 1 and 2 shall be cleaned, primed, and painted with required final top coat in accordance with TM 43-0139. In areas where Stages 3 and 4 corrosion conditions exist, Corrosion must be complete] y removed, repairs made, or parts/assemblies replaced with serviceable parts/assemblies where repair is not economical.

SECTION III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), LUBRICATION INSTRUCTIONS, AND MANDATORY REPLACEMENT PARTS

INTRODUCTION

a. General.

Preventive maintenance is the systematic care, inspection, and service of the M728 to keep it in serviceable condition and to detect faults and failures before extensive and time consuming repairs or replacement are required. Maintenance checks are services performed by organizational maintenance and are described below.

This section contains the procedures and instructions to perform M728 hull organizational preventive maintenance checks and services. These services are performed by organizational maintenance personnel assisted by the vehicle crew. Ensure that all crew level hull PMCS procedures have been completed prior to performing organizational PMCX. Refer to DA PAM 738-750 for instructions on the use of forms pertaining to PMCS.

Organizational services are defined by, and restricted to, the procedures outlined in this section and Appendix B, Maintenance Allocation Chart, unless approval to perform higher category services has been given by the support maintenance unit. For additional inspection and classification information on track components, see TM 9-2530-200-24.

Knowledge of operating and maintenance procedures outlined in TM 9-2350-222-10 is essential to the performance of organizational PMCS. Organizational mechanics must be familiar with these procedures so that they can apply them in the performance of their duties.

The driver of the vehicle is often unaware of gradually developing defects. Therefore, the vehicle must be road tested by organizational maintenance personnel during preventive maintenance checks and services. Any repairs or adjustments necessary to ensure safe operation should be made prior to road test. All faults and corrective actions will be noted on DA Form 2404, column " a ". The item number recorded in this column must correspond to the PMCS item. After deficiencies have been corrected and the tactical situation permits, an additional road test must be made for a distance of not less than three nor more than five miles.

The preventive maintenance checks and services listed in this section are to be performed at intervals determined by calendar days or vehicle operating hours, whichever comes first: (a) bimonthly or after 25 operating hours, (b) semiannually or after 150 operating hours, (c) annually or after 300 operating hours, biennial (every 2 years).

Hard (fixed) time intervals and the related man-hour times are based on normal operation. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse conditions, including longer-than-usual operating hours. The interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

PMCS items and intervals have been determined by using Reliability Centered Maintenance (RCM) logic.

INTRODUCTION - Continued

Preventive maintenance checks and services for the vehicle turret, including sighting and fire control equipment and armament, are contained in TM 9-2350-222-20-2. These checks and services will be performed by the organizational turret mechanic. Preventive maintenance checks and services for the communication system will be performed in accordance with, and by maintenance personnel as specified in the appropriate technical manuals listed in Appendix A. The services will be performed in conjunction with hull PMCS.

If anything looks wrong and cannot be fixed, report it on DA Form 2404. If something looks dangerous or may cause equipment damage, report it immediately to your maintenance supervisor.

b. PMCS Procedures. PMCS column explanations are as follows:

Column 1- Item No. The first column contains the item number which shall be used as a source of item numbers for the TM Number Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

Column 2- Interval. The second column lists the interval at which the items are to be inspected.

Column 3- Location - Item to Check/Service. The third column lists the item to be checked or serviced.

Column 4- Procedure. The fourth column contains all the information required to accomplish the checks and services.

Column 5- Not Fully Mission Capable if. The fifth column contains all the conditions which make the vehicle not fully mission capable.

c. Special Information.

(1) precaution. The following precautions will help prevent personal injury or damage to equipment:

Do not spill solvent, fuel, or lubricants on rubber parts. Solvent, fuel, and lubricants may damage rubber parts.

Do not use turbine fuel, diesel fuel, gasoline, paint thinner, or benzene (benzol) for cleaning. These liquids may cause personal injury.

Do not clean inside hull with high pressure steam, water, or air. Some parts inside hull may rust or be damaged.

Do not use polishing cloths, liquids, pastes, or other rough cleaners to clean instrument lenses or mirrors. Use lens tissue paper to clean lenses and mirrors. Remove fingerprints, oil, and dirt with lens cleaning compound and lens tissue paper.

(2) Services. services performed by the organizational maintenance mechanic consist of the following tasks:

Adjusting. Making all necessary adjustments and alinements.

INTRODUCTION - Continued

Servicing. Draining and refilling units with oil and changing or cleaning oil filters, fuel filters, and air cleaners.

Tightening. Tightening nuts, bolts, screws, and other types of fasteners with a torque wrench to the value listed in the maintenance manual. Do not overtighten; this may strip threads and break off the part being tightened.

Repairing. Repairing includes inspection, cleaning, preserving, adjusting, replacing, welding, strengthening, and other tasks associated with putting parts in working condition.

(3) General Cleaning Instructions.

If a steam cleaner is available, it may be used to remove any remaining dirt. After water or steam cleaning, lubricate vehicle. Check all lubricant reservoirs for water droplets. If water is found, drain and refill. Clean grease, oil, or dirt from all metal parts with dry cleaning solvent, cleaning compound, or equivalent.

Use mild soap and water to clean or wash parts not made of metal. Rinse thoroughly after cleaning with water and then dry.

Remove rust or dirt from fine-machined surfaces with dry cleaning solvent and crocus cloth, if necessary. Do not use any other material. Be careful not to change the dimensions of parts when rubbing off rust. Coat bare metal surfaces, after cleaning, with lubricating oil.

Nameplates, caution plates, and instruction plates may rust quickly. When they are rusty, clean parts and coat them with lubricating oil.

(4) General Maintenance Instructions.

Put protective caps or plugs on all tubes, hoses, and fittings as soon as you disconnect them. Dirt could get in and ruin the system. Do not remove caps or plugs until you are ready to connect the system.

Replace bent, broken, or stripped bolts, nuts, screws, and washers. Bolts, screws, and nuts may be loose if rust, chipped paint, or bare metal is around them. Tighten loose screws, bolts, and nuts. Replace missing parts.

Inspect electric wires for broken, chafed, cracked, discolored, frayed, loose, melted, or worn insulation. Replace or repair bad parts.

Have another soldier help aline mating ends of connectors, plugs, and receptacles on larger harnesses. Make sure that pins and keyways line up. Tighten twist-snap type connectors, plugs, or receptacles until a click is heard. Tighten screw-on type connectors until a ratchet noise is heard to indicate that connectors, plugs, or receptacles are tight.

INTRODUCTION - Continued

Hold fitting adapter with one wrench and tighten nut with another wrench. When tightening fittings, tighten nut snug and then tighten 1/6-turn to 1/8-turn more. If fitting leaks, loosen nut a full turn and then tighten. If still leaking, replace defective parts.

Service, clean, or change oil filters, as applicable, when they are known to be contaminated or clogged; service is recommended by AOAP laboratory analysis; or at prescribed hardtime intervals.

Look at hoses, fluid lines, and tubes for bends, wear, cracks, or leaks. Replace bad parts. Make sure all clamps and fittings are tight. If a fitting leaks, tighten it.

(5) Lubrication.

Use only authorized lubricants

All lubrication instructions are mandatory.

When checking fluid levels, vehicle must be on level surface.

Oil filters shall be serviced/cleaned/changed when they are known to be contaminated or clogged, service is recommended by AOAP, or hard time service is required.

Dispose of used lubricants in accordance with local Standing Operating Procedures (SOP).

For arctic operation, see FM 9-207.

For desert operation, see FM 90-3.

Clean all grease fittings before attaching grease gun.

When using grease gun, operate until grease appears around seals or out of relief valve and check escaping grease for contamination. If contamination is found, notify support maintenance.

If no other treatment is directed, paint or clean and coat unprotected metal surfaces with cleaner, lubricant, preservative (CLP).

Clean around filler necks/drain plugs/openings before servicing to keep dirt from entering system.

INTRODUCTION - Continued

Lubricate oil can points as required and as they become accessible while performing PMCS procedures. Use the applicable lubricant identified and lubricate the following items as a part of PMCS

- Headlight removal nuts
- Fender stowage box latches and hinges
- Interphone box hinge
- Towing hooks (hinge pin)
- Brake linkage
- Transmission support guide rails and rollers
- Periscope cover hinges and Periscoue hatch mounts
- Driver's escape hatch (clean and coat pins, plungers, and all unpainted surfaces)
- Grille door hinges
- Control rod clevises
- Ammunition rack retainers
- Ammunition box latches
- Cupola machine gun access door locks
- Driver's, gunner's, and commander's seats moving parts
- Hatch locks and hinges
- Manual elevating and traversing handles and universal joints
- Driver's night viewer hatch door pivot pin and latch

Oil Can Points Lubricants

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Oil Can Points +5°F to +125°F (-15°C to +52°C)	OE/HDO-15/40 (O-1236) MIL-L-2104	AR	AR/S	0.4
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

Do not lubricate the following items:

- Machine gun solenoid
- Starter solenoid
- Air cleaner blower motor
- Hydraulic powerpack electric motor
- Heater motor
- Breechblock firing pin
- Ventilator blower motor
- Gas particulate fan motor
- Tracks
- Tachometer drive adapter
- Electric firing circuit contacts
- Any item not pointed out

INTRODUCTION - Continued

(6) Leakage Definitions.

Fluid leaks affect vehicle status. Learn the following classes of fluid leaks for unit PMCS.

Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked.
Class III Leakage of fluid great enough to form drops that fall from the item being checked.

All Class III leaks and any class fuel leak in the engine compartment or in the personnel heater system must be repaired before operating the vehicle. Vehicle may be operated with Class I or Class II leaks.

(7) Corrosion. Check for corrosion on entire vehicle. Become familiar with the four stages of corrosion listed below and take the appropriate maintenance action required outlined below.

Stage 1 - Red, black, or white corrosion deposits on surface with etching or pitting. However, base metal is sound.

Stage 2- Powdered granular or scaled condition. Base metal is sound.

Stage 3- Surface condition is similar to stage 2 except that metal in the corroded area is unsound and pin holes may be present.

Stage 4- No metal remaining at point of severest corrosion. Corrosion holes in the area or metal completely worn away.

Stages 1 & 2 - Areas are to be cleaned, primed, and painted IAW TB 43-0213.

Stages 3 & 4 - Try to repair metal. If not economical or reparable, replace with new parts.

INITIAL SETUP

Preventive maintenance includes complete inspection to make sure adjustment, securing, and assembly of all parts of the vehicle are right. All cleaning, replacement, lubrication, and protection of parts or assemblies must be done as stated for trouble-free operation until the next preventive maintenance is performed.

Maintenance Forms and Records. Refer to DA PAM 738-750.

Publications. Be sure all needed publications are on hand before starting task.

Special Tools. Be sure all special tools are on hand.

Supplies. Be sure all parts and supplies are on hand.

Tools. Be sure all common tools are on hand.

Modification Work Order (MWO) Application. Check the list of current MWOS in DA PAM 25-30. Do not make any vehicle modifications except as ordered by official Army directive.

Preventive Maintenance Checks and Services for M728 Hull

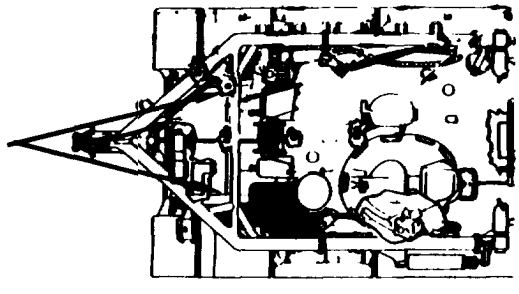
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
1	Bimonthly	Engine and Transmission	Perform powerplant oil sampling IAW DA PAM 738-750. ARMY OIL ANALYSIS PROGRAM (AOAP). Oil samples from both engine and transmission must be submitted to an assigned AOAP laboratory every 25 hours of operation or 60 days, whichever occurs first, in accordance with DA PAM 738-750. Oil will be analyzed for condition and will be changed only when directed by the AOAP laboratory. In the event AOAP laboratory support is not available, drain oil every 1500 miles or semiannually, whichever occurs first. Semiannual oil changes are to be coordinated with seasonal changes. When using OEA oil, drain every 750 miles or quarterly, whichever occurs first.	AOAP recommends oil change.
2	On Condition	Engine	Replace engine oil filters (page 6-27) and drain and fill engine crankcase (page 6-51). Run engine and check for oil leaks at filters and drain plugs (TM 9-2350-222-10).	Any Class III leak.

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Engine 0°F to +125°F (-18°C to +52°C)	OE/HDO-15/40 (O-1236) MIL-L-2104	17 gal	OC	0.5
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
3	On Condition	Transmission	Drain and fill transmission: Remove two drain plug access plates from bottom of hull (page 16-39). Position 20-gallon container under drain plugs. Remove drain plugs and allow to drain into container. Clean transmission oil filter (page 11-67). Clean side oil screen (page 11-77). Clean and install drain plugs and access plates. Refill transmission to "ADD" mark on dipstick. Check oil level (TM 9-2350-222-10). Run engine and check for oil leaks at filters and drain plugs (TM 9-2350-222-10).	Any Class III leak.



Transmission Lubricants

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Transmission 0°F to +125°F (-18°C to +52°C)	OE/HDO-15/40 (O-1236) MIL-L-2104	17 gal	OC	0.5
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

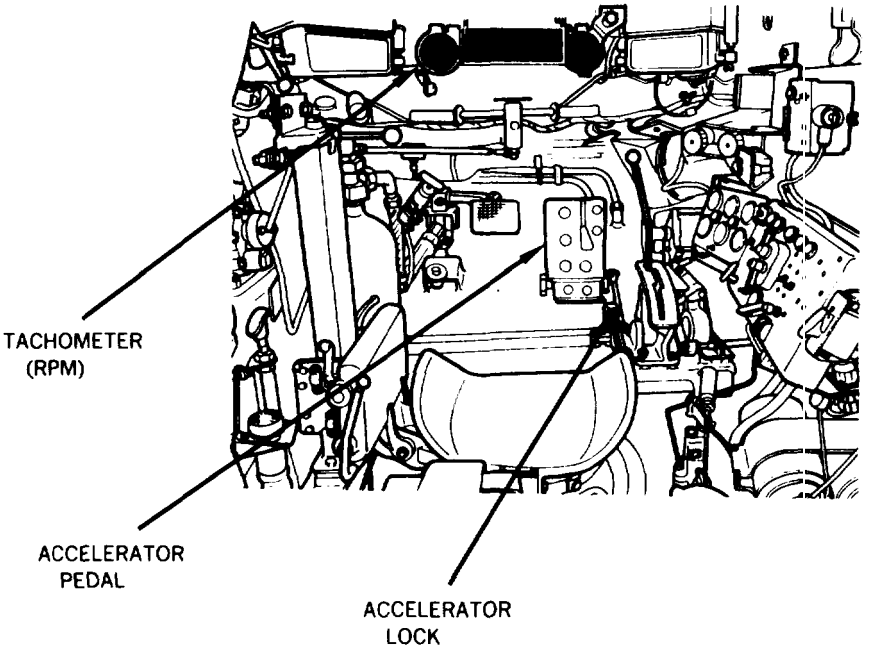
For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
4	Preservice Semiannual	Powerplant	Ensure all before operation checks listed in TM 9-2350-222-10, Preventive Maintenance Checks and Services (PMCS), are performed. If STE/ICE is available, perform the following electrical component checks. Perform BATTRY CONDITION TEST NO. 77/79 (page 4-63). Perform CHARGING CIRCUIT AND BATTERY VOLTAGE TEST NO. 67 (page 474). Perform STARTER CURRENT FIRST PEAK TEST NO. 72 (page 477). Perform CI (COMPRESSION IGNITION) POWER TEST NO. 13 (page 464).	
			INITIAL ROAD TEST	
5	Semiannual	Starter	While starting engine, listen for unusual noises and difficult cranking att starter.	Any unusual noise or improper cranking.
			CAUTION Driver must remain in driver's station at all times while engine is running.	
6	Semiannual	Engine Idle	Start engine and operate at 1000 to 1200 rpm until normal operating temperature is reached.	Any unusual noise or improper cranking.

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
6	Semiannual	Engine Idle - Continued	Reduce engine speed to an idle.	
			Check that idle speed returns to 700-750 rpm.	
			If engine speed does not return to 700-750 rpm, adjust accelerator linkage (page 7-415):	Engine speed is nonadjustable.
7	Semiannual	Accelerator Lock (Engine Running)	Engage accelerator lock with engine running.	
			Check that engine rpm remains the same when foot is removed from accelerator pedal.	
			Adjust accelerator linkage, if required (page 7-415).	Accelerator linkage cannot be adjusted.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
8	Semiannual	Engine (Governed No-Load Test)		

CAUTION

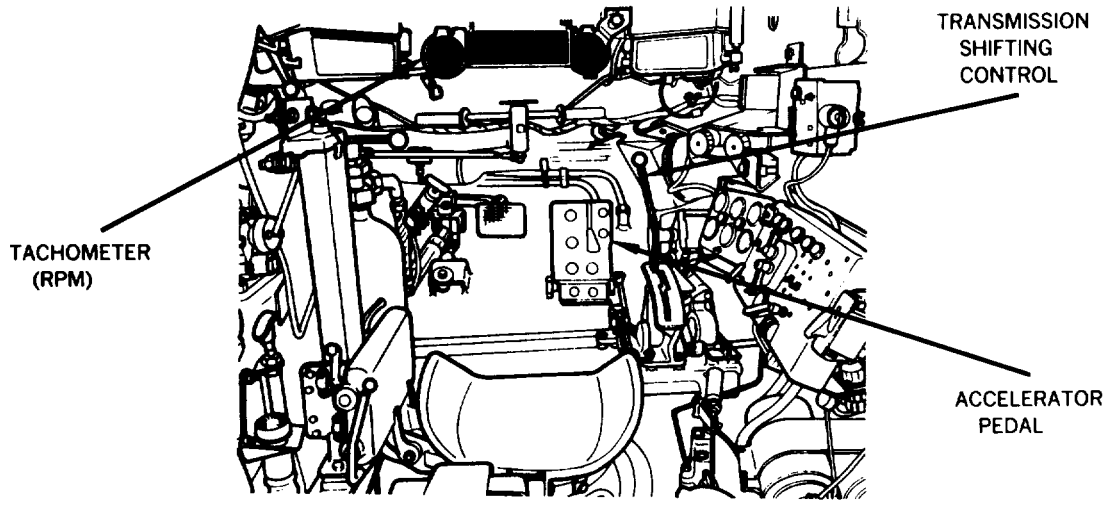
DO NOT RUN engine faster than 2640 rpm for more than 2 or 3 seconds in the event of governor malfunction.

	With transmission shift lever in "P" (Park) and brakes applied, gradually open throttle until accelerator pedal is fully depressed.	

NOTE

In most cases, engine speed will surge over 2600 rpm and then stabilize within 30 seconds between 2550-2640 rpm.

	Check that governor does not cut in and out.	Governor keeps cutting in and out. Notify support maintenance adjustments are required.
	Check that tachometer reading stabilizes between 2550 and 2640 rpm.	Tachometer reading does not stabilize. Notify support maintenance.



DRIVER'S STATION

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
9	Semiannual	Engine (Stall Test)	Perform governed no-load test before attempting stall test.	

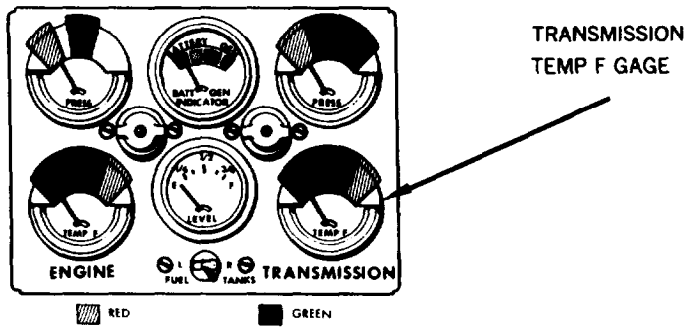
WARNING

Take all necessary safety precautions to eliminate possible injury to personnel or damage to equipment. Make sure areas in front and rear of vehicle are clear of personnel and equipment.

CAUTION

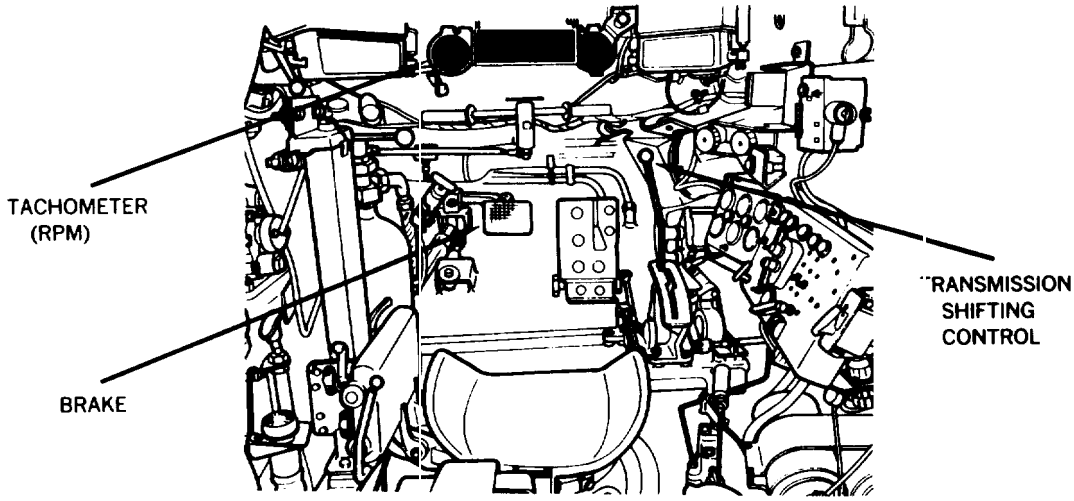
Do not stall test for more than 30 seconds at full throttle or allow transmission oil temperature to go over 300° F (149° C), red area on TRANSMISSION TEMP F gage.

	With engine at normal operating temperature, apply brakes and place transmission shift lever in high range. Run engine at full throttle for no more than 30 seconds.	
	Check that engine speed stabilizes between 1800-2050 rpm.	Engine speed is below 1800 rpm after three stall checks.



Preventive Maintenance Checks and Services for M728 Hull - Continued

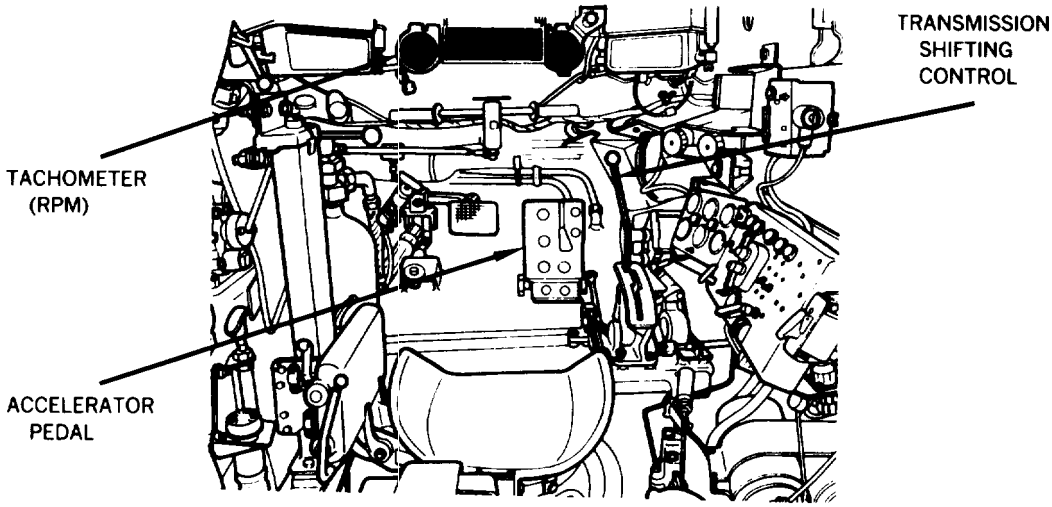
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
10	Semiannual	Transmission (Slippage Check)	Check shifting control linkage adjustment, adjust as required (page 11-2). If slippage still exists, notify support maintenance. Apply brake. Shift transmission into low and then into reverse range. Run engine at full throttle until engine rpm stabilizes 1800-2050 (not more than 30 seconds). If engine speed is more than 2050 rpm, there is slippage in transmission servobands. Adjust bands (page 11-63) and retest. If slippage still exists, notify support maintenance. Release brakes.	Engine speed is more than 2050 rpm.



DRIVER'S STATION

Preventive Maintenance Checks and Services for M728 Hull - Continued

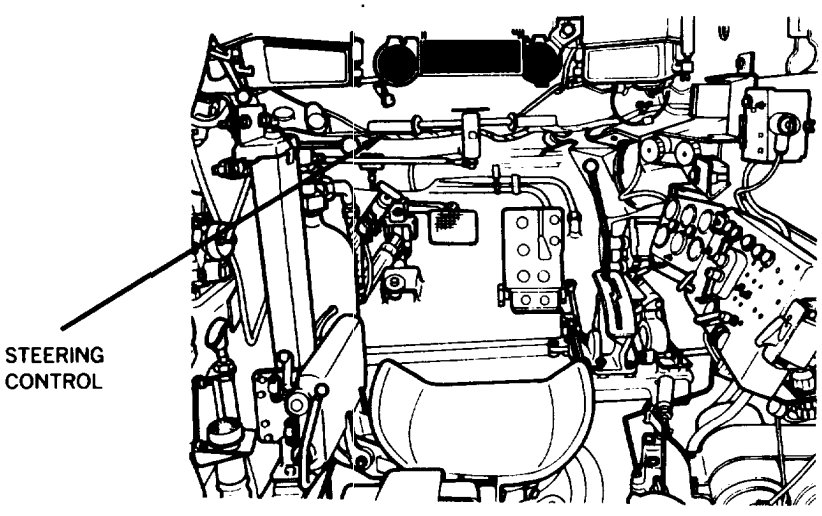
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
11	Semiannual	Engine (Governed Speed and Performance)	DURING ROAD TEST	
			Test engine for normal acceleration and full power in each transmission range while vehicle is moving.	High engine speed or low power.
			While testing in low speed range, accelerate to wide open throttle.	
			Check that engine speed under load does not exceed 2450 rpm. If engine speed exceeds 2450 rpm, notify sup port maintenance.	Engine speed exceeds 2450 rpm.



DRIVER'S STATION

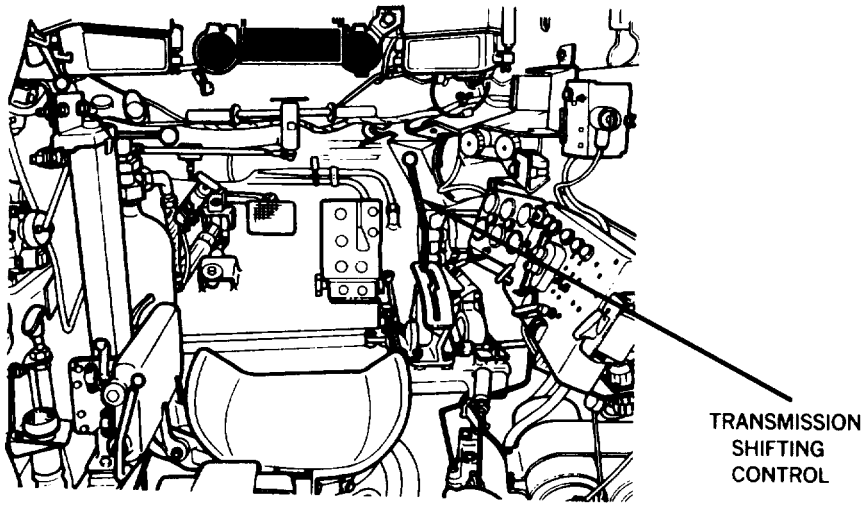
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
12	Semiannual	Steering Control		
			NOTE **If possible, the last mile of road test should be rough terrain to check shock absorbers after road test.**	
			Move steering control through full range and check for sticking or binding and that vehicle turns in the direction selected. **Check that steering control returns to center position when released after turning vehicle right and left.** **With steering control centered, check that vehicle does not wander or pull to one side at low, medium, or high speeds.** **Adjust steering control linkage, if required (page 15-2).**	**Binding, grabbing, unusual noise, vibration or failure to turn.**



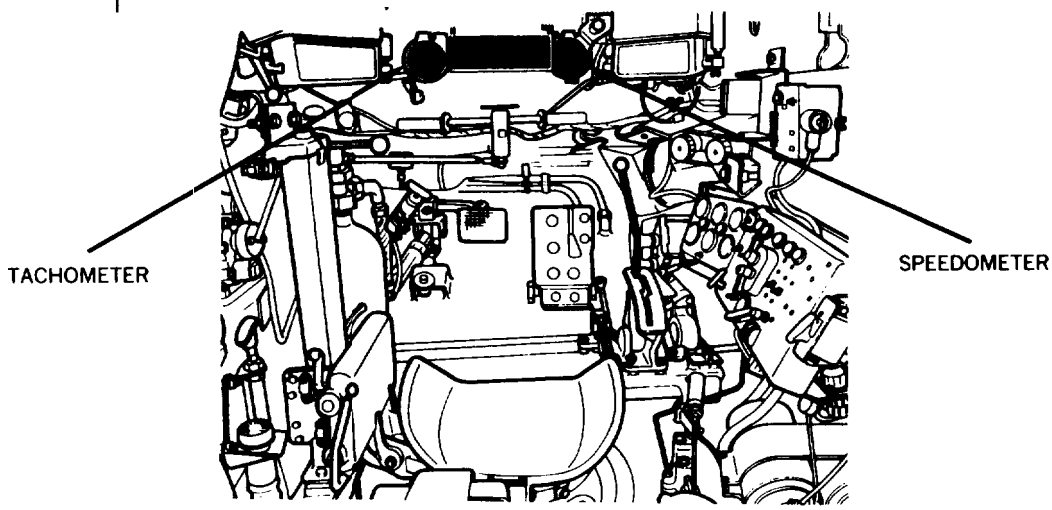
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
13	Semiannual	Shifting Control	Move shifting control through all positions.	
			Check that shifting control does not bind or stick.	Shift controls binds or sticks.
			Check for satisfactory shifting.	
			Adjust shift linkage, if required (page 11-2).	Shift linkage cannot be adjusted.



