

TECHNICAL MANUAL

**ORGANIZATIONAL MAINTENANCE MANUAL
TRUCK, LIFT, FORK; GASOLINE ENGINE DRIVEN;
PNEUMATIC TIRED WHEELS; 6000 LB. CAPACITY;
168 INCH LIFT; ALLIS-CHALMERS
MODEL FP60-24PS;
ARMY MODEL MHE-213, FSN 3930-935-7979**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
February 1971**

WARNING

DANGEROUS GASES

are generated as a result of operation of this equipment.

ASPHYXIATION

may occur if truck is operated in a closed building without providing adequate ventilation.

DEATH

or severe injury may result if personnel fail to observe safety precautions. Utilize extreme caution, do not smoke, or use flame in vicinity when servicing batteries. Batteries generate explosive gas during charging. Always maintain metal-to-metal contact when filling the fuel tank.

Do not smoke or use open flame in vicinity when filling the fuel tank. Do not fill fuel tank when truck is running.

LOSS OF HAND OR FINGERS

may occur if adjustments are made on engine while in operation, except for designated adjustments.

CHANGE

NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 30 September 1991

**Organizational
Maintenance Manual**

**TRUCK, LIFT, FORK; GASOLINE ENGINE DRIVEN; PNEUMATIC-TIRED WHEELS;
6000 LB CAPACITY; 168-INCH LIFT; ALLIS-CHALMERS MODEL FP60-24PS,
ARMY MODEL MHE-213, NSN 3930-00-935-7979**

TM 10-3930-618-34, 12 May 1971, is changed as follows:

Inside front cover, add the following WARNINGS;

WARNING

WARNING

When dislodging tire beads, lockrings, side ring flanges, or unbolting multi-piece wheels be absolutely certain no air pressure remains in the tire. Serious injury or loss of life could result.

Improperly seated side ring flanges or lockrings may blow off during inflation. Never attempt to seat a lockring or side ring flange during inflation or after inflation. Serious injury or loss of life could result.

WARNING

WARNING

Always use an inflation safety cage to inflate tires mounted on multi piece rims and tire/rim assemblies not mounted on a tire changing machine that has a positive lock down device designed to hold the assembly during inflation. When using a tire changing machine, always follow manufacturer's mounting and safety instructions. Failure to do so could cause serious injury or loss of life.

Never inflate tires over 40 PSI to seat tire beads. Serious injury or loss of life could result.

WARNING

When inflating tires in a safety cage, always use an extension airhose and gage for safety cage use. Failure to do so could cause serious injury.

WARNING

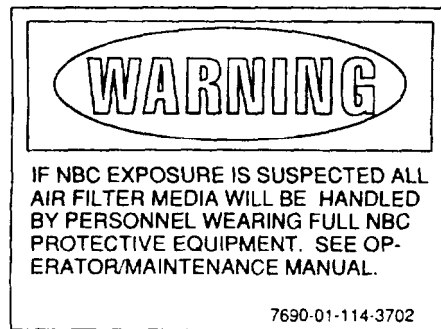
If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.

WARNING

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.

Page 1-1, the following paragraph is added after **Section II. "DESCRIPTION AND DATA."**

A decal has been developed that warns of NBC exposure. It is to be positioned in a noticeable place on or near the air cleaner or air filter housing. You may order the decal using part number 12296626, CAGEC 19207. Refer to TB 43-0219 for further information. Add the decal to the air cleaner (page 2-17, figure 2-10).



Add the following WARNING to the following pages;

page 2-6, malfunction 24, "Engine overheats," preceding l., "Clean air cleaner and change oil in cup";

page 2-16, after paragraph 2-16. "Carburetor Air Cleaner";

page 2-18, paragraph 2-17, preceding item (2). "Remove the air cleaner and the connecting hose";

page B-2, group no. 11, "AIR CLEANER";

Page 2-44, add the following WARNING after paragraph 2-56, b. "Installation":

WARNING

Be sure tire is fully deflated before proceeding with next step. Failure to do so could result in injury or death.

Page 2-44, add the following as sub-paragraph c;

"c. Drive tire removal. Deflate tire completely. Using service equipment designed for this operation, remove ring from rim. Pull rim free. and remove flap and from tire."

Page 2-44, add the following WARNINGS preceding sub-paragraph d;

WARNING

Always use an inflation safety cage to inflate tires mounted on multi piece rims and tire/rim assemblies not mounted on a tire changing machine that has a positive lock down device designed to hold the assembly during inflation. When using a tire changing machine, always follow manufacturer's mounting and safety instructions. Failure to do so could cause serious injury or loss of life.

WARNING

Improperly seated side ring flanges or lockrings may blow off during inflation. Never attempt to seat a lockring or side ring flange during inflation or after inflation. Serious injury or loss of life could result.

WARNING

Never inflate tires over 40 PSI to seat tire beads. Serious injury or loss of life could result.

WARNING

When inflating tires in a safety cage, always use an extension airhose and gage for safety cage use. Failure to do so could cause serious injury.

Page 2-44, add the following as sub-paragraph d;

“d. Drive fire installation. Using tire lubricant, mount tire assembly. Inspect the wheel assembly to insure all components are properly seated on the rim. Place tire assembly in safety cage and using an extension airhose and gage, inflate tire to a maximum of 15 PSI, and allow tire to completely deflate. Inflate tire not to exceed 40 PSI to seat both tire beads. Both tire beads should seat properly before reaching 40 PSI. If tire beads fail to seat, deflate tire, determine cause, take corrective action. add additional tire bead lubricant and inflate.”

Page 2-44, add the following as sub-paragraph e;

“e. Tire and tube repair. Reference TM 9-2610-200-23, CARE, MAINTENANCE, AND REPAIR OF PNEUMATIC TIRES AND INNER TUBES for information concerning tire maintenance.”

Page 2-45, paragraph 2-57, “a. Removal”, item (2) is to read;

“(2) Completely deflate tire to be removed.”

Renumber remaining sub-paragraphs.

Page 2-45, paragraph 2-57 a. Removal, add the following WARNING after sub-paragraph (1);

WARNING

Be sure tire is fully deflated before proceeding with next step. Failure to do so could result in injury or death.

Page 2-45, add the following WARNING paragraph 2-57 preceding, “b. Installation”;

WARNING

Always use an inflation safety cage to inflate tires mounted on multi-piece rims. Failure to do so could result in injury or death.

Page, 2-45, paragraph 2-57c., Reverse sub-paragraph’s (1) and (2).

Page 2-45, add the following WARNING preceding sub-paragraph (2):

WARNING

Be sure tire is fully deflated before proceeding with next step. Failure to do so could result in injury or death.

WARNING

Always use an inflation safety cage to inflate tires mounted on multi piece rims and tire/rim assemblies not mounted on a tire changing machine that has a positive lock down device designed to hold the assembly during inflation. When using a tire changing machine, always follow manufacturer's mounting and safety instructions. Failure to do so could cause serious injury or loss of life.

WARNING

Improperly seated side ring flanges or lockrings may blow off during inflation. Never attempt to seat a lockring or side ring flange during inflation or after inflation. Serious injury or loss of life could result.

WARNING

Never inflate tires over 40 PSI to seat tire beads. Serious injury or loss of life could result.

By Order of the Secretary of the Army:

Official:

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

Distribution:

To be distributed in accordance with DA Form 12-25-E, Block 2213, Unit Maintenance requirements for TM10-3930-618-20.

WARNING

When inflating tires in a safety cage, always use an extension airhose and gage for safety cage use. Failure to do so could cause serious injury.

Page 2-45, change sub-paragraph (5) to read;

“(5) Using tire lubricant, assemble the tire and rim components. Inspect the wheel assembly to insure all components are properly installed. Place wheel assembly in safety cage and using an extension airhose and gage, inflate tire to a maximum of 15 PSI, and allow tire to completely deflate. This will allow the tube to center itself in the tire. Inflate tire not to exceed 40 PSI to seat both tire beads. Both tire beads should seat properly before reaching 40 PSI. If tire beads fail to seat, deflate tire, determine cause, take corrective action, add additional tire bead lubricant and inflate.”

Page 2-45. change sub-paragraph (7) to read;

“(7) Reference TM 9-2610-200-24, CARE, MAINTENANCE, AND REPAIR OF PNEUMATIC TIRES AND INNER TUBES for information concerning tire maintenance.”

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

Change }
No.2 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC 29 Nov 1984

**Organizational Maintenance Manual
TRUCK, LIFT FORK; GASOLINE ENGINE DRIVEN; PNEUMATIC-TIRED WHEELS;
6000 LB. CAPACITY; 168-INCH LIFT; ALLISCHALMERS MODEL FP60-24PS,
ARMY MODEL MHE-213, NSN 393000-935-7979**

TM 10-3930-618-20, 24 February 1971, is changed as follows:

Cover. Change "FSN 3930-935-7979" to read "NSN 3930-00-935-7979"

Page i. Change "FSN 3930-935-7979" to read "NSN 3930-00-935-7979"

Page 1-4. Paragraph 1-2 is superseded as follows:

1-2. Forms and Records

You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this

manual and mail the form direct to Commander, US Army Tank-Automotive Command, ATTN: DRSTA-MB, Warren, MI 48090. A reply will be furnished to you.

Page 1-4, paragraph a is superseded as follows:

a. Identification. The truck has one identification plate. It is located in the center of the instrument panel. It contains information pertaining to the manufacturer, model, nomenclature, contract number, serial number, registration number, National Stock Number, engine serial number, capacity, and date shipped.

Page 2-1, Section III is superseded as follows:

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-5. General

To insure that the truck is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The preventive maintenance services to be performed are listed in table 2-1. Defects discovered during operation of the truck will be noted for future correction. Stop operation immediately if a deficiency is noted which would damage the equipment if operation were continued.

2-6. Preventive Maintenance

- a. Do your (M) PREVENTIVE MAINTENANCE once each month.
- b. Do your (S) PREVENTIVE MAINTENANCE once each 6 months.
- c. Do your (A) PREVENTIVE MAINTENANCE once each year.
- d. Do your (H) PREVENTIVE MAINTENANCE at the hour interval listed.
- e. If something doesn't work, troubleshoot it with the instructions in your TM 10-3930-618-20, or notify your supervisor.
- f. Always do your PREVENTIVE MAINTENANCE in the same order so it gets to be a habit.

Once you've had some practice, you'll spot anything wrong in a hurry.

g. If anything looks wrong and you can't fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to Direct Support Maintenance RIGHT NOW.

h. When you do your PREVENTIVE MAINTENANCE, take along the tools you will need to make all the checks. Take along a rag; you'll always need at least one.

WARNING

Dry cleaning solvent SD-2 is toxic and flammable. Wear protective goggles and gloves and use only 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. If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with skin or clothing is made, flush with water. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

(1) Keep it clean: Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (SD-2) on all metal surfaces. Use soap and water when you clean rubber or plastic material.

(2) Bolts, nuts, and screws: Check them all for obvious, looseness, missing, bent or broken condition. You can't try them all with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it, or report it to Direct Support Maintenance if you can not tighten it.

(3) Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to Direct Support Maintenance.

(4) Electric wires and connectors: Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure the wires are in good shape.

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

i. It is necessary for you to know how fluid leakage affects the status of your vehicle. The following are definitions of the type/classes of leakage you need to know to be able to determine the status of your vehicle. Learn, then be familiar with them and REMEMBER - WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR!

Leakage Definitions for Crew Operator PMCS

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

CAUTION

Equipment operation is allowable with minor leakages (class I or II). Of course, consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor. Exceptions are the fuel and brake system, where no leakage is allowable.

When operating with class I or II leaks, continue to check fluid levels as required in your PMCS.

Class III or fuel and brake system leaks should be reported to your supervisor.

j. Asterisks - will be used to identify Make, Model, and Characteristic of the engine on the Forklift Model No. F60-24PS.

(* Make: Allis-Chalmers, Model: 6MB-230, Characteristic: Oil base air cleaner.

(**) Make: Teledyne Continental, Model: F245-8518, Characteristic: Air cleaner element (Engine Replacement Kit).

Table 2-1. Organizational Preventive Maintenance Check and Services

A - Annually

S - Semiannually

H -Hours

Item No.	Interval			Item to be inspected Procedure: Check for and repair, fill or adjust as necessary.
	A	S	H	
				NOTE
				Perform Operator/Crew PMCS prior to or in conjunction with Organizational PMCS if:
				a. There is a delay between the daily operation of the equipment and the Organizational PMCS.
				b. Regular operator is not assisting/participating.

Table 2-1. Organizational Preventive Maintenance Check and Services (Cont'd)

A - Annually

S - Semiannually

H - Hours

Item No.	Interval			Item to be inspected Procedure: Check for and repair, fill or adjust as necessary.
	A	S	H	
1			250	ENGINE OIL Drain oil and replace engine oil filter. Refill with enough oil to bring oil level between ADD and FULL mark on dipstick (ref. LO 10-3930-618-12).
2			250	FUEL FILTERS Clean bowl and element.
3			250	ENGINE TUNE-UP a. Adjust or replace ignition points. Point gap should be (1) (*) Engine - .022 (2) (**) Engine - .020 b. Check spark plugs and replace as necessary (gap should be .025 inch). c. Clean PCV valve and breather. d. Check timing of engine (ref. paragraph 2-14).
4			250	FAN BELTS Check belts for proper tension. Should be 1/2 to 3/4 inch deflection at point midway between pulleys, approximately 10 pound of force.
5			250	BATTERY Check specific gravity and charge as necessary. Clean terminals and insure all connections are tight. Inspect battery for corrosion (ref. TM 9-6140-200-14).
6			250	BRAKE MASTER CYLINDER Check level of fluid. Fluid should be within 1/4 inch of top reservoir.
7			250	STEERING AND AXLE ASSEMBLY Lubricate/check steering mechanism to insure it operates freely without binding (ref. LO 10-3930-618-12).
8			250	ACCELERATOR PEDAL AND LINKAGE Lubricate levers and linkage to insure smooth operation (ref. LO 10-3930-618-12).
9			250	CONTROL LEVERS AND LINKAGE Lubricate levers and linkage to insure smooth operation (ref. LO 10-3930-618-12).
10			250	TILT CYLINDER Lubricate pivot points (ref. LO 10-3930-618-12).
11			250	MAST ASSEMBLY a. Lubricate sliding and roller contact surfaces (ref. LO 10-3930-618-12). b. Clean and then lubricate the chain (ref. LO 10-3930-618-12).

Page 2-12. Paragraph 2-8 is rescinded. Figure 2-4 is rescinded.

Page 2-21. Paragraph 2-21b is superseded as follows:

b. Installation. Reverse procedures in 2-21a.

(1) Make sure that the stencilled filling instructions are legible as follows:

**USE ONLY CURVED FUEL
NOZZLE OR FUEL CANS
FOR REFUELING. MAX
SAFE FUEL ACCEPTANCE
RATE, 7 G.P.M.**

Page 2-23. Paragraph 2-25. Section a, b, c, d are rescinded.

Page 2-24. Figure 2-17 is rescinded.

Page 2-25. Figure 2-18 is rescinded.

Page 2-26. Figures 2-19 and 2-20 are rescinded.

Page 2-26. Paragraph 2-25, section h, change "FSN 6850-281-1989" to read "NSN 6850-00-753-4967."

Page 2-42. Paragraph 2-51 is rescinded; Figures 2-35 and 2-36 are rescinded.

Page 2-43. Paragraph 2-53 is rescinded; Figure 2-38 is rescinded.

Page 2-46. Paragraph 2-58 is superseded as follows:

2-58. Bearings and Seals (Steer Wheels Only) (Refer to Figure 2-40)

a. Removal. If steering axle has not been removed from the truck proceed as follows:

(1) Raise the rear of the truck until the wheels clear the floor. Block front wheels securely to prevent truck from rolling.

(2) Remove the hubcaps (18).

(3) Remove the cotter pin (19) from the bearing adjusting nut (20) and remove the nuts and washers.

(4) Remove the outer bearing cone (2).

(5) Slide the hub assembly (4) from the steering axle spindle.

(6) Remove the inner bearing cone (2) and grease retainer (1) from the hub assembly.

(7) Carefully tap both bearing cups (3,5) from the hub assembly.

WARNING

Dry cleaning solvent SD-2, used to clean parts, is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 59°C (138° F).

WARNING

HIGH VELOCITY AIR

Compressed air, used for cleaning purposes, will not exceed 30 psi. Safety glasses must be used when cleaning parts with compressed air. Failure to do so could cause Serious Injury to your eyes and possible Blindness. If you hurt your eyes or if a foreign object is blown into eyes, seek medical attention immediately.

b. Cleaning, Inspection and Repair.

(1) Clean all parts with cleaning compound solvent (SD-2). Dry thoroughly with compressed air.

(2) Inspect bearing cones and cups and wheels for damage and excessive or uneven wear.

(3) Replace all parts as authorized.

(4) Repack bearings.

c. Installation and Adjustment.

(1) Install bearing cups with the taper to the inside. Tap into place using a brass drift pin. Tap evenly around the edge of the cup. Use care to prevent the cup from binding.

(2) Install the bearing cones and hub assemblies in reverse order of removal. Hold the hub assemblies in position while installing the outer bearings.

(3) Install the adjusting nut(s) and washer.

(4) Tighten the adjusting nut and, at the same time, rotate the wheel until a heavy drag is felt.

(5) Loosen the nut to the point where the wheel rotates freely but no bearing end play is apparent.

(6) Install cotter pin (19) in the wheel nut and reinstall the hubcap (18).

Page 2-46. Section XV. Paragraphs 2-59, 2-60 are rescinded.

Page 2-48. Section XV. Figure 2-41 is rescinded.

Page 2-49. Section XV. Paragraph 2-61, sections a through f are rescinded.

Page 2-50. Add the following before para 2-64, after the title "Section XVII. Maintenance of the Hydraulic Lift Components":

WARNING

Oil Under Pressure

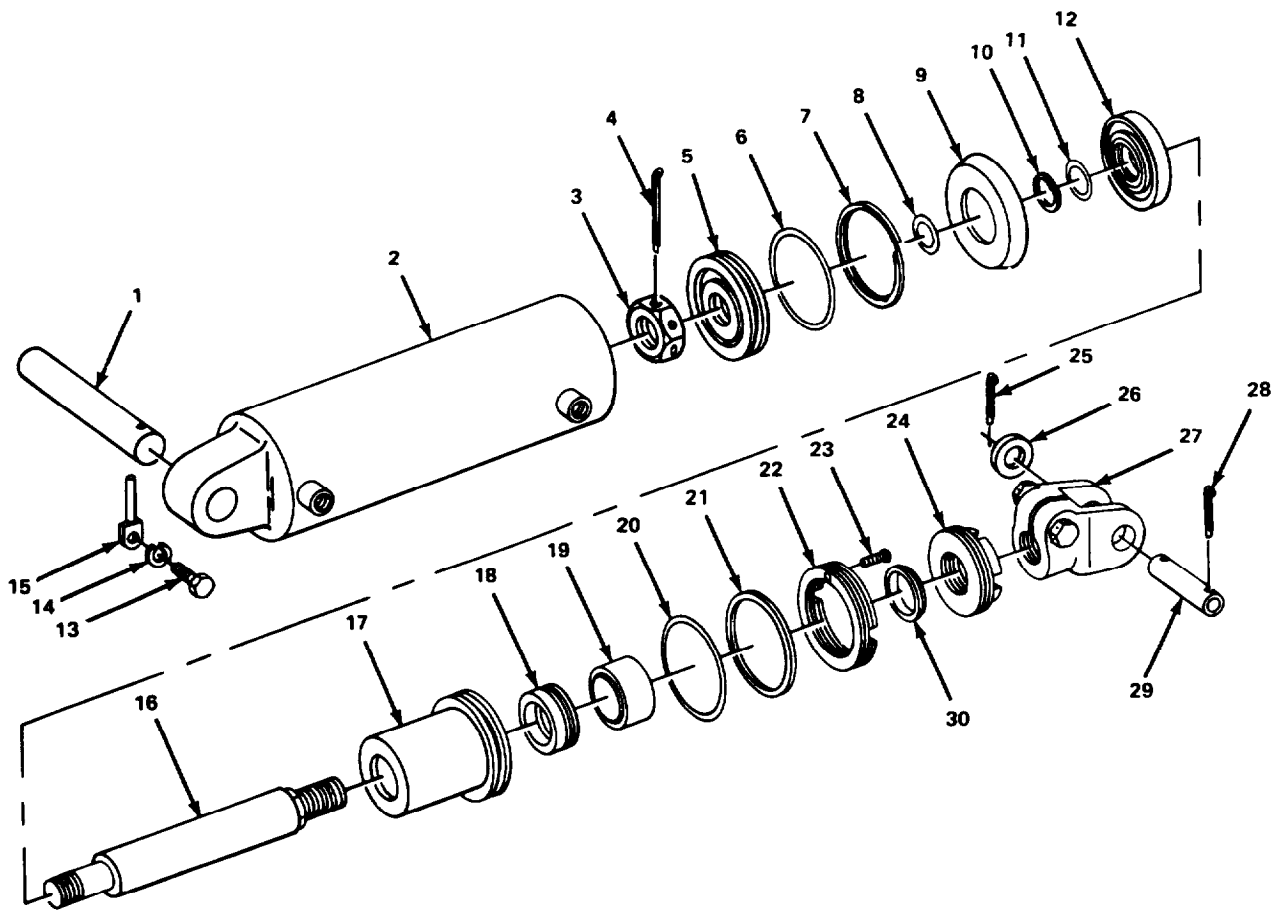
2500 PSI Pressure is used to operate this equipment. Never disconnect any hydraulic lines or fittings without dropping the pressure to zero. Operate all hydraulic levers with vehicle turned off to release

any pressure. Failure to follow this procedure could cause severe injury. Should you be struck by a high pressure oil stream, seek medical help immediately.

Page 2-50. Add the following before para 2-66, after paragraph 2-65:

2-65.1 Tilt Cylinders

a. Description. The two double acting tilt cylinders provide the means for tilting the mast assembly 3° forward and 10° back, They are located under cowls on each fender. Action of the tilt cylinder is a straight line motion. Any misalign-



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- | | | |
|-----------------|-----------------|----------------|
| 1 Pivot Shaft | 11 Packing | 21 Packing |
| 2 Tube assembly | 12 Follower | 22 Retainer |
| 3 Nut | 13 screw | 23 Screw |
| 4 Cotter pin | 14 Lockwasher | 24 Packing nut |
| 5 Guide ring | 15 Retainer | 25 Cotter pin |
| 6 Packing | 16 Plunger rod | 26 Flat washer |
| 7 Backup ring | 17 Stuffing box | 27 Yoke |
| 8 Packing | 18 Packing set | 28 Cotter pin |
| 9 Packing cup | 19 Adapter | 29 Yoke pin |
| 10 Backup ring | 20 Ring | 30 Wiper |

Figure 2-44.1. Tilt cylinder.

Bent between the cylinder and piston will cause binding, rapid wear of packing and packing gland, rapid wear of piston rod and packing, and tend to break the weld on the cylinder case. The welded section is designed to hold hydraulic pressure and should not be called upon to hold any bending action due to misalignment.

b. Removal. Refer to paragraph 2-65.2 for tilt cylinder removal and installation.

c. Disassembly. Refer to figure 2-44.1 and disassemble the tilt cylinder as follows:

(1) Secure tilt cylinder in bench vise. Be careful not to deform cylinder.

(2) Loosen capscrew in yoke (27) and unscrew yoke from plunger rod (16).

(3) Unscrew packing nut (24) from retainer (22).

(4) Remove screw (23) from retainer (22) and unscrew retainer from tube assembly.

(5) Grasp rod (16) and pull all internal parts (assembled) from tube assembly.

(6) Remove cotter pin (4) and nut (3) from rod (16).

(7) Disassemble remainder of parts in the order shown.

WARNING

Dry cleaning solvent, SD-2 used to clean parts, is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 59°C (138° F).

d. Cleaning and Inspection.

(1) Clean all metal parts with dry cleaning solvent SD-2 and dry thoroughly.

(2) Check cylinder tube bore for scores or nicks.

(3) Check sliding surfaces of guide ring (5) and follower (12) for scores, nicks, or other irregularities which could damage cylinder tube bore.

(4) Check bores of guide ring (5), follower (12), and packing nut (24) and mating surfaces of plunger rod (16) for damage which could cause faulty seating, leaks, or damage to other parts.

(5) Check all backup rings and hardware for cracks, bends, deformation, stripped threads, and other damage.

(6) If mating or sliding surfaces are damaged, the parts must be replaced.

(7) Replace all packings, guard rings, and wiper rings.

e. Reassembly.

(1) Assemble tilt cylinder in reverse order of procedures in disassembly (c above), with the addition of the following:

(a) Dip all packings, gaskets, and wiper rings in hydraulic oil before assembly.