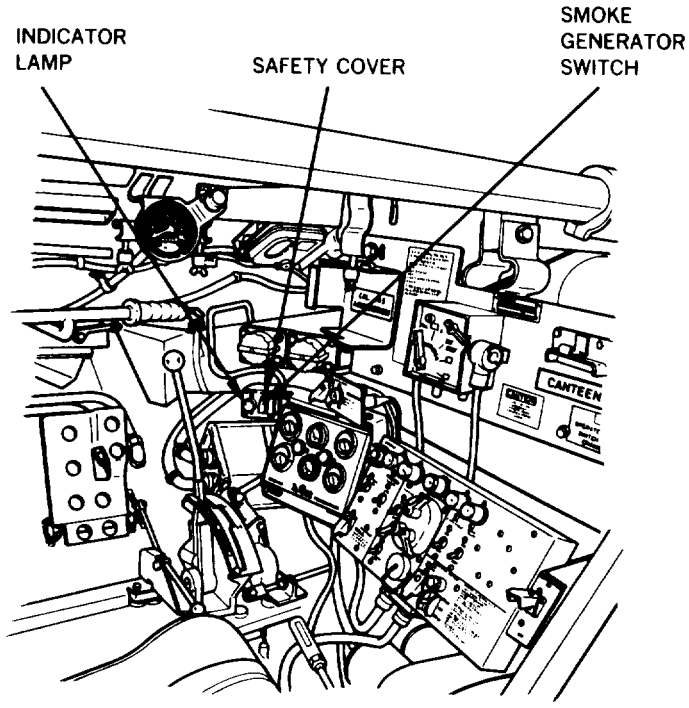
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
14	Semiannual	Brake Controls		
			WARNING **Driver must notify all personnel that brake check is to take place so they can be prepared for sudden stops.**	
			Move vehicle forward at 10-15 mph (16-24 km/h) on level surface.	
			Apply brake pedal for both normal and sudden stops.	**Vehicle fails to stop or parking brake will not hold.**
			Check for straight stopping of vehicle.	
			Adjust track tension (TM 9-2350-222-10) if vehicle does not stop in a straight line.	
			If possible, position vehicle on steep incline and engage parking brake.	
			Check that parking brake holds vehicle when brake pedal is released.	
			Adjust parking brake cable, if required (page 13-20).	
15	Semiannual	Tachometer and Speedometer	**Check that tachometer and speedometer dial readings are not erratic.**	**Tachometer inoperative or erratic.**



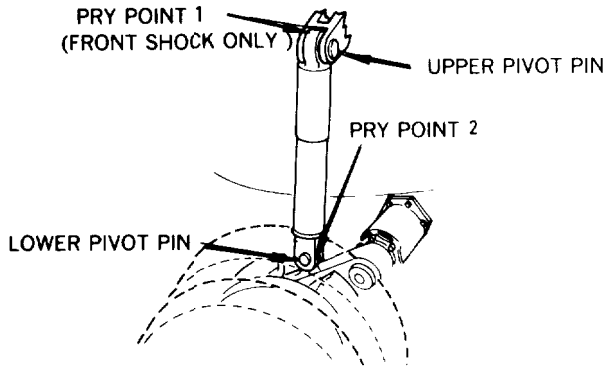
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
16	Semiannual	Engine Smoke Generator (If equipped)	Set engine speed at 1600 rpm. Lift toggle switch safety cover. Place SMOKE GENERATOR switch to ON position. Check that indicator lamp lights. Have commander in turret check for smoke emission from engine exhaust pipes. If smoke is not observed within 10 seconds, system is defective. Place SMOKE GENERATOR switch to OFF position.	Smoke is not observed within 10 seconds.



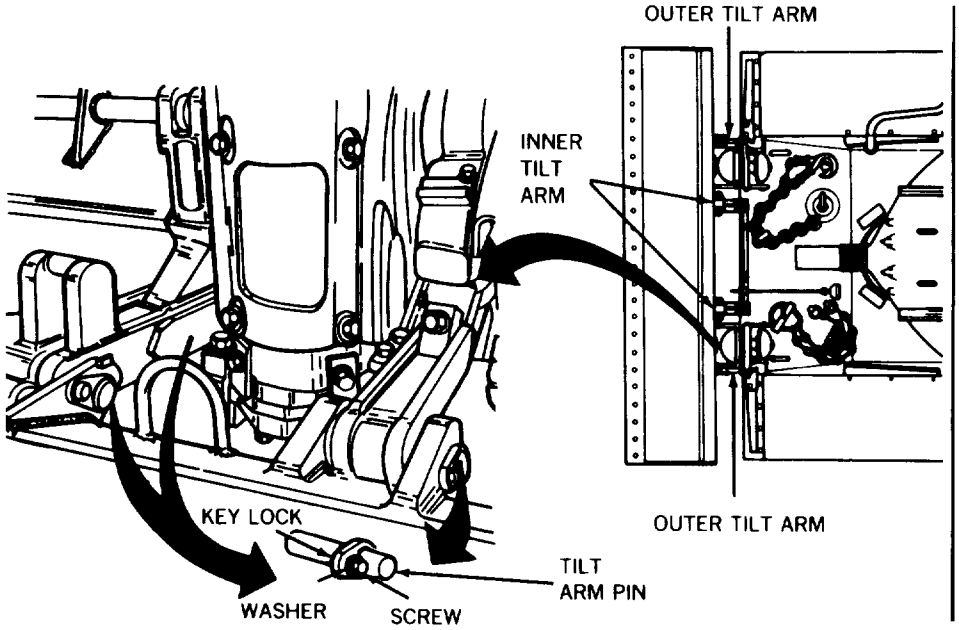
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
17	Semiannual	Shock Absorbers (Left and Right sides)	AFTER ROAD TEST	
			WARNING **To prevent injury, use care, shock absorbers may be extremely hot.**	
			Obtain small pinch bar (jimmy) from turret right wall.	
			Check wear of shock absorber upper and lower pivot pins by inserting bar between shock absorber eye and hull mounting yoke (pry point 1). Pry down on shock absorber and observe pins. Insert bar between shock absorber mounting yoke and roadwheel arm mounting eye (pry point 2). Pry up on shock absorber and observe pins.	**Any cracked, broken, bent, or missing shocks. Dents that hinder shock operation. Any Class III leak.**
			Pins that moved more than 1/8-inch (0.32 cm) while prying up or down are defective.	
			Visually check hull, shock absorber eyes, and yokes for cracks.	



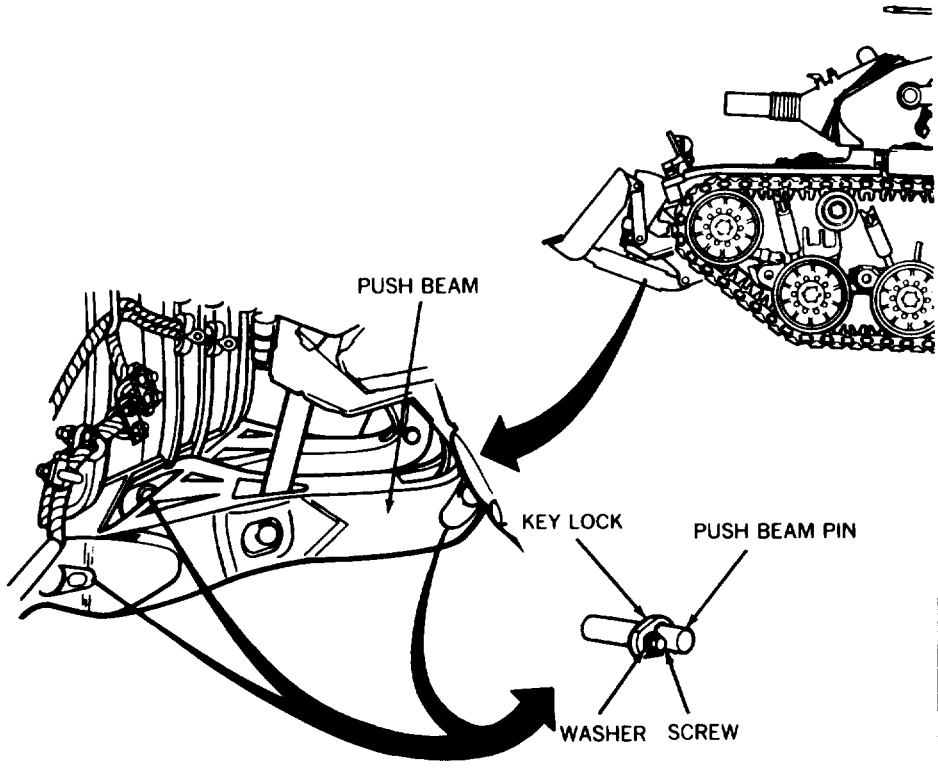
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
18	Semiannual	Moldboard Push Beams (Left and Right Sides)	Check that outer tilt arms and inner tilt arms are not damaged. Check that outer and inner tilt arm pins, key locks, screws, and washers are not loose, damaged, or missing.	Any defective tilt arms.



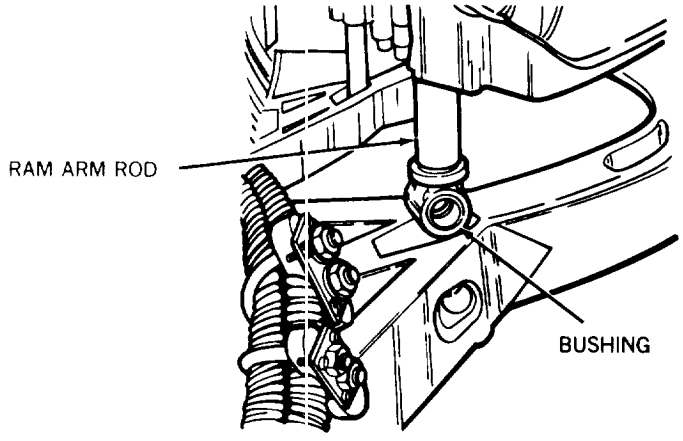
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
18	Semiannual	Moldboard Push Beams (Left and Right Sides) - Continued	Check that push beams are not bent.	Any push beam bent.
			Check that pins, key locks, screws, and washers are not loose, damaged, or missing.	Any push beam pins missing. Any key locks missing or not properly secured.



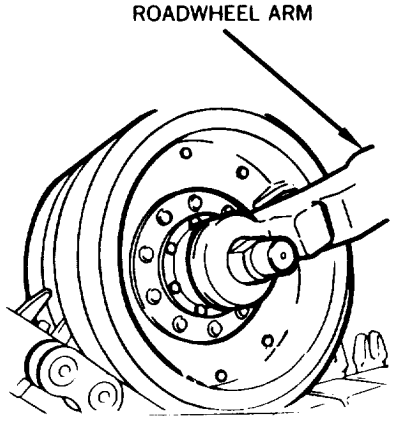
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
18	Semiannual	Moldboard Push Beams (Left and Right Sides) - Continued	Remove right and left push beam pivot pins (page 18-26).	
			Visually check that ram arm rods are not bent.	Ram arm rod bent.
			NOTE Both ram arm rods must be disconnected before rods are raised.	
			Raise ram arm rod.	
			Check that bushing is not cracked or broken. Insert pivot pin in bushing, push pin right and left then up and down.	
			Check for movement of pin.	
			Movement of pin indicates bushing is worn. If bushing is defective, replace cylinder (page 18-26). Install push beam pivot pins (page 18-30).	Bushing defective.

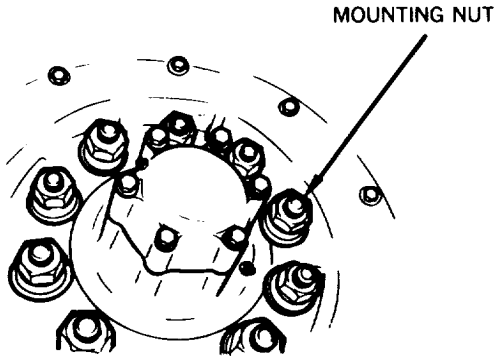


Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
19	Semiannual	Compensating Idler Wheels, Roadwheels, Arms and Hubs (Left and Right Sides)	Check all roadwheel arms for cracks, bends or damage. Using 0 to 1200 lb-ft torque multiplier, check that all mounting nuts are tightened to at least 550 lb-ft (746 N·m) dry.	Any bends or cracks.



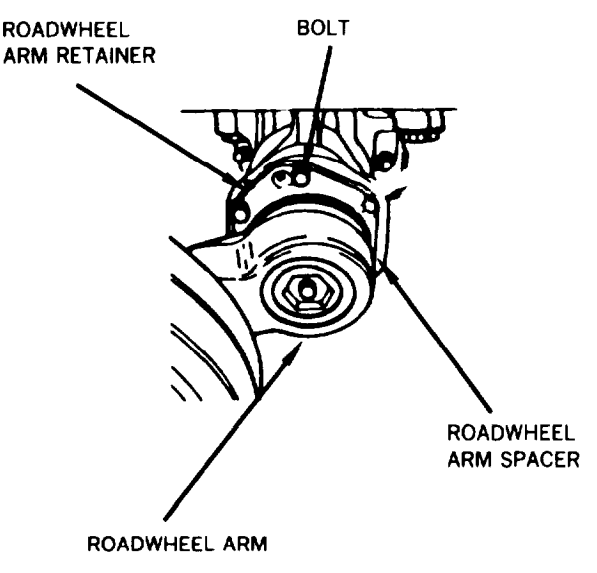
ROADWHEEL (INSIDE)

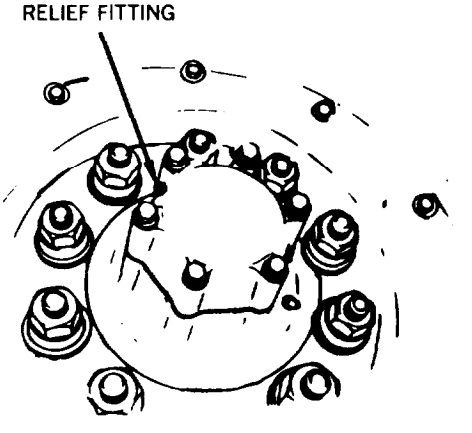


ROADWHEEL (OUTSIDE)

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
19	Semiannual	Compensating Idler Wheels, Roadwheels, Arms and Hubs (Left and Right Sides) - Continued	Check for crushed or defective roadwheel arm inner and outer bearings at inside of roadwheel as follows:	
			Using a 3/4 inch socket and socket wrench, check that socket fits on the top three bolts of roadwheel arm of retainer. If bearings are damaged or defective, socket will not fit or will be a very difficult fit.	Socket will not fit or is very difficult to fit on any three top bolts.
			Looking straight-on at the roadwheel arm, check the gap between the roadwheel arm retainer and the roadwheel arm spacer. Gap should be equal (approximately 1/4-inch (0.635 cm)) all the way around. If the gap is smaller at the top and greater at the bottom, check for bearing damage, bearing dislocation, or a loose bearing assembly retainer nut. Correct defect. Clean grease from seal assembly. Clean lubricant pressure relief fitting using a clean, lint-free, dry cloth.	





Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
19	Semiannual	Compensating Idler wheels, Roadwheels, Arms and Hubs (Left and Right Sides) - Continued		

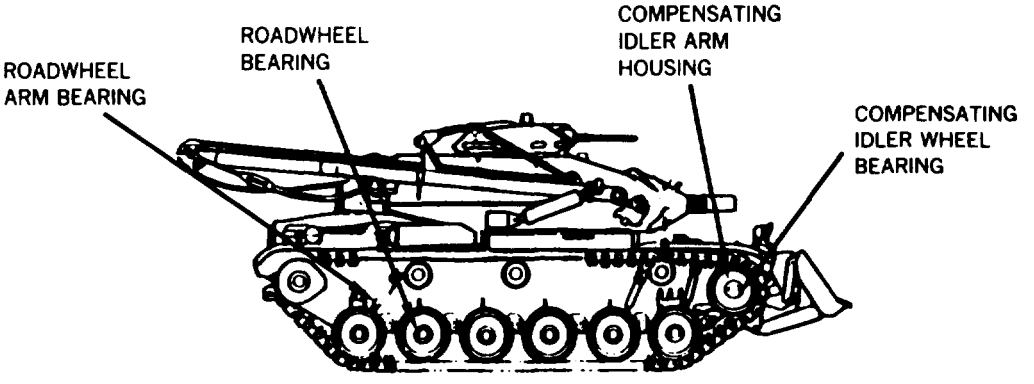
WARNING

- Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.
- Compressed air for cleaning purposes should not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

			Check compensating idler wheel bearings and roadwheel bearings relief fittings for proper operation. Plunger type fittings are checked by pulling up on plunger. Plunger should move freely. Ball-type fittings should be checked to ensure that the two relief ports are open. If plunger does not move freely or relief ports are not open, remove and thoroughly clean in dry cleaning solvent (P-D-680). Dry with compressed air or lint free cloth. Verify that ball moves and ports are open. Apply lubricant until it appears at lubricant pressure fitting. No lubricant should appear at seal assembly. Wipe off excess lubricant from relief valve.	

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
19	Semiannual	Compensating Idler Wheels, Roadwheels, Arms and Hubs (Left and Right Sides) - Continued	Lubricate roadwheel arm bearings (six fittings) and compensating idler wheel bearing until clean lubricant appears between arm retainer and arm. Wipe off excess grease. Lubricate compensating idler arm housing until clean lubricant appears at relief vent.	



Suspension Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Compensating Idler Wheel Bearings		AR	S	0.5
Compensating Idler Arm Housing		AR	S	0.5
Roadwheel Bearings All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.5

For arctic operation, see FM 9 207

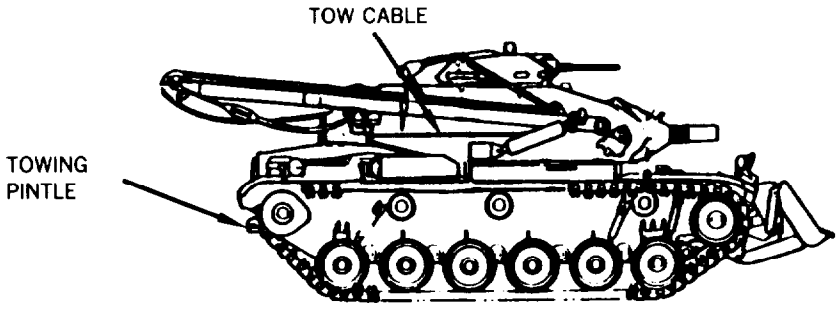
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
20	Semiannual	Towing Pintle and Tow Cables	Lubricate tow pintle (three fittings).	

WARNING

Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

		Clean tow cables with dry cleaning solvent (P-D-680) and coat with corrosion preventive compound (MIL-C-16173, Grade I).		



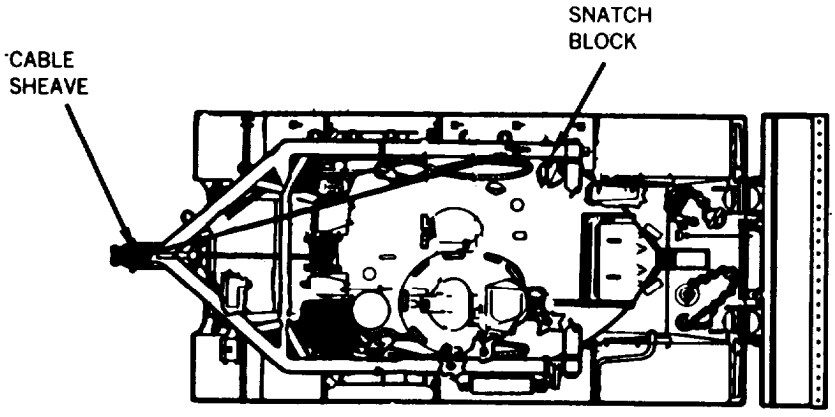
Tow Cables and Towing Pintle Lubricants

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Tow Cables	N/A (N/A) MIL-C-16173	AR	S	0.1
Towing Pintle All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.5

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
21	Semiannual	Snatch Block and Cable Sheave	Lubricate snatch block and cable sheave.	



Snatch Block and Cable Sheave Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Snatch Block		AR	S	0.1
Cable Sheave All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.2

For arctic operation, see FM 9 207

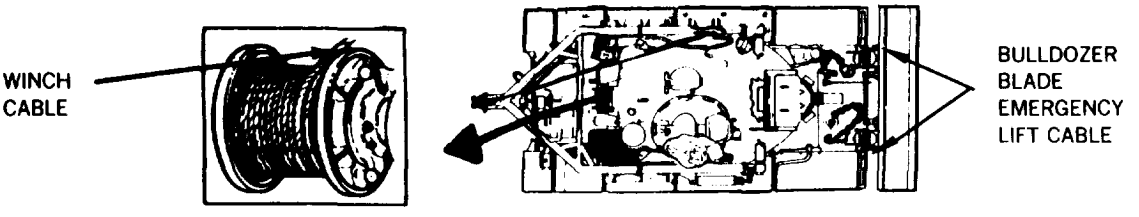
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
22	Semiannual	Bulldozer Blade Emergency Lift Cables, and Winch Cable		

WARNING

Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

Clean bulldozer blade emergency lift cables and winch cable with dry cleaning solvent (P-D-680) and coat with corrosion preventive compound (MIL-C-16173, Grade I).



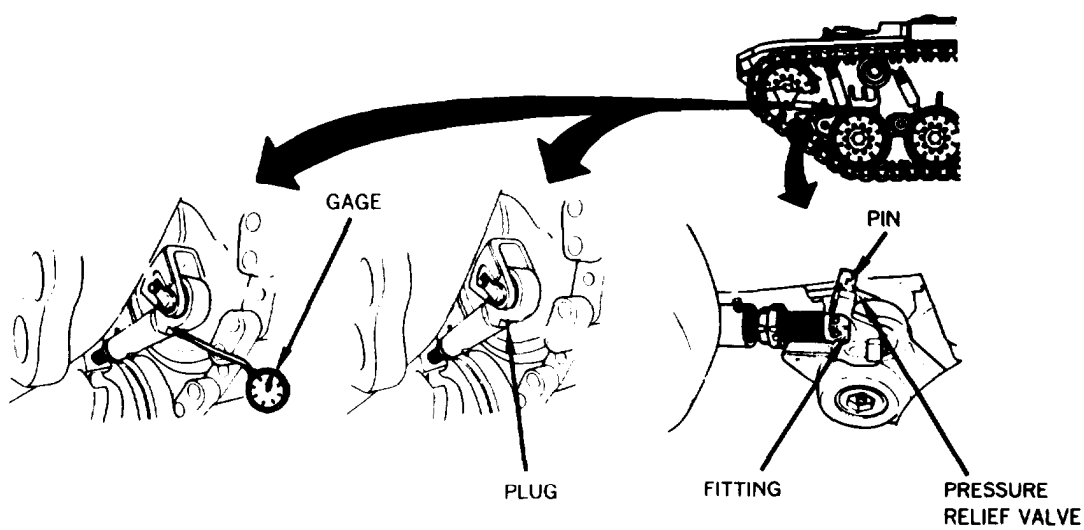
Bulldozer Blade Emergency Lift Cables and Winch Cable Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Bulldozer Blade Emergency Lift Cables		AR	S	0.1
Winch Cable		AR	S	0.1
	N/A (N/A) MIL-C-16173			

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
23	Semiannual	Grease Actuated Track Adjusting Link (Left and Right Sides)	Check that grease fitting, pressure relief valve, and plug are not damaged or missing.	
			WARNING To avoid personal injury due to high pressure grease, pressure must be reduced to zero before gage is attached to adjusting link.	
			Check pressure relief valve as follows: 1. Pry up and hold pin on pressure relief valve until grease stops flowing. 2. Remove plug and install gage (Item 16.1, Section 1, Chapter 3) into opening. 3. Attach grease gun to grease fitting. 4. Pump grease into adjusting link until grease comes out of pressure relief valve.	Pressure relief valve does not hold pressure or does not bleed at proper pressure.



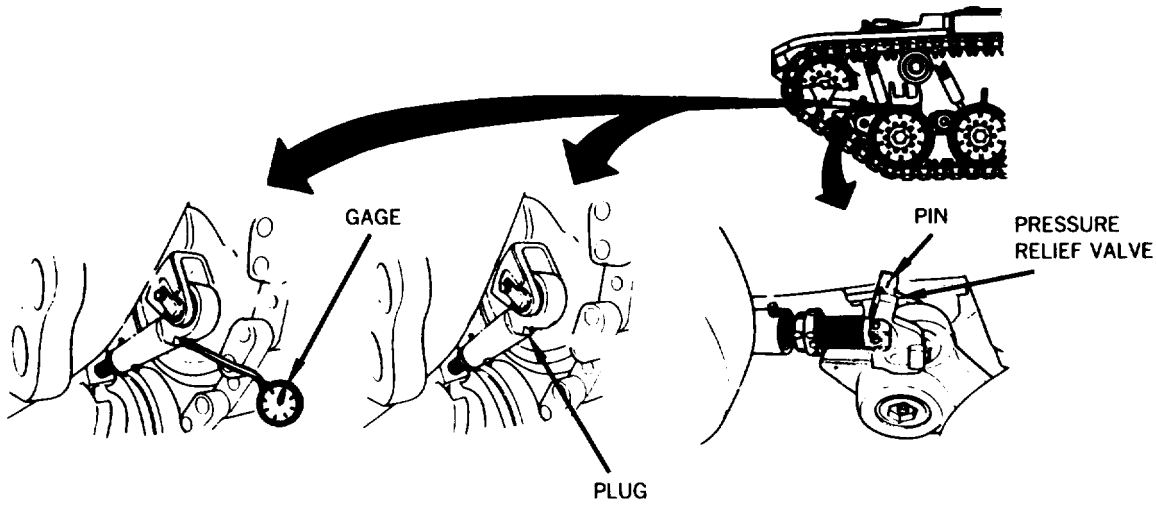
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
23	Semiannual	Grease Actuated Track Adjusting Link (Left and Right Sides) - Continued	5. Note pressure on gage when grease first starts to come out of pressure relief valve. 6. If gage indicates less than 2150 psi, replace relief valve (page 14-62.10) and repeat steps 4 and 5. 7. If gage indicates 2150-2250 psi, pressure relief valve is serviceable, proceed to step 8.	

WARNING

To avoid personal injury due to high pressure grease, pressure must be reduced to zero before gage is removed.

			8. Pry up and hold pin on pressure relief valve until grease stops flowing. 9. Remove gage and install plug. 10. Adjust track tension (TM 9-2350-222-10).	



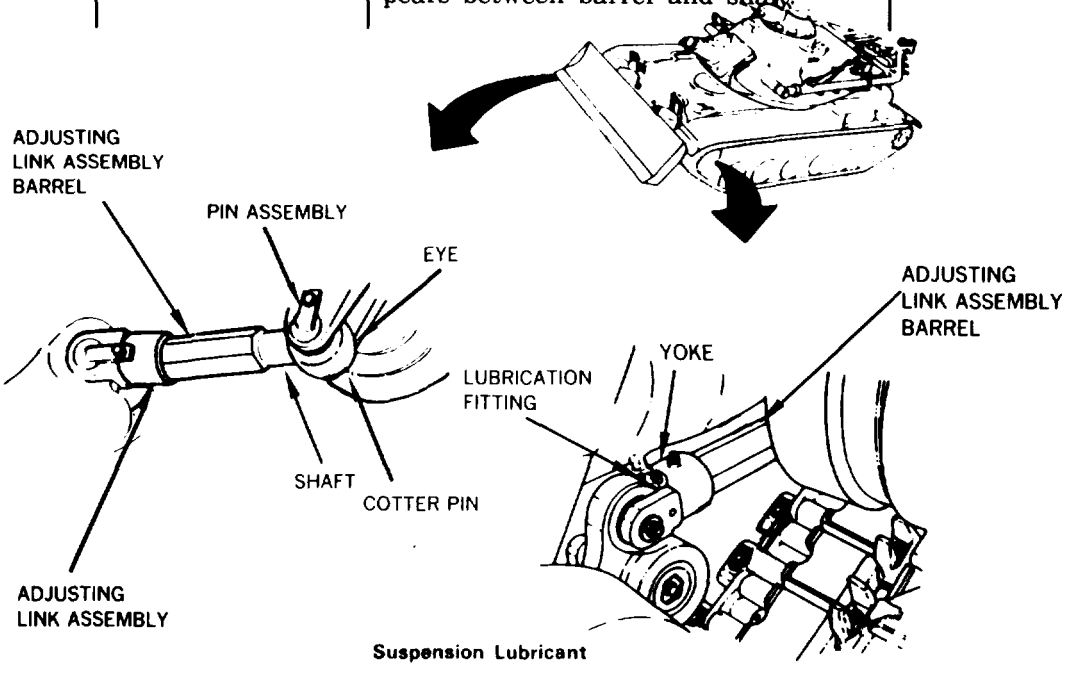
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
24	Semiannual	Mechanical Track Adjusting Link (Left and Right Sides)	Check track adjusting link assemblies for broken or missing cotter pin, lubrication fitting and pin assemblies. Check adjusting link assembly barrel, shaft, eye and yoke for cracks.	

NOTE

Pin at roadwheel arm may be installed with head of pin facing toward hull.

Lubricate until clean lubricant appears between barrel and shaft.