(b) Oil piston parts, plunger rod, and packing nut before installation.

(c) When installing packing (6) on guide ring (5), do not stretch packing any more than absolutely necessary.

(d) Do not expand backup washers any more than necessary.

CAUTION

Never use sharp tools or instruments when installing rings, packings, or backup washers.

(e) Torque nut (3) to 300 foot-pounds, and install cotter pin (4).

(f) Tighten packing nut securely, then back off approximately 1/8 turn.

(2) Be certain that all parts are kept clean during installation and that no dirt or water is allowed to enter the cylinder before the hydraulic lines are connected.

f. Installation. Install the tilt cylinder by reversing the procedure in paragraph 2-65.2.

2-65.2 Tilt Cylinders, Removal and Installation

a. Removal. Refer to figure 2-44.2 and remove tilt cylinder assemblies as follows:

(1) Operate the tilt control lever to put the mast in forward position. Hold the mast in forward position with a chain hoist.

(2) Remove the cotter pin and pull out the pin attaching the cylinder yoke to the carriage.

(3) Disconnect the hydraulic lines at the tilt cylinder.

(4) Remove the screw and pin retainer from the tilt cylinder rear mounting bracket and pivot shaft.

(5) Insert a drift in the hole (provided in the pivot shaft) and remove the pivot shaft. Lift the cylinder from the truck.

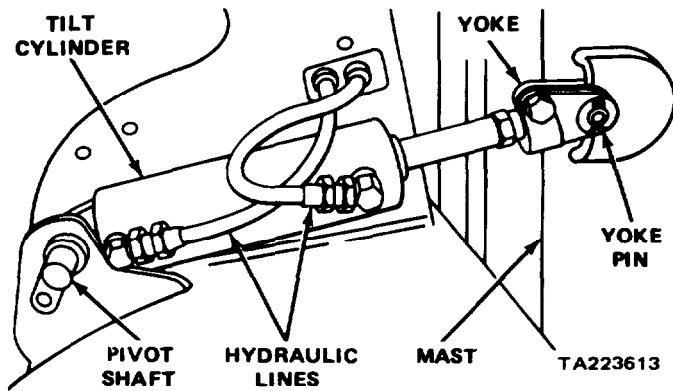


Figure 2-44.2. Tilt cylinder removal and installation.

b. Installation.

(1) Reverse procedures in a above.

(2) Make sure the rear pin retainer is positioned properly so the screw can be easily installed.

(3) Make sure that hydraulic line connections are tight.

(4) Refill hydraulic tank.

(5) Operate the cylinders and check carefully for leaks before installing the cowls.

(6) Check to be sure both cylinders bottom simultaneously.

c. The correct degree of tilt is 3° forward and 10° backward.

Page 2-53. Add the following after para 2-69, before para 2-70:

WARNING

Oil Under Pressure

2500 PSI Pressure is used to operate this equipment. Never disconnect any hydraulic lines or fittings without dropping the pressure to zero. Operate all hydraulic levers with vehicle turned off to release any pressure. Failure to follow this procedure could cause severe injury. Should you be struck by a high pressure oil stream, seek medical help immediately.

Page A-1. **APPENDIX A REFERENCES.** Section A-3 is superseded as follows:

A-3. Painting

- | | |
|------------|------------------------------------|
| TM 43-0139 | Painting Instruction for Field Use |
| FM 5-20 | Camouflage |

Page A-1. **APPENDIX A REFERENCES.** Section A-5. Change “TM 9-6140-200-15” to read “TM 6140-200-14”.

Page A-1. **APPENDIX A REFERENCES.** Section A-7. Change “TM 750-244-8” to read “TM 750-244-6”.

Page A-1. **APPENDIX A REFERENCES.** Add the following immediately after Section A-7:

A-8. Non-Aeronautical Equipment

- | | |
|------------|----------------------------------|
| TB 43-0210 | Army Oil Analysis Program (AOAP) |
|------------|----------------------------------|

A-9. Tires

- | | |
|------------------|--|
| TM 9-2610-200-20 | Organizational Care, Maintenance and Repair of Pneumatic Tires and Inner Tubes |
|------------------|--|

A-10. Decontamination

- | | |
|----------|--|
| FM 21-40 | Nuclear, Biological and Chemical Defense (NBC) |
|----------|--|

A-11. Military Publications Indexes

- | | |
|----------------|---|
| DA PAM 310-1 | Index of Administrative Publications. |
| DA PAM 738-750 | The Army Maintenance Management System (TAMMS). |

Page B-1. Appendix B Maintenance Allocation Chart is superseded as follows:

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance function on the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. Maintenance Functions. Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (including decontaminate, when required), preserve, drain, paint, or replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause correction to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a space, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position of the SMR code.

i. Repair. The application of maintenance service¹, including fault location/troubleshooting², removal/installation, disassembly/assembly³ procedures, and maintenance actions⁴ to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

¹Service - inspect, test, service, adjust, aline, calibrate, and/or replace.

²Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

³Disassembly/assembly - encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least component identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

⁴Action - welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.

1. Overhaul That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publication (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B-3. Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00".

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the function to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph C-2).

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a worktime figure in the appropriate subcolumns the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the task within the listed maintenance function vary at different maintenance categories, appropriate worktime figures will be shown for each category. The worktime figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition

under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time, troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform a specific task identified for the maintenance functions⁸ authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

- C - Operator or Crew
- O -Organizational Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance
- D - Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetical order, which shall be keyed to the remarks contained in Section IV.

B-4. Explanation of Columns in Tool and Test Equipment Requirements, Section III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. Explanation of Columns in Remarks, Section IV

a. Column 1, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
01	ENGINE								
0100	Engine Assembly	Inspect Test Service Replace Repair Overhaul	0.3 0.4	1.0	8.0	6.0 28.0			
0101	Crankcase, Block and Cylinder Head								
	Cylinder Head	Replace			2.5				
	Cylinder Block	Replace Repair			8.0	12.0			
0102	Crankshaft	Replace				12.0			
0103	Flywheel Flywheel and Housing	Replace Repair			1.0 1.0				
0104	Pistons	Replace Repair				4.0 2.0			
	Connecting Rods	Replace Repair				4.0 2.0			
0105	Valves, Camshafts and Timing System								
	Valves and Related Parts	Adjust Replace Repair			1.0 5.5 2.0				
	Timing Gear Cover	Replace			2.0				
	Camshaft and Gear	Replace				2.0			
0106	Engine Lubrication System								
	Oil Pump	Replace Repair			2.0 2.0				
	Oil Filter	Replace		0.2					
	Oil Pan	Repair			2.0				
	Breather	Service Repair	0.1	0.1					
	PCV Valve	Service Repair	0.1	0.2					
	Fuel Pump	Test Repair		0.3 0.5					
	Fuel Lines	Repair		0.5					
0108	Manifolds								
	Intake and Exhaust	Replace		1.0					
03	FUEL SYSTEM								
0301	Carburetor	Adjust Replace Repair		0.5 1.0	2.0				

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
0302	Fuel Pump	Test Repair		0.3 0.5					
	Fuel Lines	Repair		0.5					
0304	Air Cleaner	Inspect Service Replace	0.1						
				0.2 0.5					
0306	Tanks, Lines and Fittings								
	Fuel Tank	Service Replace Repair	0.1	0.4		1.5			
0308	Engine Speed Governor and Controls								
	Governor Assembly	Adjust Replace		0.2	0.5				
0309	Fuel Filters	Service Replace		0.3 0.3					
0312	Accelerator and Choke Controls								
	Accelerator	Adjust Replace		0.6 0.8					
04	EXHAUST SYSTEM								
0401	Muffler and Exhaust Pipe	Replace		1.0					
05	COOLING SYSTEM								
0501	Radiator	Inspect Service Replace Repair	0.1 0.2		1.0	2.0			
0503	Water, Manifold, Headers, Thermostats and Housing Gasket								
	Thermostat	Test Replace		0.5 0.5					
0504	Water Pump	Inspect Replace	0.1	0.4					
0505	Fan Assembly	Replace		0.5					
	Belt	Inspect Adjust Replace	0.1	0.2 0.5					
06	ELECTRICAL SYSTEM								
0601	Alternator	Test Replace Repair		1.0 0.5	2.0				
0602	Voltage Regulator	Test Adjust Replace		0.3 0.3 0.3					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
0603	Starting Motor	Test Replace Repair		0.3 0.6	1.5				
0605	Ignition Coil	Test Replace		0.2 0.3					
	Distributor	Adjust Replace Repair		0.3 0.5 0.3					
	Spark Plug	Adjust Replace		0.3 0.5					
0607	Instrument Panel	Replace		1.0					
	Gages	Replace		0.5					
0608	Fuse	Replace		0.2					
	Switch, light	Replace		0.5					
0609	Lights	Replace Repair		0.4 0.5					
0610	Sending Units and Warning Switches								
	Transmitter	Replace		0.4					
0611	Horn	Test Replace	0.1	0.5					
0612	Batteries	Test Service Replace	0.1	0.3 0.3					
07	TRANSMISSION								
0705	Shift Levers and Linkage	Adjust Replace		0.5	2.0				
0708	Torque Converter				0.5				
0710	Transmission Assembly	Inspect Test Service Replace Repair Overhaul	0.1 0.2		2.0 8.0		6.0 16.0		
0713	Intermediate Clutch	Replace Overhaul					4.0 4.0		
0714	Servo Unit Valve Assembly	Replace Repair			1.0 2.0				
0721	Coolers, Pumps and Motors								
	Transmission Oil Filter	Replace		0.2					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
09	PROPELLER, PROPELLER SHAFTS, UNIVERSAL JOINTS, COUPLER AND CLAMP ASSEMBLY								
0900	Propeller Shafts	Replace Repair			1.0 0.5				
10	FRONT AXLE								
1000	Front Axle Assembly								
	Steering Axle	Replace Repair			2.0 2.0				
11	REAR AXLE								
1100	Rear Axle Assembly	Service Adjust Replace Repair		0.4	1.0 4.0 2.0				
1102	Differential	Service Replace Repair		0.4	4.0	4.0			
1103	Planetary or Final Drive								
	Drive Axle	Service Replace Repair		0.4	4.0 2.0				
12	BRAKES								
1201	Hand Brakes	Adjust Replace Repair		0.2	0.7 0.3				
	Hand Brake Lever and Linkage	Test Service Adjust Replace Repair	0.1 0.1	0.1	1.0 0.8				
1202	Service Brakes								
	Brake Shoes	Inspect Replace Repair			0.5 1.5 1.0				
1204	Hydraulic Brake System								
	Master Cylinder Lines	Replace Repair			1.0 1.0				
	Master Cylinder	Service Replace Repair		0.2 1.0	0.3				
	Wheel Cylinder	Replace Repair			1.0 0.3				
1206	Mechanical Brake System								

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
13	Brake Controls	Replace Repair			0.2 0.5				
	Inching Controls	Adjust Replace			0.2 0.5				
1311	WHEELS and TRACKS Wheel Assembly	Replace Repair		1.0 1.0					
1313	Wheel Bearings and Seats	Service Replace		0.2 0.2					
	Tires and Tubes	Inspect Service Replace Repair	0.1 0.2	1.0 1.0					
14	STEERING								
1401	Drag Link	Service Replace Repair		0.2 2.0 0.5					
1407	Tie Rod	Service Adjust Replace Repair		0.2 1.0	2.0 0.5				
	Power Steering Gear Assembly	Replace Repair			4.0	2.0			
1410	Hydraulic Oil Filter	Service Replace Repair		0.2 0.3 0.3					
1412	Steering Cylinder	Inspect Replace Repair	0.1	1.0	2.0				
1413	Tanks and Reservoirs Hydraulic Reservoir	Service Replace	0.1	0.7					
1502	Counterweights	Replace		0.7					
1503	Towing Pin	Replace		0.3					
18	BODY, CAB and HOOD								
1801	Body, Cab, and Hood Assemblies	Replace		0.7					
1802	Overhead Guard and Side Panel Latch	Replace		0.5					
	Seat, Hood and Side Panel	Adjust	0.1						
1806	Fenders	Replace		1.5					
1806	Upholstery Seats and Carpets Seat	Adjust Replace	0.1	0.5					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category					(5) Tools and eqpt	(6) Remarks
			C	O	F	H	D		
24	HYDRAULIC and FLUID SYSTEMS								
2401	Hydraulic Pump	Test Replace Repair			0.5 1.0 2.0				
2402	Control Valves Hydraulic Control Valve	Adjust Replace Repair			1.0 1.0 2.0				
2403	Hydraulic Controls Control Valve Mounting Bracket	Replace			1.0				
2404	Tilt Cylinder and Tilt Crank Tilt Cylinder	Replace Repair Adjust Replace Repair		0.3	0.5 1.5 1.0 1.0				
2405	Mast Assembly Lift Chains	Service Adjust Replace Repair		0.3	0.7 2.0 1.0				
	Lift Cylinder	Service Adjust Replace		0.2 0.5 0.5					
2406	Hydraulic Lines and Fittings Filter and Breather	Replace Repair Inspect Replace			1.0 2.0				
	Hydraulic Reservoir	Inspect Replace	0.2	0.5	0.3				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or test equipment ref code	Maintenance category	Nomenclature	National stock number	Tool number
---------------------------------	----------------------	--------------	-----------------------	-------------

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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 12-25A, Organizational Maintenance Requirements for Warehouse Equipment.

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 23 May 1972

CHANGE }
No. 1 }

Organizational Maintenance Manual

**TRUCK, LIFT FORK; GASOLINE ENGINE DRIVEN; PNEUMATIC-TIRED
WHEELS; 6000 LB. CAPACITY; 168-INCH LIFT; ALLIS-CHALMERS
MODEL FP60-24PS, ARMY MODEL MHE-213, FSN 3930-935-7979**

TM 10-3930-618-20, 24 February 1971, is changed as follows:

Page 2-21. Paragraph 2-21b, add the following:

Make sure that the stencilled filling instructions are legible as follows:

**USE ONLY CURVED FUEL
NOZZLE OR FUEL CANS
FOR REFUELING. MAX
SAFE FUEL ACCEPTANCE
RATE, 7 G.P.M.**

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25A (qty rqr block No. 894) organizational maintenance requirements for Warehouse Equipment.

TECHNICAL MANUAL }
 No. 10-3930-618-20 }

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON, D.C. 24 February 1971

ORGANIZATIONAL MAINTENANCE MANUAL

**TRUCK, LIFT, FORK; GASOLINE ENGINE DRIVEN;
 PNEUMATIC TIRED WHEELS; 6000 LB. CAPACITY;
 168 INCH LIFT; ALLIS-CHALMERS MODEL FP60-24PS;
 ARMY MODEL MHE-213, FSN 3930-935-7979**

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CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1 Scope

a. These instructions are published for the use of the personnel responsible for organizational maintenance of the fork lift truck shown in figures 1-1 and 1-2. They provide additional information, description and data not covered in the operator's manual and instructions for preparing the equipment for preventive

maintenance services, repairs, troubleshooting, and organizational maintenance procedures.

b. Repair parts and special tools for organizational maintenance will be found in TM 10-3930-618-20P.

c. Instructions for destruction of equipment to prevent enemy use will be found in TM 750-244-3.

d. Instructions for administrative storage of equipment will be found in TM 740-90-1.

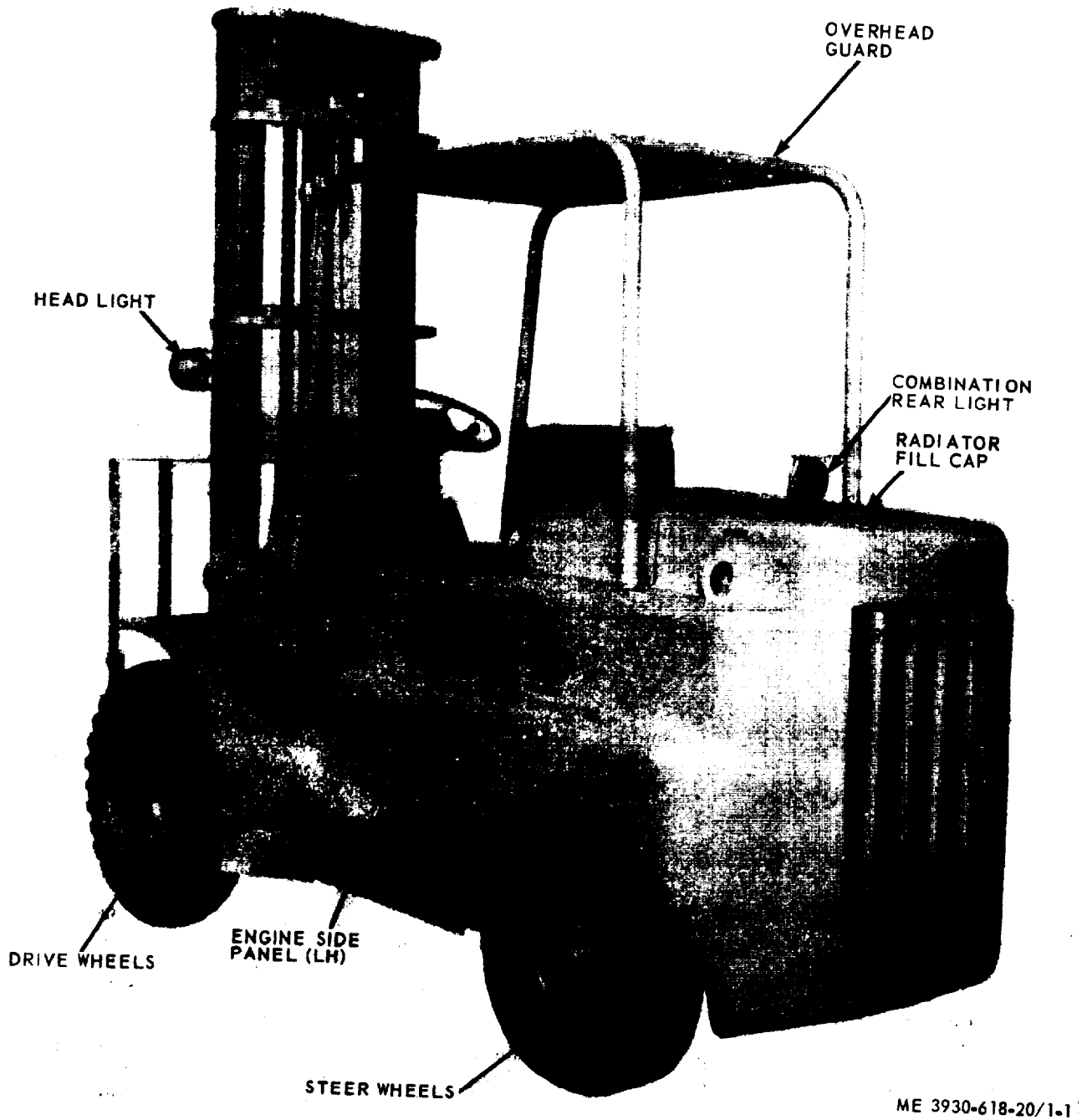
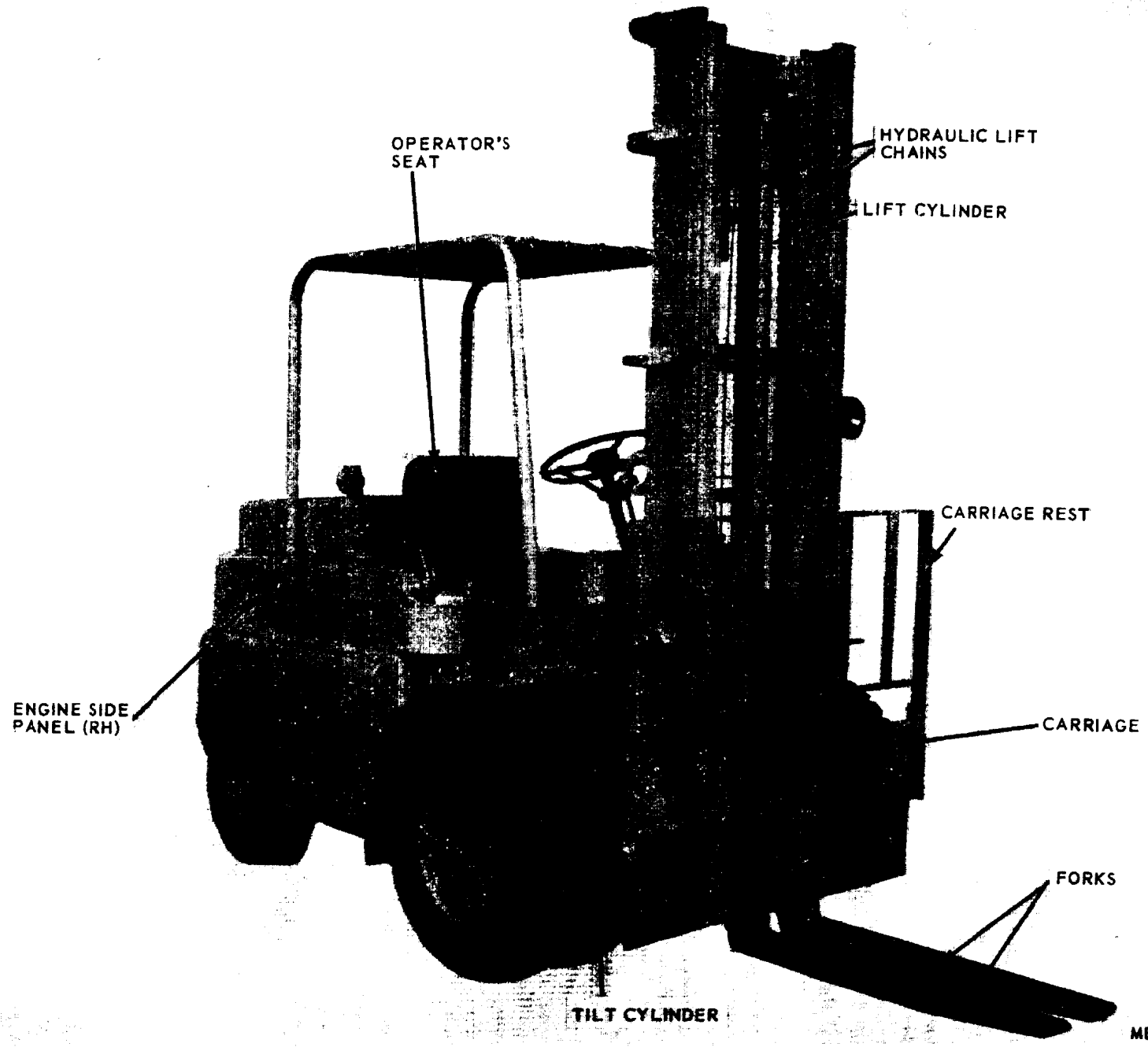


Figure 1-1. Truck, fork lift, left rear, three quarter view.

Figure 1-2 Truck, fork lift, right front, three quarter view.



1-2. Forms and Records

- a. DA Forms and records used for equipment maintenance will be only those prescribed in TM 38-750.
- b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be sub-

mitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to (Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

1-3. Description

Army Model MHE-213 (Allis-Chalmers Model FP60-24PS) trucks are non-tactical forklift trucks designed for use in a warehouse or on hard surface pavement. The truck (fig. 1-1 and 1-2) can be used to load, transport and unload, and stack loads weighing as much as 6000 lbs. at a load center of 24 inches and ran lilt the load to a height of 168 inches. (The load center is measured from the heel of the forks.) The truck is powered by a six cylinder, liquid-cooled, gasoline engine and is equipped with power assist brakes, power steering, and single speed automatic transmission.

NOTE

Throughout this manual, the use of the terms right, left, front, and rear indicates directions from the viewpoint of the operator sitting in the seat of the truck.

1-4. Identification and Tabulated Data

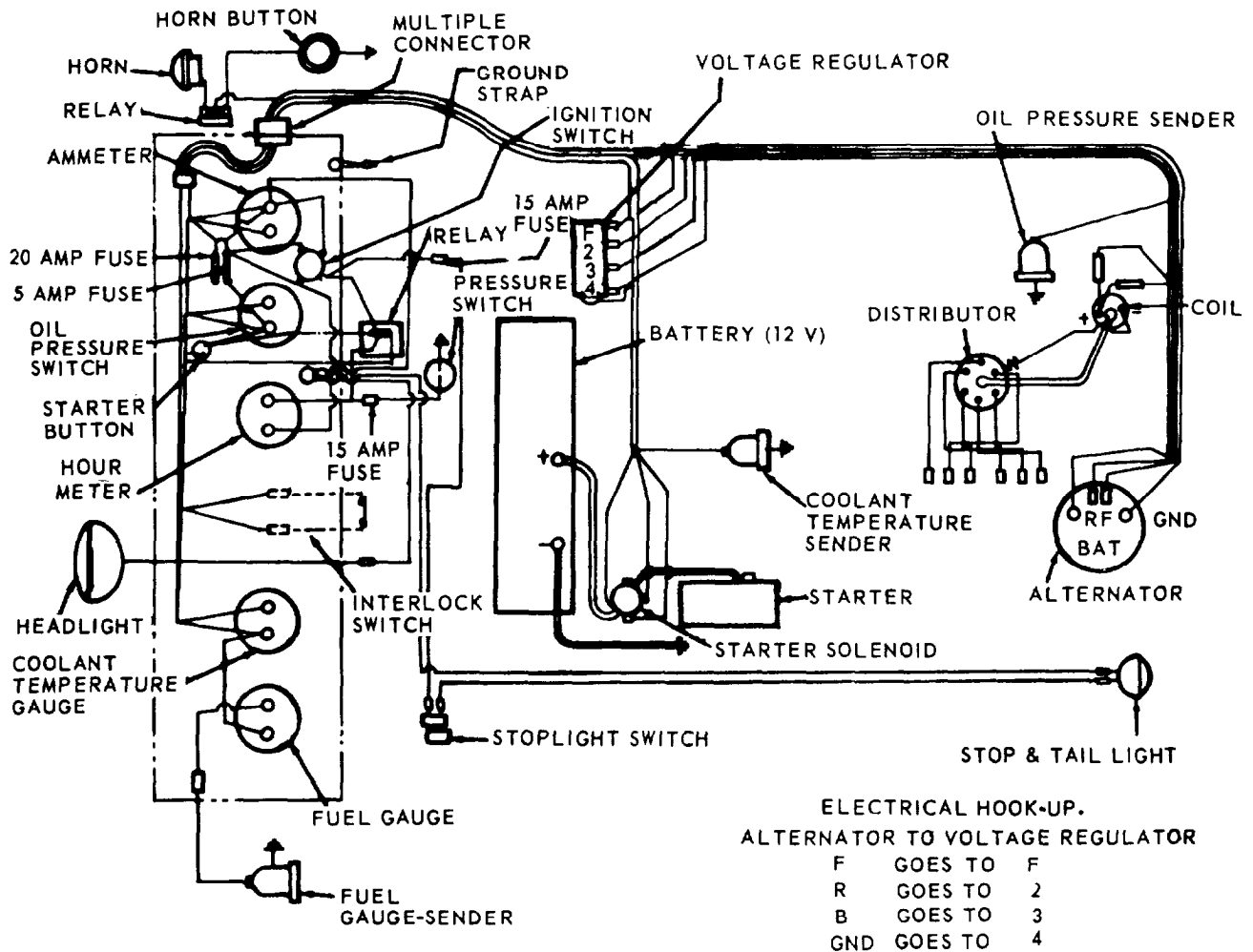
a. Identification. The truck has one identification plate. It is located in the center of the instrument panel. It contains information pertaining to the manufacturer, model, nomenclature, contract number, serial number, registration number, Federal Stock Number, engine serial number, capacity, and date shipped.

b. Tabulated Data.

Manufacturer	Allis-Chalmers
Model	FP60-24PS
Army Model	MHE-213
(1) Engine	
Make	Allis-Chalmers
Model	6mb-230
Governed speed	2200 RPM
Firing order	1-5-3-6-2-4
Idle speed	500 RPM

(2) Capacities.	
Cooling system	16 Qt
Drive axle differential	3 Qt
Planetary gear housing	¾ Qt
Engine crankcase (with filter)	7 Qt
Fuel tank	14.5 Gal
Hydraulic system:	
Brake master cylinder	¼ Pt
Lines	1 Pt
Tank (lift hydraulic system)	28 Qt
Transmission (with filter)	11 Qt
(3) Hydraulic system (steering)	
Flow regulator setting	2.5 to 3.2 g.p.m. @ 1200 psi
(4) Hydraulic system (main)	
Proper setting	2000 psi @ 1800 RPM
(5) Critical torque valves.	
Cylinder head bolts	110 ft-lb
Spark plugs	15-20 ft-lb
(6) Battery.	
Voltage	
Terminal grounded	
(7) Valves.	
Intake valve clearance (cold)	0.012 in.
Intake clearance (hot) (engine coolant at normal operating temperature)	0.010 in.
Exhaust valve clearance (cold)	0.014 in.
Exhaust valve clearance (hot) (engine at normal operating temperature)	0.012 in.
(8) Spark plugs	
Size	14 mm
Point gap	0.025 in.
(9) Distributor	
Point gap	0.022 in.

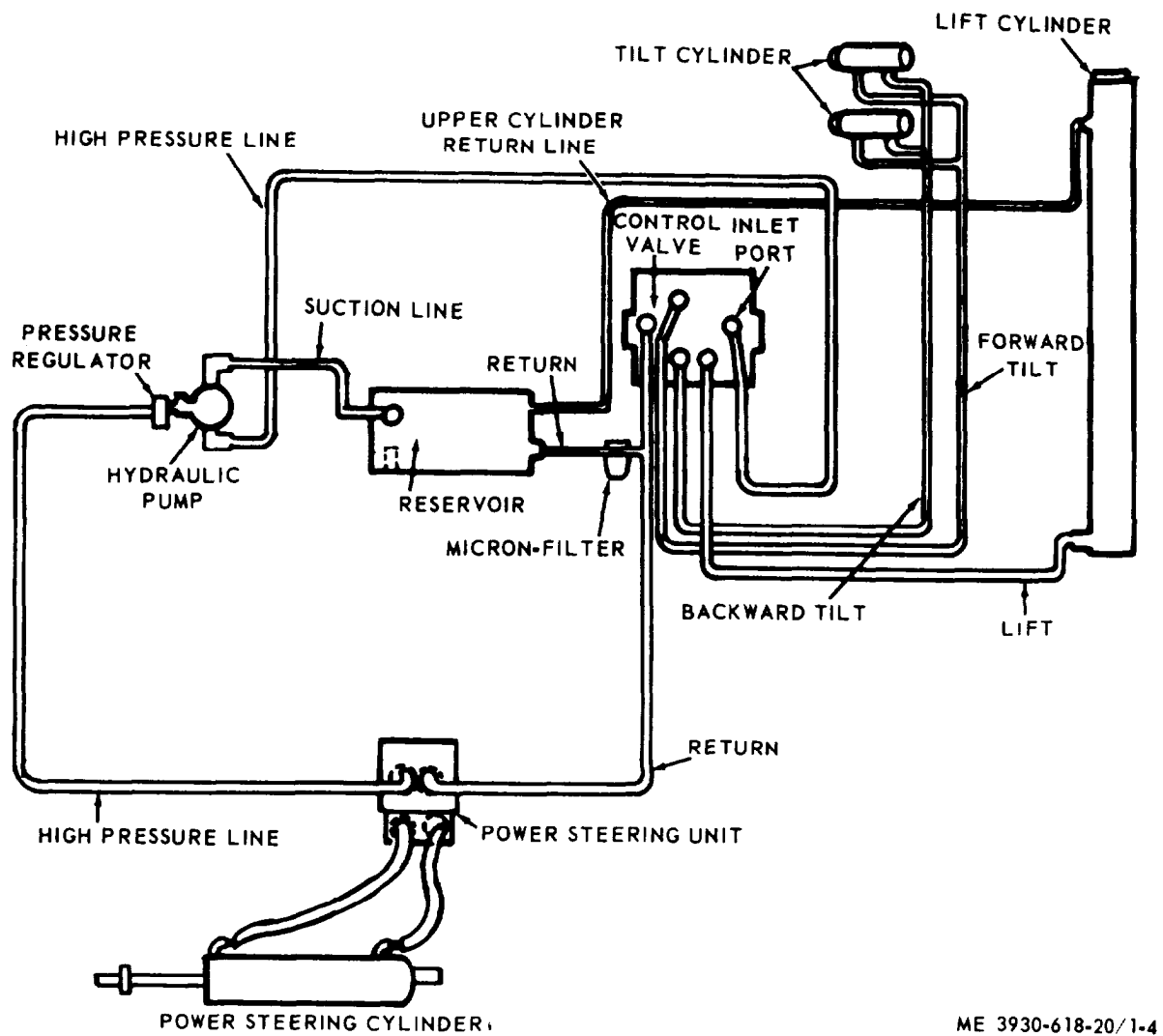
(10) Wiring diagram. See figure 1-3



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Figure 1-3. Wiring diagram.

(11) Hydraulic diagram. See figure 1-4.



ME 3930-618-20/1-4

Figure 1-4. Hydraulic diagram

1-5. Differences in Models

This manual covers only the Allis-Chalmers Model FP60-24PS fork lift truck Army Model MHE-213. No known differences exist.

CHAPTER 2 ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

2-1. Inspecting and Servicing the Equipment

Inspect the truck for any signs of damage. Check

radiator for proper coolant level and engine for proper engine oil level. Inflate tires to proper pressure. Check battery for proper electrolyte level and transmission for proper oil level. Fill fuel tank.

Section II. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

2-2. Tools and Equipment

No tools or equipment are authorized for organizational maintenance.

2-3. Special Tools and Equipment

No special tools or equipment are authorized for organizational maintenance.

2-4. Repair Parts

Repair parts and equipment are listed and illustrated in TM 10-3930-618-20P.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-5. General

To insure that the truck is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. Defects discovered during operation of the truck will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued.

2-6. Quarterly Preventive Maintenance Services

The sequence numbers indicate the sequence of minimum inspection requirements. The letter after the sequence number indicates the special frequency required for this check. If no letter is shown in column one of the table, the check is to be made on a quarterly basis. See legend at bottom of table 2-1.

Table 2-1. Preventive Maintenance Checks and Services

Item number	Interval						Item to be inspected	Procedure	Reference
	Operator			Org.					
	Daily			W	M	Q			
	B	D	A						
1						X	Brake Master Cylinder	Check for improper fluid level. Refer to current LO and refill to within 3/8 in. to 1/2 in. from top of reservoir. Inspect for leaks and insecure mounting. Check tiller cap vent for clogged condition.	(para 2-53)
2						X	Battery and Cables	Inspect battery for cracks and breaks. Inspect cables and terminals for corrosion and breaks. Inspect battery frame for security, breaks and corrosion.	(para 2-37)
3						X	Distributor	Inspect for cracks, carbon streaks, corroded terminals, and insecure mounting. Inspect contact points for burns, pits, frosting, misalignment, and improper setting. Adjust gap.	(para 2-34)

Table 2-1. Preventive Maintenance Checks and Services (Cont'd)

Item number	Interval						Item to be inspected	Procedure	Reference			
	Operator			Org.						B—Before operation D—During operation	A—After operation W—Weekly	M—Monthly Q—Quarterly
	Daily			W	M	Q						
	B	D	A									
4						X	Spark Plugs	Remove, clean and test spark plugs. Adjust gap to 0.025 in. Torque spark plugs 15 to 20 ft-lbs.	(para 2-35)			
5						X	Steering Axle	Inspect steering axle for insecure mounting. Inspect king pins and center arm for insecure mounting and wear. Check wheels to be sure there is 0° toe-in.	(para 2-50)			
6						X	Radiator	Inspect for insecure mounting, leaks, bent fins, and obstructions. If necessary add coolant until level is just below filler neck.	(para 2-25)			
7						X	Breather Lines	Crankcase vent hose and vent line from rocker arm cover may be cleaned with compressed air. Rocker arm cover valve may be cleaned with a cleaning solvent.	(para 2-9)			
8						X	Fire Extinguisher	Inspect for broken seal. Replace extinguisher if gage does not indicate full charge.				
9						X	V-Belt and Pulleys	Inspect belt for frayed condition, wear, glazing, and deterioration. Inspect pulleys for breaks and insecure mounting. Adjust V-belt for ½ inch deflection mid way between pulleys.	(para 2-26)			
10						X	Hydraulic Fluid Tank	Check level of hydraulic fluid. Refer to current LO and add fluid as required. Clean or replace the breather filters and line filters.	(para 2-68)			
11						X	Inching and Service Brake Pedals and Linkage	Check service brake pedal for free travel of ½ inch. Inspect for insecure linkage. Inspect inching pedal and linkage for improper adjustment.	(para 2-52)			
12						X	Hand Brake Lever and Linkage	Inspect for insecure mounting, improper operation, and maladjustment. Check cable for wear and frayed condition.	(para 2-51)			
13						X	Tilt Cylinders	Check for leaks and insecure mounting. Adjust for correct degree of tilt of 3° forward and 10° back.	(para 2-66)			
*14 M						X	Lights	Inspect for burned out lamps and defective leads. Replace lamps and leads as necessary.	(para 2-39)			
15						X	Lift Chains	Inspect chains for wear and inspect rollers for breakage and binding. Adjust chain so that the carriage lifts evenly.	(para 2-67)			
16 17						X	Lift Cylinder Controls and Instruments	Inspect for leaks and insecure mounting. Replace damaged instruments. Tighten loose mountings. With engine running, check controls and instruments for improper operation. The normal instrument readings are: Ammeter-Indicates slight positive charge Hourmeter-Register total hours of operation Oil pressure gage-25 to 30 psi Temperature gage-160°F. to 180°F.	TM 10-3930-618-10			

Section IV. TROUBLESHOOTING

This section contains information useful in diagnosing and correcting unsatisfactory operation or failure of the truck. Malfunctions which may occur are listed in table 2-2. Each malfunction is followed by a list of

probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 2-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Engine will not start (no spark. Ammeter shows no discharge. Zero reading with ignition switch on).	<ul style="list-style-type: none"> a. Ignition switch defective. b. Ignition primary wires or starting motor cables broken or connections loose. c. Ignition coil primary winding open. d. Distributor points dirty. e. Distributor points not closing. f. Loose or corroded ground or battery cable connection. 	<ul style="list-style-type: none"> a. Replace switch. b. Repair or replace and tighten. c. Replace coil (para 2-36). d. Clean and adjust points (para 2-34). e. Adjust or replace points (para 2-34). f. Remove, clean, reinstall, tighten cable lamps (para 2-37).
2. Engine will not start (ammeter shows abnormal discharge with ignition switch on).	<ul style="list-style-type: none"> a. Short-circuited or burned distributor cap or rotor. b. Short-circuited wire between ammeter and Ignition switch. c. Short-circuited primary winding in ignition coil. 	<ul style="list-style-type: none"> a. Replace defective parts (para 2-34). b. Repair or replace wire. c. Replace coil (para 2-36).
3. Engine will not start (weak spark or no spark).	<ul style="list-style-type: none"> a. Distributor points not opening. b. Distributor points pitted or burred. c. Distributor capacitor weak. d. Ignition coil weak. e. Primary wire connections loose. f. High-tension wires, spark plug wires, or distributor cap wet. g. High-tension wires, spark plug wires, or distributor cap damaged h. Distributor cap or rotor burred or broken. i. Spark plug gaps incorrect. j. Short-circuited secondary circuit in ignition coil. 	<ul style="list-style-type: none"> a. Clean or replace and adjust points (para 2-34). b. Clean or replace (para 2-34). c. Replace capacitor (para 2-34). d. Replace coil (para 2-36). e. Tighten connections. f. Dry thoroughly. g. Replace defective parts. h. Replace defective parts (para 2-34). i. Reset gaps (para 2-35). j. Replace coil (para 2-36).
4. Engine will not start (good spark).	<ul style="list-style-type: none"> a. Fuel tank empty. b. Dirt or water in carburetor or float switch. c. Carburetor and engine flooded by excessive use of choke. d. Fuel not reaching carburetor. e. Dirt in fuel lines or tanks. f. Fuel line pinched. g. Ignition wires incorrectly installed in distributor cap. h. Ignition timing incorrect. i. Fuel pump not pumping. j. Lack of engine compression. 	<ul style="list-style-type: none"> a. Refill tank. b. Replace carburetor (para 2-17). c. Depress accelerator pedal fully and crank engine: d. Inspect for damaged or leaky lines or air leak into line between tank and fuel pump. e. Disconnect lines, drain tank and blow out lines (para 2-21). f. Repair or replace line. g. Install wires correctly. h. Reset timing (para 2-14). i. Replace fuel pump (para 2-18). j. Report to direct support maintenance.
5. Engine backfires.	<ul style="list-style-type: none"> a. Ignition out of time. b. Spark plug wires incorrectly installed in distributor cap or at spark plugs. c. Distributor cap cracked or shorted. d. Valve holding open. 	<ul style="list-style-type: none"> a. Reset timing (para 2-14). b. Install wires correctly. c. Replace cap (para 2-34). d. Report to direct support maintenance.
6. Engine operates erratically.	<ul style="list-style-type: none"> a. Improper ignition timing. b. Spark plug wires incorrectly installed in distributor cap. c. Dirt or water in carburetor. d. Carburetor improperly adjusted. e. Valve sticking, not seating properly, burned or pitted. 	<ul style="list-style-type: none"> a. Reset timing. b. Install wires correctly. c. Drain carburetor, clean fuel system. d. Adjust carburetor (para 2-17). e. Report to direct support maintenance.

Table 2-2. Troubleshooting (Cont'd)

Malfunction	Probable cause	Corrective action
7. Engine stalls on idle.	<ul style="list-style-type: none"> f. Excessive carbon on cylinder head. g. Valve springs weak. h. Fuel pump, pressure low. i. Fuel filter clogged. j. Partly clogged or pinched fuel lines. k. Intake manifold leak, l. Distributor cap cracked or shorted. a. Carburetor throttle valve closes. b. Carburetor choke remaining closed. c. Dirt or water in idler passages of carburetor. d. Air leaks at intake manifold. e. Spark plugs defective, gaps incorrect. 	<ul style="list-style-type: none"> f. Report to direct support maintenance. g. Report to direct support maintenance. h. Replace pump (para 2-18). i. Replace filter (para 2-18). j. Clean and repair lines. k. Inspect gaskets and tighten. l. Replace cap (para 2-34). a. Adjust carburetor (para 2-17). b. Adjust choke cable (para 2-17). c. Drain carburetor (para 2-17). d. Tighten manifold stud nuts or replace gaskets (para 2-11). e. Clean or replace spark plugs, set gap clearance (para 2-35).
8. Engine misfires on one or more cylinders.	<ul style="list-style-type: none"> f. Ignition timing early. g. Low compression. a. Dirty spark plugs. b. Cracked spark plug porcelain. c. Spark plug wires grounded. d. Spark plug wires incorrectly installed in cap or at spark plugs. e. Distributor cap on rotor burned or broken. f. Valve tappet holding valve open. g. Low engine compression. h. Cracked cylinder block or broken valve tappet or tappet screw. 	<ul style="list-style-type: none"> f. Reset timing (para 2-14). g. Report to direct support maintenance. a. Clean, adjust or replace plugs (para 2-35). b. Replace spark plugs (para 2-35) c. Replace wires. d. Install wires correctly. e. Replace defective parts (para 2-34). f. Report to direct support maintenance. g. Report to direct support maintenance. h. Report to direct support maintenance.
9. Engine does not idle properly	<ul style="list-style-type: none"> a. Spark plugs dirty or gap too close. b. Ignition timing incorrect. 	<ul style="list-style-type: none"> a. Clean and adjust spark plugs (para 2-35). b. Reset timing (para 2-14).
10. Engine misses at high speed.	<ul style="list-style-type: none"> a. Distributor points sticking, dirty, or improperly adjusted. b. Distributor rotor or cap cracked or burred. c. Uneven cylinder compression. d. Leaking high tension or spark plug wires, cracked insulation. e. Carburetor choke not adjusted. f. Defective carburetor accelerating pump system, dirt in metering jets, or incorrect float level g. Fuel pump defective, causing lack of fuel. h. Air cleaner dirty. i. Valves sticking: weak or broken valve springs. j. Fuel filter clogged. k. Weak distributor breaker arm spring. l. Excessive play in distributor shaft bearing. 	<ul style="list-style-type: none"> a. Clean, adjust, or replace points (para 2-34). b. Replace defective parts (para 2-34) c. Report to direct support maintenance. d. Replace defective parts. e. Adjust choke (para 2-17) f. Replace carburetor (para 2-17) g. Replace fuel pump (para 2-18) h. Clean air cleaner and refill oil cup (para 2-16). i. Report to direct support maintenance. j. Remove and clean strainer (para 2-18). k. Replace point set (para 2-34). l. Replace distributor (para 2-34).
11. Engine pings.	<ul style="list-style-type: none"> a. Ignition timing early. b. Distributor automatic spark advance stuck in advance position. or spring broken. c. Incorrect fuel. 	<ul style="list-style-type: none"> a. Reset timing (para 2-14). b. Replace distributor (para 2-34). c. Drain, use correct fuel.
12. Engine lacks power	<ul style="list-style-type: none"> a. Ignition timing late. b. Incorrect fuel. c. Engine running cold d. Insufficient oil or improper grade of oil. e. Oil system failure. f. Air cleaner dirty. g. Spark plug gaps too wide. h. Choke partially closed, or throttle not opening fully. 	<ul style="list-style-type: none"> a. Reset timing (para 2-14). b. Use correct fuel. c. Test thermostat (para 2-28). In cold weather cover air intake under driver's seat. d. Lubricate in accordance with lubrication order. e. Report to direct support maintenance. f. Clean air cleaner, change oil in cup (para 2-16). g. Reset gaps (para 2-35). h. Adjust choke (para 2-17), accelerator pedal (para 2-20), and governor linkage (para 2-19).