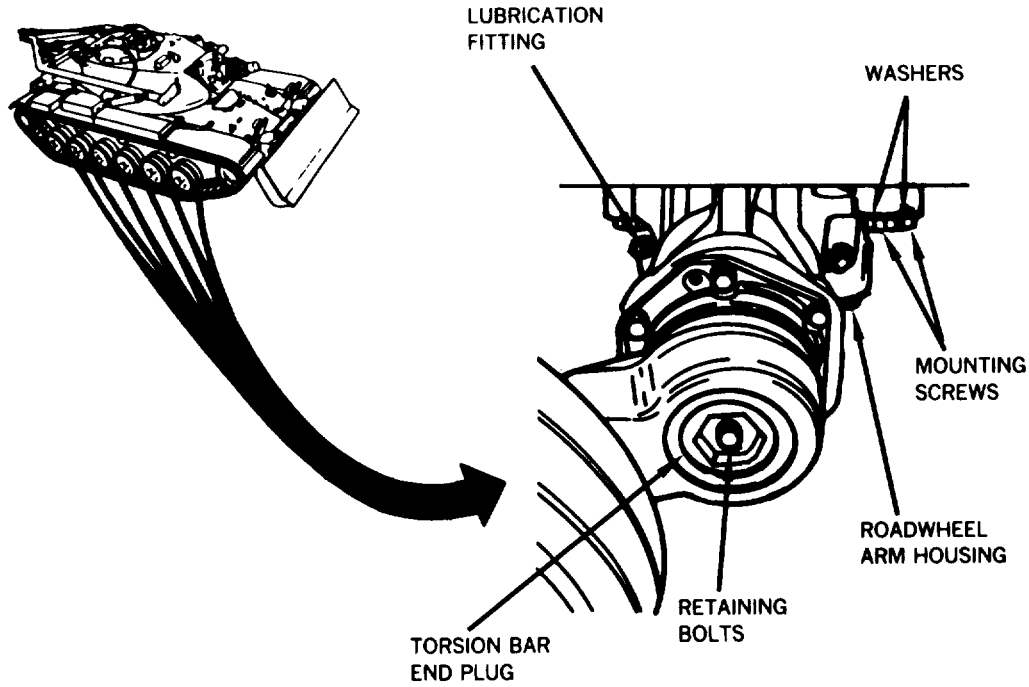


Suspension Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Mechanical Track Adjusting Link All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.1

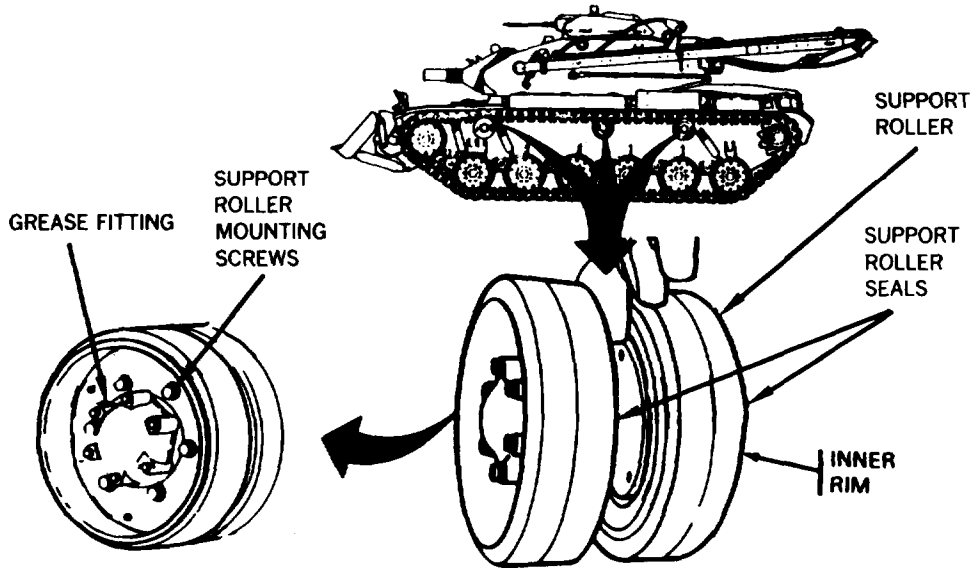
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
25	Semiannual	Roadwheel Arm Housings (Left and Right Sides)	Check that roadwheel arm housings, mounting screws, washers, and lubrication fittings are not damaged or missing. Make sure that mounting screws are not backed out of mounting holes.	Roadwheel arm housing damaged.
			NOTE If mounting screw must be tightened, replace lockwasher before tightening screw.	
			Using a 0-600 lb-ft torque wrench, tighten replaced or loose mounting screws to 450-470 lb-ft (610-637 N·m). Check that screws are not loose, damaged, or missing. Check that torsion bar end plugs are fully seated and retaining bolts are secure.	



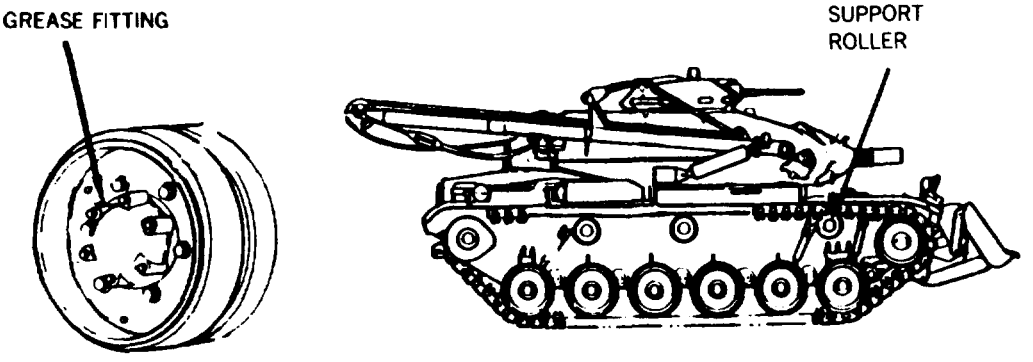
Preventive Maintenance Checks and Services for M728 Hull - Continued

[tern No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
26	Semiannual	Track Support Rollers (Left and Right Sides)	Check track support roller seals and bearings by inspecting inboard side of track support rollers for grease spattering along inner rim. If there is grease spattering on inner rim, clean all lubricant from behind the roller, seal, and along roller inner rim, check for space at bottom side of seal indicating worn or damaged bearings. If lubricant spattering is found, track support roller seal is defective. Replace defective seal (page 14-34). Check if support roller mounting screws and grease fitting are damaged or missing.	Any Class III leak. Any worn or defective bearings.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
27	Semiannual	Track Support Roller Bearings (left and Right Sides)	Lubricate (three fittings) until lubricant can be felt at seal behind roller. Wipe off excess lubricant from behind roller, seal, and along inner rim.	Any Class III leak.



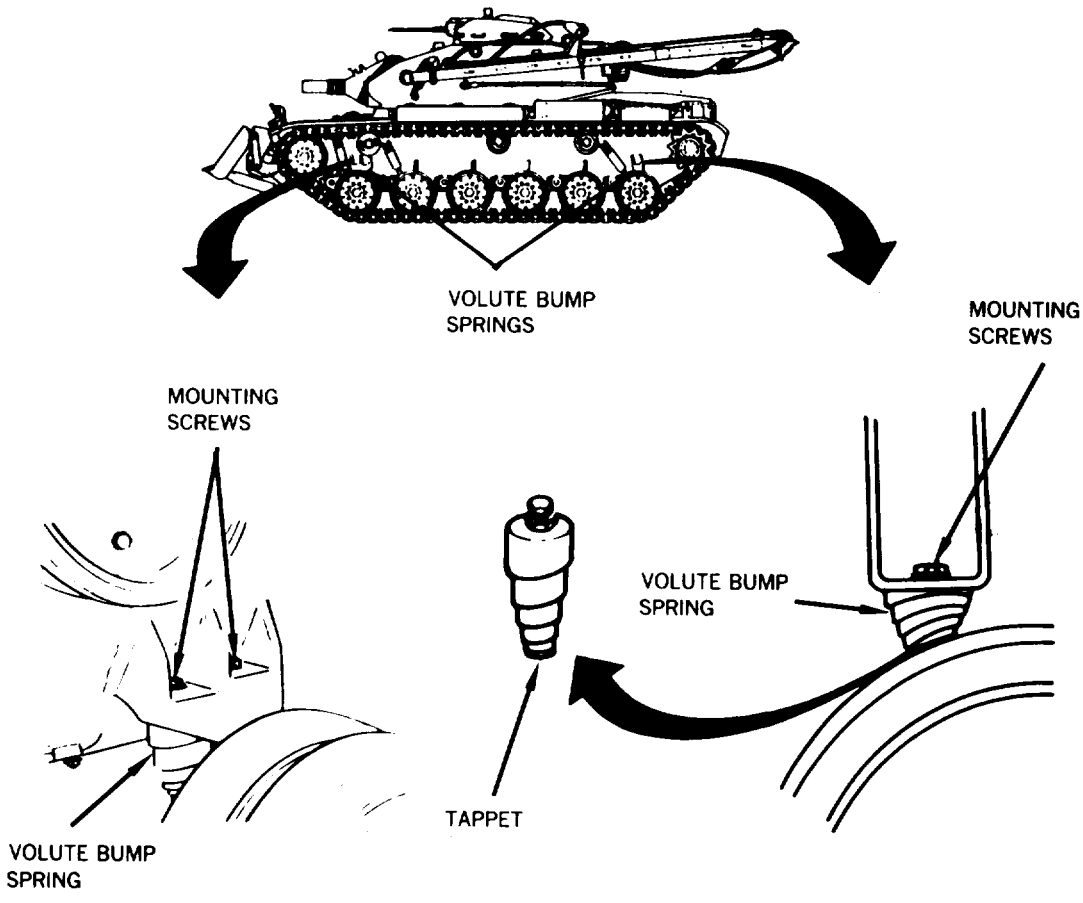
Track Support Roller Bearings Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Track Support Roller Bearings All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.2

For arctic operation, see FM 9-207

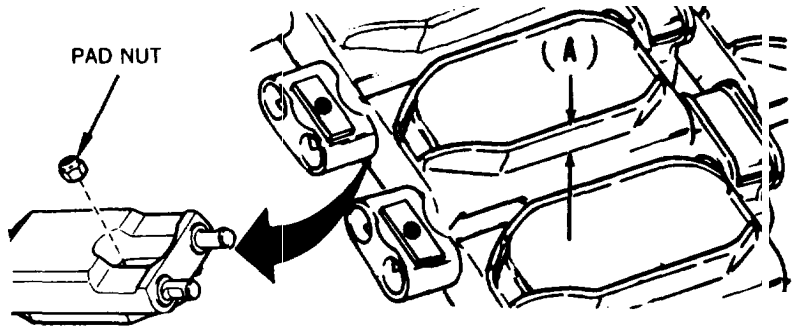
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
28	Semiannual	Volute Bump Springs (Left and Right Sides)	Check if volute bump springs are broken, cracked, deformed, or missing. Check that volute bump spring tappet is not damaged or missing. Check that mounting screws are tightened to at least 160 lb-ft (217 N•m).	**Broken** or missing springs.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
29	Semiannual	Track Shoes and Grousers (Left and Right Sides)	Check that pad nut on replaced track shoe is tightened to 240-270 lb ft (325-366 N•m). Measure metal grouser height (A). If grouser is less than 1/4-inch (0.635 cm), replace track shoe (page 14-91).	
30	Semiannual	Track End Connectors (Left and Right Sides)	To inspect end connectors, position wear gage (Item 29, Chapter 3, Section I) on end connector.	End connectors are worn or missing.

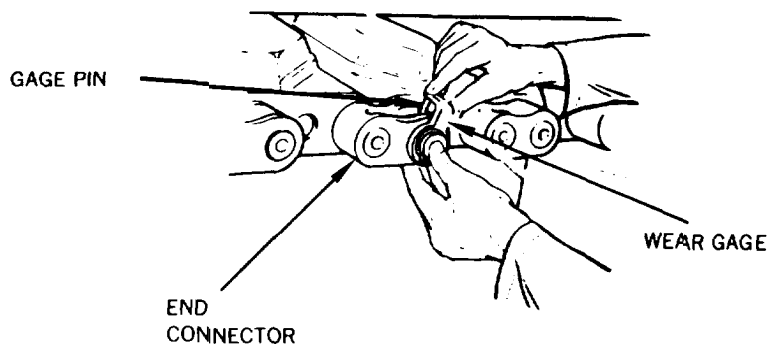


WARNING

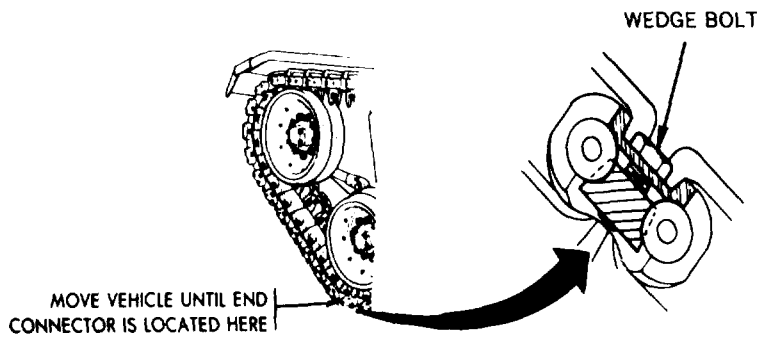
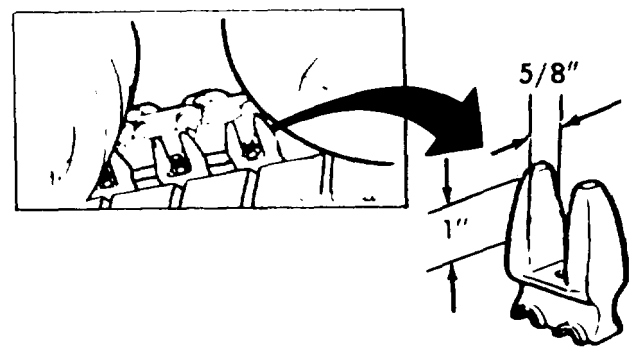
To avoid personal injury, wear goggles when hitting bolt or end connector with hammer.

Turn gage around both end surfaces of connector and depress gage pin at several positions. Check that pin touches at each position.

If pin touches at each position, end connector is okay. If pin does not touch, end connector is worn.

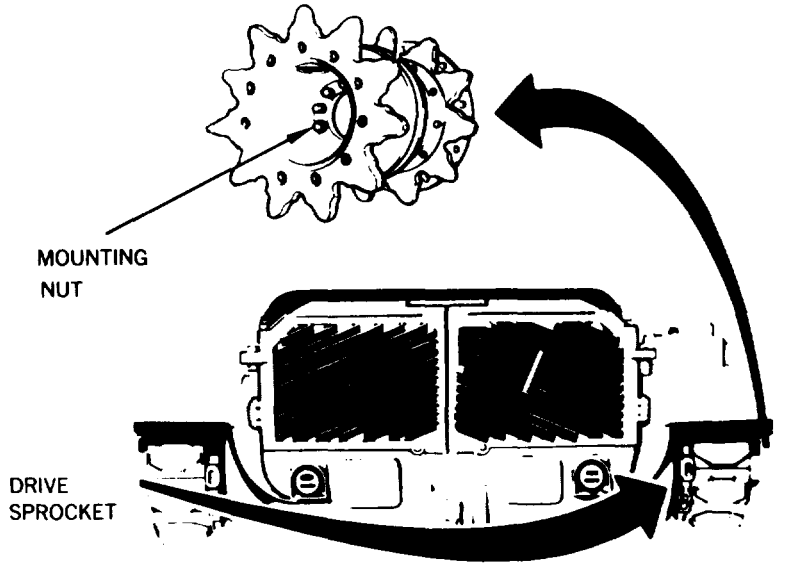


Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
31	Semiannual	Track Wedge and Wedge Bolts (Left and Right Sides)	Check that all wedge bolts are tightened to 140-160 lb-ft (190-217 N·m).	Loose or missing wedges/bolts.
				
32	Semiannual	Centerguides (Left and Right Sides)	Move vehicle as necessary to gain access to center guide(s). **Measure down 1 inch (2,54 cm) from top of centerguide.** **Check that centerguide thickness measures 5/8 in (1.6 cm) or more. Replace if less than 5/8 in (page 14-92).** **Check that centerguide nuts are tightened to at least 300 lb-ft (407 N•m).**	Worn centerguide or loose missing nuts.
				

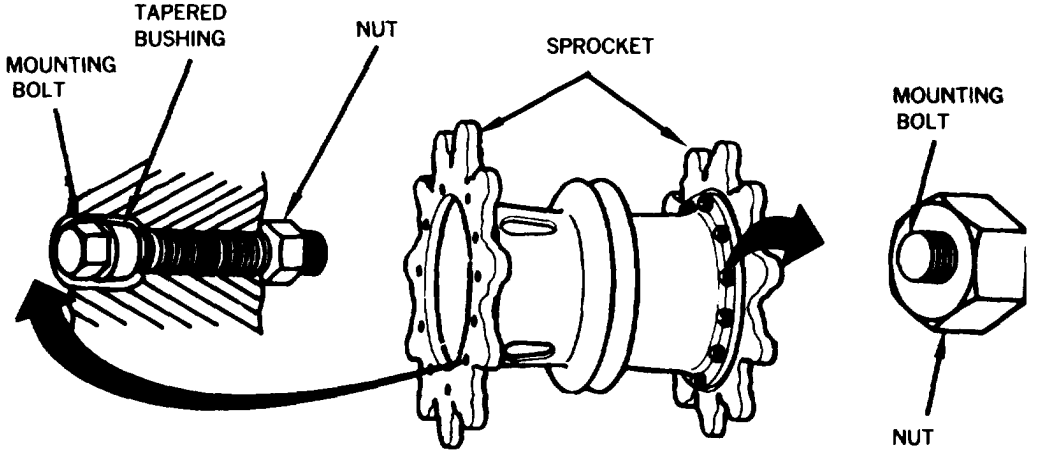
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
33	Semiannual	Sprocket Hub (Left and Right Sides)		
			Check that final drive hub mounting nuts are tight. Do not tighten loose nuts, replace them.	Any nuts missing or loose.
			Check that mounting holes are not egg-shaped (out of round). Shiny areas next to mounting nuts indicate out of round holes.	Mounting holes are out of round.
			Use a 0-600 lb-ft torque wrench to torque replacement nuts to 450-470 lb-ft (610-637 N·m).	
			Visually check final drive output seal for leaks by inspecting lower part of inboard side of drive sprocket for evidence of oil. If oil is present, final drive seal is defective.	Any Class III leak. Oil is contaminated.



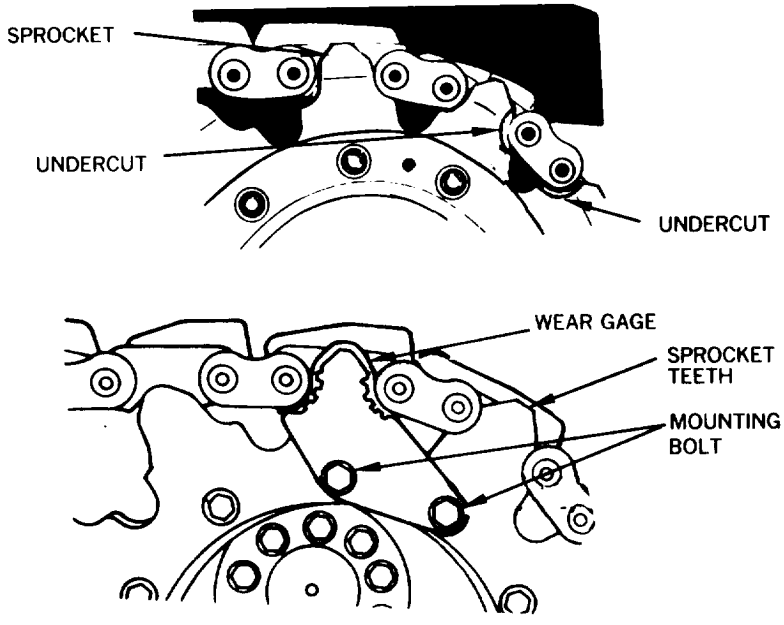
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
34	Semiannual	Drive Sprockets (Left and Right Sides)	Move vehicle as needed to perform sprocket checks.	
			Visually check that nuts for both inside and outside sprockets have not backed off mounting bolts. (Check that each bolt extends beyond nut approximately same number of threads.)	Any nuts are missing or loose.
			Do not tighten loose nuts. If nuts are loose, replace them. Tighten replacement nuts to 115-165 left (156-224 N•m).	
			If mounting bolts must also be replaced, replace tapered bushings. Lightly lubricate replacement bolts and thread into hub through bushings into sprocket. Tighten bolts to 140-190 lb-ft (190-257 N•m). Install replacement nuts and tighten to 115-165 lb-ft (156-224 NŽm).	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
34	Semiannual	Drive Sprockets Left and Right Sides) - Continued	Check sprocket teeth for wear by looking at undercut on sprocket (undercut is located on two teeth). Sprocket teeth are excessively worn if wear has reached bottom of undercut. If sprocket is not equipped with undercut indicators, use side "A" of wear gage (Item 28, Chapter 3, Section I) to measure wear on driving side of sprocket teeth. If sprockets have been reversed, use side "B" of gage. Place wear gage over two mounting bolts and check for wear. Sprocket teeth are excessively worn if wear has reached bottom of any notch on gage.	
			If sprocket teeth are excessively worn, reverse or replace sprocket (page 14-72).	Sprocket teeth are excessively worn on both sides.



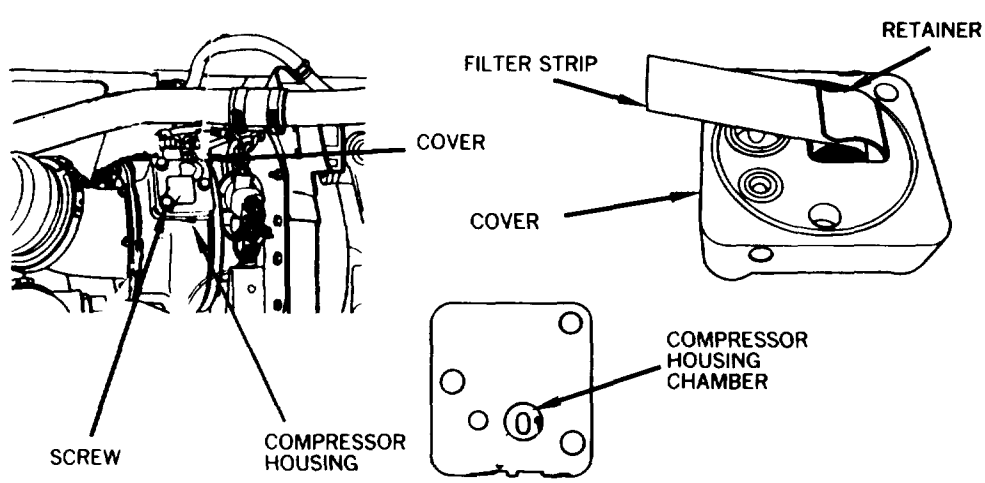
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
35	Semiannual	Dust Detector Filter Strip (Left and Right Sides) (If Equipped)		

NOTE

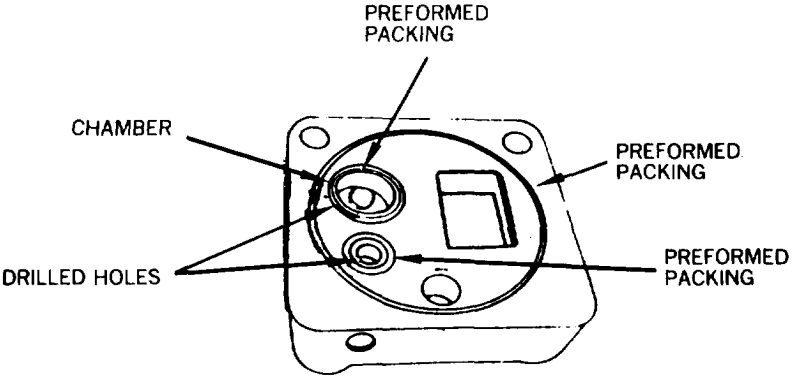
Service dust detector filter strip semiannually, or after 750 miles of operation, or whenever dust detector indicates ingestion of foreign matter.

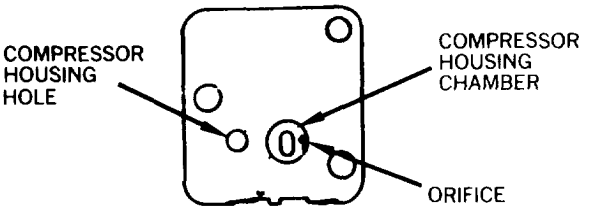
	Open top deck grille doors (TM 9-2350-222-10). Remove dust and dirt from filter strips cover and compressor housing. Loosen three screws securing filter strip cover to compressor housing. Remove cover. Remove filter strip with retainer from filter strip cover (page 7-148.12). Clean cover and mounting face of compressor housing. Inspect compressor housing chamber for contamination. Clean chamber as required.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

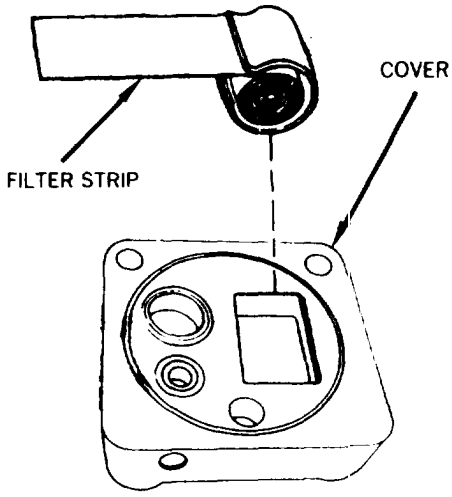
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Puny Mission Capable if:
35	Semiannual	Dust Detector Filter Strip (Left and Right Sides) (If Equipped) - Continued	Using pipe cleaner (Item 70, Appendix D), clean compressor housing chamber. Use a small (not more than 0.030 inch diameter) wire to clean orifice. Blow out chamber and orifice by mouth using a short piece of tubing (Item 71, Appendix D). Blow out (by mouth) compressor housing hole. Inspect cover chamber for contamination. Clean chamber as required. Using pipe cleaner (Item 70, Appendix D), clean drilled holes and blow out (by mouth). Replace three preformed packings (page 7-148.14).	

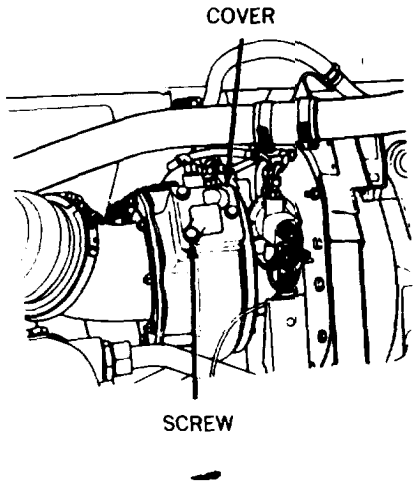




Preventive Maintenance Checks and Services for M728 Hull - Continued

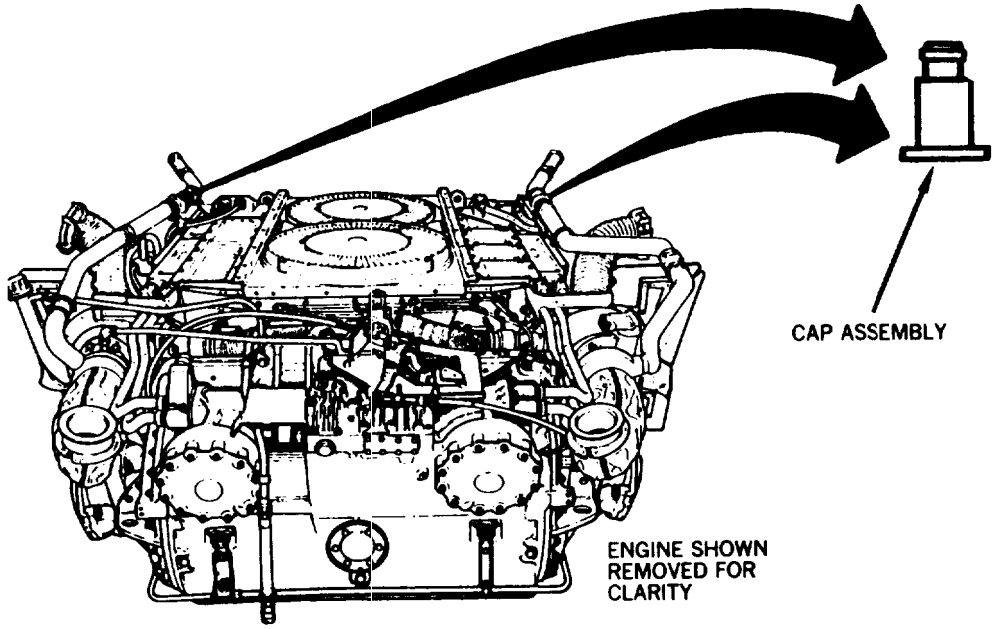
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
35	Semiannual	Dust Detector Filter Strip (Left and Right Sides) (If Equipped) - Continued	Service dust detector filter strip. Cut off approximately 2-inches from end of filter strip. Pull filter strip so that approximately 1/2-inch will extend past edge of cover when filter strip is installed. Install filter strip and retainer in cover. Filter strip must be approximately 1/2-inch past edge of cover. Ensure all orifices are clean. Install cover. Tighten three screws. Preform dust detector operational test (page 10-350.19).	





Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
36	Semiannual	Vehicle Exhaust Dust Ejector System (VEDES) (If Equipped)	Remove cap assembly (page 8-14. Inspect cap assembly to make sure flapper is not sticking or broken. If sticking or broken, install new cap assembly (page 8-16). Install cap assembly (page 8-14).	



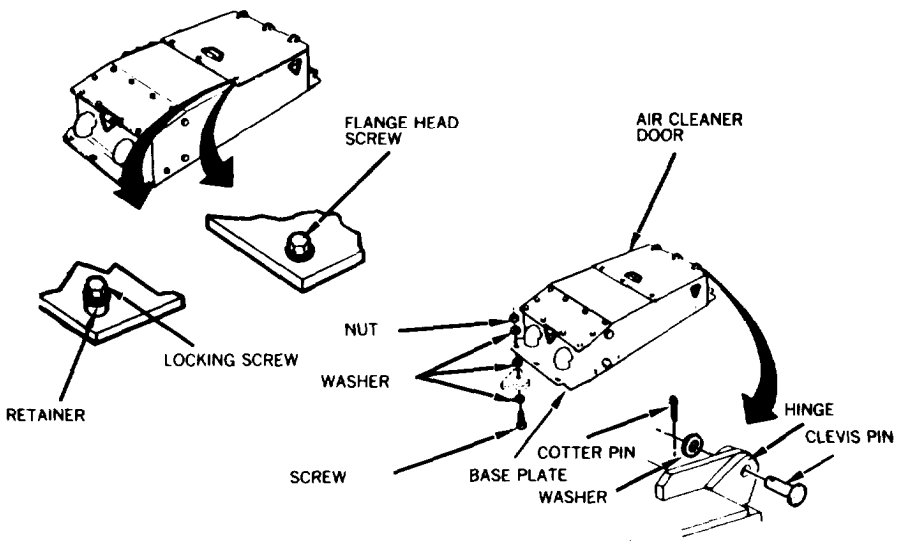
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
37	Semiannual	Air Cleaner (Left and Right Sides)		

NOTE

Air cleaner doors are equipped with either locking screws and retainers or with flanged-head screws.

	Check air cleaner door for loose or missing screws or damaged retainers. Replace missing or damaged door screws or retainers. Make sure screw holes are free of dirt. Check that clevis pins, washers, or cotter pins are not missing from hinges. Check that base plate is secured to tank outrigger by six screws, 18 washers, and six nuts. Check that hinges are not cracked. Check that access plate mounting screws are not loose or missing.	