Table 2-2. Troubleshooting (Cont'd)

Malfunction	Probable cause	Corrective action
	<ul style="list-style-type: none"> i. Exhaust pipe, muffler or tailpipe obstructed. j. Low compression, broken valve springs, sticking valves k. Improper tappet adjustment. l. Lack of fuel. 	<ul style="list-style-type: none"> i. Remove obstructions or replace parts (para 2-23). j. Report to direct support maintenance. k. Adjust tappets (para 2-8). l. Clean filter. inspect fuel pump, inspect carburetor for water or dirt, and replace if necessary.
13. High oil consumption.	<ul style="list-style-type: none"> a. High engine speeds. b. Oil leak. c. Improper grade of oil or diluted oil. d. overheating of engine causing thinning of oil. e. Defective piston or rings; excessive side clearance of intake valves in guides; cylinder bores worn (scored, out-of-round, tapered); worn or damaged seals. 	<ul style="list-style-type: none"> a. Adjust governor (para 2-19). b. Report to direct support maintenance. c. Use new oil of proper grade. d. See "engine overheats," item 24 below. e. Report to direct support maintenance.
14. Low engine oil pressure.	<ul style="list-style-type: none"> a. Insufficient oil supply. b. Improper grade of oil or diluted c. Oil too heavy. d. Oil leaks. e. Oil pump faulty; pressure regulator valve stuck or improperly adjusted, or broken spring. 	<ul style="list-style-type: none"> a. Fill crankcase to prescribed level. b. Change oil, inspect crankcase ventilation, and inspect for water in oil. c. Change to proper grade of oil Refer to Lubrication Chart. d. Report to direct support maintenance. e. Report to direct support maintenance.
15. Poor engine compression.	<ul style="list-style-type: none"> a. Incorrect tappet adjustment. b. Leaking, sticking or burned valves; sticking tappets; valve spring weak or broken; valve stems and guides worn; piston ring grooves worn or rings worn, broken or stuck cylinder bores scored or worn. 	<ul style="list-style-type: none"> a. Adjust tappets (para 2-8). b. Report to direct support maintenance.
16. Fuel does not reach carburetor.	<ul style="list-style-type: none"> a. No fuel in fuel tank. b. Fuel filter clogged. c. Fuel line air leak between tank and fuel pump. d. Fuel line clogged. e. Fuel tank cap vent clogged. f. Fuel pump defective. 	<ul style="list-style-type: none"> a. Fill fuel tank. b. Replace filter cartridge (para 2-18). c. Repair or replace line. d. Disconnect and blow out lines. e. Clean vent. f. Replace pump (para 2-18).
17. Fuel reaches carburetor, but does not reach cylinders.	<ul style="list-style-type: none"> a. Choke not closing. b. Fuel passage in carburetor clogged. c. Carburetor float valve stuck closed. 	<ul style="list-style-type: none"> a. Adjust choke control. b. Replace carburetor (para 2-17). c. Replace carburetor (para 2-17).
18. High fuel consumption.	<ul style="list-style-type: none"> a. Incorrect adjustment of carburetor. b. Vehicle overloaded. c. High engine speeds. d. Air cleaner clogged. e. Carburetor float level too high; acceleration pump not properly adjusted. f. Fuel line leak. g. Overheating engine. h. Carburetor parts worn or broken. i. Fuel pump pressure too high or diaphragm leaking. j. Engine runs cold. k. Ignition incorrectly timed. l. Spark advance stuck. m. Leaking fuel filter bowl gasket. n. Low engine compression. o. Choke partially closed. p. Engine idling too fast. q. Spark plug dirty. r. Weak coil. s. Clogged muffler or bent exhaust pipe. 	<ul style="list-style-type: none"> a. Adjust carburetor (para 2-17). b. Reduce -loads to specified minimum capacity. c. Adjust governor (para 2-19). d. Clean air cleaner and change oil in cup (para 2-16). e. Replace carburetor (para 2-17). f. Correct leaks, replace lines. g. See "Engine Overheats," item 24 below. h. Replace carburetor (para 2-17). i. Replace fuel pump (para 2-18) j. Inspect thermostat (para 2-28). k. Reset timing (para 2-14). l. Replace distributor (para 2-34). m. Replace gasket (para 2-18). n. Report to direct support maintenance o. Adjust choke control. p. Adjust carburetor idle speed (para 2-17). q. Clean and gap or replace spark plugs (para 2-35). r. Replace coil (para 2-36). s. Remove obstruction or replace, defective parts (para 2-23)

Table 2-2. Troubleshooting (Cont'd)

Malfunction	Probable cause	Corrective action
19. Low fuel pressure.	<ul style="list-style-type: none"> a. Air leak in fuel lines b. Fuel pump defective, diaphragm broken, valves leaking, linkage worn. c. Fuel lines clogged 	<ul style="list-style-type: none"> a. Tighten connections, repair line if damaged. b. Replace fuel pump (para 2-18). c. Clean or replace lines.
20. Engine idles too fast.	<ul style="list-style-type: none"> a. Improper carburetor throttle stop adjustment b. Accelerator linkage sticking. c. Accelerator linkage return spring weak 	<ul style="list-style-type: none"> a. Adjust idle speed adjustment screw (para 2-17) b. Free and lubricate linkage (para 2-20). c. Replace spring (para 2-20)
21. Fuel gage does not register.	<ul style="list-style-type: none"> a. Loose wire connection at instrument panel or tank unit. b. Instrument panel unit or tank unit inoperative. 	<ul style="list-style-type: none"> a. Tighten connections. b. Replace unit
22. Loss of coolant.	<ul style="list-style-type: none"> a. Loose hose connections. b. Damaged or deteriorated hose. c. Leaking radiator. 	<ul style="list-style-type: none"> a. Tighten hose connections. b. Replace hoses. c. Replace radiator (para 2-25).
23. Engine too cool during operation	<ul style="list-style-type: none"> a. Thermostat sticking. b. Low air temperature. 	<ul style="list-style-type: none"> a. Replace thermostat and gasket (para 2-28). b. Cover radiator.
24. Engine overheats.	<ul style="list-style-type: none"> a. Air flow through radiator core restricted b. Coolant level low c. Clogged radiator core. d. Thermostat stuck. e. Damaged or deteriorated hose or fan belt f. Radiator or water pump leaking. g. Loose fan belt. h. Cylinder block or head leaking. i. Ignition timing incorrect. j. Damaged muffler; bent or clogged exhaust pipe. k. Insufficient oil or improper grade of oil. l. Air cleaner restricted. m. Water pump impeller broken n. Poor compression. o. Timing incorrect. 	<ul style="list-style-type: none"> a. Clean radiator core from counterweight side with compressed air or water (para 2-25). b. Fill radiator to proper level (para 2-25). c. Clean by Hushing radiator (para 2-25) d. Replace thermostat (para 2-28). e. Replace defective hose (para 2-25). Replace defective fan belt (para 2-26). f. Replace defective parts (para 2-25). g. Adjust fan belt tension (para 2-26). h. Report to direct support maintenance. i. Reset timing (para 2-14). j. Replace defective parts (para 2-23). k. Refer to lubrication order. l. Clean air cleaner and change oil in cup (para 2-16). m. Replace pump (para 2-27). n. Report to direct support maintenance. o. Reset timing (para 2-14).
25. Starting motor cranks engine slowly.	<ul style="list-style-type: none"> a. Engine oil too heavy. b. Weak battery. c. Battery cell shorted d. Battery connections corroded, broken or shorted. e. Starting motor defective. f. Starting switch defective. 	<ul style="list-style-type: none"> a. Change to proper grade oil. b. Recharge or replace battery (para 2-37). c. Replace battery (para 2-37). d. Clean and tighten or replace cables. e. Replace starting motor (para 2-33) f. Replace switch.
26. Starting motor does not crank engine.	<ul style="list-style-type: none"> a. Engine oil too heavy. b. Starting motor solenoid or cables defective, loose connections. c. Starting motor pinion gear jamming in flywheel drive gear. d. Dirty starter drive mechanism. e. Faulty starter relay. f. Faulty ignition switch. g. Faulty neutral starting switch. 	<ul style="list-style-type: none"> a. Change to proper grade oil. b. Replace defective starting motor (para 2-33). c. Replace starting motor (para 2-33). d. Clean and lubricate mechanism. e. Replace starter relay (para 2-33). f. Replace switch. g. Replace switch.
27. Starting motor operates but fails to crank engine when switch is engaged.	<ul style="list-style-type: none"> a. Starting motor gear not engage flywheel. b. Starting motor or drive gear defective. 	<ul style="list-style-type: none"> a. Replace starting motor (para 2-33). b. Replace starting motor (para 2-33).
28. No alternator output.	<ul style="list-style-type: none"> a. Regulator defective. b. Alternator defective. 	<ul style="list-style-type: none"> a. Adjust or replace regulator (para 2-32). b. Adjust or replace alternator (para 2-31).
29. Low or fluctuating alternator output.	<ul style="list-style-type: none"> a. Loose fan belt. b. Loose or dirty connections in charging circuit. c. Defective alternator. d. Defective regulator. 	<ul style="list-style-type: none"> a. Adjust belt (para 2-26). b. Clean and tighten connections. c. Replace alternator (para 2-31). d. Adjust or replace regulator (para 2-32).
30. Excessive alternator output.	<ul style="list-style-type: none"> a. Defective alternator. b. Defective regulator. 	<ul style="list-style-type: none"> a. Replace alternator (para 2-31). b. Adjust or replace regulator (para 2-32).

Table 2-2. Troubleshooting (Cont'd)

Malfunction	Probable cause	Corrective action
31. Alternator noisy.	a. Loose pulley or alternator mounting. b. Defective bearings or armature rubbing or field poles.	a. Tighten. b. Replace alternator (para 2-31).
32. Battery discharge	a. Battery solution level low. b. Short in battery cell. c. Alternator not charging. d. Loose or dirty connections, broken cables. e. Excessive use of starting motor. f. Idle battery or excessive use of lights with engine at idle. g. Short circuits.	a. Add distilled water to bring level above plates; inspect for cracked case. b. Replace battery (para 2-37). c. Sec "So Alternator Output" or "Low or Fluctuating Alternator Output" items 28 or 29 above. d. Clean and tighten connections; replace cables. e. Tune up engine, change battery. f. Recharge or replace battery (para 2-37). Use lights sparingly. g. Replace defective wiring.
33. Lights do not light.	a. Switch not fully ON. b. Loose or dirty connections, broken wire. c. Wiring circuit short-circuited or open d. Light burned out. e. Defective switch.	a. Turn switch ON fully. b. Clean short circuited wiring or replace defective parts. c. Connect short circuit or replace defective parts. d. Replace light (pars 2-39). e. Replace switch.
34. Lights dim.	a. Loose or dirty connections. b. Wiring short circuited. c. Defective switch. d. Weak battery.	a. Clean and tighten connection. b. Replace defective wiring. c. Replace switch. d. Recharge or replace battery (para 2-37). Replace wire.
35. Horn sounds continuously	Short circuit in wiring between horn and horn button.	Replace wire.
36. Horn will not operate.	a. Horn fuse blown. b. Loose or dirty conditions. c. Open circuit.	a. Replace fuse. b. Clean and tighten connections. c. Repair or replace wiring.
37. Continuous drive axle noise.	a. Unevenly worn tires. b. Improperly adjusted wheel bearing. c. lack of lubricant. d. Worn parts.	a. Replace tires (para 2-57). b. Adjust bearings (para 2-58). c. Fill to correct level. d. Report to direct support maintenance.
38. Axle noise on drive or on coast only.	Parts worn or out of adjustment.	Report to direct support maintenance.
39. Excessive backlash in drive axle.	Parts worn or out of adjustment.	Report to direct support maintenance.
40. Complete failure of drive axle.	Damaged parts.	Report to direct support maintenance.
41. Steering is difficult.	a. Lack of lubrication. b. Tight steering gear, misaligned wheels. c. Bent or misaligned parts.	a. Lubricate. b. Report to direct support maintenance. c. Report to direct support maintenance.
42. Truck wanders or weaves	a. Improper toe-in, camber or caster. b. Loose wheel bearings. c. Steering gear worn or maladjusted. d. Steering gear mounting bolts loose.	a. Report to direct support maintenance. b. Adjust wheel bearings (para 2-58). c. Report to direct support maintenance. d. Tighten mounting bolts.
43. Shimmying or wobble at low speeds.	a. Steering gear worn or adjusted too loose b. Loose wheel bearings.	a. Report to direct support maintenance. b. Report to direct support maintenance.
44. Vehicle pulls to one side.	a. Odd size or new and old tires on opposite wheels. b. Improper toe-in, camber or caster. c. Tight wheel bearings. d. Bent steering arm or connection.	a. Match tires. b. Report to direct support maintenance. c. Report to direct support maintenance. d. Report to direct support maintenance.
45. Brakes drag	a. Improper pedal adjustment. b. Brake shoe return spring broken or weak. c. Loose or damaged wheel bearings. d. Brake backing plate loose.	a. Adjust brake pedal free travel (para 2-52). b. Report to direct support maintenance. c. Report to direct support maintenance. d. Report to direct support maintenance.
46. Brakes grab.	a. Grease on bearings b. Dirt imbedded in lining. c. Drums scored or rough.	a. Report to direct support maintenance. b. Report to direct support maintenance. c. Report to direct support maintenance.
47. Brake locked.	a. Brake pedal locking free travel. b. Brake frozen to drums (cold weather).	a. Adjust pedal free travel (para 2-52). b. Break loose by driving vehicle.
48. Brake noisy or chatters	a. Brake lining worn b. Grease on linings. c. Dirt imbedded in linings.	a. Report to direct support maintenance. b. Report to direct support maintenance. c. Report to direct support maintenance.

Table 2-2. Troubleshooting (Cont'd)

Malfunction	Probable cause	Corrective action
49. Excessive brake pedal travel.	d. Improper or loose linings. e. Brake shoe on drum distorted.	d. Report to direct support maintenance. e. Report to direct support maintenance.
50. Excessive brake pedal pressure necessary to actuate brakes.	a. Lining worn. b. Pedal free travel improperly adjusted.	a. Report to direct support maintenance. b. Adjust free travel (para 2-52).
51. Wheel wobble.	a. Insufficient fluid in master cylinder b. Grease on linings, worn or glazed lining. c. Warped brakeshoes or defective brake linings. d. Brake drum scored or distorted.	a. Fill master cylinder to within 1/4-inch of the top (para 2-53). b. Report to direct support maintenance. c. Report to direct support maintenance. d. Report to direct support maintenance.
52. Tanks do not lift to mechanism height.	a. Wheel bent.	a. Inspect mounting on hub, splindles, and drive axles, replace defective wheel or mounting (para 2-56 and 2-57).
53. Tilt.	b. Wheel loose on hub.	b. Tighten nuts or bolts.
54. Oil leak at top of cylinder assembly.	c. Wheel bearing not adjusted	c. Report to direct support maintenance. Fill to correct level.
55. With load centered on lift forks, load is lifted unevenly.	Hydraulic oil level low. Loss of oil pressure.	Refer to direct support maintenance. Refer to direct support maintenance.
56. Truck will not move in either direction.	Defective cylinder. Lift chains out of adjustment.	Adjust chains for even lift of carriage.
57. Truck will move in one direction only.	a. Parking brake not released. b. Transmission oil level low. c. Transmission control linkage not properly adjusted. d. Transmission inoperative.	a. Release brake. b. Fill to correct level. c. Report to direct support maintenance.
58. Truck moves slowly in either direction at wide open throttle.	a. Transmission control linkage not adjusted. b. Defective transmission.	d. Report to direct support maintenance. a. Report to direct support maintenance. b. Report to direct support maintenance.
59. Transmission overheating.	a. Oil level low. b. Brakes dragging. c. Defective transmission.	a. Fill to correct level. b. Refer to "Brakes drag" Item 46 above. c. Report to direct support maintenance.
	a. Oil level low. b. Brakes dragging. c. Plugged radiator. d. Defective transmission.	a. Fill to correct level. b. Refer to "Brakes drag" Item 46 above. c. Flush radiator (para 2-25). d. Report to direct support maintenance.

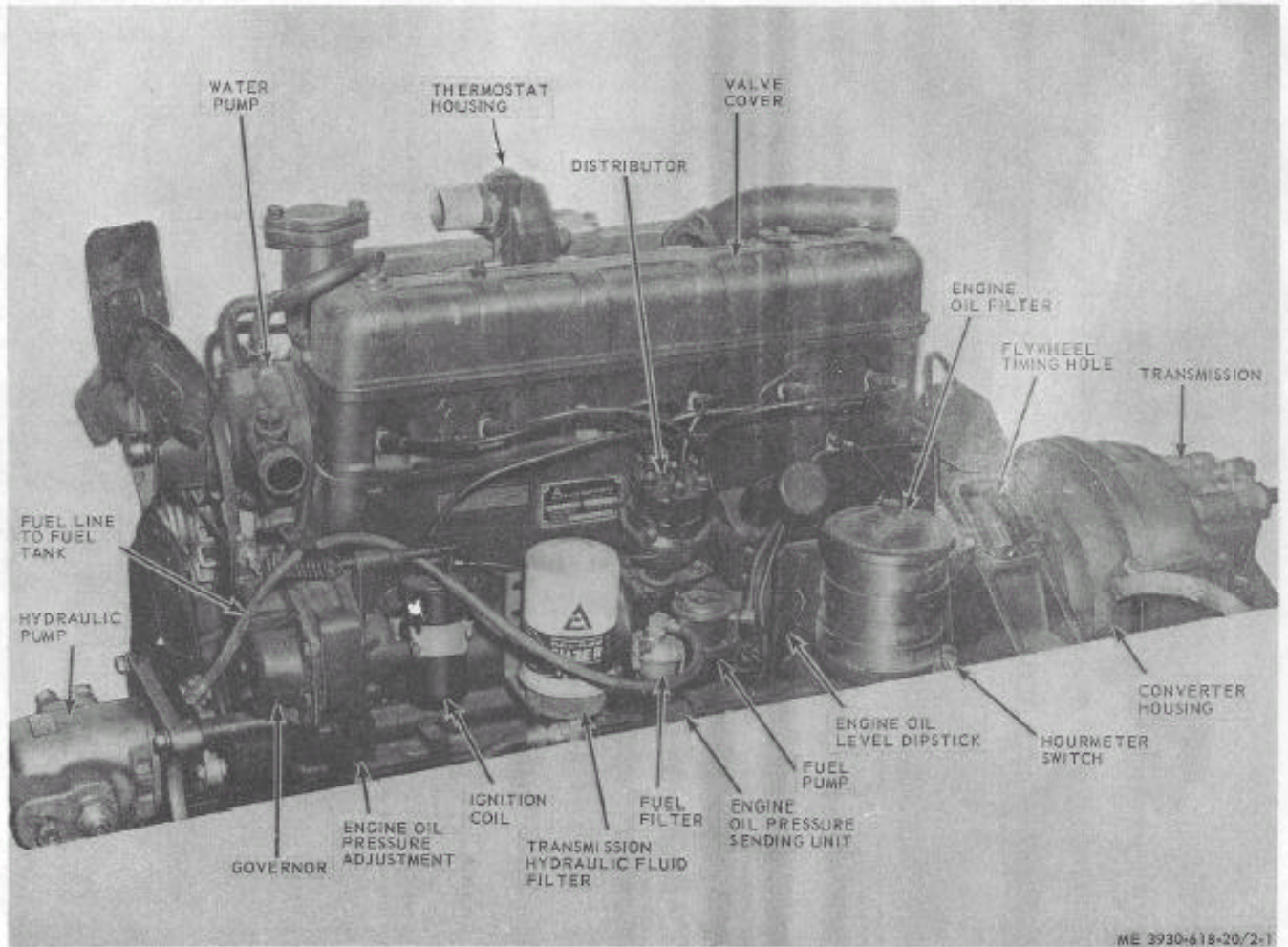
Section V. MAINTENANCE OF THE ENGINE

2-7. Engine

The engine is a six cylinder, four-stroke cycle, valve-in-head, gasoline engine. The engine lubrication system is a full pressure, force feed type employing a spring

loaded relief valve that is accessible from the outside of the engine for adjustment. The cooling system is thermostatically controlled and features an impeller type water pump and full-length cylinder water jacket. The engine is illustrated in figure 2-1, and 2-2 and 2-3.

Figure 2-1. Engine, right side view.



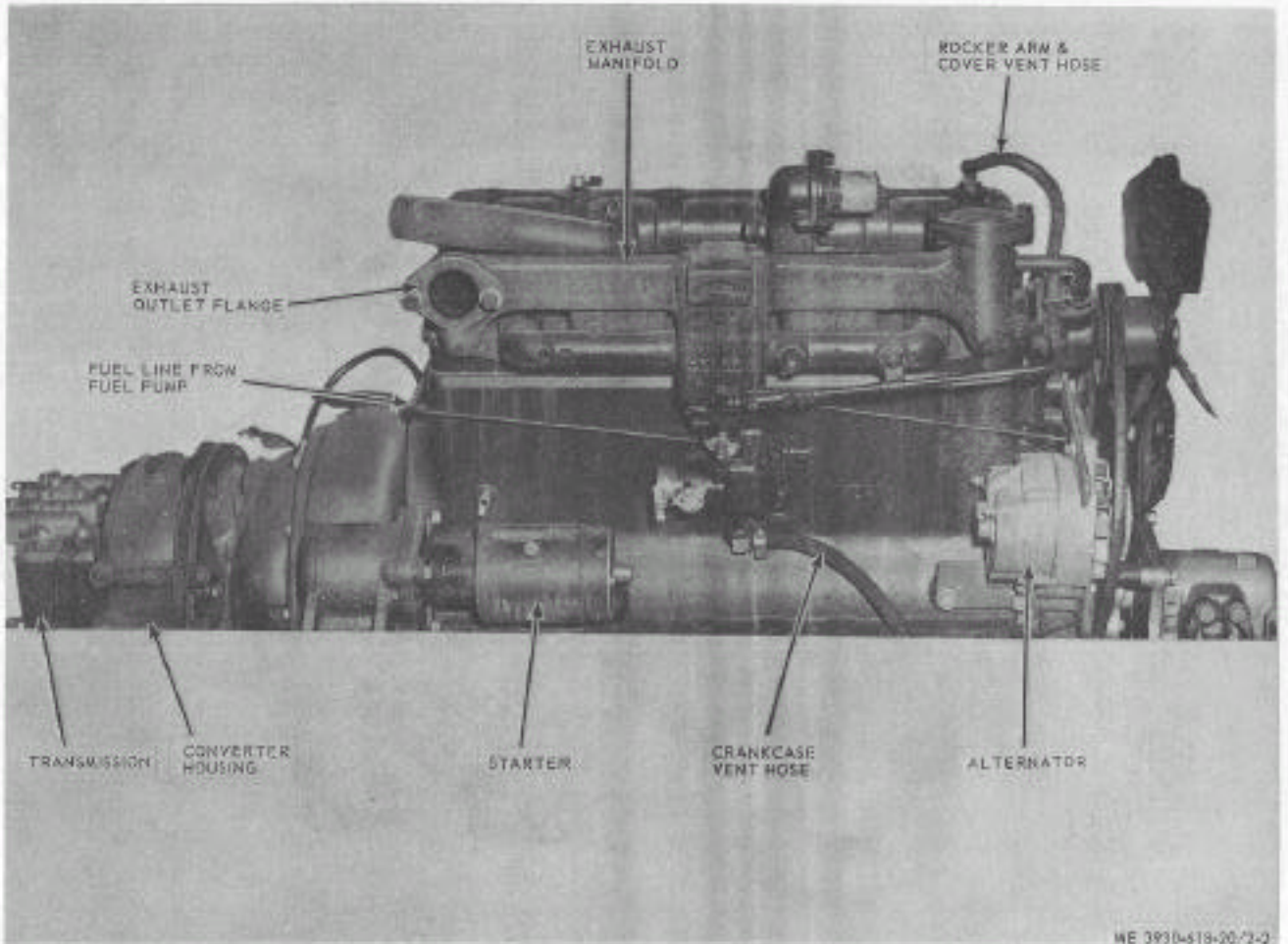


Figure 2-2. Engine, hp 440000

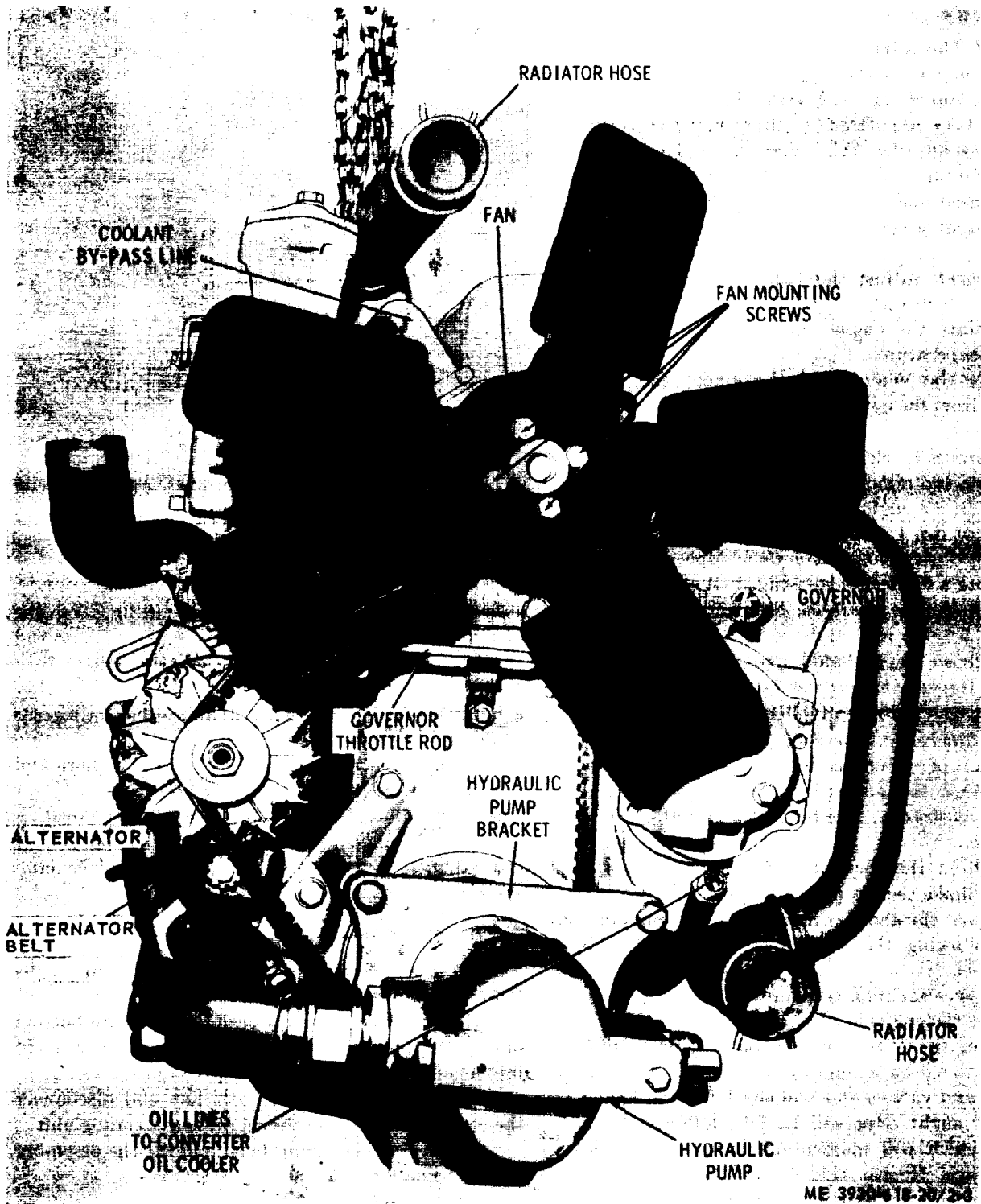


Figure 2-3. Engine, rear view (fan end).

2-8. Valves

a. General. The valves are of the overhead type and adjustment may be made after removing the rocker arm cover on top of engine. Maintaining correct valve clearance is very important. Insufficient valve clearance will cause burning of the valves and valve seats if allowed to continue. Excessive valve wear will result in faulty engine operation and valve and lifter wear will cause rapid wear of the valve operating mechanism.

b. Adjustment. Adjust the valve clearance as follows:

(1) Operate the engine until it reaches normal operating temperature.

(2) Stop the engine and disconnect the high tension wire from the ignition coil to prevent accidental starting.

(3) Thoroughly clean the valve cover and surrounding area and remove the valve cover.

(4) Crank the engine with the starter motor until both valves of No. 1 cylinder are closed and the push rods are at the lowest position on their respective cams.

(5) Using a flat feeler gage (fig. 2-4) of 0.012 inch thickness, check the clearance between the exhaust valve stems (engine hot) and their respective rocker arms. The feeler gage should pass through with a slight drag. Repeat this process on the intake valves using feeler gage thickness of 0.010.

(6) If adjustment is necessary, loosen the locknut and obtain proper clearance by turning the adjusting screw. Turning the adjusting screw clockwise will decrease the clearance; counterclockwise will increase the clearance.

(7) Tighten the locknut and then recheck the clearance to make certain no change occurred.

(8) Repeat the above procedure on the remaining cylinders following the firing order of the engine (1-5-3-6-2-4).

(9) Connect the high tension wire to the ignition coil and start the engine.

(10) Run the engine at operating temperature, pass the feeler gage back and forth between the exhaust rocker arms and valve stems and check for 0.012-inch thickness. A slight drag will be felt, followed by a tightening which will momentarily prevent moving the feeler gage. Repeat this process for the intake valves and check for 0.010-inch thickness. Stop the engine and correct any improperly adjusted clearances. Repeat step (10) above.

(11) Install the valve cover, making certain that the cover gasket is in good condition and positioned properly to prevent oil leakage.

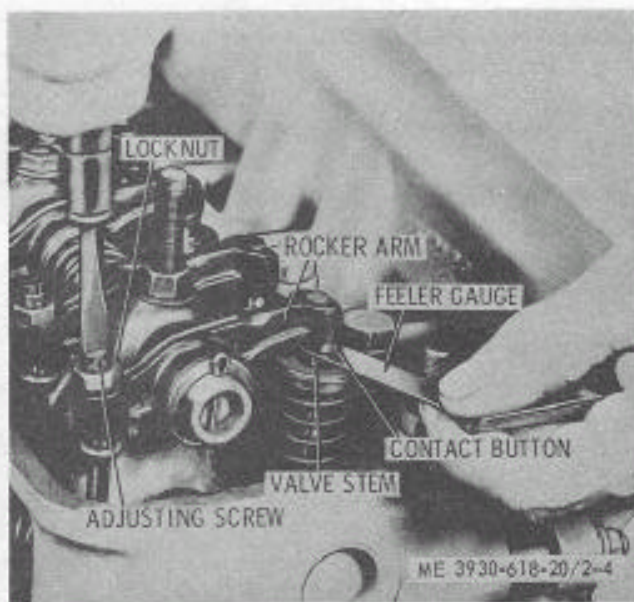


Figure 2-4. Adjusting valve clearance.

2-9. Breather Lines

a. General. There are two breather lines on the engine. One is the crankcase breather flexible hose and the other is the rocker arm cover breather line.

b. Removal. Remove the two lines and the rocker arm cover (PCV) valve (fig. 2-2) and service at regular intervals. See Table 2-1.

c. Cleaning and Inspection. Clean flexible hose and breather line with low pressure air hose.

d. Installation. Installation is reverse of removal.

e. Inspection. Check lines for breaks, cracks, or other damage. Check valve for damage. Replace damaged lines or valves.

2-10. Oil Filter

a. Removal. Refer to figure 2-5 and remove as follows:

(1) Disconnect the oil outlet line at the bottom of the filter body and drain the oil from the filter body into a suitable container.

(2) Disconnect the oil inlet line and disconnect the electrical wire from the oil pressure sending unit.

(3) Loosen the clamp bolts and lift the assembly out of the clamps.

b. Disassembly.

(1) Remove the cover bolt and lift off the cover and gasket.

(2) Lift the element from the body.

c. Cleaning and Inspection.

(1) Clean all parts in PD-680 and dry thoroughly.

(2) Inspect the body and cover for breaks or cracks.

(3) Inspect fittings and hardware for stripped or damaged threads. Replace damaged parts.

d. Assembly. Reverse procedures in b above.

e. Installation. Reverse procedures in a above.

f. Filter and Element Replacement. The filter element should be replaced at each engine oil change. Wipe the cover area clean and proceed as directed in b above. Discard the cover gasket. The element and cover gasket are contained in a kit.

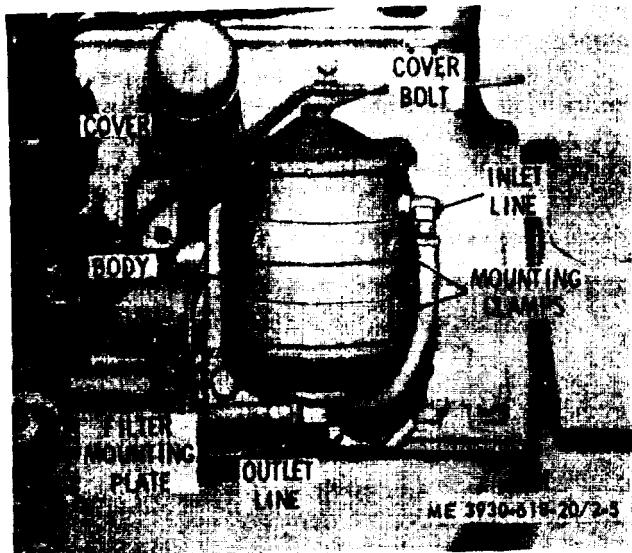


Figure 2-5. Engine oil filter, installed view.

2-11. Manifold Assembly

a. General. The exhaust and intake manifold is a one-piece casting: stud-mounted to the cylinder head. The carburetor is attached to the intake section and the exhaust pipe is attached to the exhaust outlet flange. Unless physically damaged, the manifold will require little service.

b. Removal. Refer to figure 2-6 and remove the manifold as follows:

(1) Remove engine side panels, seat, seat deck, and air cleaner.

(2) Remove the carburetor air hose, rocker arm cover breather line and exhaust pipe.

(3) Disconnect choke control, accelerator rod, and governor control rod from the carburetor (para 2-17).

(4) Close the fuel supply valve at the fuel tank. Remove the carburetor (para 2-17).

(5) Remove the nuts and washers attaching the manifold to the studs and remove the manifold.

(6) Remove the retainers and gaskets from the manifold ports.

c. Cleaning and Inspection.

(1) Remove carbon deposits using PD-680.

(2) Check for cracks and warpage. To check for warpage, lay a straight-edge across the manifold ports. Replace damaged parts.

d. Installation.

(1) Reverse procedures in b above.

(2) Use new gaskets.

(3) Tighten attaching nuts to 32-35 foot-pounds of torque.

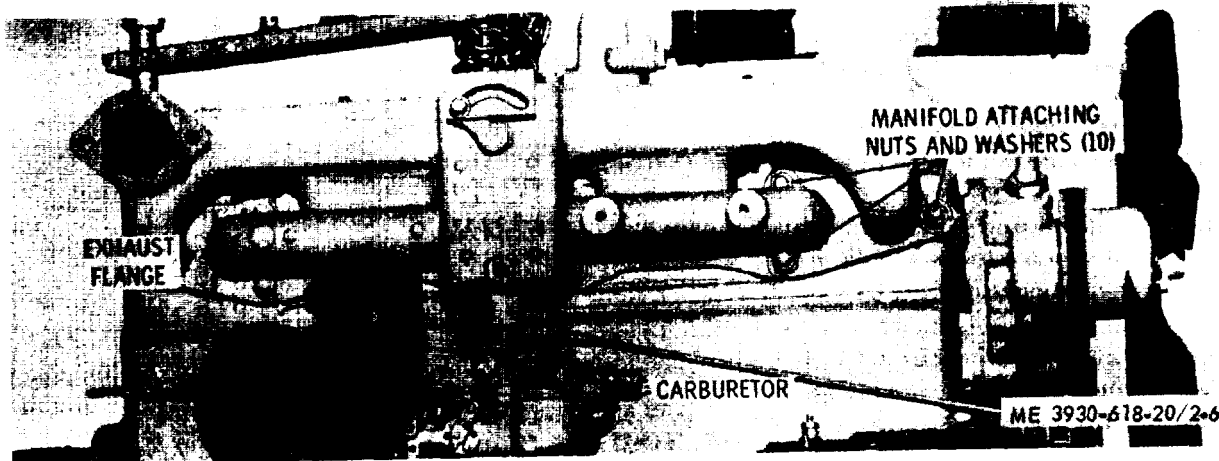


Figure 2-6. Manifold assembly, installed view.

2-12. Compression Test

a. General. The compression test is performed to aid in determining the condition of the rings and valves and to detect a leaking head gasket. Perform the compression test as follows :

b. Test Procedure.

(1) Start the engine and allow it to idle until it reaches normal operating temperature.

(2) Turn the ignition switch OFF and leave it in OFF position.

(3) Remove the spark plugs.

(4) Install a compression gage tightly in number one spark plug hole.

(5) Crank the engine with the starter motor to allow several revolutions. Note the reading on the gage.

(6) Repeat the test on each of the remaining cylinders.

(7) Compression readings for the cylinders should not vary more than 10 pounds. Normal pressure on the gage at starting speed is 120 to 125 pounds.

(8) Retest low-reading cylinders using the oil test as follows :

(a) Add oil through the spark plug hole in an amount sufficient to seal the piston rings.

(b) Crank the engine over five or six times to allow the oil to work down around the rings and take another compression reading.

(c) An increase in compression indicated defective or worn piston rings.

(d) No increase in compression indicates defective valves.

(e) Two adjacent low-reading cylinders may indicate a defective cylinder gasket.

2-13 Vacuum Test

To conduct a reliable vacuum test the engine must be at normal operating temperature. Conduct the test as follows :

a. Remove the rocker arm cover vent valve and install a vacuum gage in the pipe plug opening in the intake manifold (fig. 2-6).

b. Start the engine and observe the vacuum gage. An analysis of a vacuum test is as follows:

(1) If the engine is normal, a vacuum of approximately 18.3-inch suction pressure will be indicated. The pressure will drop to about 3.4 inches when the throttle is opened and will increase, to about 24 inches when the throttle is closed.

(2) A vacuum of 15- or 16-inches with a steady needle indicates that the piston rings, pistons, or lubricant are probably in poor condition. Slight needle motion indicates late ignition timing.

(3) A vacuum of 8- to 12-inches with a steady needle indicates worn valve guides, worn piston rings, poor lubricant, or an intake manifold leak.

(4) A vacuum of below 5 inches with a steady needle indicates an intake manifold leak.

(5) If the vacuum pressure is normal when the engine starts but drops gradually, the exhaust system is probably defective or the muffler is restricted.

(6) If the vacuum is normal but drops at irregular intervals, sticking valves: rich or lean carburetor mixture: or defective spark plugs are indicated.

(7) If the vacuum pressure is normal but drops at regular intervals, defective valves or a leaky cylinder head gasket is indicated.

2-14. Ignition Timing

a. Remove the timing cover from the engine flywheel housing and remove the spark plug from number one cylinder.

b. Place thumb over the spark plug opening and rotate engine crankshaft until outward pressure can be felt. Continue cranking until the TDC mark on the flywheel is aligned in the center of the timing hole (fig. 2-7).

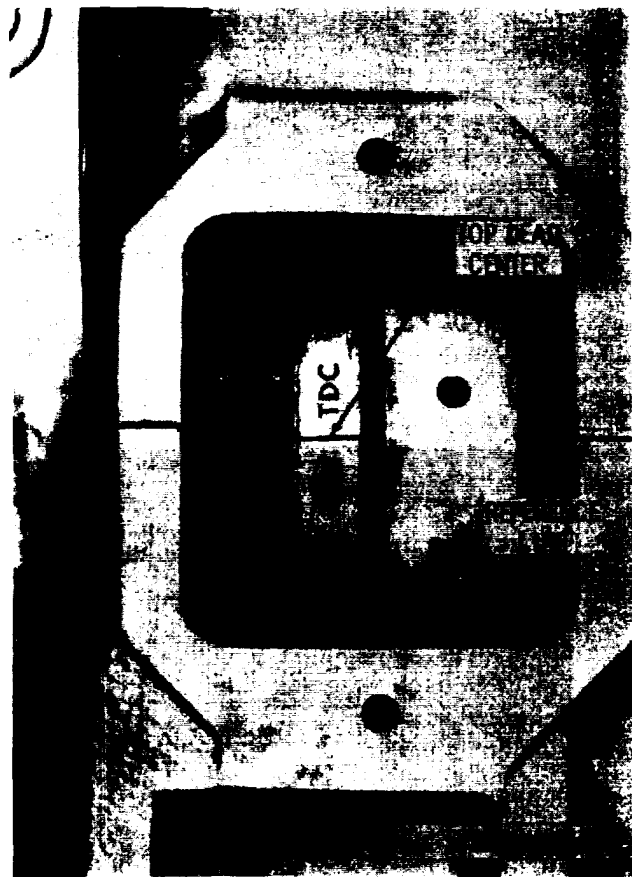


Figure 2-7. Flywheel timing marks.

c. Remove the distributor cap, rotor and dust cover. Check and adjust the contact point gap. (para 2-34f.)

d. Install all parts removed in step c.

e. Loosen the screw at the distributor advance arm and set the pointer at 0. (fig. 2-8).

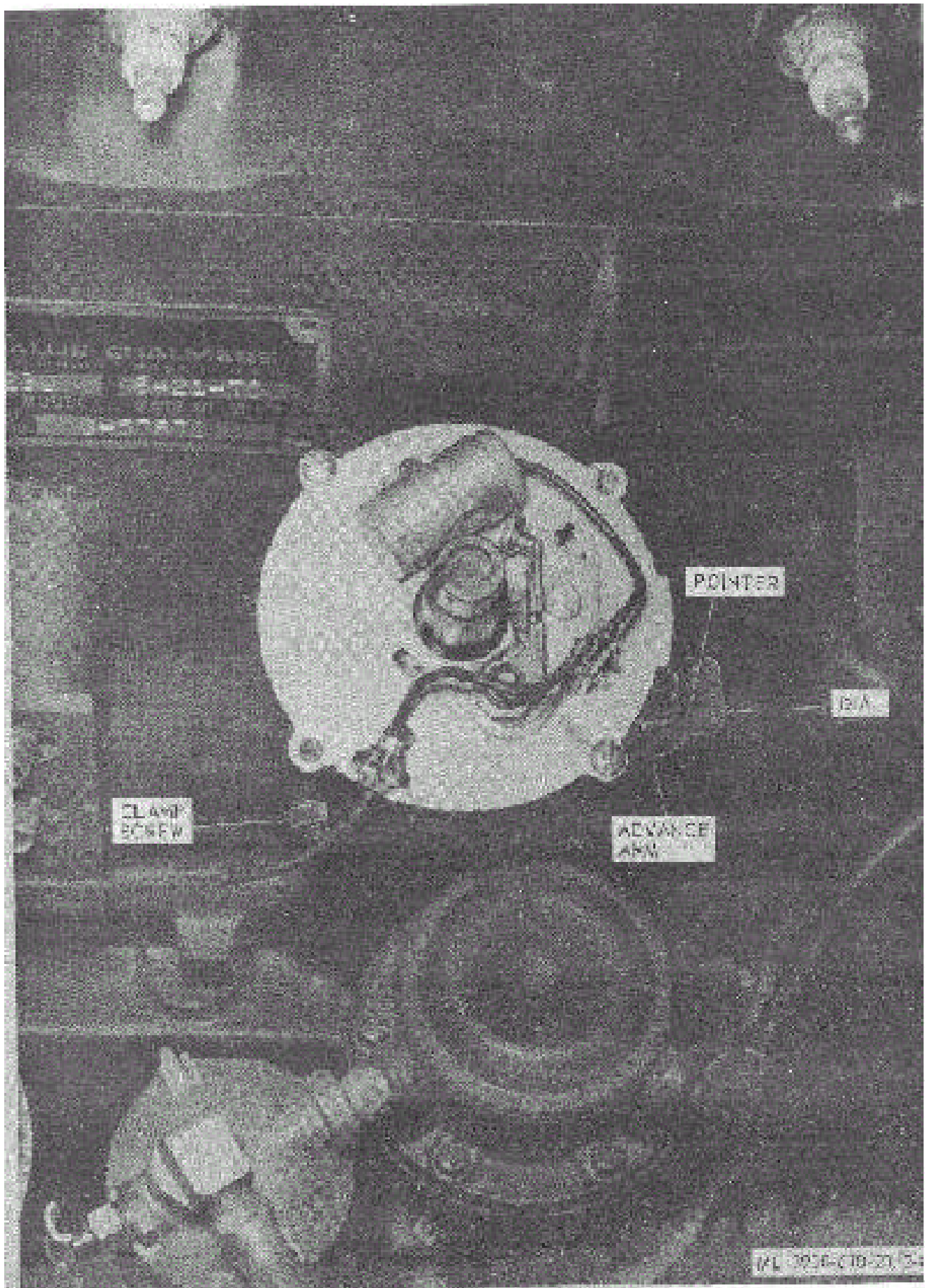
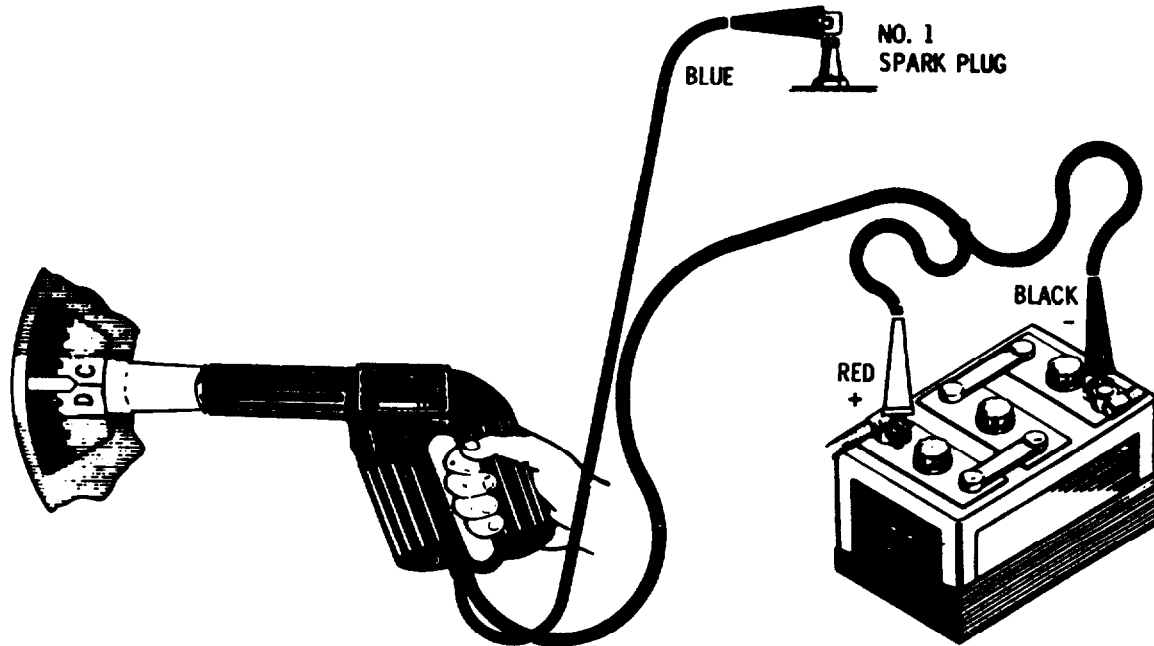


Figure 2-8. Distributor Timing Adjustment

- f. Advance the flywheel until the ignition timing line on the flywheel is aligned with the reference line on the flywheel housing. This line is TDC (top dead center).
- g. If necessary, mark the flywheel and housing with white chalk or paint.
- h. Connect a timing light as shown in figure 2-9.
- i. Connect the hot lead of a tachometer to the positive lead on the coil and connect remaining lead to ground.

- j. Start the engine and using the idle adjustment screw, lower the low idle speed to 400 RPM.
- k. Direct the timing light at the timing hole in the flywheel housing and rotate the distributor to set the timing to TDC (0°), then tighten the distribution advance screw.
- l. Increase the low idle speed to 450 to 500 RPM.



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Figure 2-9. Timing light connections.

- m. With the timing light, again check flywheel timing and note whether IGN TDC line on flywheel has moved away from reference line on flywheel housing.
- n. After timing is correctly adjusted, accelerate the engine rapidly a few times and observe the move-

ment of the flywheel timing mark. If the spark advance is functioning properly IGN TDC mark on the flywheel will move counterclockwise away from the reference line on the flywheel housing. As the engine decelerates the IGN TDC on the flywheel will line up with reference line on flywheel housings.

Section VI. MAINTENANCE OF THE FUEL SYSTEM

2-15. General

The fuel system is comprised of an 14.5 gallon capacity tank, diaphragm-type fuel pump, single-venturi updraft carburetor, centrifugal governor, and connecting lines. A bowl type fuel filter is included as an integral part of the fuel system.

2-16. Carburetor Air Cleaner

CAUTION

Never remove the air cleaner while the engine is running.
Do not run the engine unless the air cleaner is in place.

a. *Removal.* Loosen the hose clamp, unscrew the wingnut, and lift out the filter assembly (fig. 2-10).

b. *Disassembly.* Remove the cover and lift out the oil cup.

c. *Cleaning.*

(1) Pour out the old oil from the oil cup and scrape away accumulated dirt from the bottom of the oil cup.

(2) Clean the cover, oil cup, and base assembly inside and outside with SD.

(3) Refill the oil cup (capacity 1/2 pt) with engine oil of grade and weight presently used in the engine.

d. *Assembly.* Reverse procedures in b above.

e. Installation.

(1) Assemble the base assembly to the tubing and tighten the clamp. Make sure that there is an airtight connection.

(2) Insert the through-bolt through the mounting bracket as shown in figure 2-10 and tighten the wingnut.

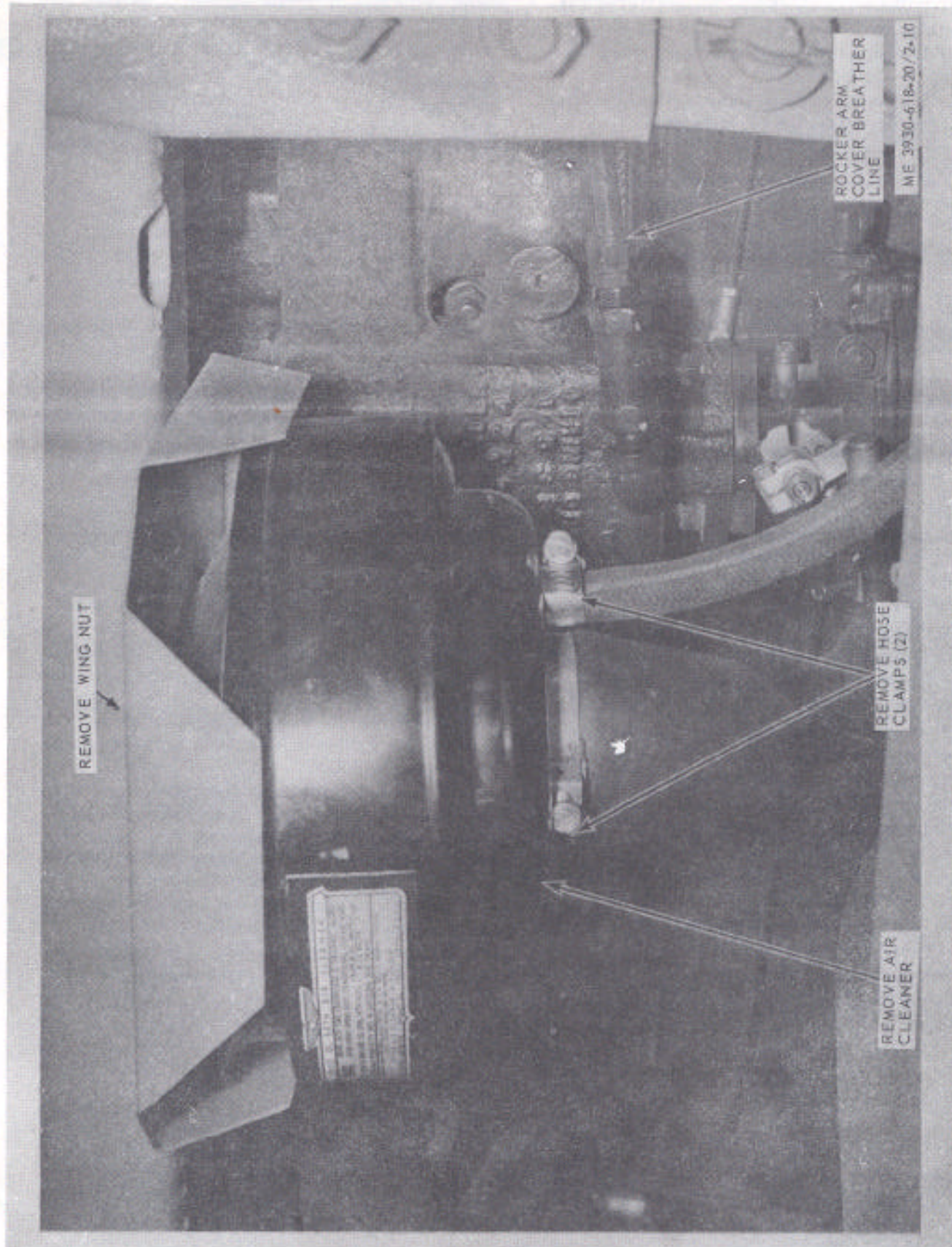


Figure 2-10. Carburetor air cleaner, installed view.