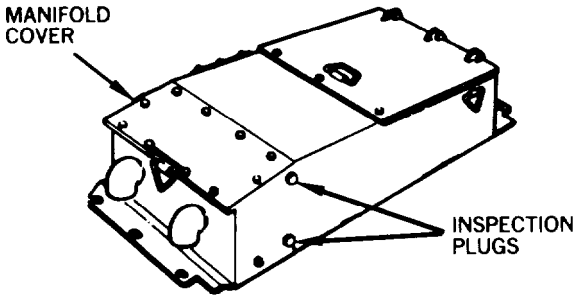
Preventive Maintenance Checks and Services for M728 Hull - Continued

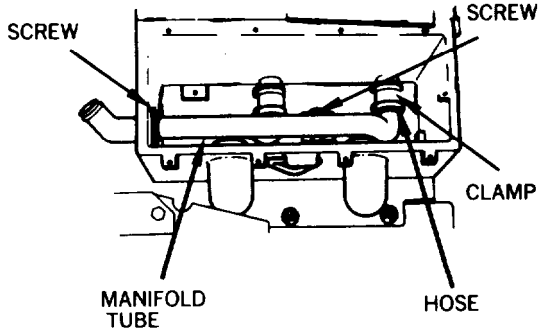
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
37	Semiannual	Air Cleaner (Left and Right Sides) - Continued		

WARNING

When using compressed air, use effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

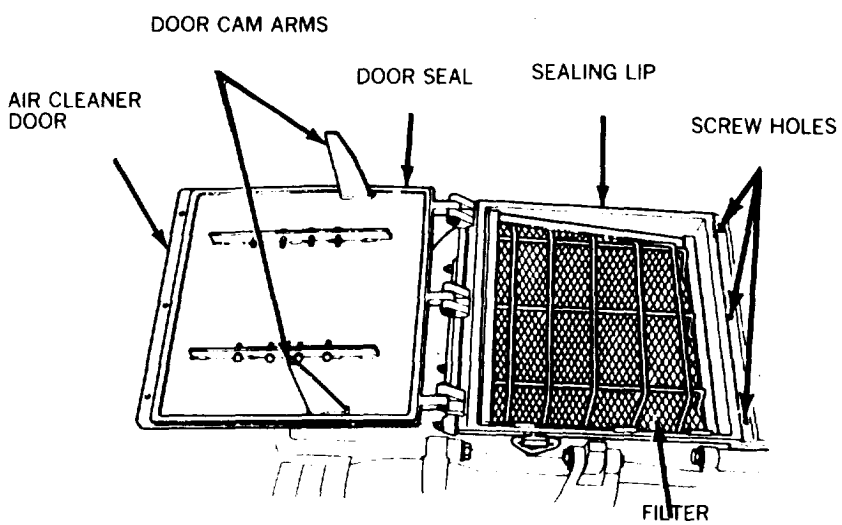
	Remove two inspection plugs. Using V-Pack cleaner (Item 34.1, Chapter 3, Section I), direct compressed air into upper hole until air coming out of lower hole is free of dirt.	
	If equipped with Vehicle Exhaust Dust Ejector System (VEDES), perform the following	
	Remove manifold cover (page 7-148.2).	
	Check that four clamps are not loose, damaged, or missing.	
	Check that two hoses are not damaged or loose.	
	Check that six mounting screws are not loose or missing.	
	Check that manifold tube is not damaged.	
	Install manifold cover (page 7-148.3).	





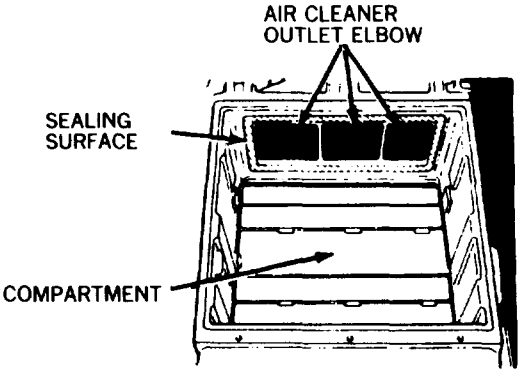
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
37	Semiannual	Air Cleaner (Left and Right Sides) - Continued	Open air cleaner door (page 7-103). Check that door cam arms are not bent, cracked, or missing. Check that air cleaner door seal is not hardened, damaged, missing, or does not have indentations. Check that screw holes are drilled through and free of dirt or obstructions. Check housing sealing lip for damage. If sealing lip is damaged, notify support maintenance of defective housing. Remove filter.	



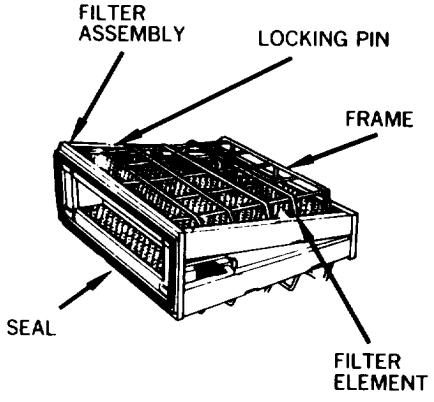
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
37	Semiannual	Air Cleaner (Left and Right Sides) - Continued	Check compartment for internal cracks and damage.	
			Check filter element sealing surface for dirt damage that would prevent proper sealing of filter element.	Element is damaged.
			NOTE Dust trails in the outlet elbow may be caused by damaged seal between air cleaner and outlet elbow, missing air restriction indicator (if equipped), or damaged air filter element.	
			Check inside of air cleaner outlet elbow for dust trails.	

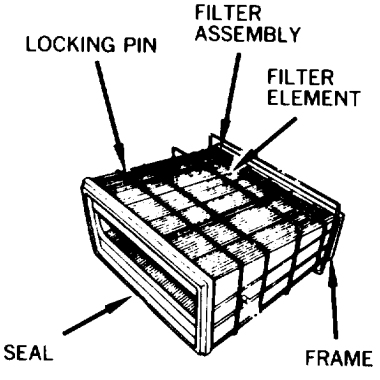


Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
38	Semiannual	Air Cleaner Filter (Left and Right Sides)	Service air cleaner filter assembly (page 7-110). Check that seal is not hardened, cracked, damaged, missing, or does not have permanent indentations. Check that frame or either locking pin is not damaged or missing. Check filter element for rips, holes, tears, or other damage.	Air filter seal is unserviceable.



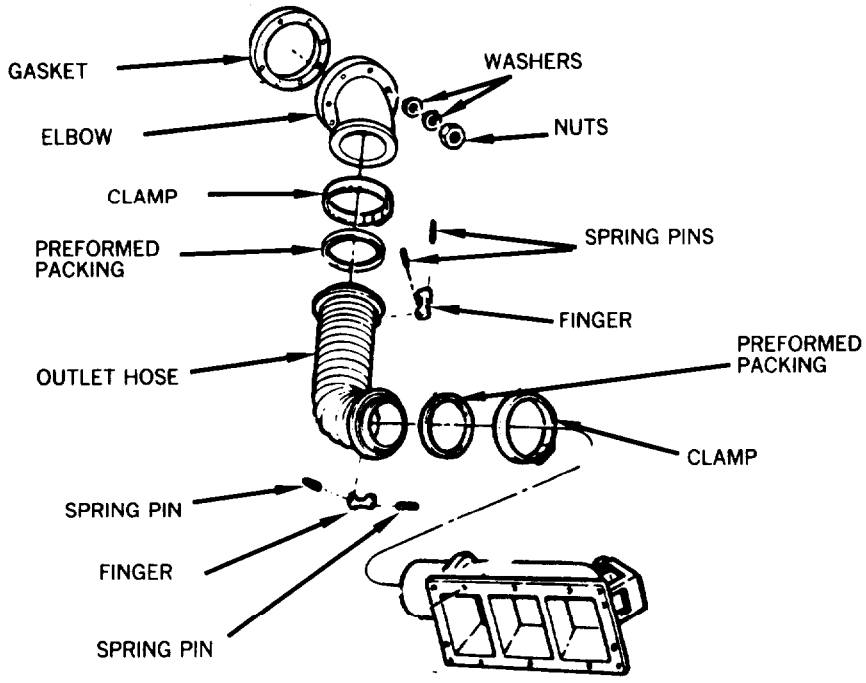
LATE MODEL



EARLY MODEL

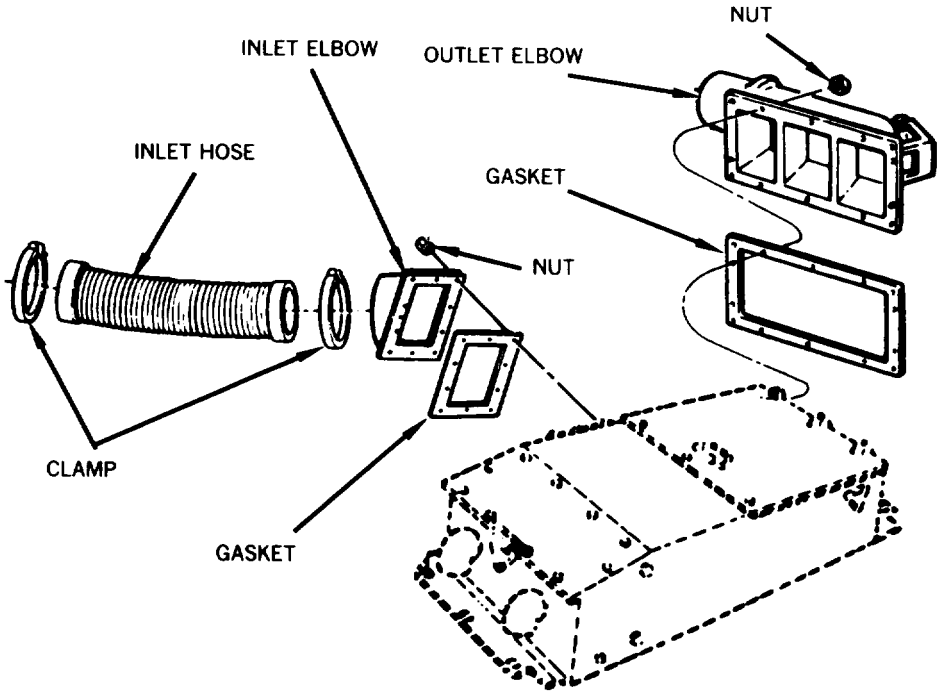
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
39	Semiannual	Air Cleaner Elbows, Hoses, and Clamps (Left and Right Sides)	Remove air cleaner outlet hose (page 7-73).	
			NOTE Dust trails in the outlet hose maybe caused by bad preformed packing, loose clamps, damaged outlet hose, or improper installation of hose.	
			Check that outlet hose is not cracked, torn, or leaking and that clamps are not loose or missing. Check that fingers and spring pins (if used) are not loose, damaged, or missing. Check that preformed packings are not hardened, cracked, or missing. Check that turbocharger elbow, gasket, washers, and nuts are not damaged or missing.	Cracked, torn, leaking, or missing outlet hose.



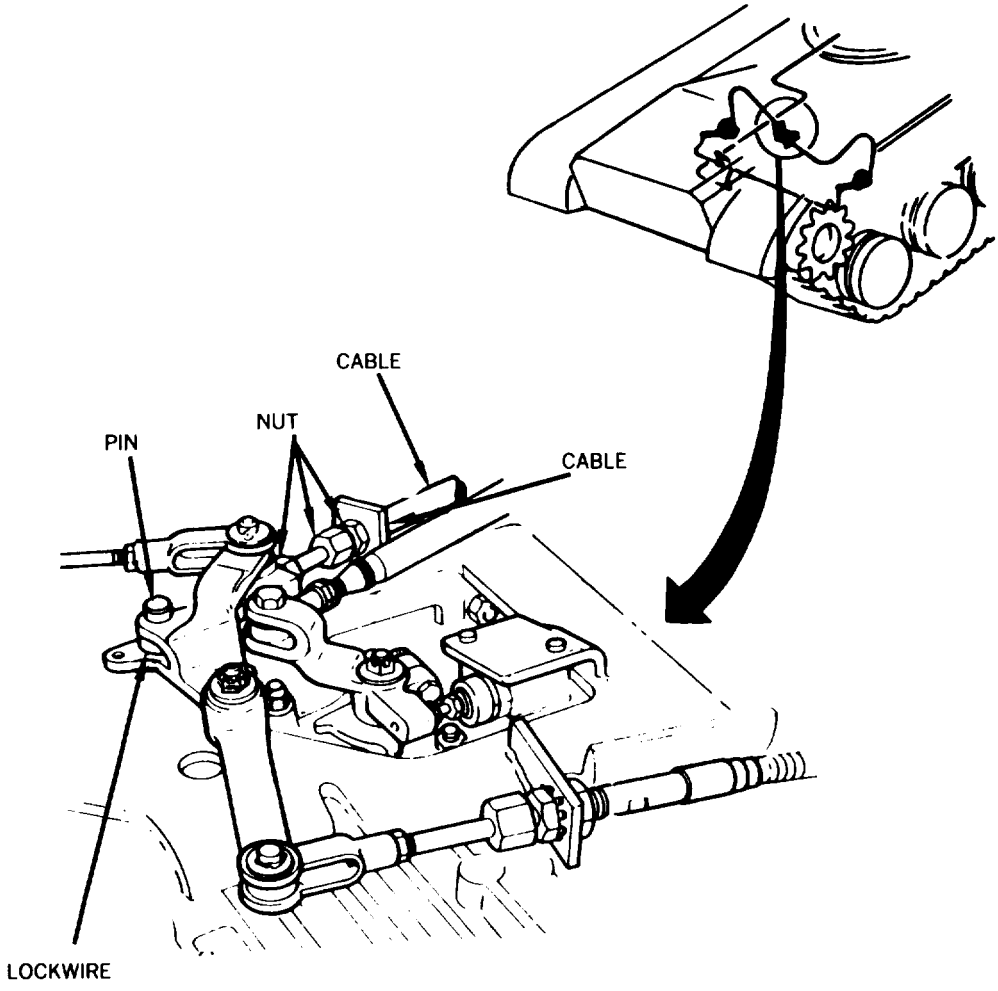
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Missio Capable if:
39	Semiannual	Air Cleaner Elbows, Hoses, and Clamps (Left and Right Sides) - Continued	Check that outlet elbow, inlet elbow, gaskets, and mounting nuts are not damaged or missing. Check that inlet hose is not torn or damaged, and that clamps are not damaged, loose, or missing. Install air cleaner outlet hose (page 7-74).	



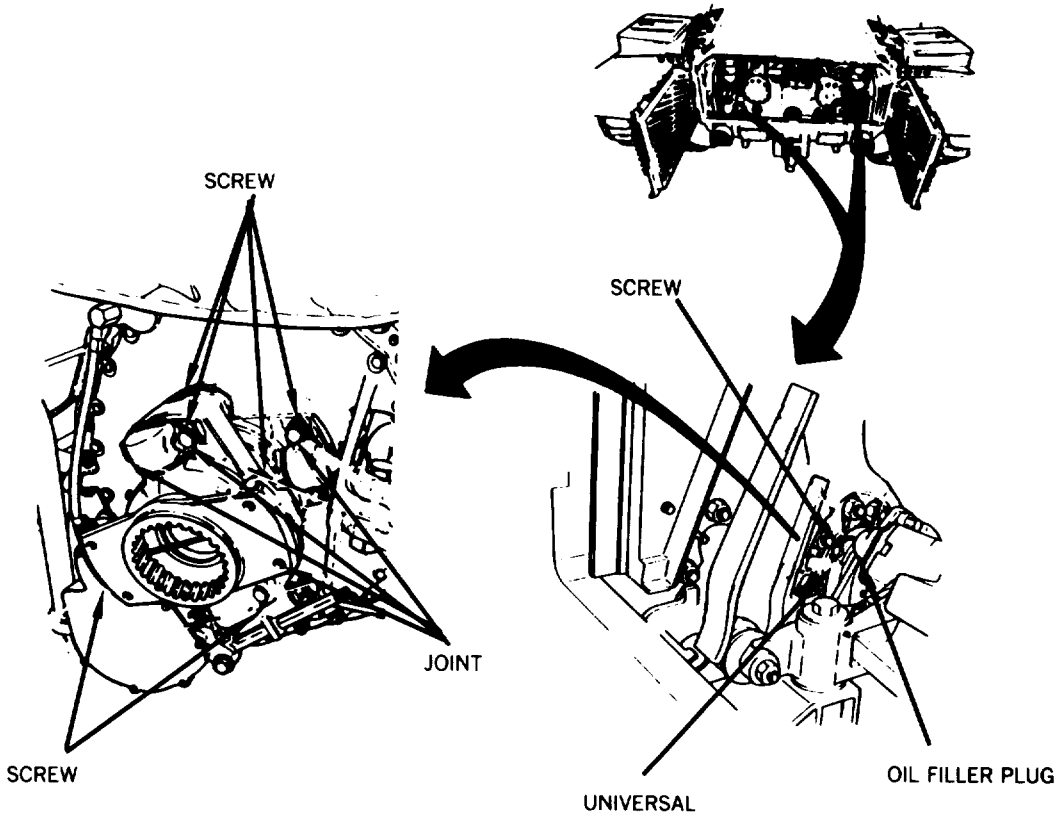
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
40	Semiannual	Parking Brake Control Linkage	Remove transmission shroud (page 9-20).	
			Check parking brake linkage in engine compartment for binding, corroded or damaged cable.	Parking brake inoperative.
			Check for broken or damaged bracket and rod end.	
			Check nuts and pin for damage.	



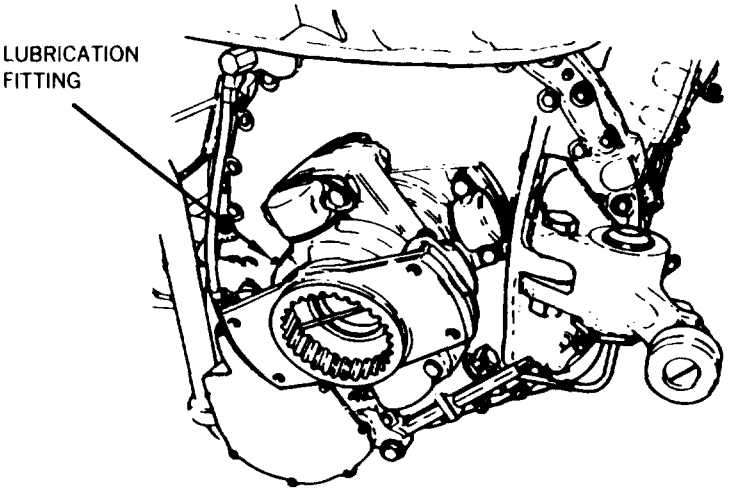
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
41	Semiannual	Final Drive Universal Joint and Disconnect Flange (Left and Right Side)	Check universal joint and disconnect flanges for cracks and damage. Check for missing or broken lockwire. If lockwire is missing or broken, check that screws are tightened to at least 118 lb-ft (160 N•m). It may be necessary to remove power plant (page 5-1) before torque can be checked. Do not tighten loose screws, replace them. Tighten new screws to 118-128 lb-ft (160-173 N•m).	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
41	Semiannual	Final Drive Universal Joint and Disconnect Flange (Left and Right Side) - Continued	Lubricate universal joints. If lubrication fitting holes are plugged with protective plugs, remove plugs and install lubrication fitting and lubricate. Leave fittings in universal joints.	



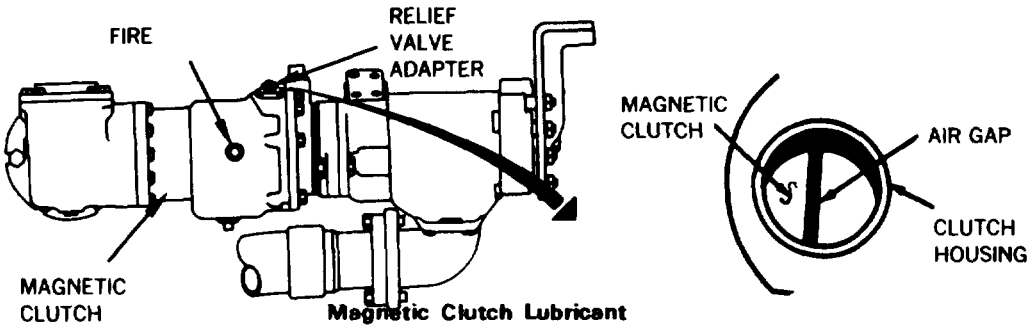
Final Drive Universal Joints Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Final Drive Universal Joints All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.5

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
42	Semiannual	Magnetic Clutch	Remove relief valve adapter. Set MASTER BATTERY switch to ON. Set HYDRAULIC PUMP switch to ON Using plastic or brass thickness gage, check that air gap is between 0.015 and 0.018 inches. If air gap is within tolerance, clutch is operable. If air gap is not within tolerance, notify support maintenance of defective clutch. Remove oil filler plug and check for oil level at lower end of filler plug hole. Add oil, as required to attain proper level. Clean filler plug and install.	



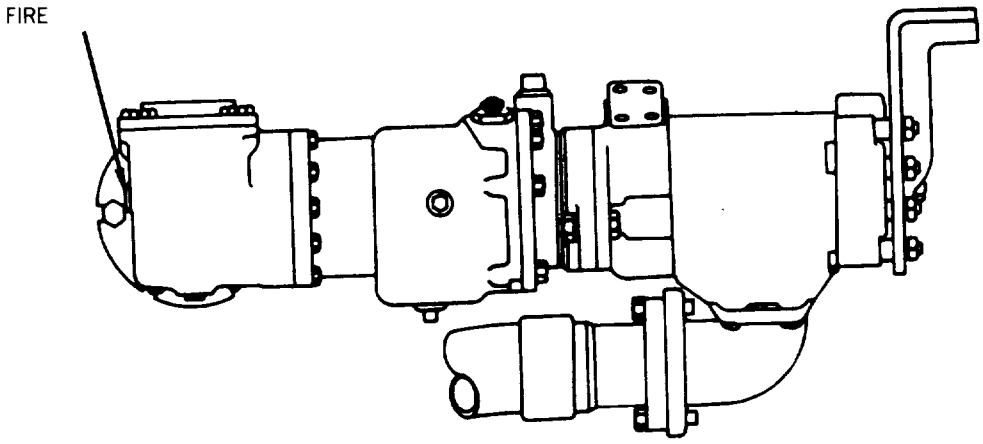
Magnetic Clutch Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Magnetic Clutch +5°F to +125°F (-15°C to +52°C)	OE/HDO-10 (O-237) MIL-L-2104	AR	S	0.2
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
43	Semiannual	Right Angle Drive	With engine running, set HYDRAULIC PUMP switch to ON. Check for excessive noise and any leaks. Remove plug. Check oil level. Fill to bottom of plug hole with vehicle on level ground. Clean and install plug.	Any excessive noise. Any Class III leak.



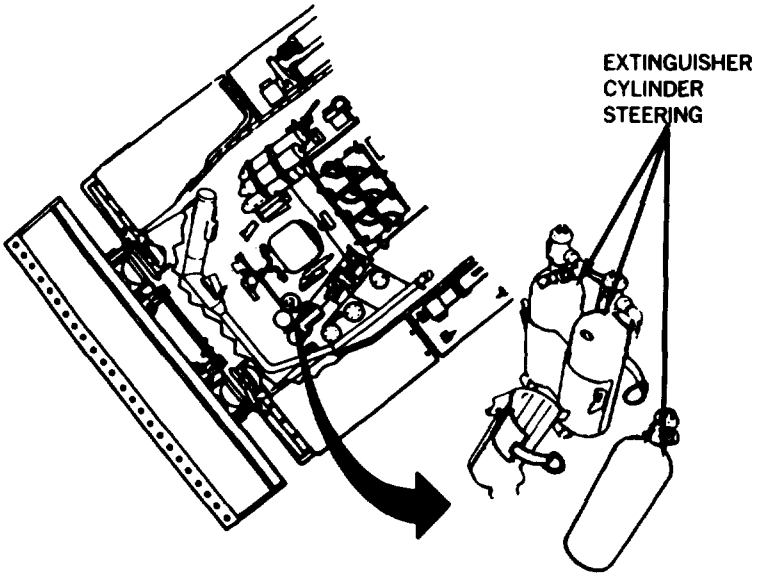
Right Angle Drive Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Right Angle Drive +5°F to +125°F (-15°C to +52°C)	OE/HDO-10 (O-237) MIL-L-2104	AR	S	0.2
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9 207

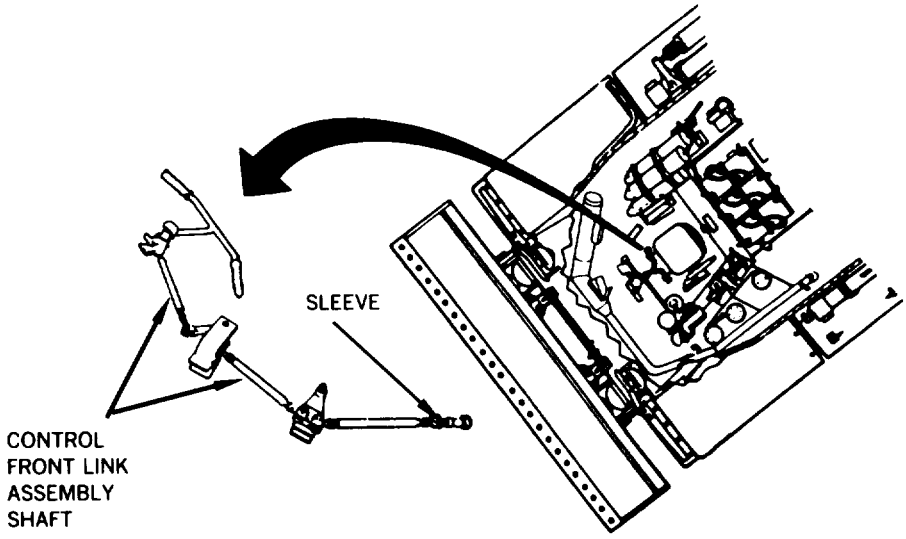
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
			WARNING Handle charged cylinders with care. Do not jar or subject cylinders to temperatures above 140°F (60°C). Accidental discharge could result in injury or death to personnel.	
44	Semiannual	Fixed Fire Extinguisher System	Remove three freed fire extinguisher cylinders from vehicle and weigh (page 21-49 or 21-52).	Extinguisher is missing.
			Check neck of cylinder for pressure test date. Time period since last test date must not exceed 5 years.	Last test date exceeds 5 years.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
44	Semiannual	Fixed Fire Extinguisher System - Continued	While fire extinguishers are removed, lubricate steering control front link assembly and sleeve.	



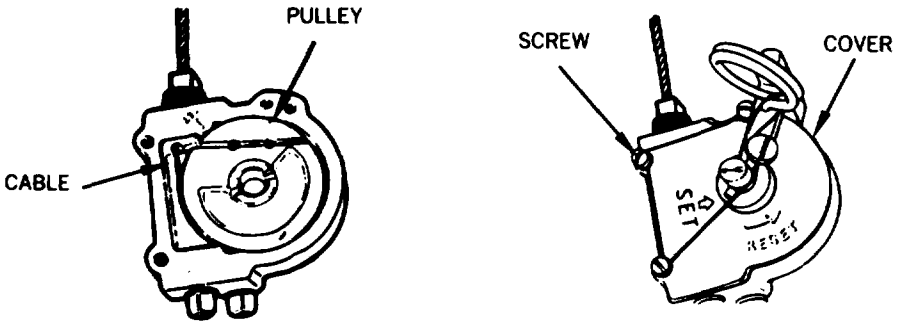
Steering Linkage Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Steering Control Linkage Steering Linkage Sleeve All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.2

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
44	Semiannual	Fixed Fire Extinguisher System - Continued	Remove three screws securing cover and remove cover. Clean pulley mechanism and surrounding areas. Check for proper operation of actuator mechanism. Coat pulleys and cables with WTR. Position cover and secure with three screws.	



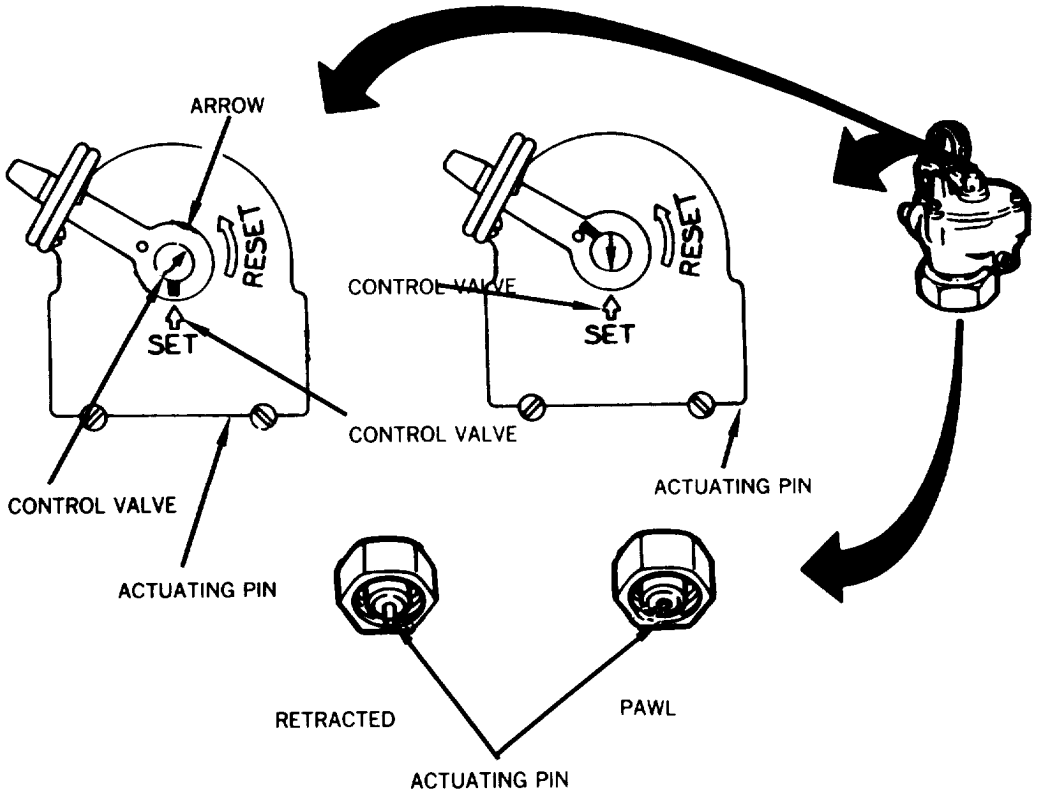
Fire Extinguisher Pulleys Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Fire Extinguisher Pulleys All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.1

For arctic operation, see FM 9-207

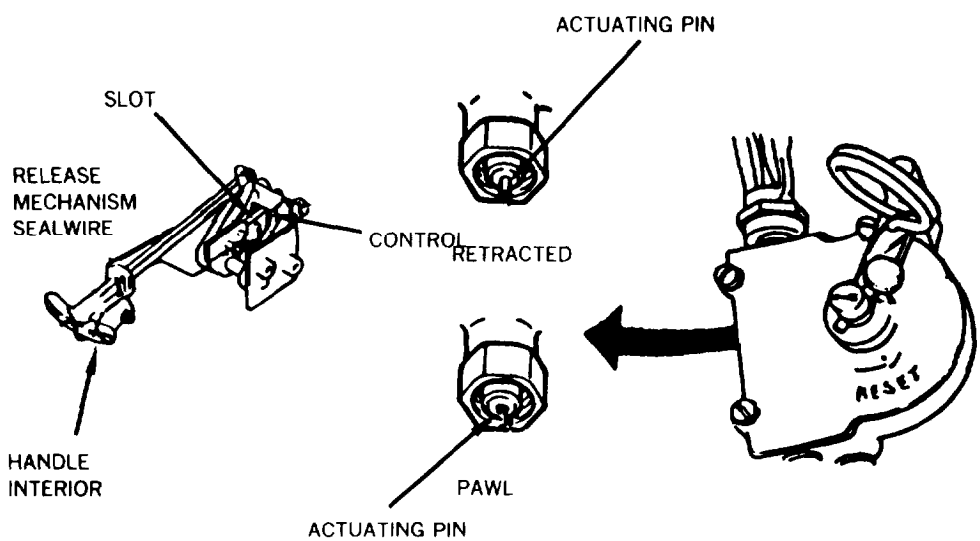
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
		WARNING Handle charged cylinders with care. Do not jar or subject cylinders to temperatures above 140°F (60°C). Accidental discharge could result in injury or death to personnel.		
44	Semiannual	Fixed Fire Extinguisher System - Continued	Reset control valves. Turn shaft counter-clockwise until arrow on cover end of shaft is aligned with SET arrow on cover. Check for retraction of actuating pins on No. 1 and 2 control valves.	



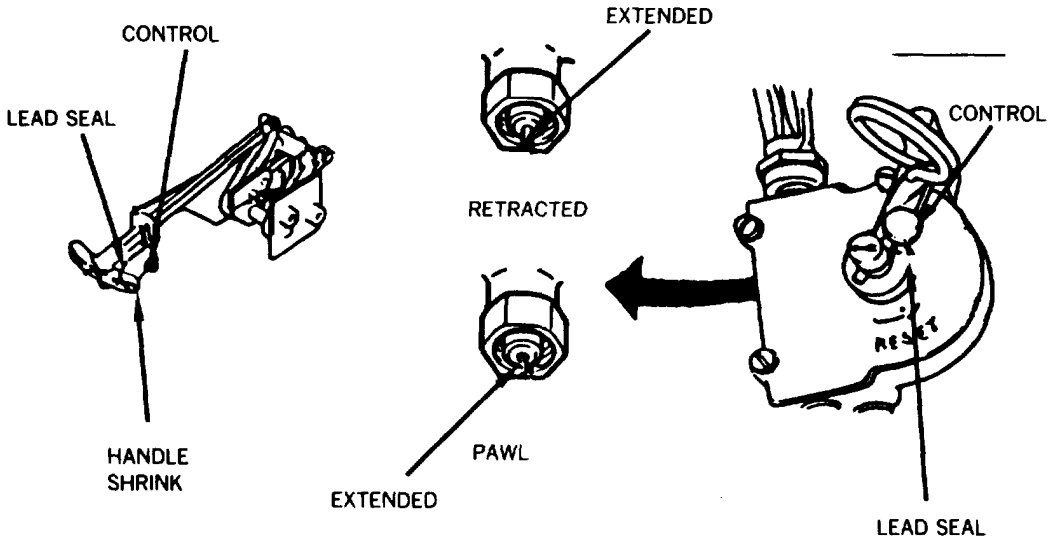
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
			NOTE Control valves must be held firmly in position while handle is being pulled. If this is not done, control valves may not be actuated.	
44	Semiannual	Fixed Fire Extinguisher System - Continued	Pull FIRE-PULL hard interior control handle and release. Check for smoothness and freedom of action of cables and controls. Check extension of actuating pin on No. 1 control valve. Push FIRE-PULL hard interior control handle and release again. Check for smoothness and freedom of action of cables and controls. Check for extension of actuating pin on No. 2 control valve. Reset control handle position pawl in slot.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
44	Semiannual	Fixed Fire Extinguisher System - Continued	Reset control valves. Turn shaft counter-clockwise until arrow on end of shaft is aligned with SET arrow on cover. Check for retraction of actuating pins on No. 1 and 2 control valves.	
			CAUTION Use only approved seal wire. Do not use safety wire or lock wire. Do not make additional loops/runs for additional strength.	
			Install seal wire and lead seal on No. 1 and 2 control valves and interior release mechanism.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
44	Semiannual	Fixed Fire Extinguisher System - Continued	Check each replacement cylinder for lead seal. Check each replacement cylinder for heat shrink tubing over safety valve outlet. Replace cylinder if heat shrink tubing is missing or broken.	Seal/lockwire broken.

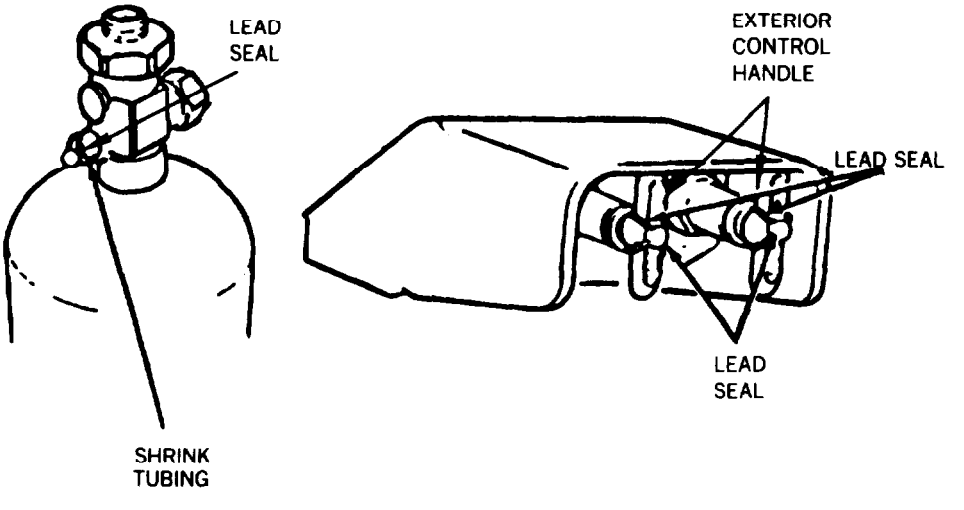
WARNING

Handle charged cylinders with care. Do not jar or subject cylinders to temperatures above 140°F (60°C). Accidental discharge could result in injury or death to personnel.

CAUTION

Use only approved seal wire. Do not use safety wire or lock wire. Do not make additional loops/runs for additional strength.

		Install seal wire and lead seals on 1st shot and 2nd shot exterior control handles. **Install three fixed fire extinguishers in vehicle (page 21-50 or 21-52.1).**	



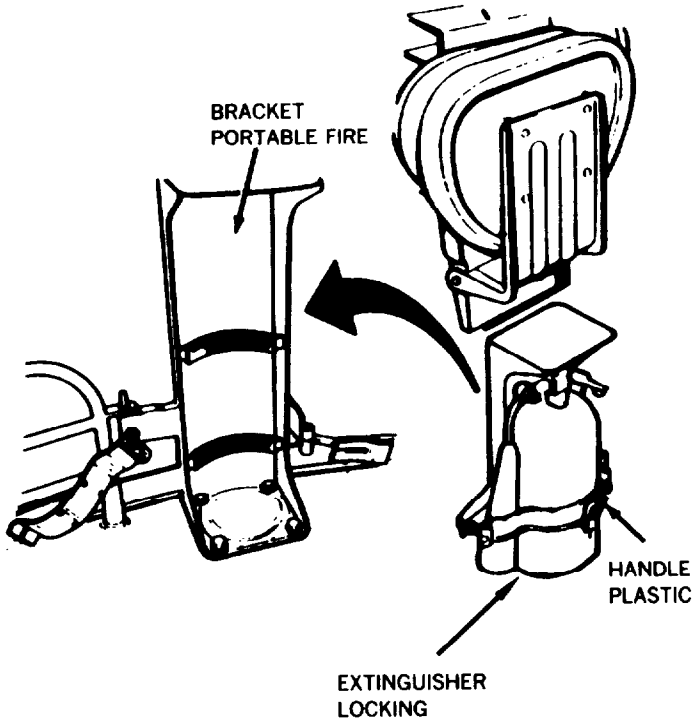
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
45	Semiannual	Portable Fire Extinguisher		

WARNING

Handle charged cylinder with care. Do not jar or subject cylinders to temperatures above 140°F (60°C). Accidental discharge could result in injury or death to personnel.

	Remove and weigh portable fire extinguisher (TM 9-2350-222-20-2). Check portable fire extinguisher mounting bracket for extinguisher secure attachment to rack on turret platform. Check locking handle for freedom of action.	Extinguisher is missing or seal/hardware is missing or broken.



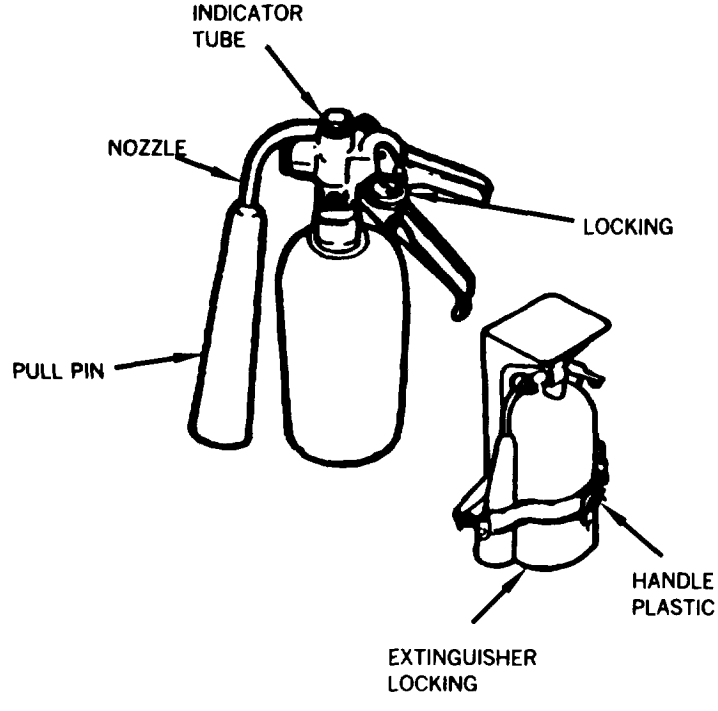
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
45	Semiannual	Portable Fire Extinguisher - Continued	Check that plastic indicator is intact.	

NOTE

Some fire extinguishers have a safety wire-lead seal attached to pull pin.

	Check that safety wire-lead seal is not broken or missing.	
	Check that tube is not kinked.	
	Check that nozzle is clear of obstructions.	
	Install portable fire extinguisher on mounting bracket.	
	Check that locking handle holds fire extinguisher firmly in position on mounting bracket.	



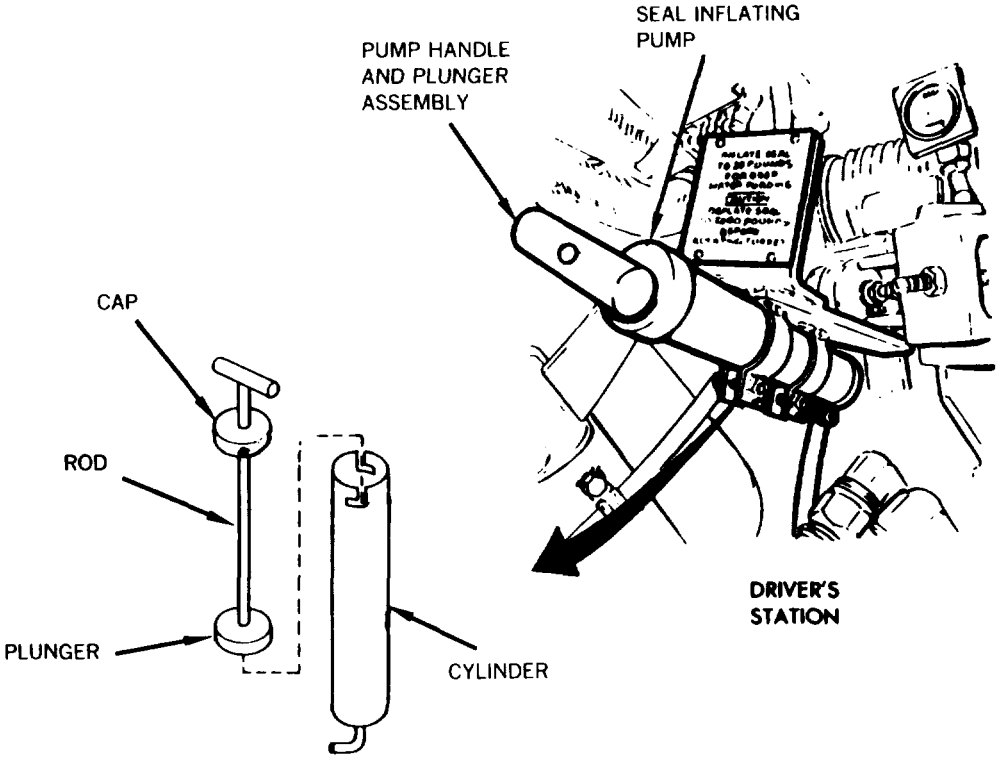
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
46	Semiannual	Turret Seal Hand Pump	To service seal inflating pump, remove pump handle and plunger assembly by turning cap counterclockwise then pulling out.	

WARNING

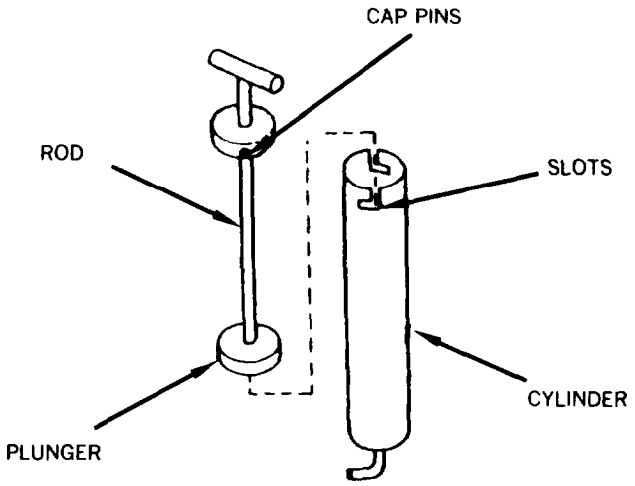
Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

		Clean inside of cylinder, plunger, and rod by rubbing lightly with crocus cloth (Item 14, Appendix D) and wiping clean with dry cleaning solvent (Item 54, Appendix D).	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
46	Semiannual	Turret Seal Hand Pump - Continued	Lubricate plunger and rod lightly with silicone compound (Item 32, Appendix D). Assemble pump by guiding plunger into cylinder. Aline cap pins with slots and turn clockwise to secure.	



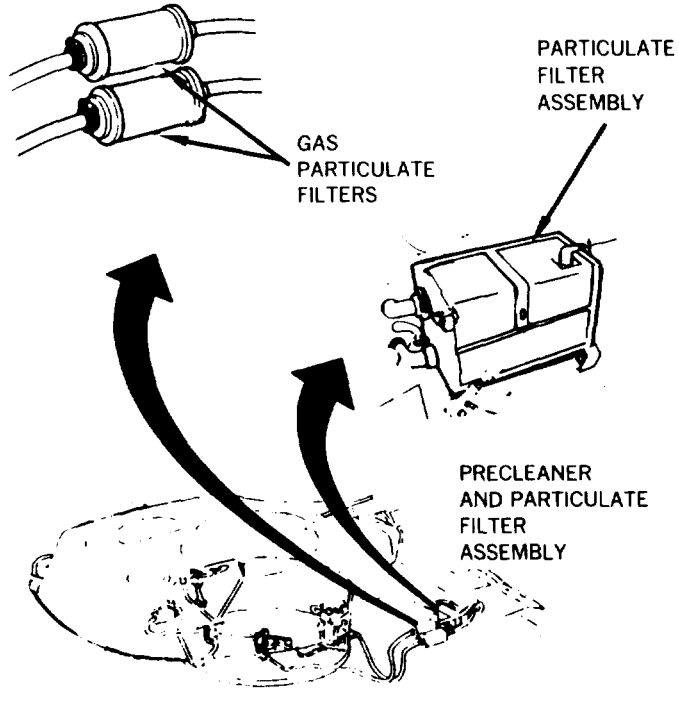
Turret Hand Seal Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Turret Seal Pump All Temperatures	N/A (S-736) MIL-S-8660	AR	S	0.3

For arctic operation, see FM 9-207

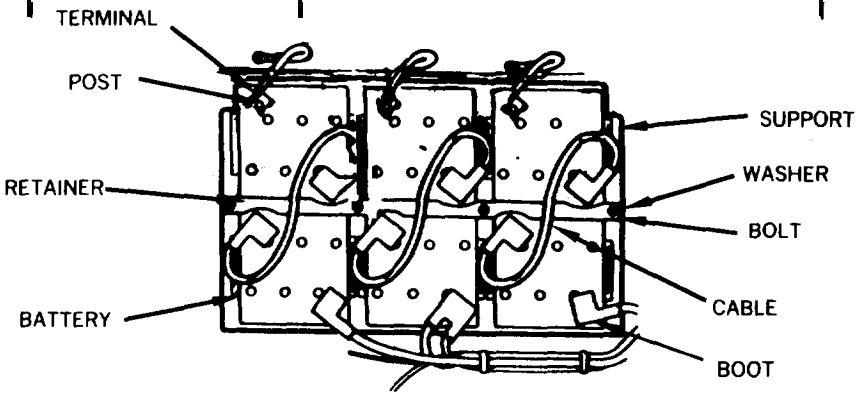
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
			WARNING • If NBC exposure is suspected, all filter media must be handled by personnel wearing protective equipment. Contact your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures. • Gas particulate filters must be replaced at the initiation of combat operations where the use of a blood agent (AC or CK) is expected or after a known blood agent attack.	
47	Semiannual	Gas Particulate Filter System	**For air flow testing see (TM 3-6680-316-10).** **Check precleaned and particulate filter assembly and two M18 gas particulate filters for dents/damages. Replace defective filters (page 22-2).** **Replace filters when notified by vehicle operator that gas filter change criteria has been met.**	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
48	semiannual	Hydraulic Line Filters (Forward and Rear)	Replace forward and rear filter elements (page 18-65).	
			WARNING Never allow flame or sparks near battery. Battery gas (hydrogen and air) is a dangerous explosive. **NOTE** For further maintenance instructions, see TM 9-6140-200-14.	
49	Semiannual	Batteries and Battery Retainer	Check cables, terminals, posts, batteries, supports, retainers, bolts, and washers for dirt, excess grease, and corrosion. If dirt, grease, or corrosion are found, remove batteries (page 10-293). Using a stiff brush and solution of water and bicarbonate of soda, clean cables, terminals, posts, batteries, supports, retainers, bolts, and washers. Install batteries if removed (page 10-298). Tighten terminals and retainer hold-down screws carefully to avoid damage to batteries. Apply light coat of grease (Item 36, Appendix D) to terminals. Check battery terminal protective boots for cracks and tears.	



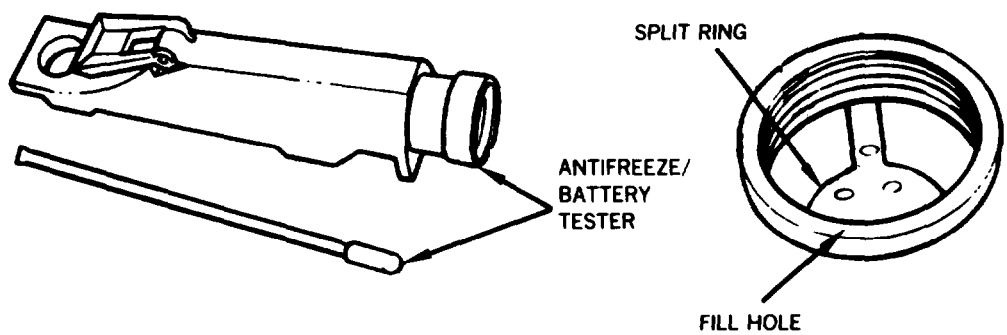
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
49	Semiannual	Batteries and Battery Retainer - Continued	Remove battery caps. Check that electrolyte covers plates at bottom of fill hole.	

WARNING

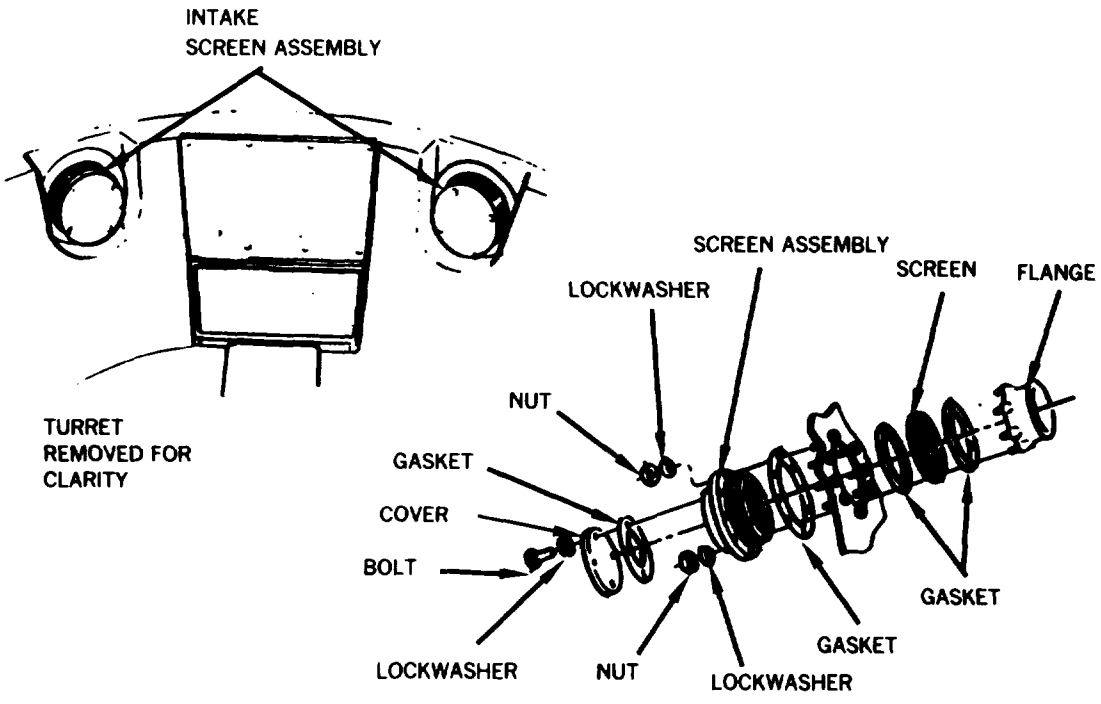
Do not fill battery cells from a pressurized water source. Electrolyte and battery corrosion can injure you. Wear safety goggles and gloves. If for any reason electrolyte or battery corrosion contacts the eyes, skin, or clothing, immediately flush with large amounts of fresh water. In case of eye or skin contact, see doctor immediately.

			If level is low, add distilled water to fill hole, as required, until level is above plates (if equipped with split ring fill to bottom of split ring). Do not overfill. If water is added to batteries, install caps, start engine, and charge batteries for 15 minutes (TM 9-2350-222-10). Wait 30 minutes for batteries to stabilize, then perform battery testing (page 10-289).



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
			WARNING Check that all personnel are clear of tank before traversing turret.	
50	Semiannual	Air Intake Screens and Covers (Left and Right Sides)	Traverse turret to expose either of two intake screen assemblies. Remove four bolts and lockwashers. Remove cover and gasket. Remove 14 nuts and lockwashers. Remove intake screen assembly.	
			NOTE • Do not remove flange from air cleaner hose. • Late models (improved clean air system) have only one gasket and no screen.	
			Check gaskets and screens for damage. If damaged, remove gaskets from metal parts and discard gaskets.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
50	Semiannual	Air Intake Screens and Covers (Left and Right Sides) - Continued		
			WARNING Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.	
			Clean adhesive from metal parts using dry cleaning solvent (Item 54, Appendix D). Secure new gaskets in place using adhesive (Item 2, Appendix D).	

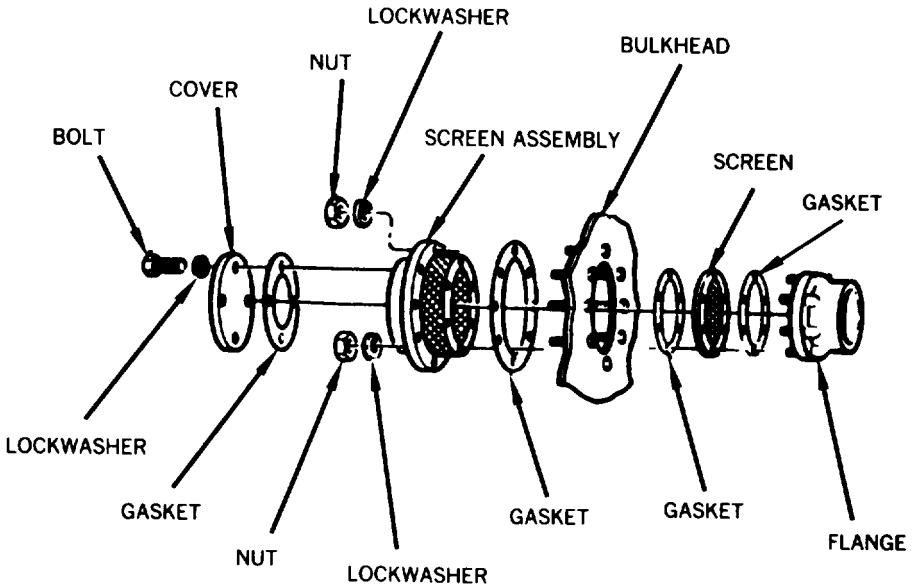
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
50	Semiannual	Air Intake Screens and Covers (Left and Right Sides) - Continued		

NOTE

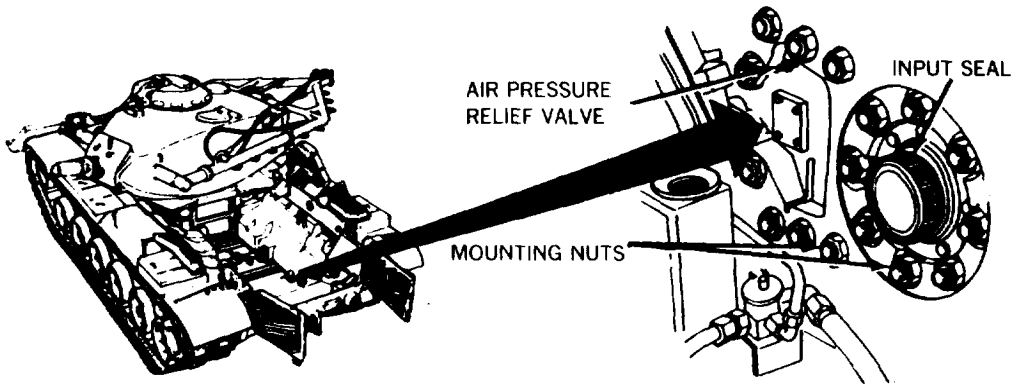
Late models (improved clean air system) have only one gasket and no screen.

		Secure gaskets to flange and screen. **Secure gasket to bulkhead and cover.** **Aline flange studs with holes in intake screen.** **Position intake screen assembly on bulkhead with holes alined. Install six new lockwashers and nuts on flange studs. Install eight new lockwashers and nuts. Position cover on intake screen assembly with holes alined. Install four new lockwashers and four bolts.**



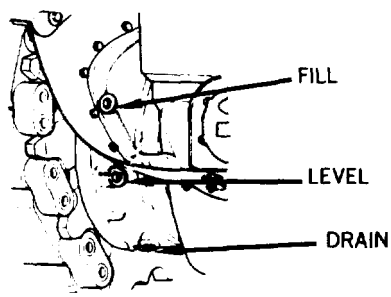
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not FuIly Mission Capable if:
51	Semiannual	Engine Compartment	Remove powerplant (page 5-1) and check engine compartment for oil, grease, sand and dirt. Clean engine compartment to remove all oil, grease, sand, and dirt.	
52	Semiannual	Final Drive (Left and Right Sides)	Visually check final drive input seal for leaks by inspecting area below final drive adapter for evidence of oil. If there are signs of leaks, seal is defective. Use 0-600 lb-ft torque wrench to check that final drive mounting nuts are tightened to at least 460 lb-ft (624 N. m). Do not tighten loose nuts. Nuts not meeting torque requirements must be replaced. Tighten replaced nuts to 460-500 lb-ft (623-677 N· m). If equipped, replace air pressure relief valve (page 12-8). If performing biennial PMCS, go to Item 85 (page 3-124).	Any class III



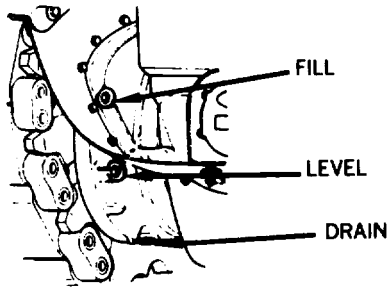
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
52	Semiannual	Final Drive (Left and Right Sides) - Continued	Check oil level. Check more frequently if there is evidence of leakage. Check before operating vehicle when oil is cold. To check oil level remove level plug. If oil has been overfilled, allow excess oil to drain into a suitable container. It is normal for a small quantity of oil (approximately 2 or 3 tablespoons), trapped behind plug, to run out when plug is removed. Check level plug (magnetic) and oil for metal chips or shavings. Check that oil level is up to lower edge of level plug hole. Carefully insert finger into plug hole and feel for oil, If oil level is up, clean and install level plug.	Any large metal chips or shavings.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
52	Semiannual	Final Drive (Left and Right Sides) - Continued	If oil level is low, install level plug, remove fill plug, and add oil. Check oil level at level plug. Repeat procedure as necessary until proper level is reached. Do not overfill. Clean and install fill and level plugs. When temperatures are constantly below +10°F (-12°C) for 7 days or more, change oil to OEA (MIL-L-46167).	