2-17. Carburetor

a. Removal. Refer to figure 2-11, and remove the carburetor as follows:

- (1) Remove the left side panel.
- (2) Remove the air cleaner (para 2-16) and the connecting hose.
- (3) Disconnect the fuel inlet line at the carburetor.
- (4) Disconnect the accelerator rod and governor control rod (fig. 2-14) from the carburetor.

NOTE

Note the position of the throttle lever and governor lever before removing the control rods. Do not change the length of the rods.

(5) Disconnect the choke control cable at the carburetor (fig. 2-11).

(6) Remove the 2 nuts and lockwashers securing the carburetor to the intake manifold and remove the carburetor.

b. Installation. Reverse procedures in *a* above. Adjust as instructed in *c* below.

c. Adjustment. Carburetor adjustments consist of the idle speed adjustment and idle mixture adjustment. Proceed as follows:

(1) As initial adjustments, before starting the engine, turn the idle stop screw (fig. 2-11) in against the stop to hold the throttle slightly open and set the idle mixture adjustment screw at approximately midposition.

(2) Turn the idler speed adjustment screw (fig. 2-11) in against the stop to hold the throttle slightly open. Set the idle mixture adjustment screw at approximately midposition.

(3) Start the engine and allow it to warm up to normal operating temperature.

(4) Gradually turn the idle mixture adjustment screw in until the engine begins to miss; then turn it out until the engine begins to run unevenly.

(5) Turn the idle mixture adjustment screw in to a point midway between the two points reached in (4) above or until the engine runs smoothly.

(6) With the idle stop adjustment screw, set the idle speed at 500 to 550 rpm.

(7) Readjust the idle mixture as necessary to achieve smooth engine operation at normal idle speed.

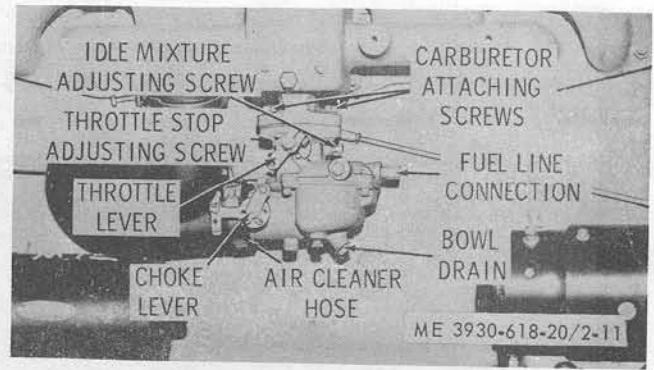


Figure 2-11. Carburetor, installed view.

2-18. Fuel Pump Assembly

a. Inspection and Cleaning.

(1) Inspect the fuel pump assembly for cracks, breaks, leaks, and secure mounting.

(2) Loosen the thumb nut on the filter bail (fig. 2-12) and swing the bail to one side. Remove the filter bowl and screen.

(3) Clean the bowl thoroughly with SD, P-S-661 and be sure no sediment or lint remains in the bowl or on the screen.

(4) Replace the gasket, screen, and bowl. Swing the bail into place and tighten the nut.

b. Removal. Refer to figure 2-12 and remove the pump assembly as follows:

(1) Close the fuel shutoff valve (fig. 2-12) at the fuel filter.

(2) Disconnect the fuel inlet and fuel outlet lines at the fuel pump assembly.

(3) Remove the three screws and lockwashers securing the pump assembly to the engine block and remove the pump.

c. Installation. Reverse procedures in *b* above.

d. Testing. Following installation, perform a static pressure test as follows:

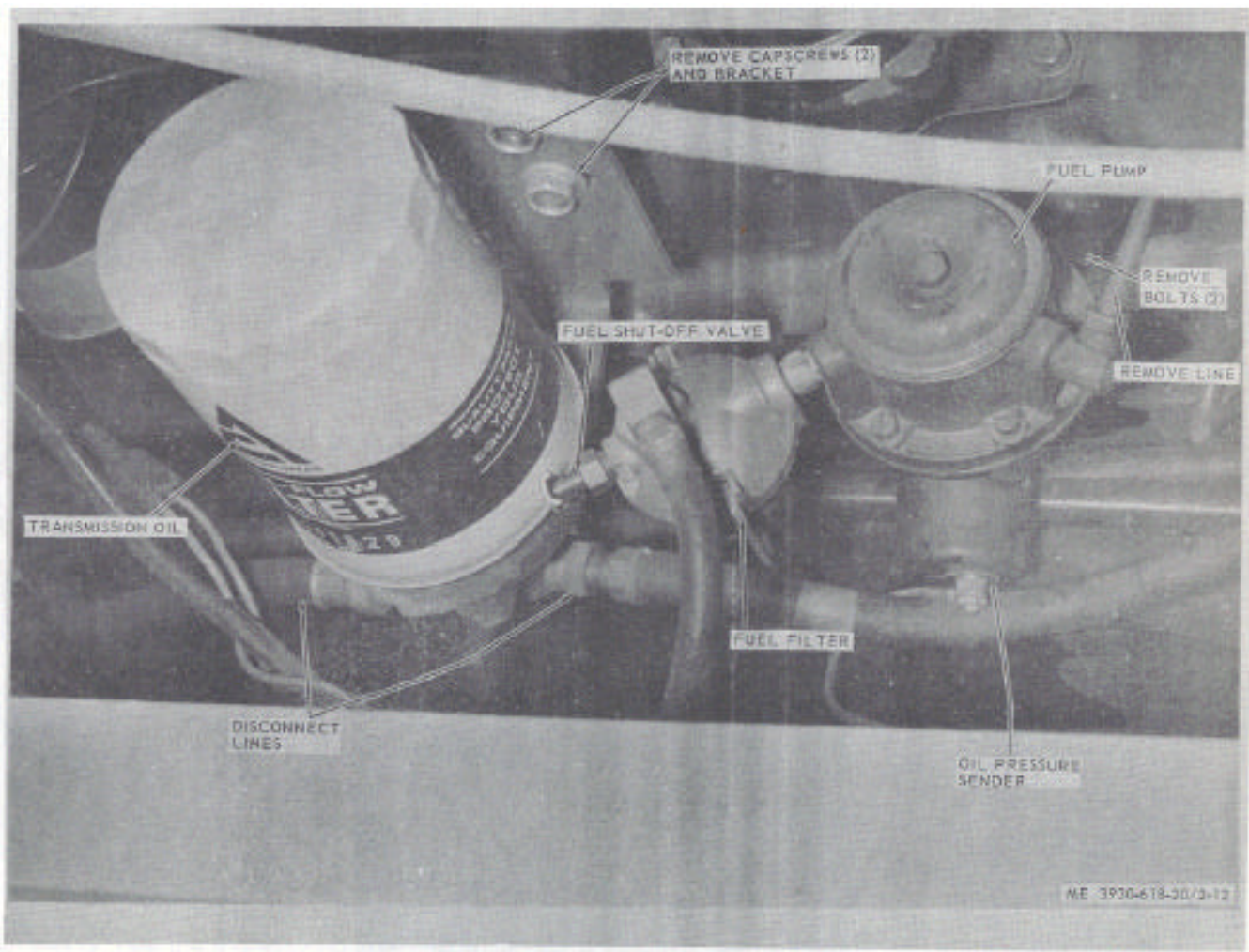
(1) Disconnect the fuel outlet line at the pump.

(2) Install the necessary adapter and fitting in the pump outlet elbow and connect a pressure gage with rubber tubing. Length of the tubing must not exceed 6 inches or inaccurate readings will result.

(3) Start the engine and run it at idle speed with the fuel remaining in the carburetor.

(4) The pressure indicated on the gage is the static pressure of the fuel pump and should be 3-psi. maximum.

Figure 8-12. Fuel pump and hydraulic filter



67
2-19

2-19. Governor

a. Inspection.

(1) Inspect for general mechanical defects and restricted linkage movements.

(2) Inspect the high speed spring for corrosion, damage, or wear. Replace a defective spring.

(3) Attach a tachometer to the engine (para 2-14j) and observe engine speed with the throttle fully open.

(4) Engine speed observed in (3) above, should be approximately 2,200 rpm and there should be no tendency to hunt (surge). Make necessary adjustments as outlined in *b* below.

b. Adjustments. Refer to figure 2-13 and make adjustments as follows:

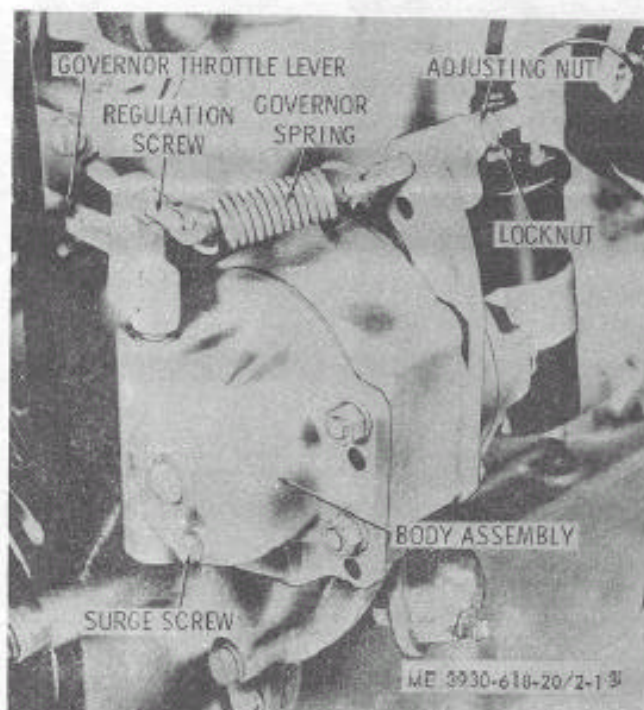


Figure 2-13. Governor adjustments.

(1) Operate the engine until it reaches normal operating temperature.

(2) Shut off the engine and, from under the floor plate, remove the return spring from the accelerator rod. Hold the throttle lever in fully open position.

(3) Note the governor spring length. Loosen the locknut and turn the governor adjusting nut counter-clockwise until all tension is removed from the governor spring.

(4) Operate the governor throttle lever manually to check for binding in the linkage. Eliminate any binding and then adjust the governor spring to its original length.

(5) Adjust the governor throttle lever length to hold the carburetor lever approximately $\frac{1}{8}$ inch from the fully open position. Make sure the rod ends are snug and will move without friction.

(6) Loosen the surge screw in that position.

(7) Install an electric tachometer (para 2-14j) and start the engine.

(8) Operate the engine at full throttle and adjust the spring tension adjusting nut to obtain an engine speed of 2200 rpm. with no load.

(9) Load the engine by operating the tilt cylinder to the end of its stroke to actuate the hydraulic relief valve.

(10) If the engine surges, adjust the regulating screw in small increments until surging ceases. When the throttle is opened quickly, the governor should surge once or twice and then remain steady.

CAUTION

Engine speed must be rechecked after making the surge adjustment in (10) above.

(11) If the governor surges at no load, turn the surge screw in, one turn at a time, until the surging stops.

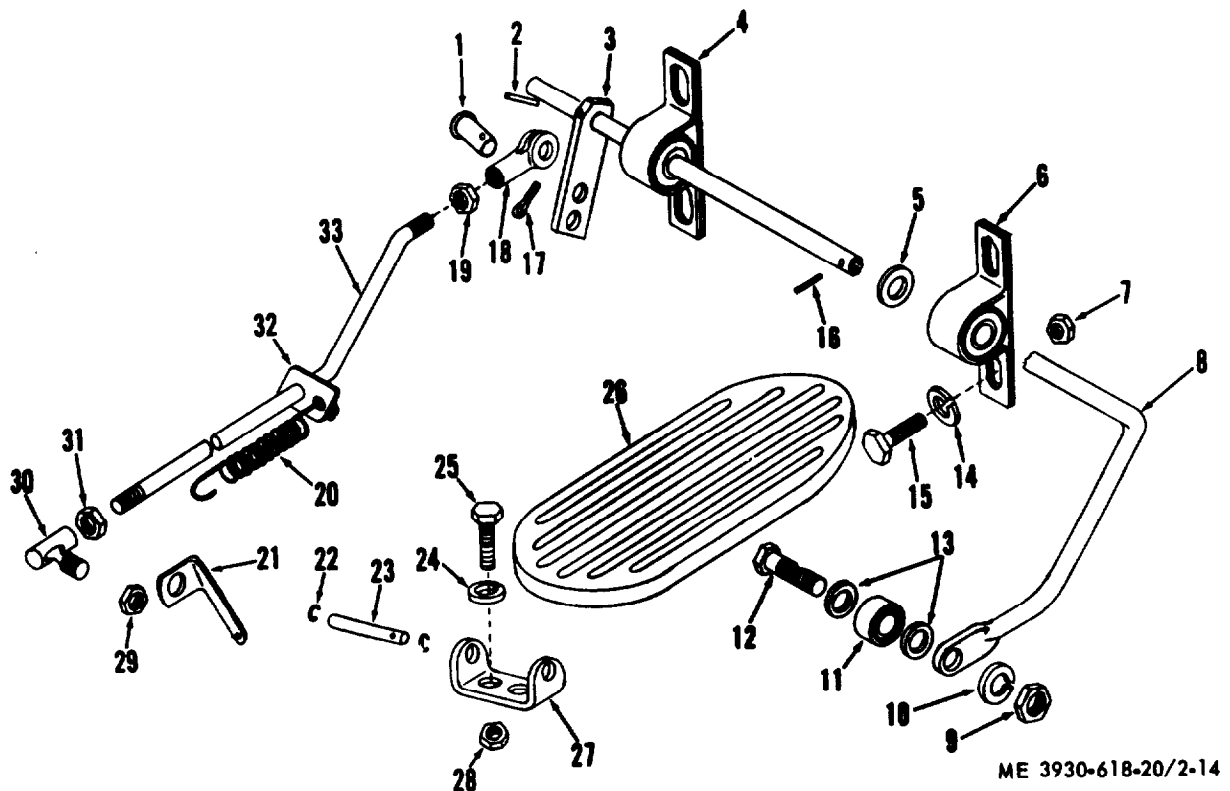
CAUTION

Do not turn the surge screw in far enough to increase no load engine speed.

2-20. Accelerator Pedal Linkage

a. Removal. The accelerator pedal and linkage are shown on figure 2-14. Do not remove the complete assembly; only the individual piece parts requiring repair or replacement.

b. Installation. Reverse removal procedures. After installing the accelerator rod (33), adjust yoke (18) to obtain a loose fit on the pins with the accelerator pedal fully released.



- | | |
|------------------|----------------------|
| 1. Pin, yoke | 18. Yoke, adjustable |
| 2. Pin, roll | 19. Nut |
| 3. Lever | 20. Spring |
| 4. Block | 21. Angle |
| 5. Washer, Hat | 22. Ring, retaining |
| 6. Block | 23. Pin, hinge |
| 7. Nut | 24. Washer, lock |
| 8. Shaft | 25. screw |
| 9. Nut | 26. Pedal |
| 10. Washer, lock | 27. Bracket |
| 11. Bearing | 28. Nut |
| 12. screw | 29. Nut |
| 13. Washer, flat | 30. Rod, end |
| 14. Washer, lock | 31. Nut |
| 15. screw | 32. Clip |
| 16. Pin, roll | 33. Accelerator rod |
| 17. Pin, cotter | |

Figure 2-14. Accelerator pedal and linkage. exploded view.

2-21. Fuel-Tank

a. *Removal.* Refer to figure 2-15 and remove the fuel tank as follows :

(1) Close the fuel shutoff valve at the fuel filter (fig. 2-12) and disconnect the fuel line from the valve fitting.

(2) Attach a length of hose to the shutoff valve fitting and drain the tank through the hose. Total tank capacity is 14.5 gallons. Choose container accordingly.

(3) Remove the screws and lockwashers, from the outeredge of the mounting plate and lift the cowl away from the mounting plate.

(4) Disconnect wire from the sending unit terminal at the top of the tank.

(5) From inside the driver compartment, remove the screws, washers, and nuts which secure the tank to the support brackets.

(6) Lower the tank, being careful not to damage the shutoff valve.

b. *Installation.* Reverse procedures in a above.

c. *Cleaning.*

(1) Remove the filler assembly from the top of the tank and clean the strainer.

(2) Remove the shutoff valve and elbow from the tank. Remove the drain plug and allow any sediment or water to drain out.

(3) Clean the outside of the tank with PD-680.

(4) Clean the inside of the tank with PD-680 and then drain.

(5) Allow the tank to dry thoroughly before re-filling it with fuel.

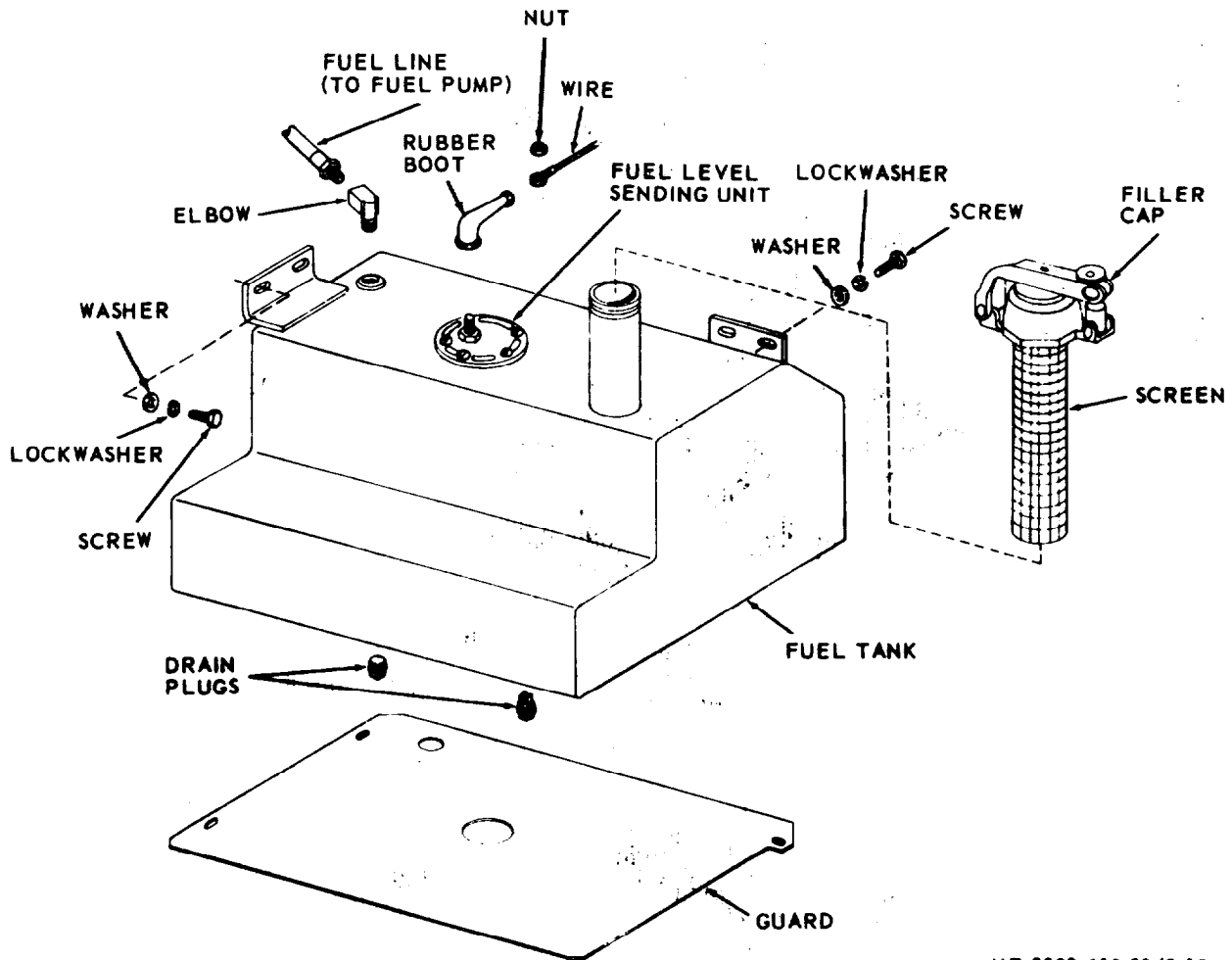


Figure 2-15. Fuel tank exploded view.

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Section VII. MAINTENANCE OF THE EXHAUST SYSTEM

2-22. General

The exhaust system is comprised of a muffler, exhaust pipe, and tailpipe. The muffler is attached to the inside of the left-hand frame member, adjacent to the engine. The exhaust pipe connects the muffler to the engine exhaust manifold. The tailpipe carries the exhaust gases from the muffler to the rear of the truck.

2-23. Muffler and Pipes

a. Removal. Refer to figure 2-16 and remove the muffler and pipes as follows:

(1) To remove the muffler, remove the exhaust pipe (2) below and loosen the clamp securing the tailpipe to the muffler. Lift out the muffler.

(2) To remove the exhaust pipe, remove the 2 screws and lockwashers attaching it to the engine exhaust manifold. Then loosen the clamp securing it to the muffler and remove the clamp and flange gasket.

(3) To remove the tailpipe, loosen the clamp securing it to the muffler and remove the rear clamp (not shown). Lift out the tailpipe and sleeve. (not shown).

b. Installation. Reverse the procedure in a above. Use a new flange gasket. Check for leaks.

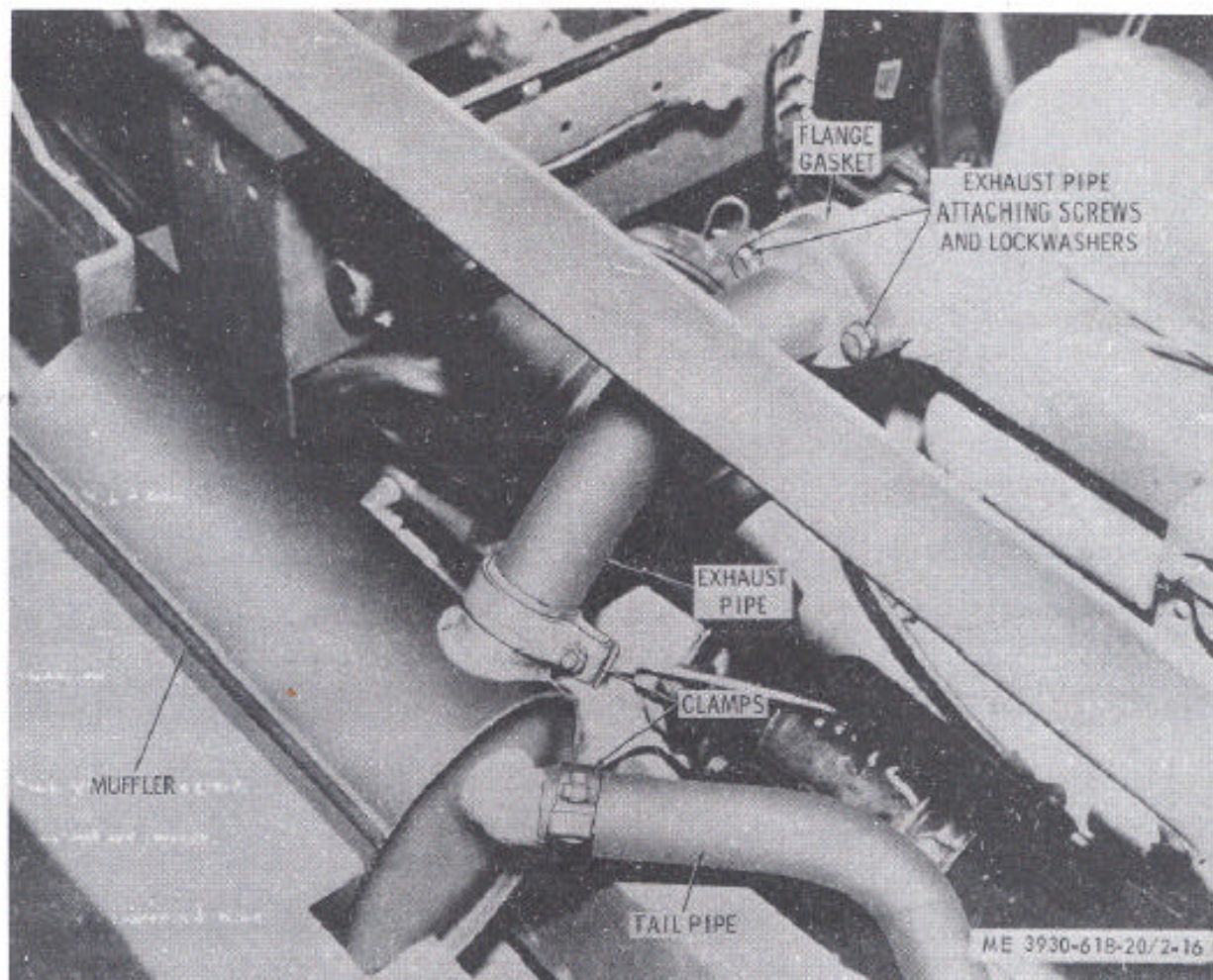


Figure 2-16. Muffer and pipes, installed view.