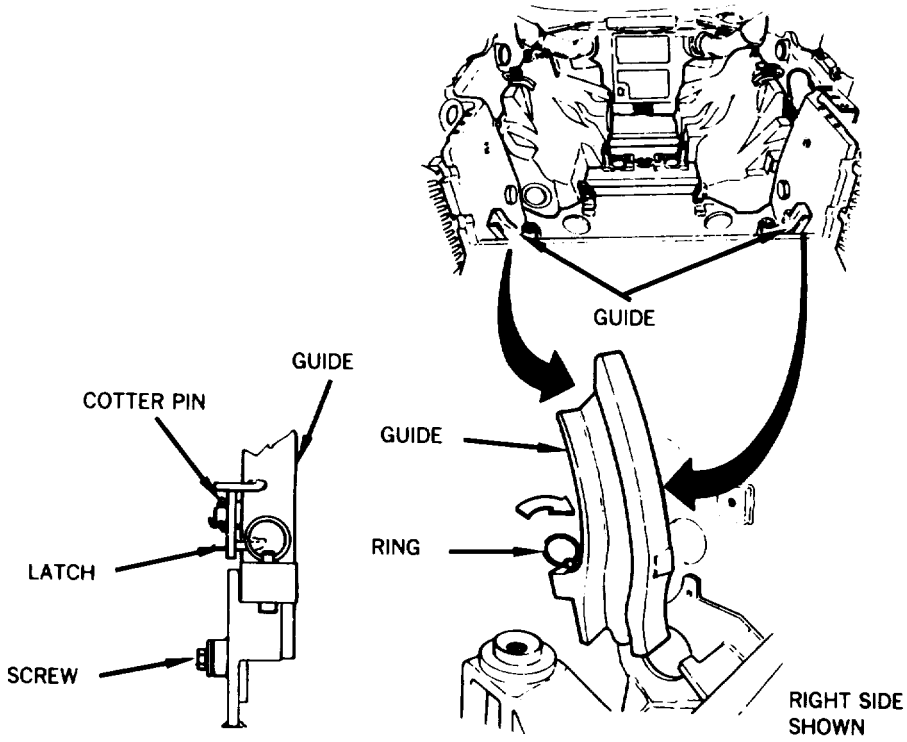
Final Drive Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Final Drive +5°F to +125°F (-15°C to +52°C)	OE/HDO-15/40 (O-1236) MIL-L-2104	AR	S	0.5
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

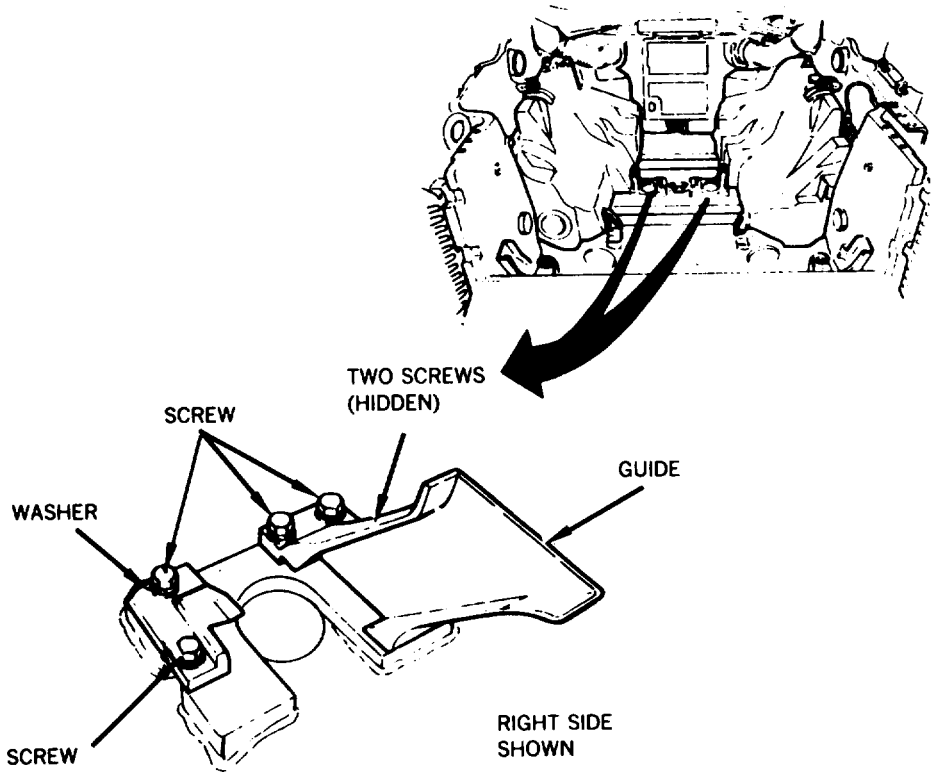
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
53	Semiannual	Powerplant Mounting Guides (Front and Rear)	Check rear guides for cracks and wear. Enter engine compartment. Pull up on ring. While holding ring up, move guide back and forth. Guide must move freely. Release ring. Ring must return to its original position. If ring does not return, spring (hidden) is defective. Check back of guide. Check that screw cannot be turned by hand. Check that cotter pin is not broken or missing. Lift latch up. Latch must move freely.	Any cracked or broken mounts.



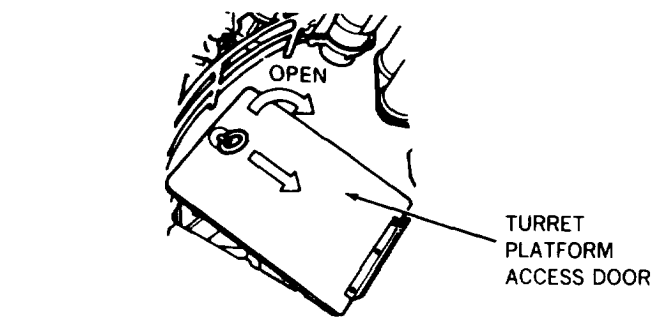
Preventive Maintenance Checks and Services for M728 Hull - Continued

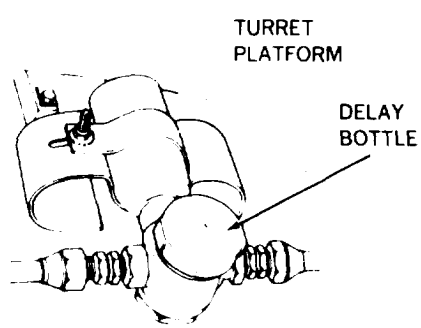
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
53	Semiannual	Powerplant Mounting Guides (Front and Rear) - Continued	Check front guides for cracks and wear. Check both guides for broken or missing washers and screws.	Any cracked or broken mounts.
			NOTE Three screws on right guide and center screw on left guide are inaccessible and cannot be checked.	
			Check that accessible screws are tightened to at least 155 lb-ft (210 N·m).	



Preventive Maintenance Checks and Services for M728 Hull - Continued

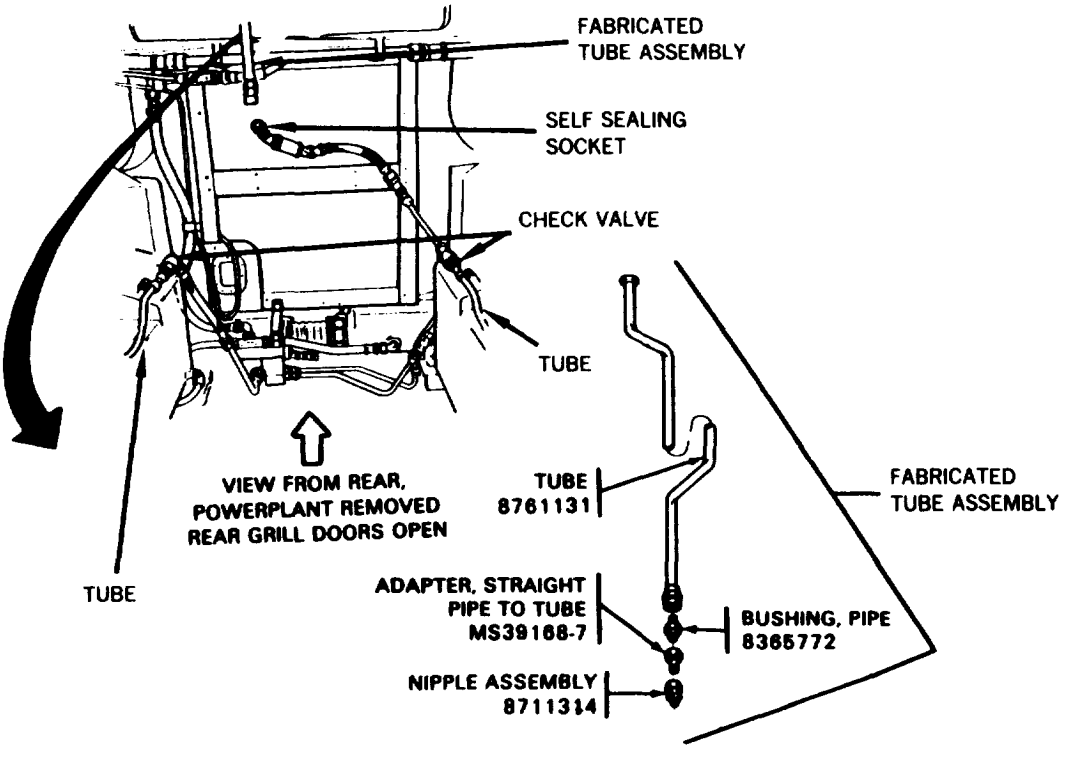
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
			NOTE One person is required to perform steps 1 through 4, 12 and 13. Three persons are required to perform steps 5 through 11.	
54	semiannual	Fixed Fire Extinguisher System	Step 1 Open turret platform access door. Traverse turret to gain access to fire extinguisher line and delay bottle on lower left forward wall of hull. Continue to traverse turret, as necessary, until fire extinguisher lines and fittings on floor and walls of hull are visible. Check for looseness of lines and fittings. Check for cracked, dented, or broken lines. Tighten loose fittings.	Fixed fire extinguisher system does not operate properly.





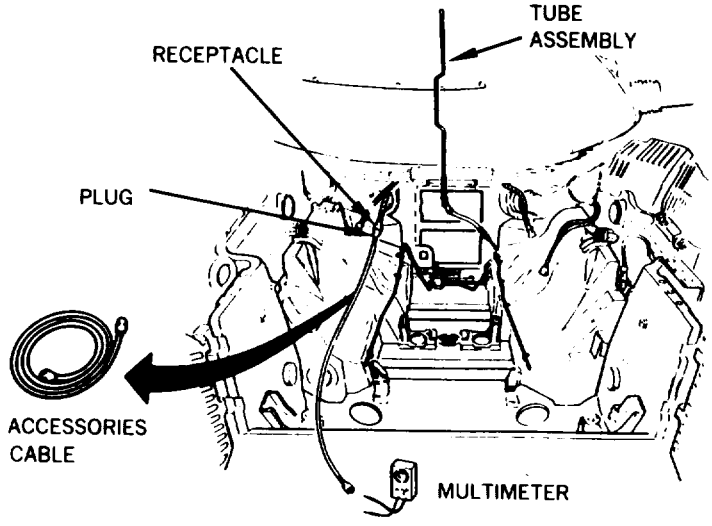
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	Step 2 Check that 18 spray holes, located in tubes are clear. Check that drain holes located at bottom of each tube adjacent to check valves are clear. Check tubes for punctures, damages, or dents larger than 1/16 inch (0.16 cm). Step 3 Attach fabricated tube assembly to engine quick disconnect upper discharge self-sealing socket.	



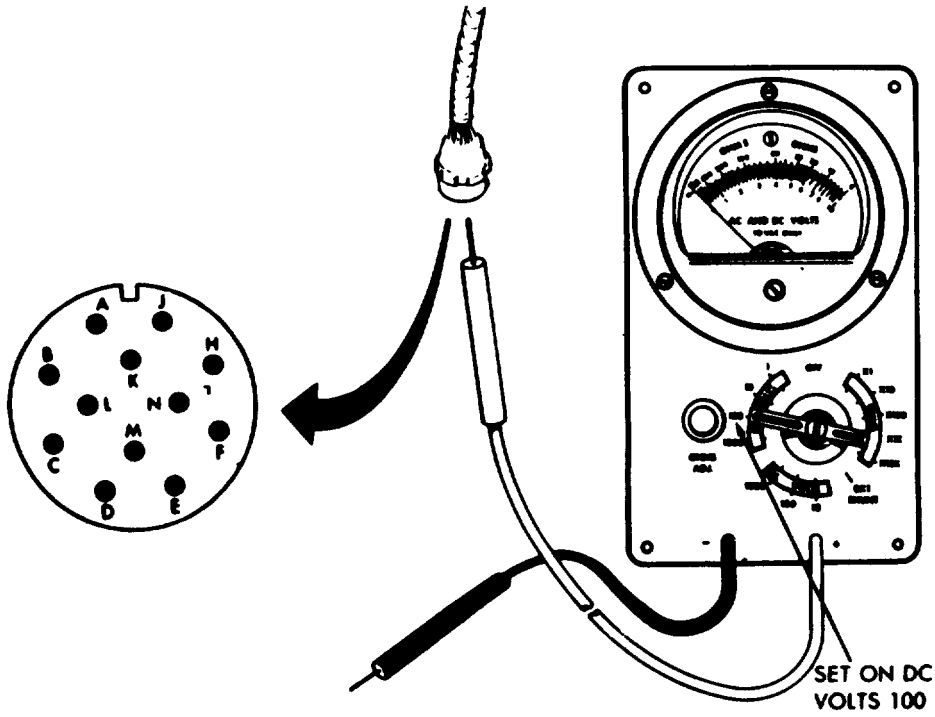
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued		
			CAUTION Do not traverse turret while tube assembly is secured to handrail.	
			Position crimped end of tube assembly in upright position and secure to turret handrail with webbing strap. Do not obstruct spray holes in tubs assembly with webbing strap or handrail. step 4 Attach plug of powerplant test run accessories cable (Item 30, Chapter 3, Section I) to receptacle of engine accessories harness at left side hull-engine disconnect.	



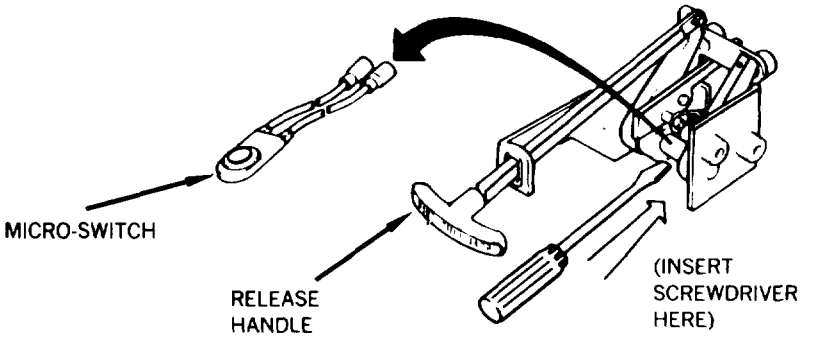
Preventive Maintenance Checks and Services for M728 Hull - Continued

No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued		
			NOTE Negative battery terminals must be connected for this procedure.	
			Set multimeter to 100 volts DC scale. Connect red probe of multimeter to pin B of accessory cable. Connect black probe of multimeter to vehicle ground.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	Station person No. 1 in driver's station, person No. 2 in turret, and person No. 3 at rear of vehicle just outside of engine compartment. Step 5 Person No. 1 set MASTER BATTERY switch to ON. Operate (and hold momentarily) ENGINE FUEL SHUT OFF switch. Person No. 3 check that multimeter reads 18-30 volts dc. Person No. 1 set MASTER BATTERY switch to OFF. **NOTE** Do not pull inside fire extinguisher release handle. Person No. 1, insert 6-inch flat tip screwdriver from front side between fuel shut-off switch guard and release cam. Depress (and immediately release) micro-switch located in release mechanism handle. Step 6 Person No. 3 check that multimeter reads 18-30 volts dc for a minimum of 10 seconds.	

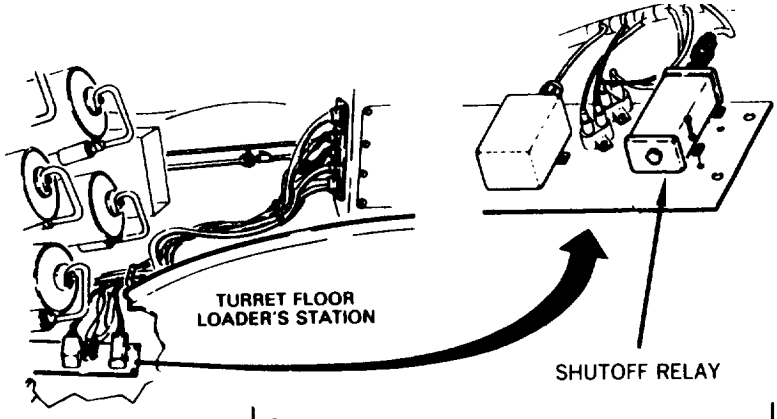


Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	3emiannual	Fixed Fire Extinguisher System - Continued	If multimeter indicates 18 to 30 volts dc for less than 10 seconds in duration, fire extinguisher fuel shut-off relay is defective. If no voltage is observed, troubleshoot fire extinguisher fuel shut-off switch circuitry (page 4-798).	

NOTE

Do not disconnect multimeter at this time (multimeter is needed for Step 9).



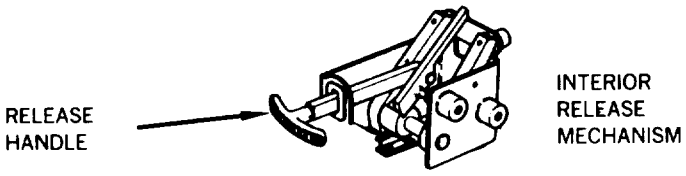
Step 7

NOTE

. Before proceeding to step 7, ensure all personnel are familiar with steps 7 through 11. This is necessary to ensure all procedures are completed during the short duration of the cylinders' discharge (9-15 seconds).

. Complete steps 7 through 11 before attempting repair or retest.

Person No. 1 pull inside release handle. Announce firing and push handle back in.



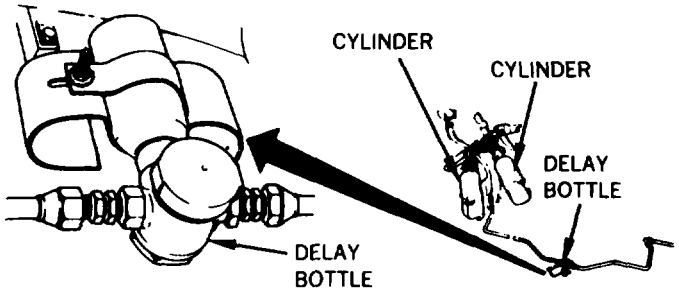
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued		

NOTE

Leaks can be located by checking for frost on system lines immediately after system is fired. If check is not completed immediately, all lines normally will frost within 20-30 seconds and cover frost formed due to leaks.

	Person No. 1 and 2, immediately after firing announcement, check system from cylinders to delay bottle for sound of leaks, visible vapor, or frosting around leak. **If vapor does not appear from engine compartment within 10 seconds after handle is pulled, proceed to Step 13. If vapor is seen from only one tube in engine compartment, proceed to Step 12.** **Person No. 2 also check time interval from firing announcement to exit of vapor from engine spray tubes. Time interval must be from 6 to 10 seconds.** **If time interval is less than 6 seconds or more than 10 seconds, replace defective delay bottle (page 21-66.1).**	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	Step 8 Person No. 2 check downstream of delay bottle for sound of leaks, visible vapor, and frosting around leak. step 9 As firing of extinguisher is announced, person No. 3 check that multimeter immediately shows 18-30 volts .	

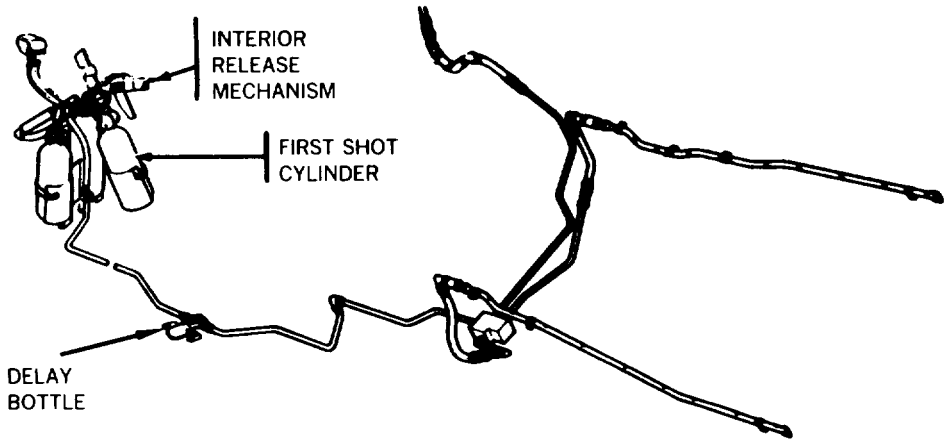
WARNING

Handle charged cylinders with care. Do not jar or expose to temperatures-above- 140°F (60°C). Accidental discharge could result in injury or death to personnel.

NOTE

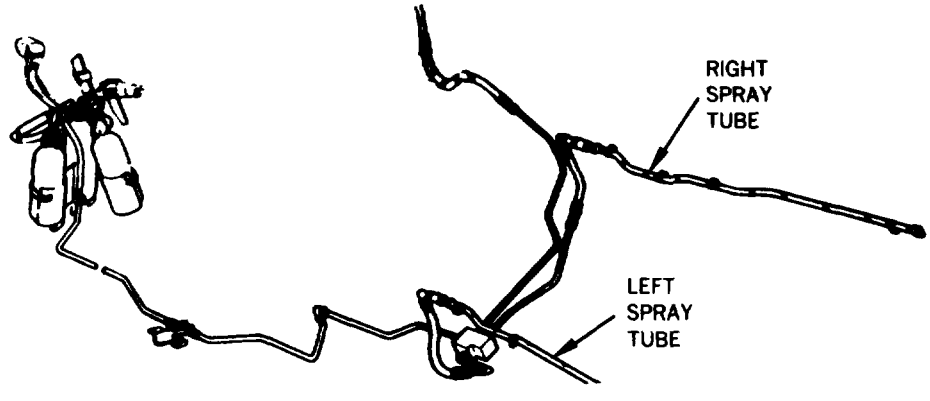
Observation of the CO_2 discharge must be performed when little or no wind is present. Start timing when CO_2 cloud spray is first seen. Stop timing when CO_2 cloud starts to shrink.

	Step 10 Person No. 3 check that time of visible duration of CO_2 cloud/spray is no more than 8 seconds.	



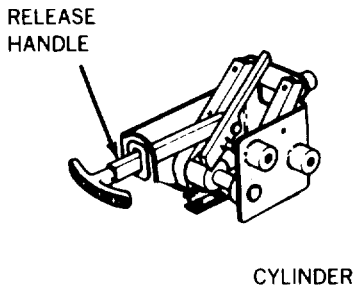
Preventive Maintenance Checks and Services for M728 Hull - Continued

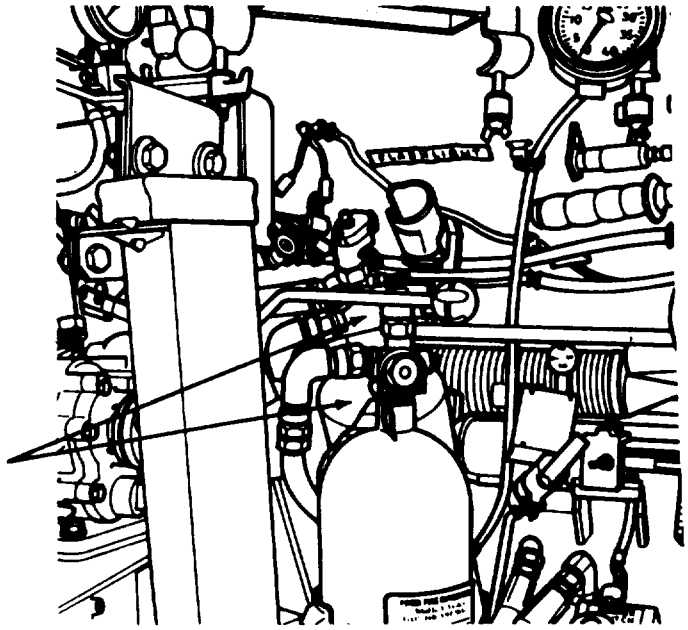
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	Start timing when CO_2 cloud/spray is first seen. Stop timing when CO_2 cloud/spray starts to shrink. Check that CO_2 cloud/spray in hull area is continuous and uniform with no voids in upper and lower rows of spray holes in left and right spray tubes. If cloud spray is not continuous and uniform, check for punctures, leaks, and clogging. Correct defects before continuing with preventive maintenance checks. Check that CO_2 cloud/spray from left and right spray tubes are of equal size. If either cloud/spray is 1/3 size of other, check for restricted tubes and valves.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	semiannual	Fixed Fire Extinguisher System - Continued	Immediately after timing cloud/spray, person No. 3 check that tube assembly and both hull extinguisher tubes are frosted their full length. All tubes must be frosted their full length. If any tube is partially frosted, check for clogging in spray tube. If not frosted at all, check for faulty check valve or clogged supply line, If duration of spray cloud is more than 8 seconds, immediately check to see if No. 2 and 3 cylinders are frosted. If cylinders are frosted (discharging), interior release handle mechanism is defective. Replace release handle mechanism (page 21-14).	





Preventive Maintenance Checks and Services for M728 Hull - Continued

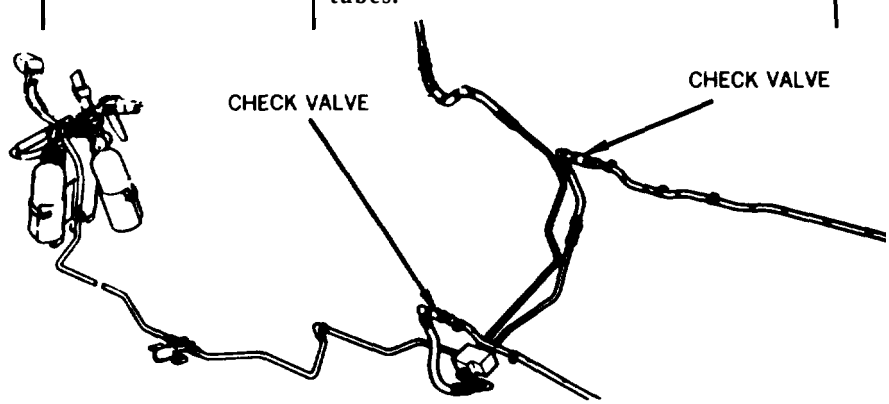
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	Clocked time for CO_2 cloud duration is valid only when all other checks (non-electrical) are acceptable. If all checks are acceptable, except cloud duration time, No. 1 cylinder was defective. If any defects are found, correct defects, and retest. If no defects are found, continue with Step 12. Step 11 If retest is needed, reset control handle by positioning pawl into slot, reset No. 1 control valve, and replace No. 1 cylinder. Repeat steps 7 through 10 to retest cloud/spray duration time.	

NOTE

If delay bottle is still open (from having fired No. 1 shot), there will be no (6 to 10 second) delay of CO_2 when a subsequent shot is fired. Opened delay bottle may take 2 to 4 hours to thermally reseat before it can delay another CO_2 shot. (Resetting is not necessary to time cloud duration.)

Step 12

If only one spray tube discharges, check for defective valve on other tube and for clogged or pinched tubes.



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
54	Semiannual	Fixed Fire Extinguisher System - Continued	step 13 If there is no CO_2 discharge whatsoever, check for trapped high pressure gas.	

WARNING

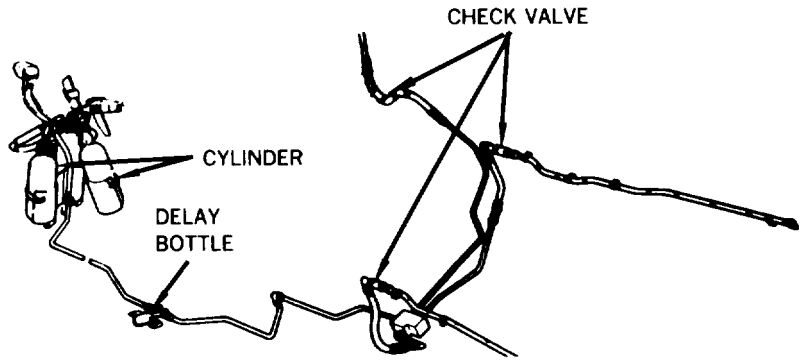
Wear gloves and eye protection while checking for trapped gas. High pressure gas (800-1800 psi) may exist in system and must be released slowly. Do not breathe the vapors. Failure to comply may result in injury or death to personnel.

Slowly loosen any fitting between delay bottle and check valve. If trapped gas escapes, replace all three check valves and repeat Step 7.

If no gas escapes, tighten fitting. Loosen any fitting between CO_2 cylinder and delay bottle. If gas escapes, replace discharge delay bottle (page 21436.1). Remove No. 1 CO_2 cylinder (page 21-49). Tag and send to support maintenance for charging. Reset control handle and reset control valve. Replace No. 1 CO_2 cylinder (page 21-51). Repeat Steps 7 through 11.

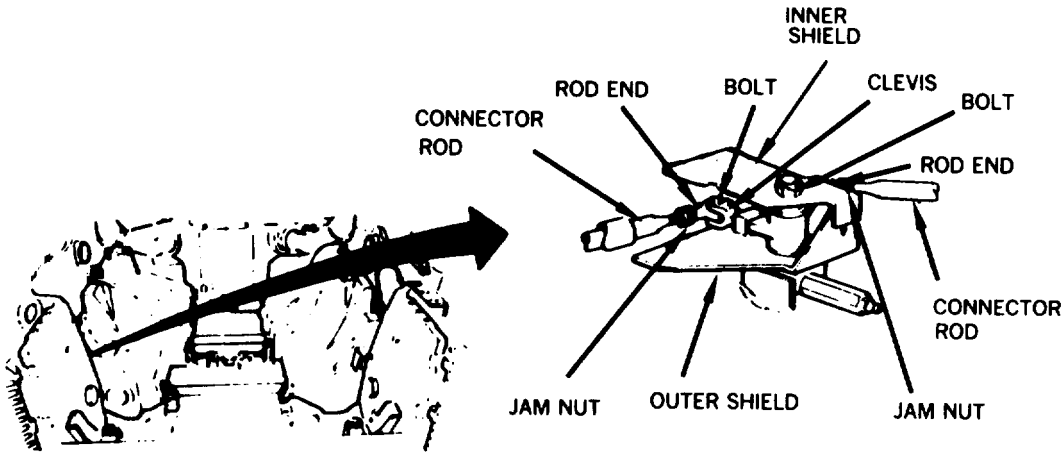
Remove multimeter from accessory test cable. Remove accessory test cable from engine accessory control harness.

Reset control handle, reset control valve and replace No. 1 CO_2 cylinder.



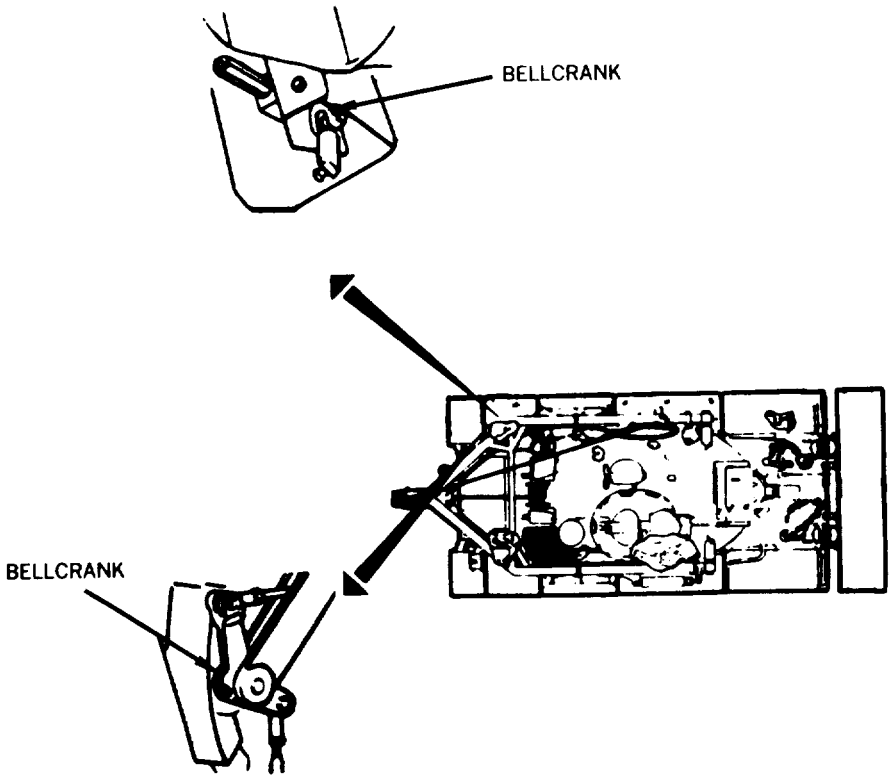
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
55	Semiannual	Steering Control Linkage	Check steering control linkage, inner and outer shields, clevis, connector rods, and rod ends for looseness, damage, and corrosion, Check that bolts and jam nuts are secure.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
55	Semiannual	Steering Control Linkage - Continued	Lubricate steering bellcranks.	



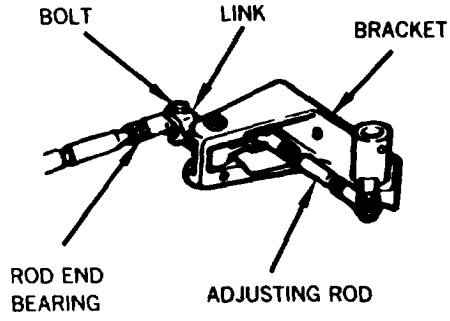
Steering Bellcranks Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Steering Bellcranks All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.3

For arctic operation, see FM 9-207

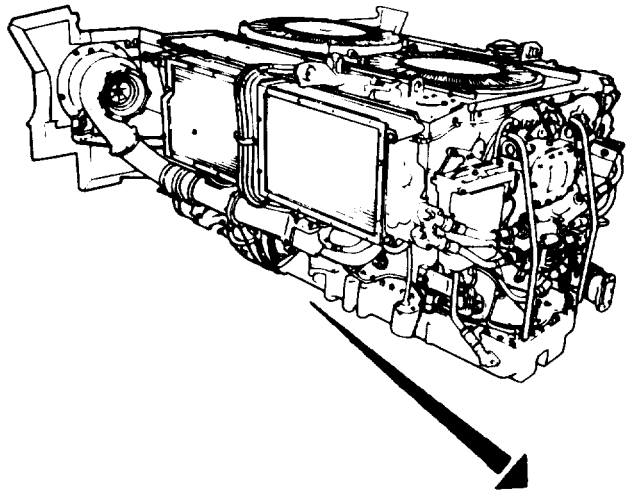
Preventive Maintenance Checks and Services for M728 Hull - Continued

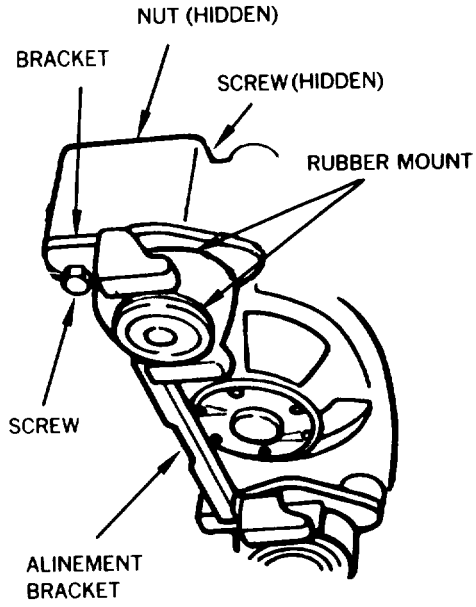
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
56	Semiannual	Shifting Control Linkage	Check shifting control linkage bracket, link, adjusting rod, and rod end bearing for looseness, damage, and corrosion. Check that bolt is secure.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

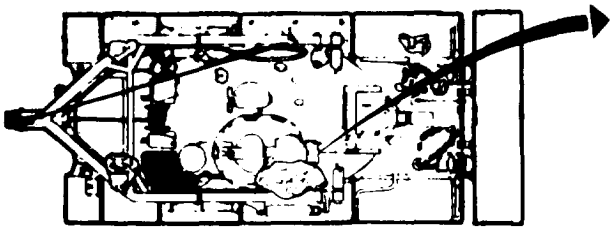
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
57	Semiannual	Engine Mounts (Left and Right Sides)	Check for broken, bent, or damaged mount bracket. Check for loose, missing, or broken screws and nuts.	Broken or damaged mounts.
			NOTE Use torque wrench from the underside of the mount. Position mirror under torque wrench to observe torque reading.	
			Using 0-600 lb-ft torque wrench, check that screws and nuts are tightened to at least 450 lb-ft (610 N·m). Check for cracks and damage to rubber mount. Check for bent or broken alinement bracket.	

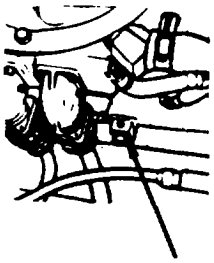




Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Miaaion Capable if:
58	Semiannual	Drain Valve Control Rod Housing	Traverse turret until turret basket opening is over drain valve control rod housing (TM 9-2350-222-10). Open turret basket opening. Lubricate drain valve control rod housing.	





DRAIN VALVE HANDLE HOUSING ROD END

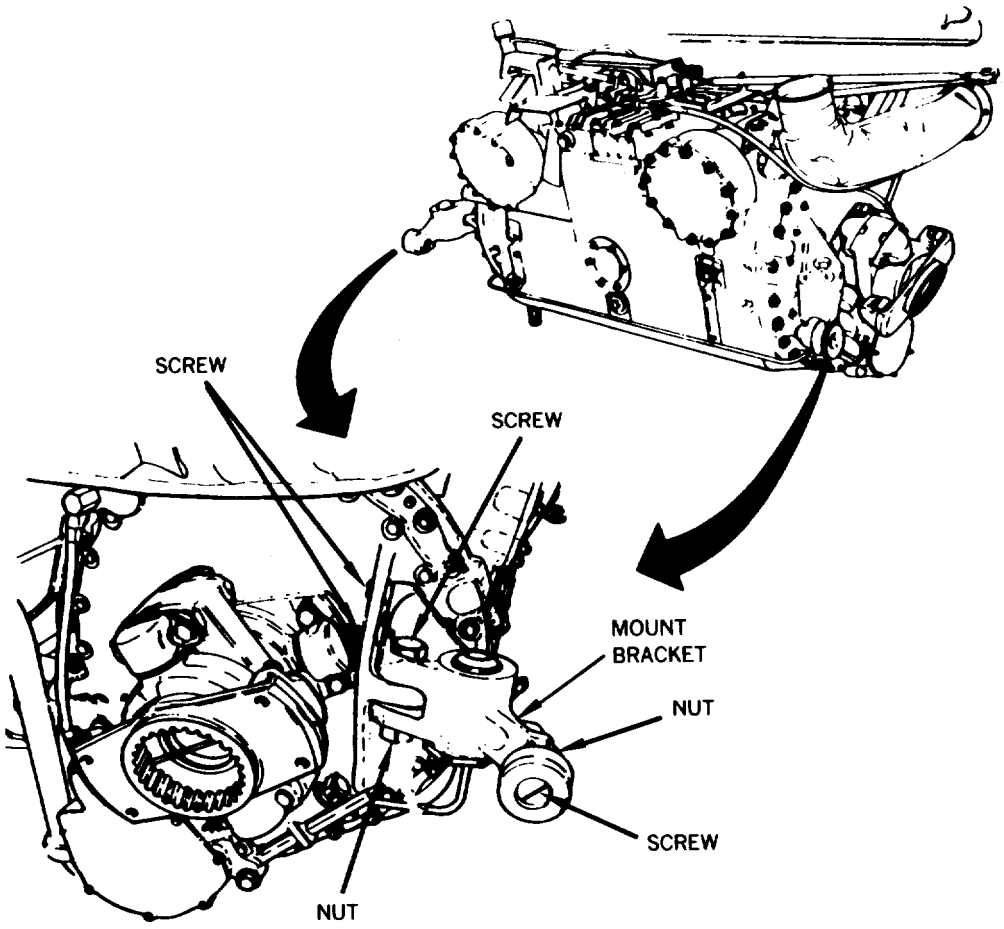
Drain Valve Control Rod Housing Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Drain Valve Control Rod Housing All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.3

For arctic operation, see FM 9-207

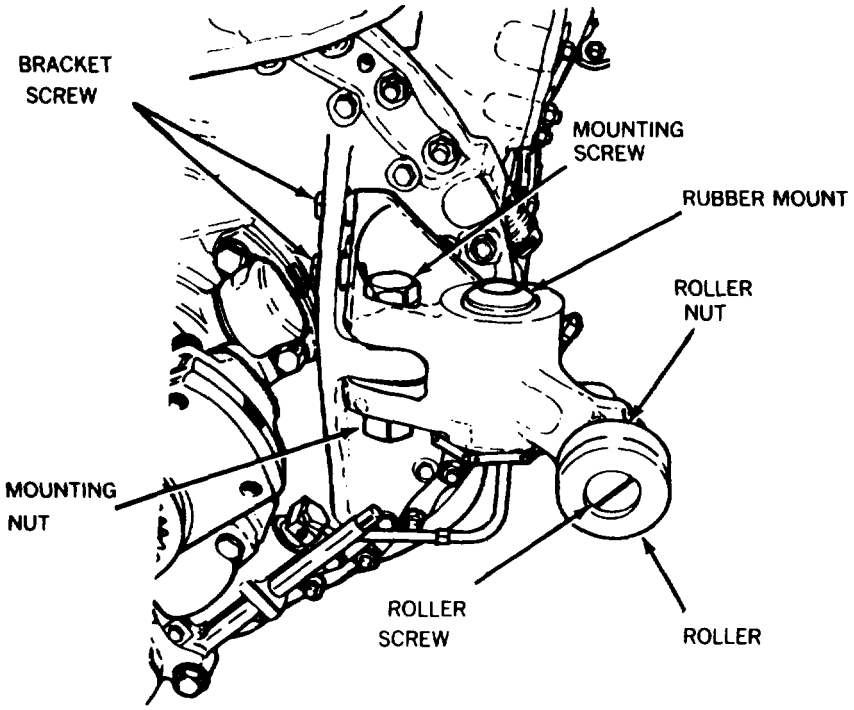
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
59	Semiannual	Transmission Mount (Left and Right Sides)	Check for broken, bent, or damaged mount bracket. Check for loose, missing, or broken nuts and screws.	Broken or damaged mounts.



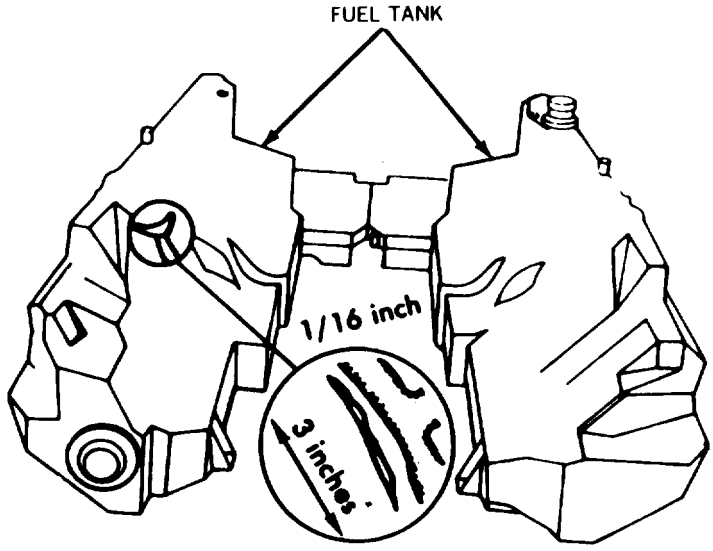
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
60	Semiannual	Transmission Mounts (Left Right Sides) - Continued	Check that rubber mount is not torn or cracked. Check roller for freedom of movement. Check that bracket screws are tightened to at least 70 lb-ft (95 N·m). Check that mounting screw and nut are tightened to at least 380 lb-ft (515 N·m). Check that roller nut is not backed off roller screw.	



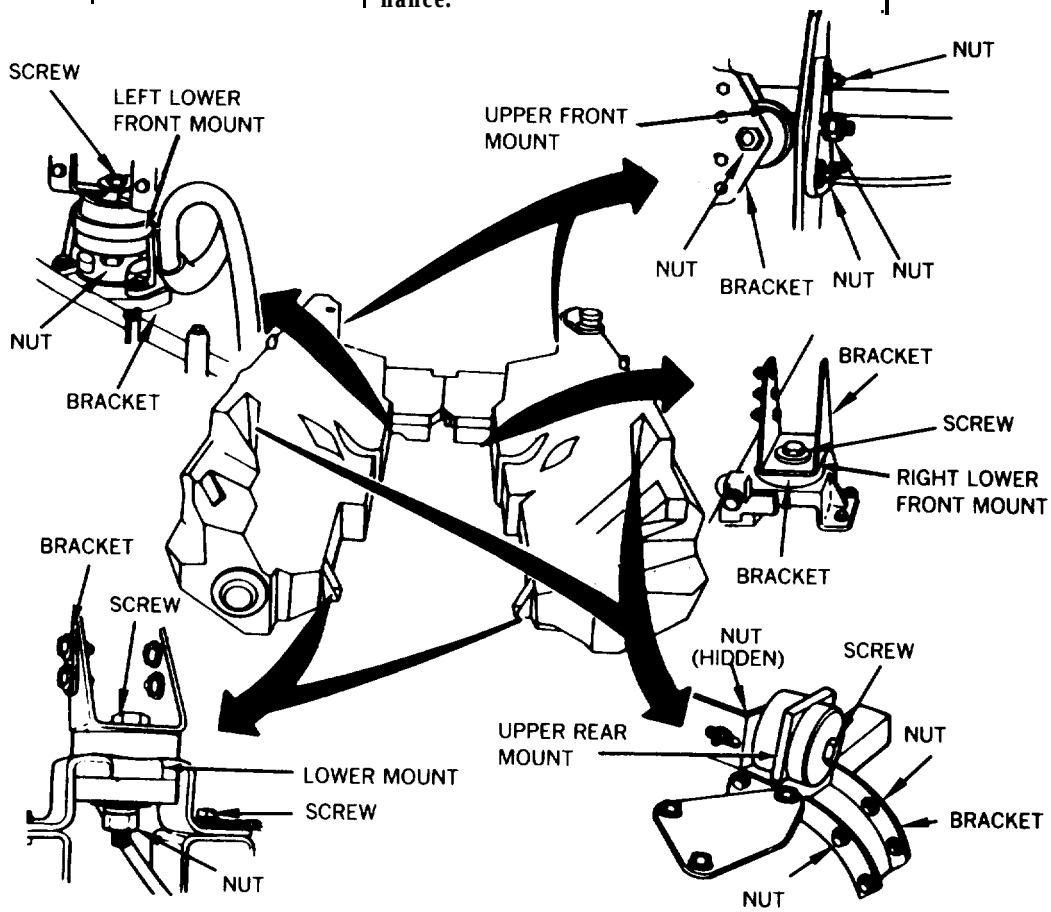
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
61	Semiannual	Fuel Tanks (Left and Right Sides)	Check fuel tanks for cracks. Repair cracks that are less than 3 inches (7.62 cm) long and 1/16 inch (0.16 cm) wide (page 7-150). If larger cracks exist, notify support maintenance. Check engine compartment floor for diesel fuel leaking from back of fuel tank. If any fuel is found, notify support maintenance.	Any class III fuel leak.



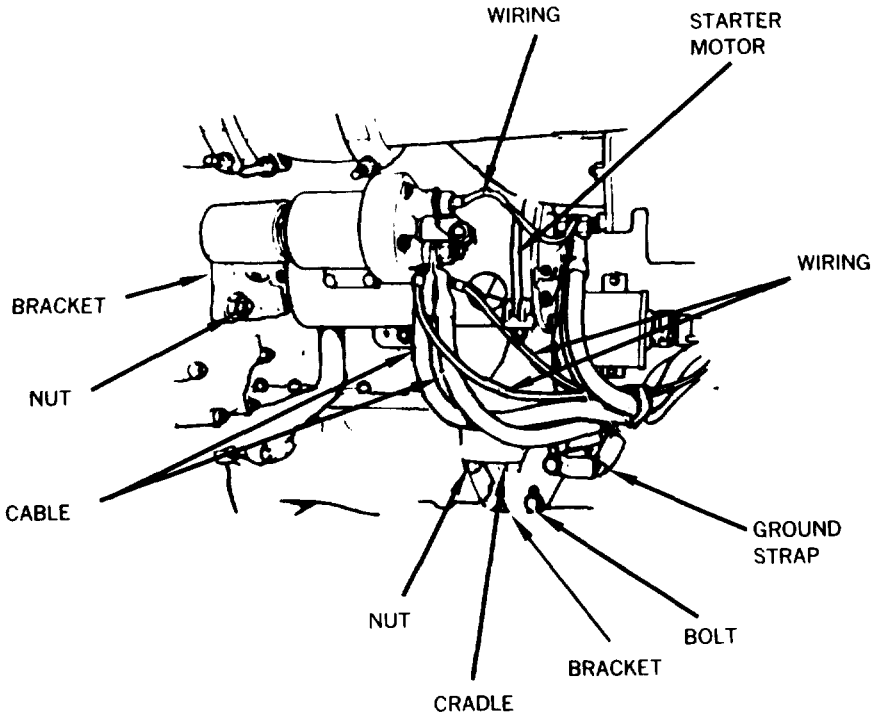
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
62	Semiannual	Fuel Tank Mounts and Brackets	Remove left and right turret bulkhead access covers to gain access to upper front fuel tank mounts and brackets. Check rubber bumpers on upper front mounts, left lower front mount, right lower front mount, upper rear, and lower mounts for deterioration, cracks, and cuts. Check brackets for looseness, cracks, and other damage. Check that nuts, screws, and bolts are not loose. [f rubber mounts or brackets are damaged, notify support maintenance.	Any loose or damaged brackets.



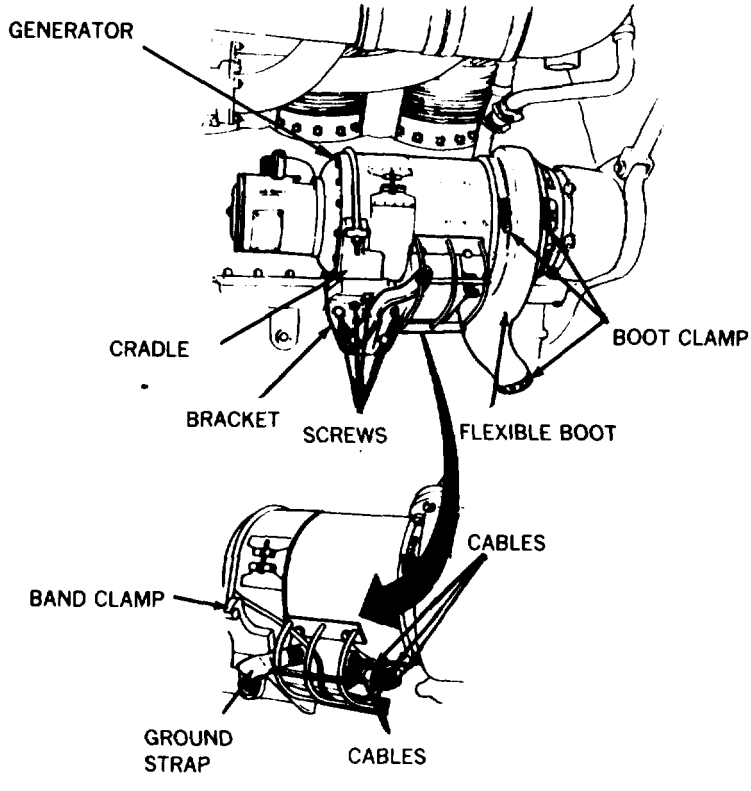
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
63	Semiannual	Starter Motor	Check starter motor for bent, cracked, or damaged brackets, and cradle. Check for loose, missing, or damaged nuts and bolts. Check for missing or broken lockwire at bolts. Check starter for frayed wiring or cables. Check that cables, wiring, and ground strap are securely connected.	Damaged or bent brackets or cradle. Frayed wiring or cables.



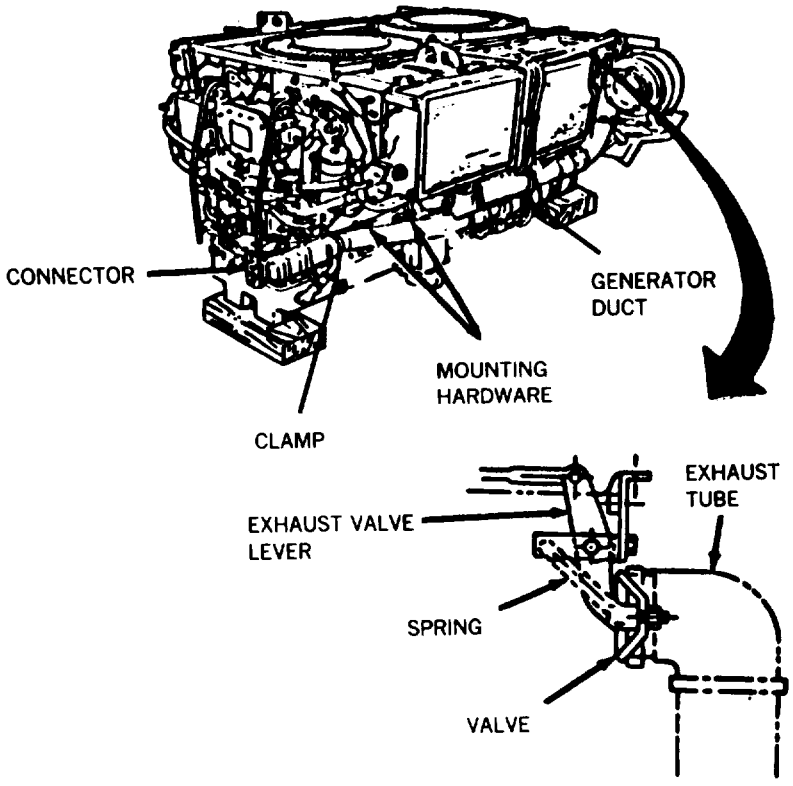
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
64	Semiannual	Generator	Check generator for bent or damaged bracket and cradle.	Damaged or bent brackets or cradle.
			Check for loose, missing, or damaged screws.	
			Check for damaged or cracked flexible boot.	
			Check for frayed cables. Check for secure connections of ground strap and cables.	Frayed wiring or cables.
			Check that cable connections and ground strap connections are free of corrosion.	
			Check that cable band clamp and flexible boot clamps are not loose.	



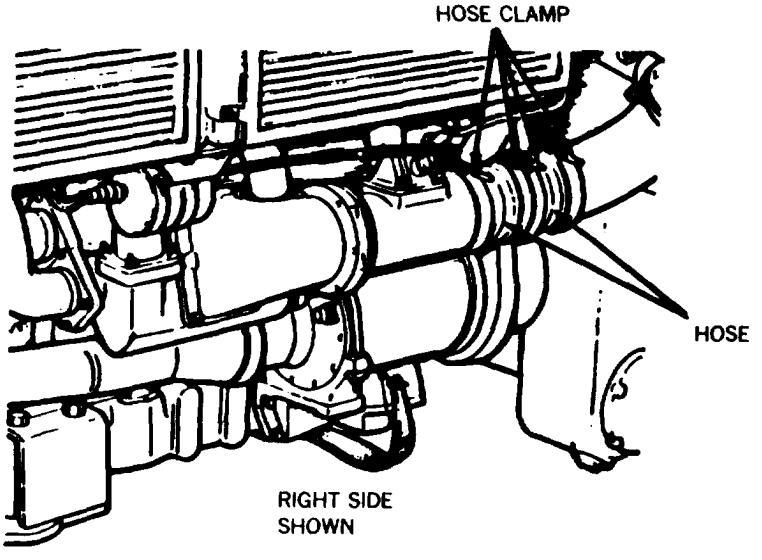
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
65	Semiannual	Generator Duct	Check flexible connector for cracks and tears. Check that clamp is not loose or missing. Check that generator duct mounting hardware is not loose or missing. Check the generator duct for cracks. Check that springs are not missing or broken. Manually pull and hold generator exhaust valve lever. Check that valve is firmly seated on exhaust tube. Release generator exhaust valve lever.	



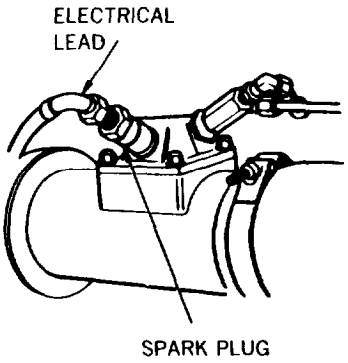
Preventive Maintenance Checks and Services for M728 Hull - Continued

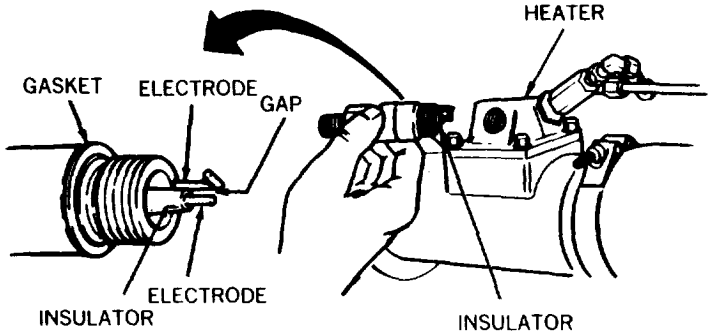
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
66	Semiannual	Water Seperator Outer Filter Elements	Service and replace water separator outer filter elements and final filter (center) element (page 7-322).	
67	Semiannual	Water Separator Drain Sensor and Solenoid Valve	Perform operational check on water separator, drain sensor, and solenoid valve (page 7-266).	System does not operate.
68	Semiannual	Primary Fuel Filter and Housing	Replace primary fuel filter element and clean housing, 2DA engine (7-288).	
69	Semiannual	Manifold Heaters Fuel Filters	Service and inspect manifold heater fuel filter (page 7-408).	
70	Semiannual	Manifold Heater Spray Nozzles (Left and Right)	Service and inspect manifold heater spray nozzles (page 7-369).	
71	Semiannual	Manifold Hoses and Clamps (right and left)	Check that intake manifold hose clamps are tightened to 30-40 lb-in (3-5 N·m). Check hoses for cracks and damages.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

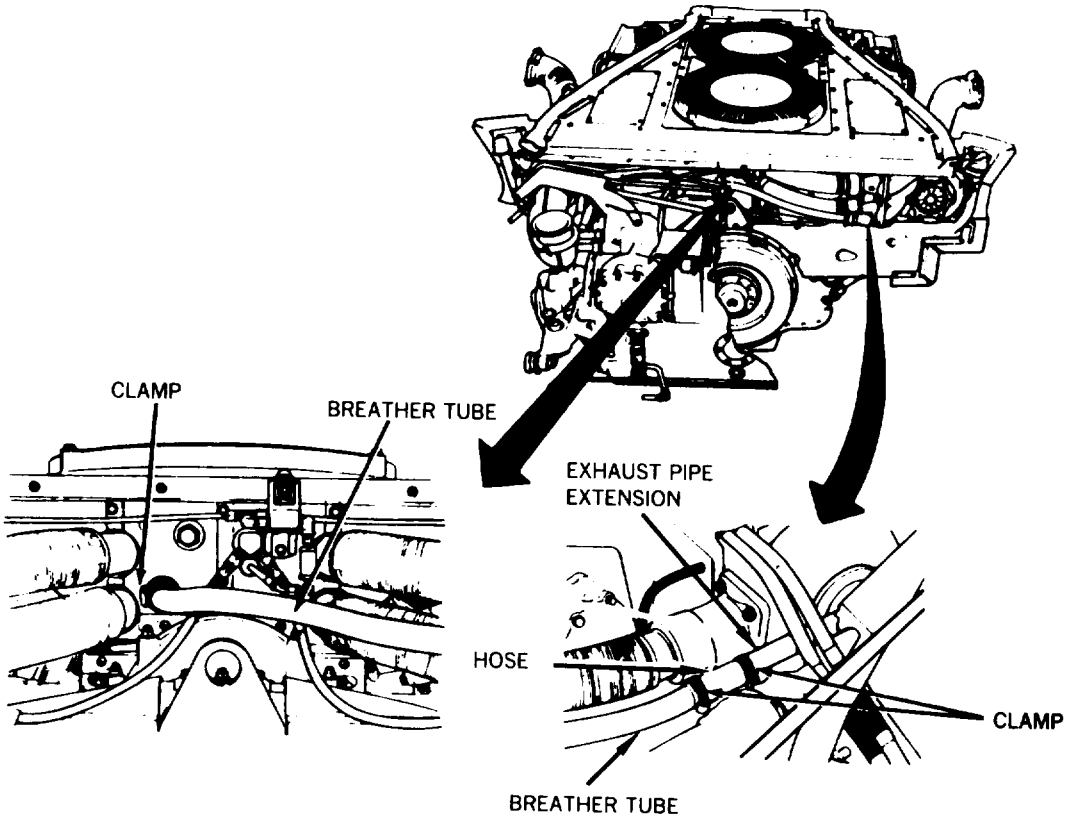
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
72	Semiannual	Manifold Heater Spark Plugs (Left and Right)	To check and service manifold heater spark plug, disconnect electrical lead from manifold heater spark plug. Unscrew spark plug and remove plug and gasket from heater. Wipe off grease and dirt from electrode and insulator. Check electrodes for pitting and carbon buildup. Clean spark plug and check insulator for cracks. Set spark plug gap to 0.094 to 0.114 inch (0.24 to 0.29 cm). Install spark plug and gasket in manifold heater. Connect electrical lead to spark plug.	