Section VI1. MAINTENANCE OF THE COOLING SYSTEM

2-24. General

The engine cooling system consists of a centrifugal water pump, radiator, by-pass type thermostat, cooling fan, and the necessary hoses and lines to complete the system. Total capacity of the cooling system is 16 quarts.

2-25. Radiator

a. Inspection and External Cleaning.

- (1) Remove the counterweight. Refer to figure 2-171

WARNING

Use lifting device, with a 4000 lb capacity, for removing counterweight from truck.

- (2) Remove dirt, insects, and other obstructions lodged in the fins by directing compressed air or a stream of pressured water at the core from the front (engine side). Do not use steam, gasoline, fuel oil, or kerosene.

- (3) Straighten bent fins using a piece of wood or a blunt instrument. Be careful not to puncture the tubes.

- (4) Inspect radiator mounts and tighten as necessary.

- (5) Tighten hose clamps.

- (6) Inspect radiator core and hoses for leaks.

- (7) Inspect hoses for cracks or deterioration.

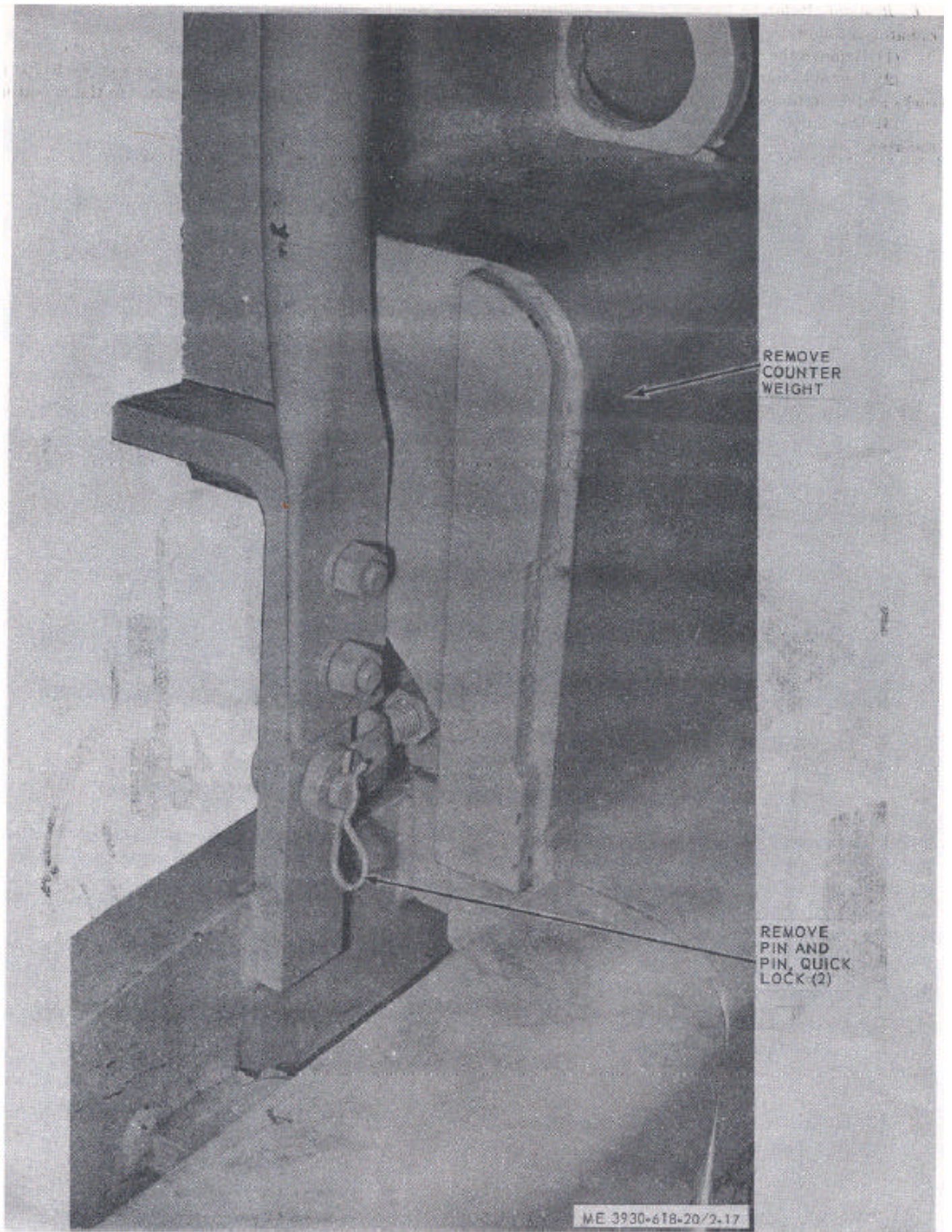


Figure 2-17. Counter weight, installed view.

b. Removal. Refer to figure 2-18 and remove the radiator as follows :

- (1) Remove the side panels and raise the seat.
- (2) Remove the radiator cap, open the drain cocks and drain the cooling system.
- (3) Disconnect upper and lower hoses from the radiator.

(4) Disconnect the converter oil cooler lines at the radiator.

(5) Remove the radiator grille and panel.

(6) Remove the four screws (two on each side of the radiator) that secure the radiator to the mounting bars.

(7) Remove radiator.

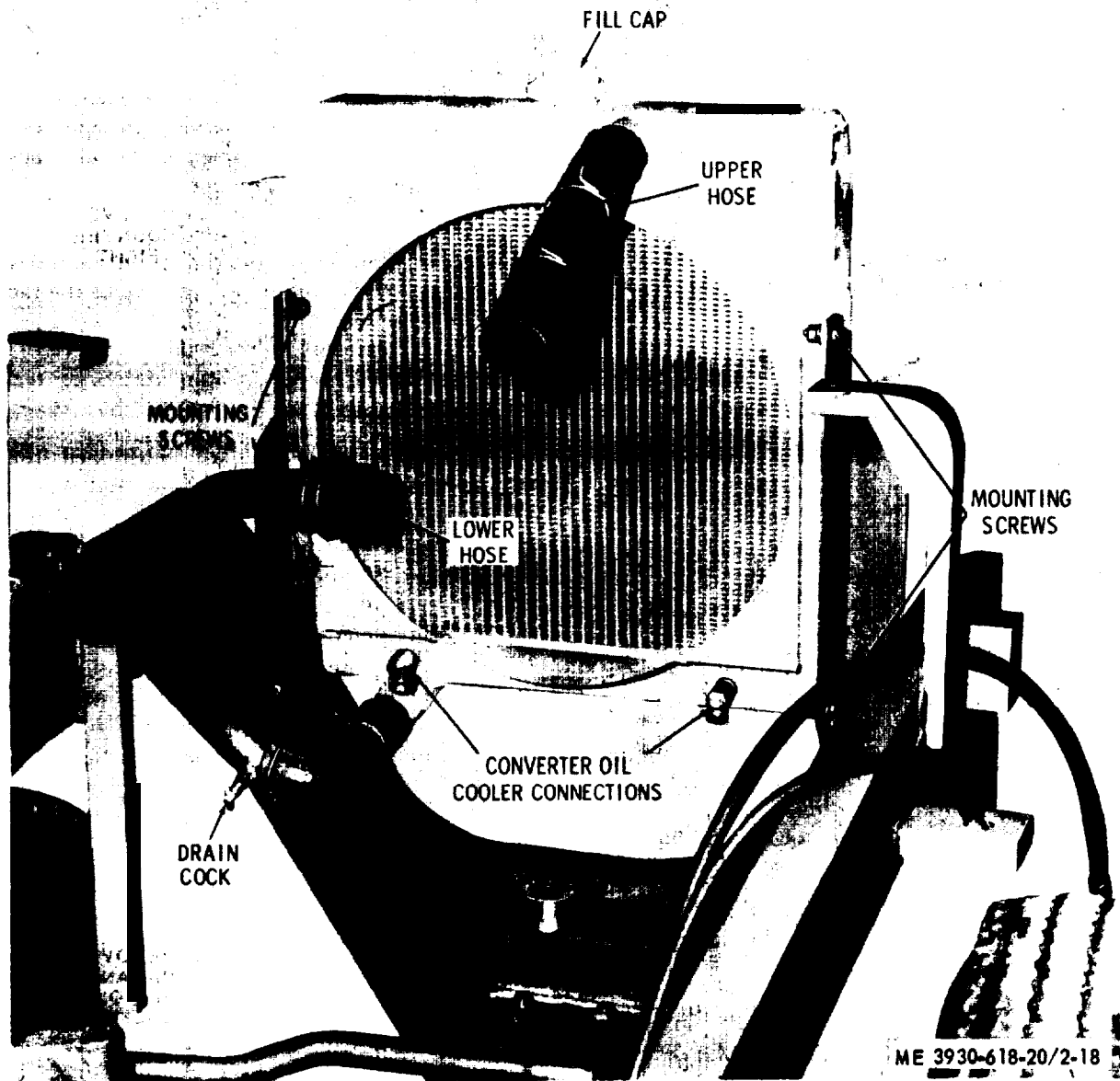


Figure 2-18. Radiator. installed view

c. Installation. Reverse procedures in *b* above. Make sure that all lines and hoses are tight.

d. Draining and Refilling.

(1) To drain the cooling system remove the radiator cap and open the drain cocks (fig. 2-19) and (fig. 2-20). If the cooling system is not to be refilled immediately, attach a notice to the steering wheel to warn personnel that the cooling system has been drained.

(2) After draining and before refilling, clean and flush the cooling system (*e* below). Pressure flush the radiator (*f* below) if overheating cannot be corrected by normal cleaning and flushing.

(3) Use soft water in the cooling system wherever possible. Add antifreeze or corrosion inhibitor to the water as applicable.

(4) To fill the cooling system, close the drain cocks and pour coolant into the radiator filler opening until the coolant reaches the bottom of the filler neck. Then start the engine and let it idle until the thermostat opens.

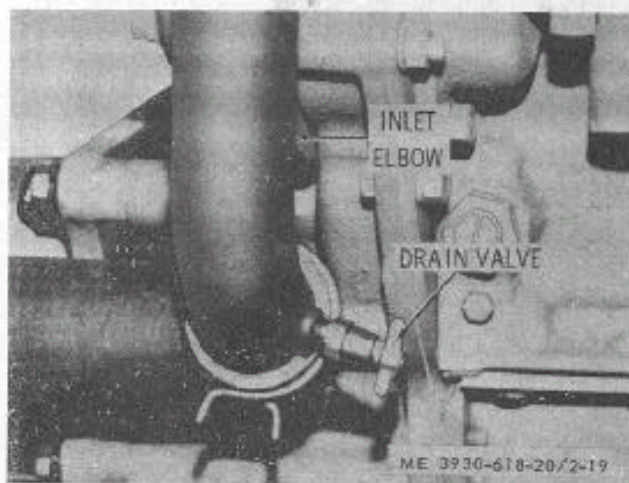


Figure 2-19. Drain valve, radiator.

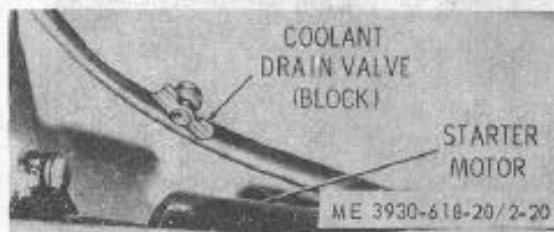


Figure 2-20. Drain valve, block.

e. Cleaning and Flushing. Use a good grade of commercial flushing compound. Inspect for leaks after flushing and cleaning.

f. Pressure Flushing. If the radiator tubes become clogged, the obstruction may sometimes be removed by reverse flushing of the radiator. Proceed as follows:

(1) Drain the cooling system (*d* above).

(2) Disconnect the upper and lower radiator hoses.

(3) Connect a pressure water hose to the lower radiator connection with a suitable adapter.

(4) Plug the upper hose connection and remove the radiator cap.

CAUTION

Do not use more than 6 pounds of pressure in the flushing operation as excessive pressure may cause the radiator tubes, oil cooler or tanks to rupture.

(5) Force water upward through the radiator to loosen foreign material from the top of the tubes. The material will flow out through the top of the radiator with the water.

(6) Inspect carefully for leaks after reverse flushing.

g. Antifreeze Protection.

(1) Antifreeze solution will be drained from the cooling system at the end of each cold season and discarded.

(2) Never add antifreeze to a cooling system containing corrosion inhibitor. The cooling system must be cleaned and flushed (*e* above) to remove all traces of corrosion inhibitor before adding antifreeze.

(3) Add a sufficient quantity of antifreeze to the cooling system to provide protection at the lowest expected temperatures for the regional location.

(4) Add water to the antifreeze.

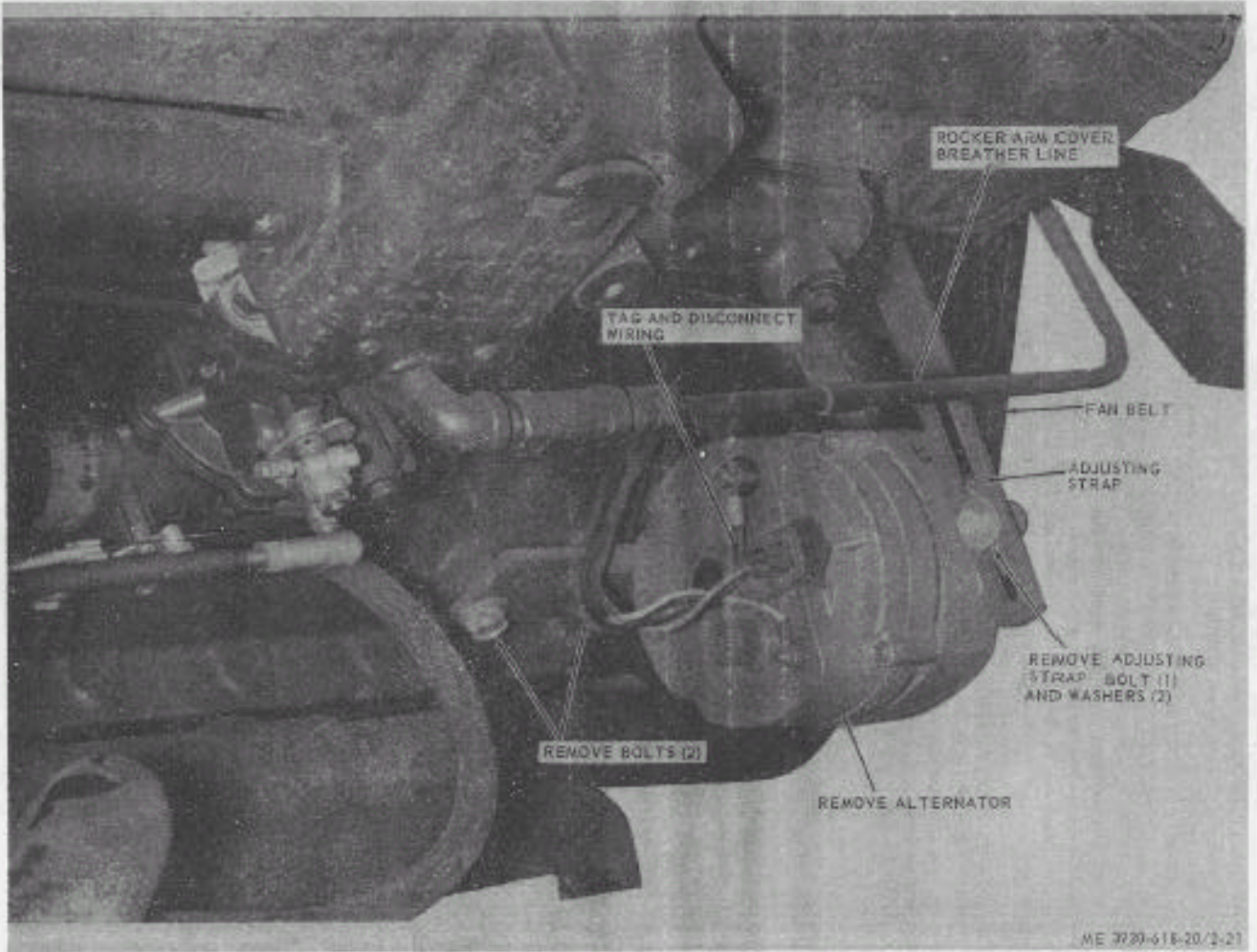
(5) Run the engine and allow the coolant to reach normal temperature. Then check the strength of the solution with a hydrometer.

h. Corrosion Inhibitor. Use corrosion inhibitor compound (FSN 6850-281-1980) in a cooling system containing water only. Do not mix corrosion inhibitor and antifreeze solution in the cooling system. Add 11 ounces of corrosion inhibitor to the 16 quarts of water in the cooling system.

2-26. Fan and Alternator Belt

a. Adjustment and Inspection. Inspect the belt for wear, fraying or deterioration. Check for 1/2-inch deflection at a point halfway between the fan pulley and the crankshaft pulley with approximately 10 pounds of force. Adjust for proper tension as follows. (fig. 2-21).

Figure 2-27 Alternator, installed view



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2-27
20

(1) Loosen bolt in adjusting strap and loosen bolt below alternator (not shown in fig. 2-21).

(2) Using a pry bar or long handled screwdriver, pry the alternator away from the engine until proper tension is obtained.

(3) Hold the alternator in position and tighten the adjusting strap bolt and then tighten mounting bolt below alternator in that order.

b. Removal.

(1) Loosen bolt in adjusting strap and loosen bolt below alternator.

(2) Disconnect hydraulic line on left hand side of hydraulic pump and catch hydraulic fluid in a clean container (fig. 2-3).

(3) Remove four cap screws and lockwashers holding pump to timing gear cover.

(4) Remove the pump and flange by pulling straight away from the engine.

(5) Remove the belt from the pulleys

c. Installation.

(1) Reverse procedure in *b* above.

(2) Adjust belt as instructed in *a* above.

2-27. Water Pump

a. Inspection. Visually inspect for leaks or signs of wear.

b. Removal. Refer to figure 2-22 and remove the water pump as follows:

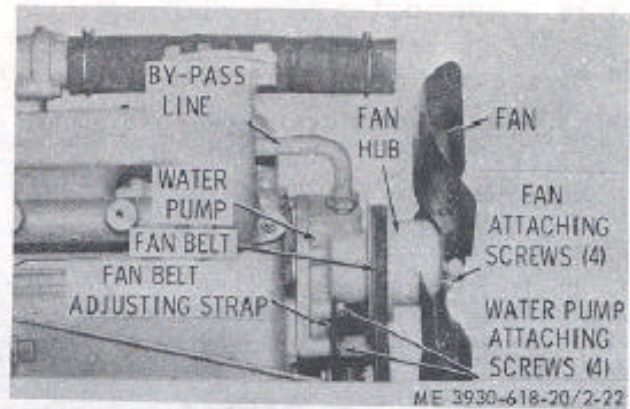


Figure 2-22. Water pump, installed view.

(1) Remove the radiator (para 2-25).

(2) Loosen the hose clamp and remove the coolant hose from the pump.

(3) Remove the coolant bypass tube.

(4) Loosen the fan belt (para 2-26) and slip it from the fan pulley. Allow the fan belt to hang loose on the alternator and crankshaft pulleys.

(5) Remove the 4 screws and lockwashers attaching the fan pulley to the fan hub and remove the fan and fan pulley.

(6) Remove the 4 screws and lockwashers attaching the water pump to the engine block. Move the adjusting strap out of the way and remove the pump and gasket.

c. Installation. Reverse procedures in *b* above. Use a new mounting gasket. Check carefully for leaks.

2-28. Thermostat

a. Remove. Refer to figure 2-29 and remove the thermostat as follows:

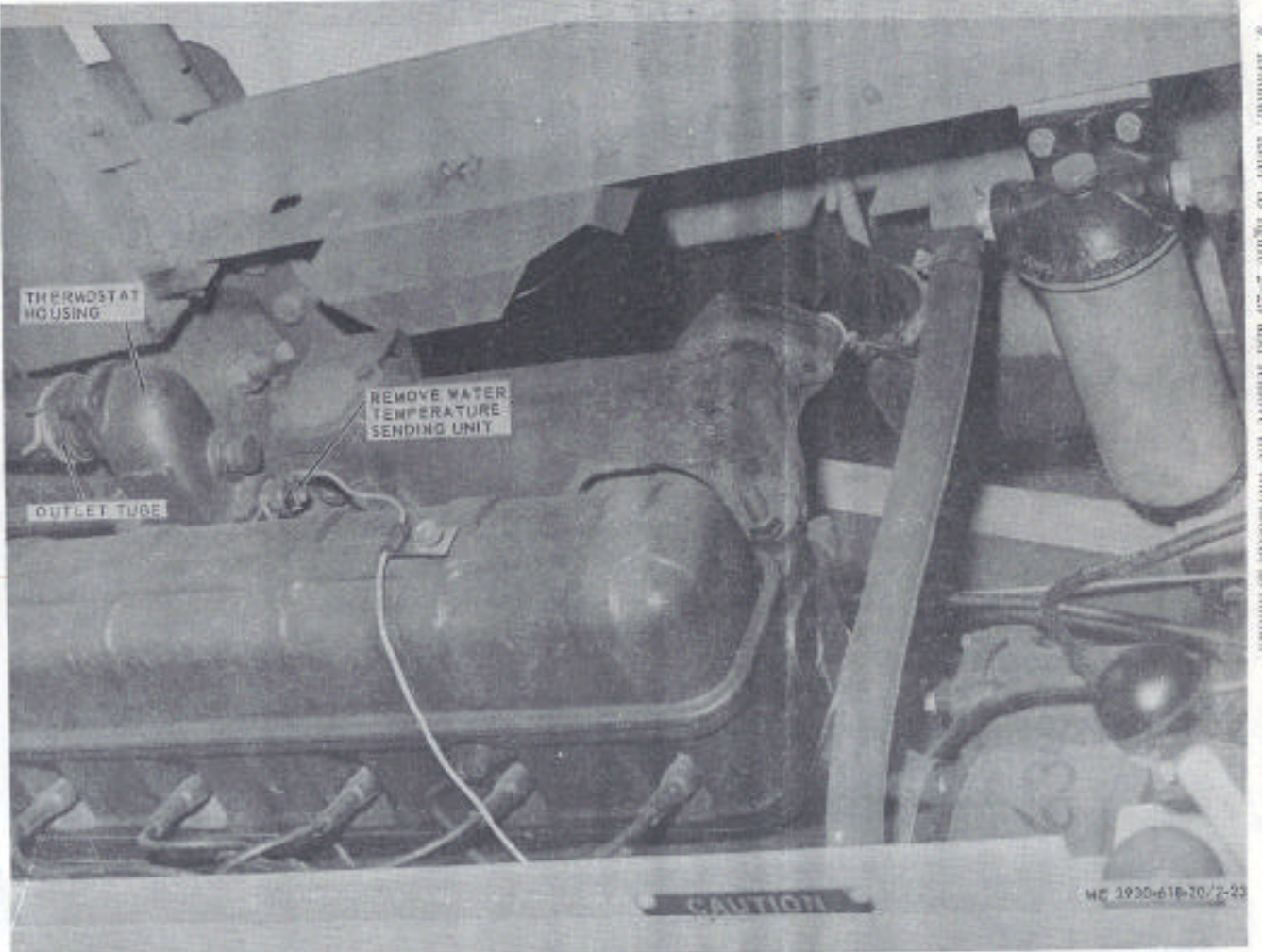
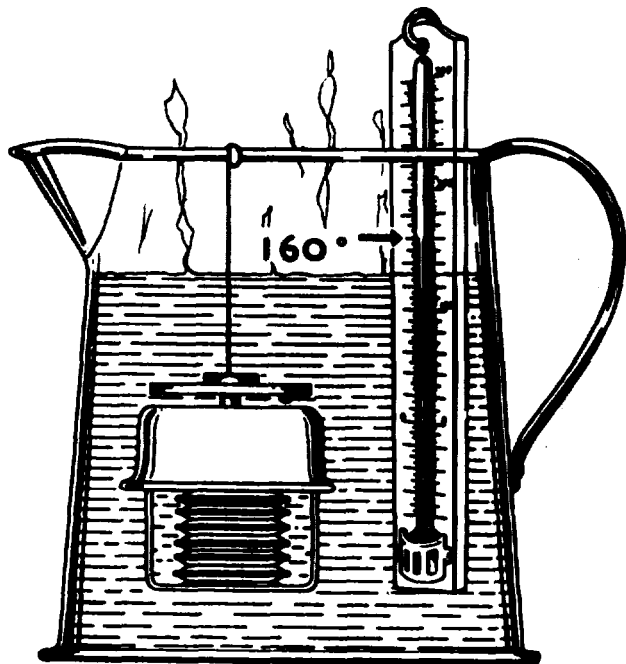


Figure 2-29. Thermostat and water temperature sending unit, standard view.