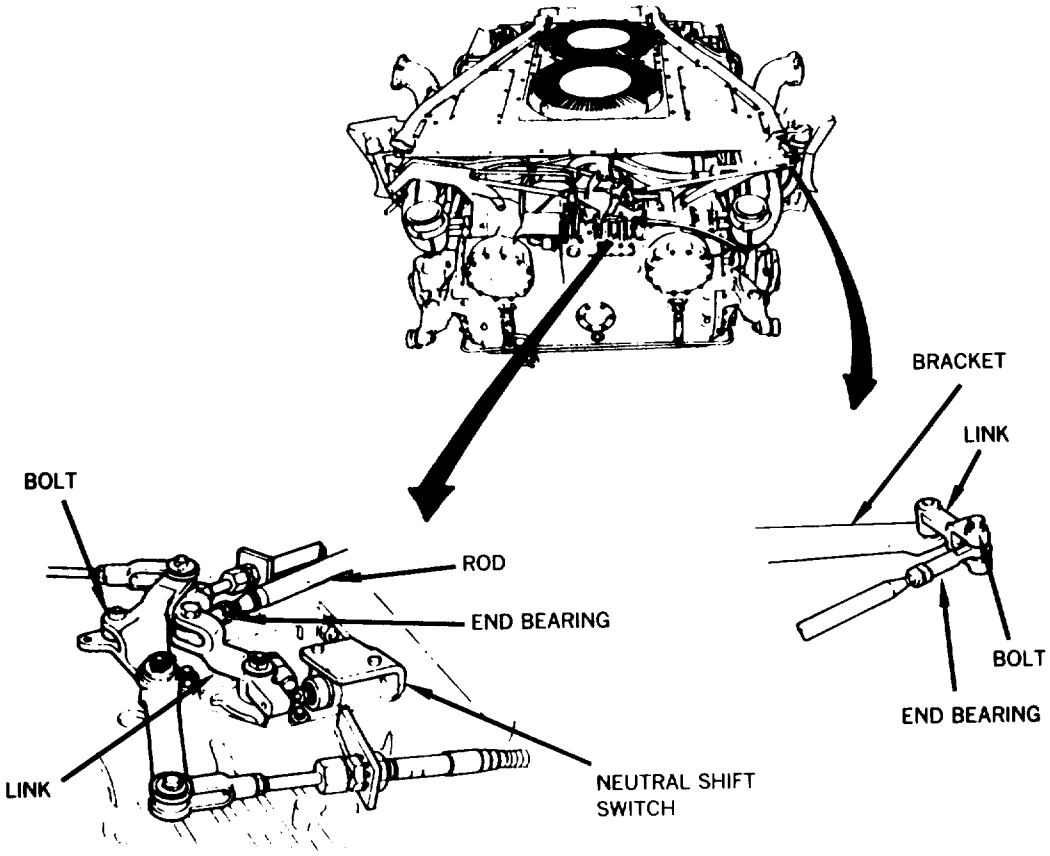
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
73	Semiannual	Crankcase Breather Tube	Remove two hose clamps. Loosen breather tube clamp, Remove hose from breather tube and exhaust pipe extension, Insert rod into exhaust pipe extension to remove carbon buildup. Install two hose clamps on hose, Install hose between breather tube and exhaust pipe extension and secure with two clamps.	



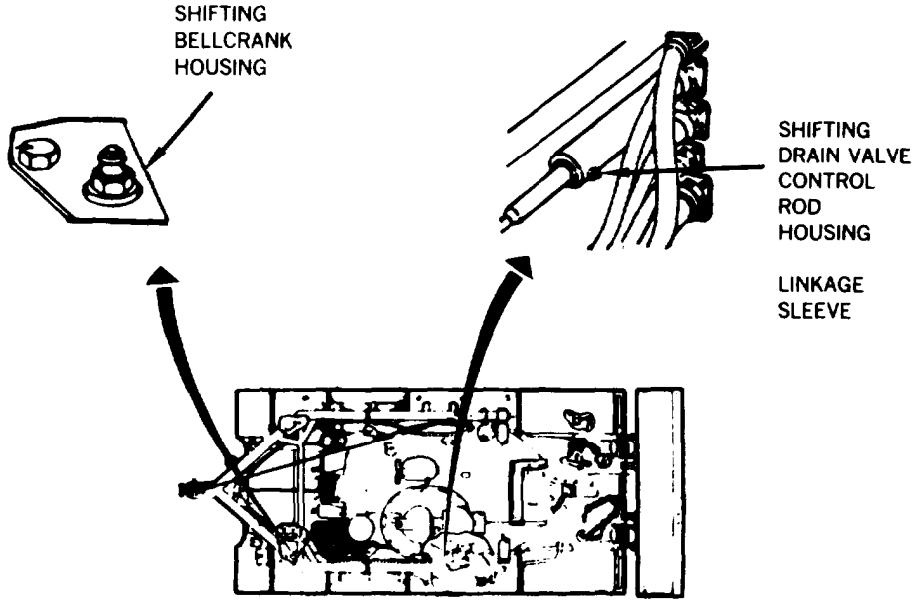
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
74	Semiannual	Transmission	Clean and service main oil filters (page 11-67).	
75	Semiannual	Shifting Control Linkage	Check rod end bearing, link, and bolt, located on top of transmission, for looseness, damage, or corrosion. Check neutral shift switch, for loose bolts and loose or damaged wiring. Check end bearing, link, bracket, and bolt for looseness, damage, or corrosion.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
75	Semiannual	Shifting Control Linkage - Continued	Lubricate shifting bellcrank housing located at rear of right fuel tank. Lubricate shifting linkage sleeve.	



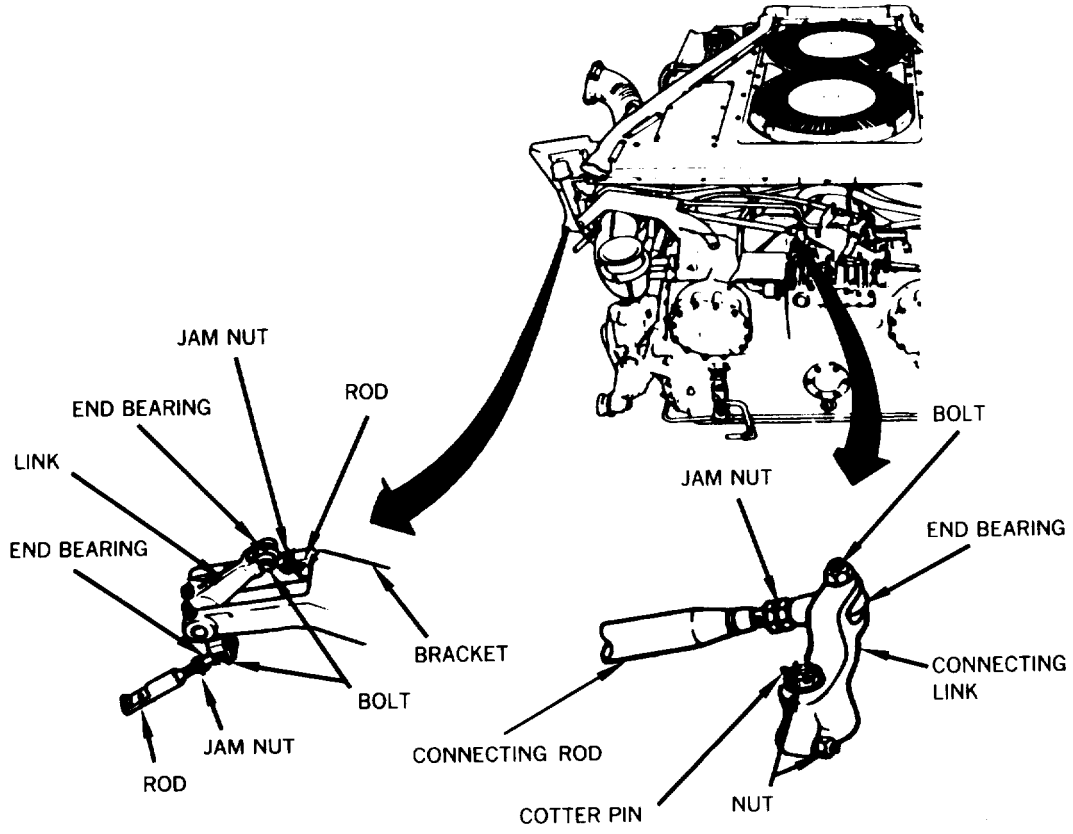
Shifting Bellcrank Housing and Linkage Sleeve Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Shifting Bellcrank Housing		AR	S	0.1
Shifting Linkage Sleeve All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.5

For arctic operation, see FM 9 207

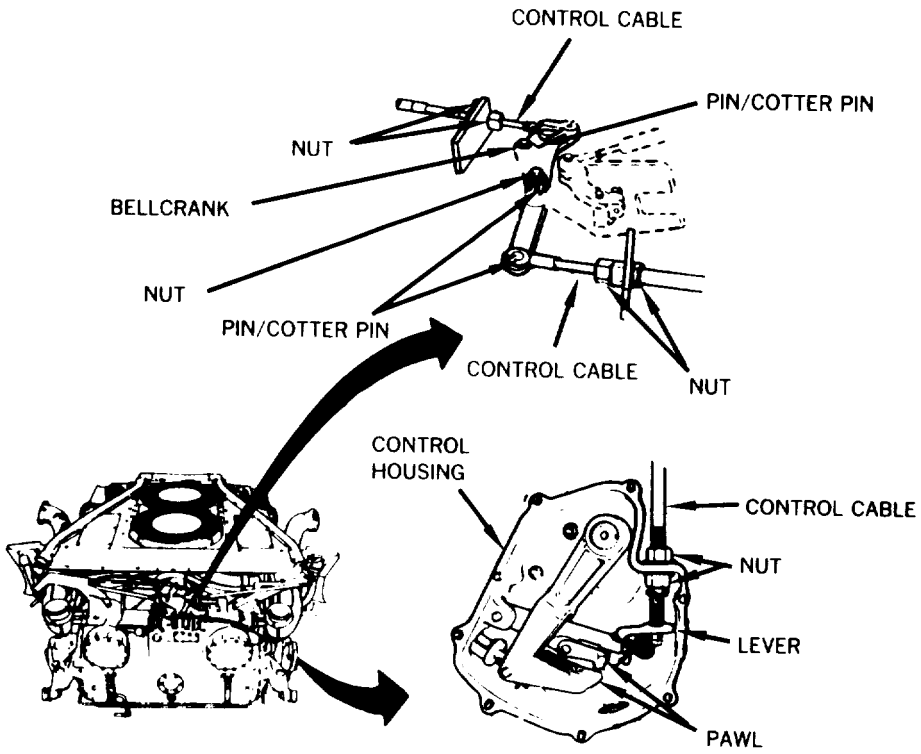
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
76	Semiannual	Steering Control Linkage	Check steering control brackets, links. rods, and end bearings, located on top of transmission, for looseness, damage, or corrosion: . Check that bolts and jam nuts are secure. Check connecting rod, end bearing, and connecting link for looseness, damage, or wear. Check that bolts, nuts, and jam nut are secure and cotter pin is not missing or damaged.	



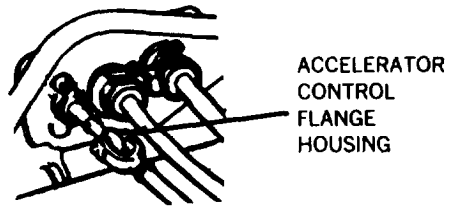
Preventive Maintenance Checks and Services for M728 Hull - Continued

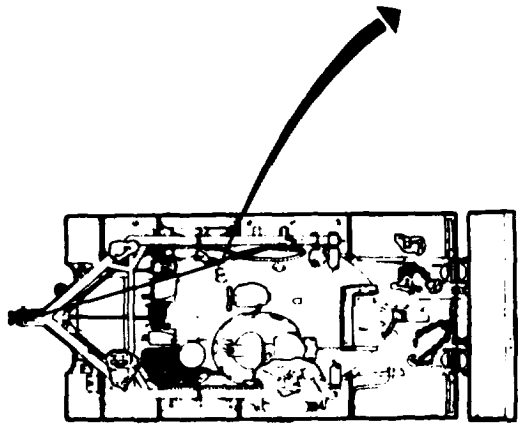
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
77	Semiannual	Brake Control and Linkage	Check brake control control cable and bellcrank, located at top of transmission, for looseness, damage, or corrosion . Check security of pin/cotter pins and nuts. Remove cover and gasket from brake control housing on each side of transmission. Check cable for looseness, damage, or corrosion. Check that nuts are secure. Check remote control pawl and lever teeth for damage. Clean all moving parts with CLP. Install cover and gasket on brake control housing on each side of transmission.	



Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
78	Semiannual	Accelerator Control Flange Housing	Lubricate accelerator control flange housing.	





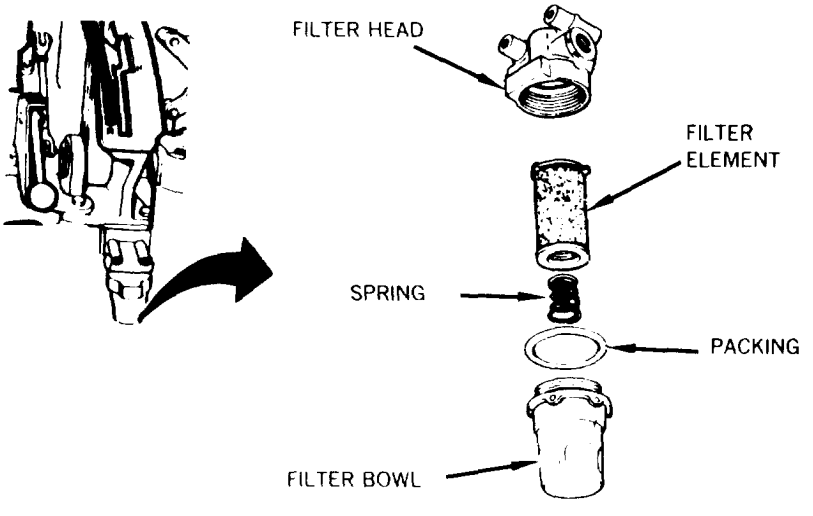
Accelerator Control Flange Housing Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Accelerator Control Flange Housing All Temperatures	WTR (G-395) MIL-G-81322	AR	S	0.5

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
79	Semiannual	Primer Pump Filter	To service primer pump filter assembly, unscrew filter bowl from filter head. Remove packing and discard. Remove filter element and spring.	
			WARNING Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I Dry Cleaning Solvent is 100°F (38°C), and for Type II is 140°F (60°C). If you become dizzy while using Dry Cleaning Solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.	
			Clean filter bowl, filter head, element, and spring with dry cleaning solvent (Item 54, Appendix D).	



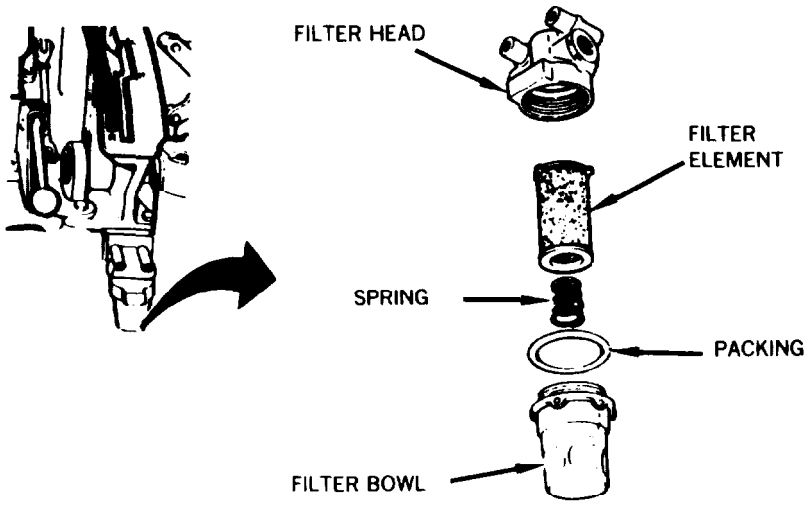
Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
79	Semiannual	Primer Pump Filter - Continued		

WARNING

Compressed air for cleaning purposes must not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

	Blow low pressure compressed air through filter element to remove dirt particles. Inspect element for dents, tears, and separations. Replace defective filter element. Inspect for broken or cracked components. Position spring and filter element in filter bowl. Position new packing over lip of filter bowl and install on filter head.	



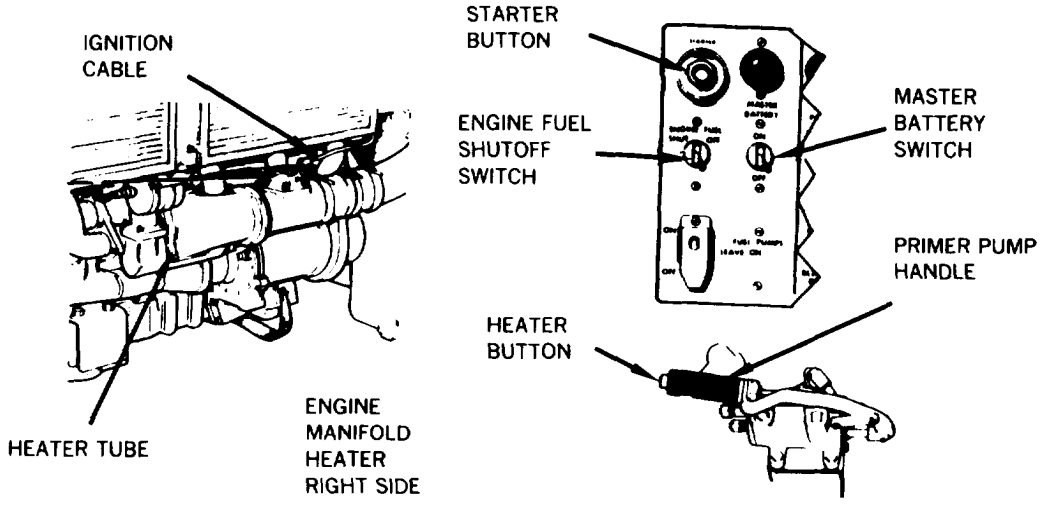
Preventive Maintenance Checks and Services for M728 Hull - Continued

[tern No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
80	Semiannual	Manifold Heater (Left and Right Sides)	Install ground hop kit (page 5-48). Check that all cables and hoses are connected for ground hop test.	

WARNING

Keep hand away from high voltage ignition cable. Perform the following steps in the sequence given to prevent damage to engine and possible injury to personnel.

	Position a person on each side of engine with hand on intake manifold heater tube. Set MASTER BATTERY switch to ON. Press STARTER button and at same time operate primer pump handle and press heater button on handle for no more than 15 seconds. Check that heater is working by feeling for heat at each intake heater tube. If heat is felt, heater is working, shut off engine by raising and holding ENGINE FUEL SHUT OFF switch until engine stops. Set MASTER BATTERY switch to OFF.	

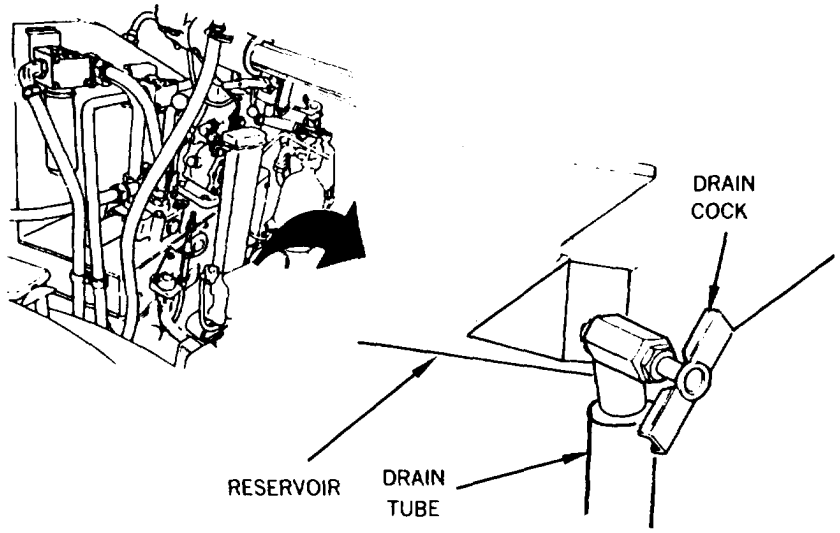


Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
81	Semiannual	Powerplant	Perform out-of-vehicle engine test run (ground hop) (page 5-48). After engine test run, install powerplant (page 5-37).	
82	Semiannual	Vehicle	Perform road test.	
83	Annual	Bulldozer, Winch, and Boom Oil Reservoir		
			WARNING FRH hydraulic fluid may contain tricresyl phosphate which, if taken internally, can produce paralysis. Hydraulic fluid may be absorbed through the skin. Wear long sleeves, gloves, goggles, and face shield. If FRH gets in eyes, wash them, and get medical aid immediately. If FRH gets on skin, thoroughly wash with soap and water. Wash hands thoroughly prior to eating or smoking. Application of these measures is considered an effective control of the hazard.	
			Perform hydraulic reservoir oil sampling IAW DA PAM 738-750. In the event AOAP laboratory support is not available, drain oil annually or every 3000 miles, whichever occurs first.	AOAP requires oil change.

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
83	Annual	Bulldozer, Winch, and Boom Oil Reservoir- Continued	To drain, drop driver's escape hatch (TM 9-2350-222-10). Attach drain tube to reservoir drain cock and route tube thru hatch opening into a suitable container (reservoir contains 56 gallons (212 liters) of hydraulic fluid). Open reservoir drain cock and drain oil. After draining, close drain cock and remove drain tube. Fill to level mark on dipstick (TM 9-2350-222-10, Appendix G).	



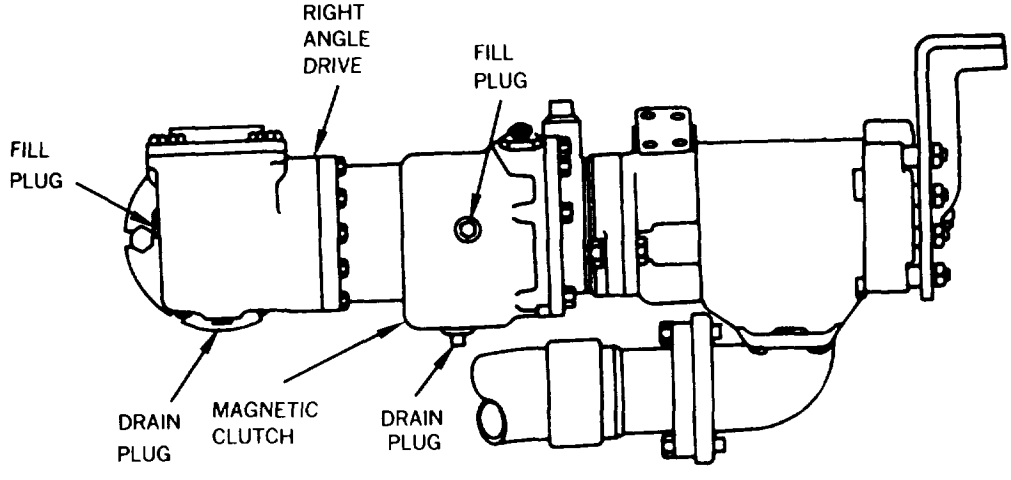
Bulldozer, Winch, and Boom Reservoir Lubricants

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Bulldozer, Winch, and Boom Reservoir +5°F to +125°F (-15°C to +52°C) +5°F to -70°F (-15°C to -57°C)	OE/HDO-10 (O-237) MIL-L-2104 OEA (O-183) MIL-L-46167	56 gal	A	0.5

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
84	Annual	Right Angle Drive and Magnetic Clutch	To drain right angle drive, remove drain plug in bottom of housing. Drain into suitable container. Clean and install drain plug. Remove fill plug. Fill to bottom of fill plug hole.	Any Class III leaks.
			To drain magnetic clutch, remove drain plug in bottom of housing. Drain into suitable container. Clean and install drain plug. Remove fill plug. Fill to bottom of fill plug hole.	Any Class II leaks.



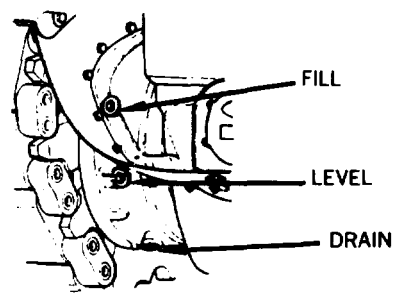
Right Angle Drive and Magnetic Clutch Lubricants

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Right Angle Drive		AR	A	0.2
Magnetic Clutch		AR	A	0.2
+5°F to +125°F (-15°C to +52°C)	OE/HDO-10 (O-237) MIL-L-2104			
+5°F to -70°F (-15°C to -57°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
85	Biennial	Final Drives (Left and Right Sides)	Drain and fill. To drain, remove drain plug from bottom of housing. Drain only after operation while oil is warm. Drain into suitable container. Check magnetic drain plug for metal shavings. After draining, clean and install drain plug. Fill to proper level and continue semiannual PMCS procedures (page 3-82).	Any large metal chips or shavings.



Final Drive Lubricant

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
Final Drive		8 qt	B	0.4
+10°F to +125°F (-12°C to +52°C)	OE/HDO-30 (O-238) MIL-L-2104			
-70°F to +20°F (-57°C to -7°C)	OEA (O-183) MIL-L-46167			

For arctic operation, see FM 9-207

Preventive Maintenance Checks and Services for M728 Hull - Continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
86	Biennial	Suspension System (Left and Right Sides)	Remove six roadwheel arms (page 14-4).	
			Disassemble, clean and inspect six roadwheel arms (14-10 thru 14-12).	
			Disassemble, clean and inspect six roadwheel hubs (page 14-15 thru 14-18).	
			Remove compensating idler wheel (page 14-51).	
			Disconnect track adjusting link at No. 1 compensating idler wheels (page 14-57).	
			Remove compensating idler arm (page 14-64).	
			Remove track support rollers (page 14-35).	
			Inspect all components for damaged bearings or leaking seals.	Any worn bearings, damaged *or* leaking seals.
			Install six roadwheel arms.	
			Install track adjusting link at No. 1 compensating idler wheels (page 14-59).	
			Install track support rollers (page 14-40).	

PMCS MANDATORY REPLACEMENT PARTS LISTS

The following tables provide a list of all mandatory replacement parts required to perform semiannual, annual, or biennial PMCS. The semiannual/annual PMCS parts list contains the quantity of parts required to perform one semiannual PMCS or one annual PMCS. The biennial PMCS parts list contains the quantity of parts required to perform one annual PMCS and all the additional mandatory replacement parts to complete the required biennial tasks.

SEMIANNUAL/ANNUAL PMCS PARTS LIST

Nomenclature	NSN	Part Number and CAGE	Quantity
Packing, preformed	5330-00-180-9951	MS9068-038 (96906)	2
Packing, preformed	5330-00-724-5541	MS9068-018 (96906)	2
Packing, preformed	5330-00-724-7902	MS9068-013 (96906)	2
Seal, antipilferage	5340-00-902-0426	MS51938-6 (96906)	6
Filter	4240-00-828-3952	D5-19-2350 (81361)	2
Filter	4240-00-866-1825	C5-19-1175 (81361)	1
Valve, vent (early model)	4820-00-726-4719	5196397 (57733)	2
Kit, fuel filter	4330-00-801-1152	5702738 (19207)	1
Kit, fuel filter	4330-00-410-1964	5704487 (19207)	1
Filter, fuel	2940-00-808-2421	A-3002-1 (08181)	1
Kit, filter, fluid	4330-00-397-3404	5704486 (19207)	1
Gasket, brake housing	5330-00-888-9403	10911888 (19207)	2
Packing, preformed	5330-00-265-1089	7413738 (19207)	1
Parts Kit, fluid	4330-00-229-5723	5703567 (19207)	2

BIENNIAL PMCS PARTS LIST

Nomenclature	NSN	Part Number and CAGE	Quantity
Packing, preformed	5330-00-180-9951	MS9068-038 (96906)	2
Packing, preformed	5330-00-724-5541	MS9068-018 (96906)	2
Packing, preformed	5330-00-724-7902	MS9068-013 (96906)	2
Seal, antipilferage	5340-00-902-0426	MS51938-6 (96906)	6
Filter	4240-00-828-3952	D5-19-2350 (81361)	2
Filter	4240-00-866-1825	C5-19-1175 (81361)	1
Valve, vent (early model)	4820-00-726-4719	5196397 (57733)	2
Kit, fuel filter	4330-00-801-1152	5702738 (19207)	1
Kit, fuel filter	4330-00-410-1964	5704487 (19207)	1
Filter, fuel	2940-00-808-2421	A-3002-1 (08181)	1
Kit, filter, fluid	4330-00-397-3404	5704486 (19207)	1
Gasket, brake housing	5330-00-888-9403	10911888 (19207)	2
Packing, preformed	5330-00-265-1089	7413738 (19207)	1
Parts Kit, fluid	4330-00-229-5723	5703567 (19207)	2
Seal, plain	5330-01-126-8190	12270997 (19207)	14
Seal, plain	2530-00-736-4672	7364672 (19207)	14
Seal, plain	5330-00-350-9945	343XW420 (80201)	6
Gasket	5330-00-291-8991	8387092 (19207)	21
Gasket	5330-00-291-7465	8387093 (19207)	14

☆ U.S. GOVERNMENT PRINTING OFFICE: 1996 746-014/20189

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Your mailing address

DATE SENT
Date you fill out this form.

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 9-2350-222-20-1-1	20 Feb 1981	Organizational Maintenance M728 Combat Engineer Vehicle

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
3		2		Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.
09		51		Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.
2-8			2-1	Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.
12	1-6a			Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

SAMPLE

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER
John Doe, WO/2, 602-234-5789

SIGN HERE
John Doe

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

REVERSE OF DA FORM 2028-2

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

EPARTMENT OF THE ARMY

SAMPLE

OFFICIAL BUSINESS

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

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 9-2350-222-20-1-1	20 Feb 1981	Organizational Maintenance M728 Combat Engineer Vehicle

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 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

REVERSE OF DA FORM 2028-2

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

TEAR ALONG PERFORATED LINE

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

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

To be distributed in accordance with DA Form 12-37, Organizational Maintenance requirements for Combat Engineer, Full Track M728.

U. S. GOVERNMENT PRINTING OFFICE : 1994 O - 155-384

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

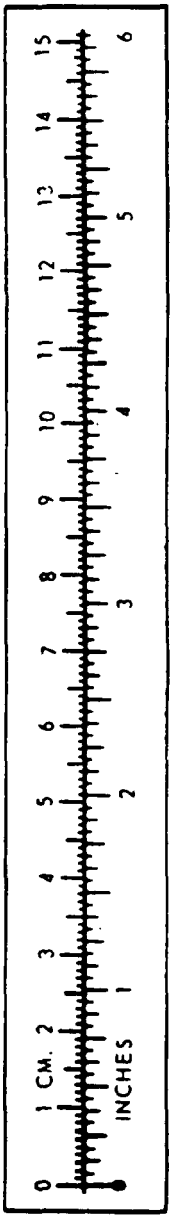
TEMPERATURE

$\frac{5}{9}(°F - 32) = °C$
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
$\frac{9}{5}\,°C + 32 = °F$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



TA089991