(1) Drain a sufficient amount of coolant from the radiator to bring the level below that of the thermostat housing.

(2) Remove the 2 screws and lockwasher attaching the outlet tube to the thermostat housing and move the tube from the housing.

b. Testing.



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Figure 2-24. Testing thermostat (typical).

(1) Fill a container with sufficient water to cover the thermostat.

(2) Suspend a reliable thermometer in the water so the sensitive portion does not rest directly on the container bottom or sides.

(3) Place the container on a stove or other heat source. Stir the water occasionally for even heating.

(4) In the temperature range of 166°F to 165°F the thermostat should start to open and should be completely open when the temperature is between 185°F and 190°F.

(5) Lifting the thermostat into the colder temperature of the surrounding air should cause a pronounced closing action within a short time.

(6) Discard a thermostat that fails to pass the above test.

c. Installation. Reverse procedure in a above. Attach the outlet tube securely and check for leaks with the engine operating.

2-29. Water Temperature Sending Unit

a. Inspect. Check to see if coolant is leaking around sending unit. Run engine for ten minutes and see if water temperature dial shows an increase in temperature. If not, sending unit is probably defective. Replace a defective unit.

b. Removal. Refer to figure 2-23 and remove the water temperature sending unit as follows :

(1) Drain a sufficient amount of coolant from the radiator to bring the level below that of the water temperature sending unit.

(2) Disconnect wire going to unit.

(3) Remove water temperature sending unit.

c. Installation. Reverse procedure in a above. Inspect for leaks.

Section IX. MAINTENANCE OF THE ELECTRICAL SYSTEM

2-30. General

The electrical wiring diagram for the truck is shown in figure 1-3. The electrical system includes the 12-volt negative ground battery, distributor, ignition coil, spark plugs, starter motor and starter motor solenoid, current and voltage regulator, horn circuit, lights sending units and gages, and wiring. The electrical gage, horn, and lighting circuits are protected by fuses. Fuses are located on the underside of the instrument panel near the ignition switch.

2-31. Alternator

a. Removal. Refer to figure 2-21 and remove the alternator as follows :

- (1) Tag and disconnect wiring.
- (2) Remove bolt, washer, and nut in adjusting strap.
- (3) Remove bolt and nut below alternator.
- (4) Remove alternator.

b. Installation. Reverse procedure in a above.

2-32. Voltage Regulator

a. Test. The desired voltage regulator setting is one which keeps the battery in a satisfactory state of charge (3/4 charge or more) without causing excessive battery water usage.

Either of the two conditions may persistently exist which indicate the need for adjusting the regulator

setting: (1) Battery is being overcharged, (2) battery remains undercharged.

b. Adjustments. Corrections should be made as follows :

(1) If the battery uses too much water at the "normal" setting, reduce the voltage setting approximately 0.3 volt and check for decreased battery water usage over a reasonable period. If necessary, repeat the process until the battery remains charged with a minimum use of water.

(2) If the battery is consistently undercharged (evidenced by inability to crank the engine) at the normal setting, increase the voltage setting 0.3 volts and check for improved condition over a reasonable service period. If necessary, repeat this process until the battery remains charged with a minimum use of water. The external adjustment type regulator has positive stops on the adjusting mechanism that will prohibit excessive high and low settings. To adjust the voltage regulator setting of the external adjustment type regulator, remove the access plug from the regulator. Then for an undercharged battery insert screwdriver into slot and turn clockwise one notch (0.3 volt) to increase the setting. For an overcharged battery, turn counterclockwise one notch (0.3 volt) to decrease setting. Reference figure 2-25. Check for an improved battery condition over a service period of reasonable length. If necessary repeat the above procedure for a higher or lower setting.

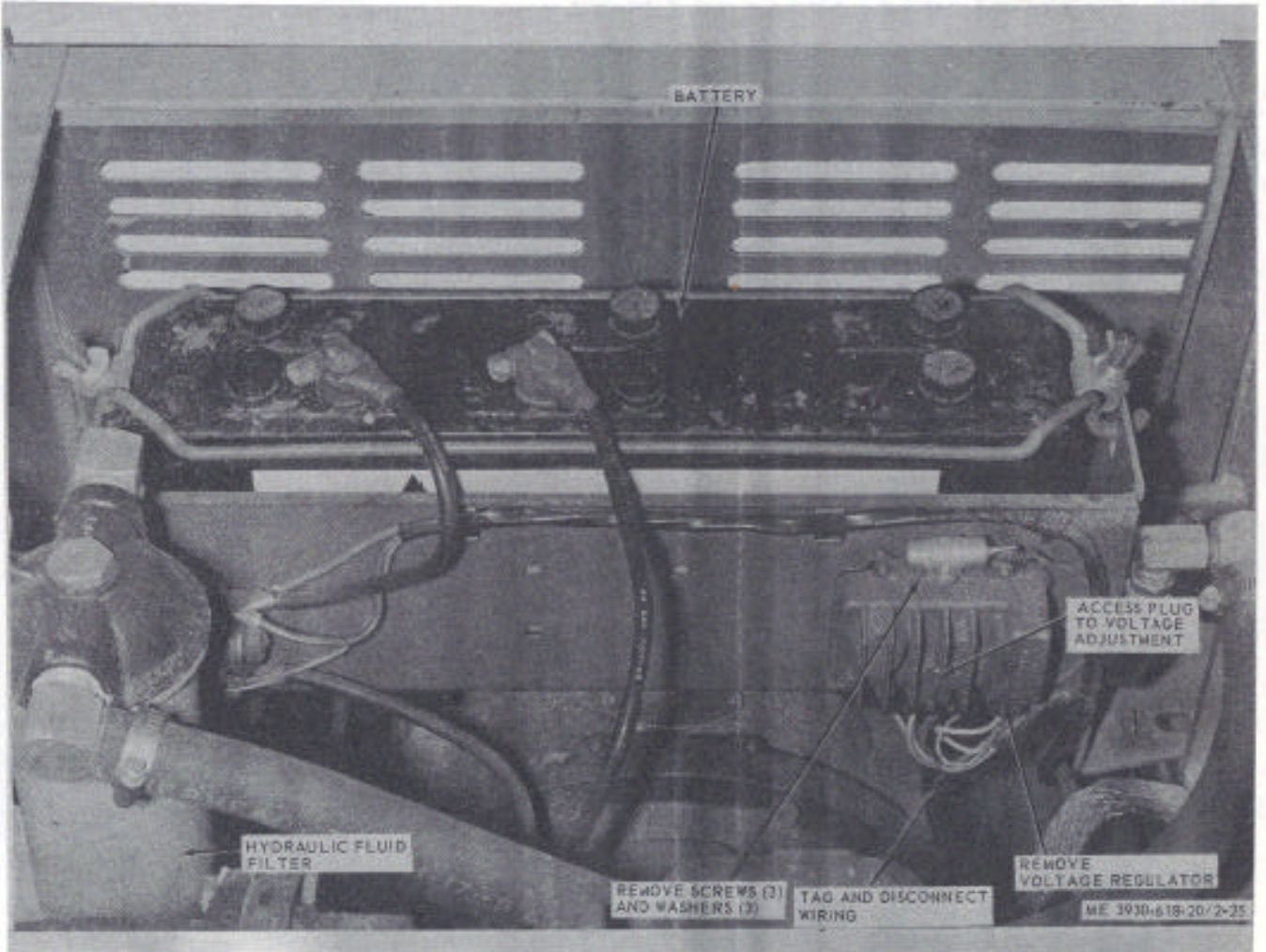


Figure 2-25. Voltage regulator, installed over.

c. *Removal.* Refer to figure 2-25 and remove voltage regulator as follows:

(1) Disconnect and tag electrical leads.

(2) Remove the screws and washers securing the regulator to its mounting plate and remove the regulator.

d. *Installation.* Reverse procedure in c above.

2-33. Stating Motor

a. *Removal.* Refer to figure 2-26 and remove the starter motor as follows :

(1) Remove the operator's seat and the side panel.

(2) Disconnect and tag all electrical leads from the starter motor.

(3) Remove the bolts securing the starter motor to the flywheel housing.

(4) Withdraw the starter motor from the flywheel housing until the drive end clears the flywheel housing. Then tilt the commutator end-up and remove the starter motor.

b. *Installation.*

(1) Reverse procedure in a above.

(2) If the drive mechanism is fully extended, mesh pinion gear with flywheel ring gear.

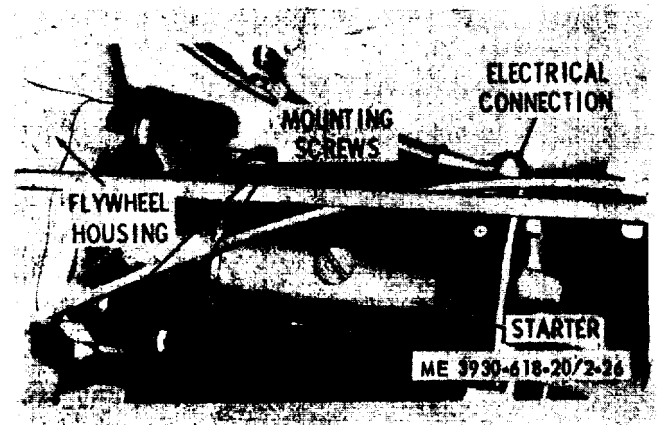


Figure 2-26. Starter motor. installed view.

2-34. Distributor

NOTE

Because of the offset torque and groove drive, the distributor can be removed, overhauled and replaced without retiming the engine. When removing the distributor, do not loosen or remove the advance arm. Remove distributor and advance arm as an assembly.

a. *Removal.* Refer to figure 2-27 and remove the distributor as follows :

(1) Disconnect spark plug cables from the spark plugs, ignition coil cable from the coil, and the primary lead from the distributor primary terminal.

(2) Remove the screw and washers from the advance arm and lift the distributor from the drive housing.

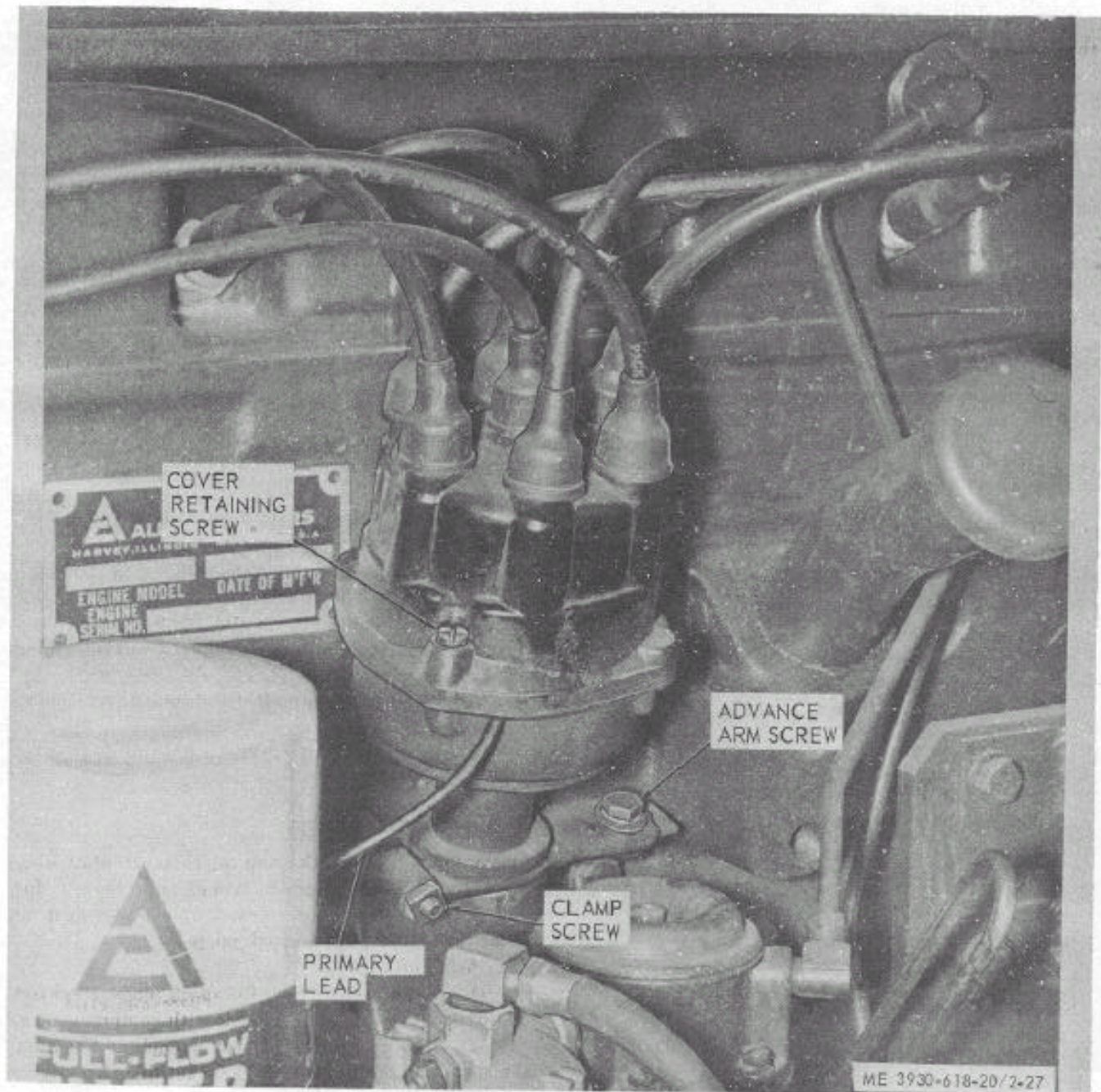
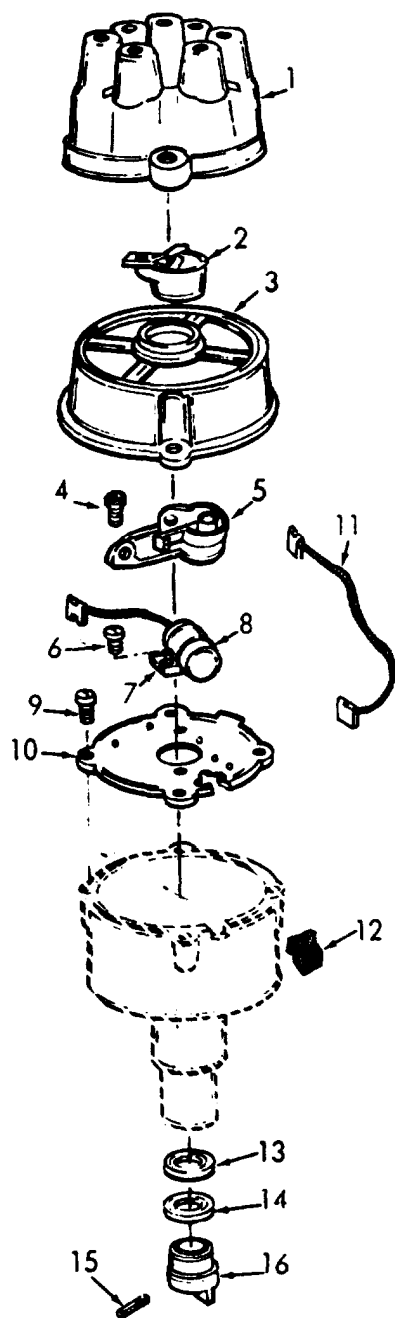


Figure 2-27. Ignition distributor, installed view.

b. *Disassembly.* Refer to figure 2-28 and disassemble the distributor in numerical disassembly sequence.



- | | |
|---------------|-------------------|
| 1 cap | 9 Screw |
| 2 Rotor | 10 Plate, breaker |
| 3 Cover | 11 Lead |
| 4 Screw | 12 Grommet |
| 5 contact set | 13 Shim |
| 6 Screw | 14 Washer |
| 7 Bracket | 15 Pin, spring |
| 8 Capacitor | 16 Coupling |

Figure 2-28. Ignition distributor. exploded view.

c. *Cleaning and Inspection.*

(1) Clean all parts thoroughly and replace any damaged or worn parts. Do not clean the cap, dust cover, rotor, condenser, insulator, or housing in degreasing compound.

(2) Repair slightly worn or pitted contact points with a few strokes of a clean fine cut point file. Replace contact points if worn or badly pitted.

(3) Check the breaker lever rubbing block for excessive wear.

(4) Check the condenser for leakage. Replace it if testing is impractical.

(5) Check the distributor cap and rotor for cracks, burning of contacts, or carbon streaks.

d. *Assembly.* Reverse procedure in b above.

e. *Installation.* Reverse procedures in a above.

f. *Adjustments.* Refer to paragraph 2-14 for ignition timing adjustment.

(1) Remove distributor cap rotor and dust cover.

(2) Rotate the crankshaft until the breaker lever rubbing block is on a high spot on the cam, thus opening the contact points to their maximum open position.

(3) Loosen the contact plate locking screw.

(4) Turn the eccentric adjusting screw to obtain the correct gap of 0.022 inch and tighten the locking screw.

(5) Recheck the gap after tightening the locking screw.

(6) Install the dust, rotor, and distributor cap.

2-35. Spark Plugs

Spark plugs and spark plug wires must always be maintained in good condition and kept free of dirt and grease. Replace any burned, cracked, broken, or otherwise unserviceable spark plugs.

a. *Removal.*

(1) Disconnect wires at the spark plugs. Blow out all dirt from the spark plug wells with compressed air.

(2) Use a spark plug socket wrench and remove the spark plugs. Make sure the socket fits correctly to avoid damaging the plugs.

(3) As each plug is removed make sure the copper gasket is also removed.

b. *Cleaning.*

(1) Clean spark plugs by scraping excess carbon and lead deposits off the electrodes and insulator body.

(2) Sand blasting does not clean between the electrodes and will ruin the glaze on the insulator material if left in the sand blast machine too long.

(3) Using a file, file electrodes until square on flat at the gap surface.

(4) Clean exposed insulator surface of all grease, dirt or paint.

c. *Adjusting gap.* Adjust the gap by bending the outside electrode. Never bend the center electrode. Use a round wire feeler gage for measuring. Adjust for 0.025 inch gap.

d. *Testing.* After cleaning and adjusting the gap, test all spark plugs in a standard spark plug testing machine. Discard all plugs that test unsatisfactorily.

e. *Installation.*

(1) Always use new copper gasket.

(2) Tighten plugs by hand and then torque to 15-20 foot-pounds.

(3) Connect spark plug wires to the correct plugs.

2-36. Ignition Coil

a. *Inspection.* Inspect ignition coil to see if case is cracked or if oil is leaking from case. Replace a defective ignition coil.

b. *Removal.*

(1) Tag and disconnect the wires going to the ignition coil.

(2) Loosen clamp holding ignition coil.

(3) Remove coil.

c. *Installation.* Reverse procedure in b above.

2-37. Battery and Cables

a. *Removal.* Refer to figure 2-29 and remove the battery as follows:

(1) Remove the operator's seat.

(2) Remove the wingnuts from the holddown studs and remove the battery holddown.

(3) Remove both cables from the battery posts.

To prevent accidental damage to the battery posts or cable terminals, use a cable terminal puller tool to remove the cables.

(4) Tilt the battery towards the rear of the truck and lift it out of the battery tray.

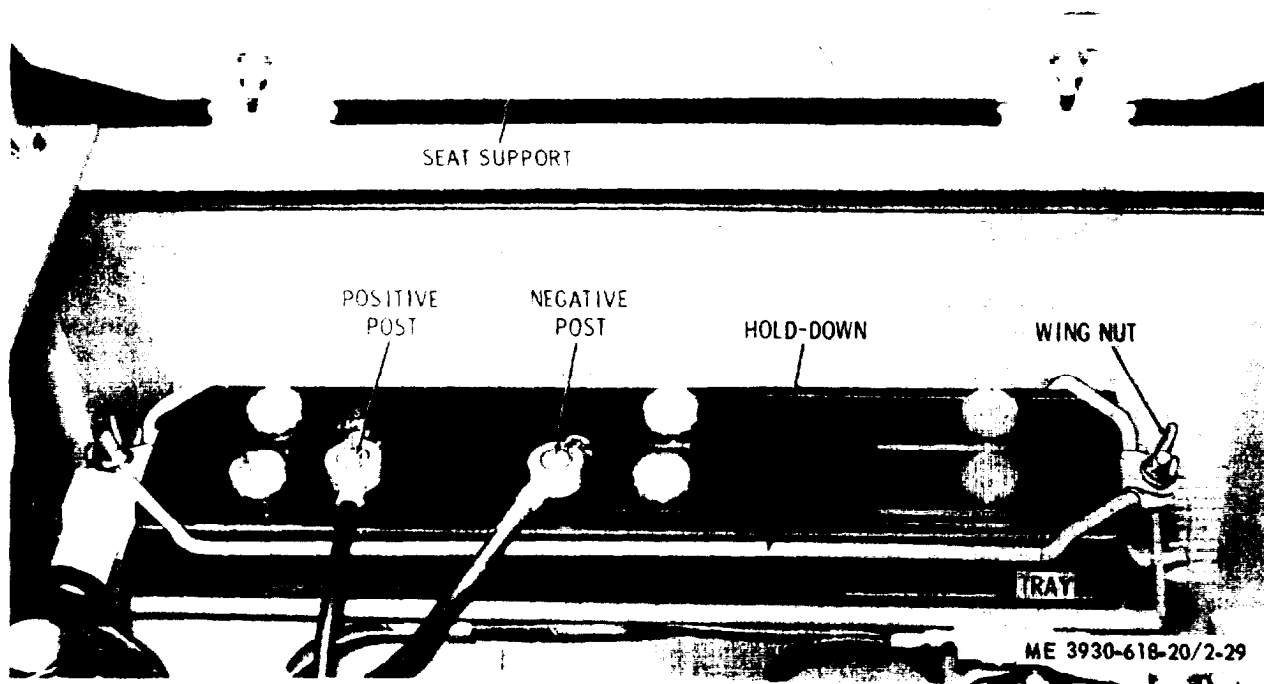


Figure 2-29. Battery and cables, installed view.

b. *Cleaning.*

(1) Clean the top of the battery, posts, and cable terminals with a solution of baking soda and water.

(2) Make sure that all fittercaps are tight to prevent any solution from entering the cells.

(3) After foaming stops, flush the battery and cable terminals with clean, fresh water.

c. *Inspection and Testing.*

(1) Inspect cables for broken strands, defective insulation, or damaged terminals.

(2) Inspect the battery for cracks, breaks, or other defects,

(3) Take a specific gravity reading of the electrolyte using a hydrometer. If the specific gravity reading is 1.225 or lower, recharge the battery. A fully charged battery will read from 1.265 to 1.290 specific gravity.

d. *Installation.* Reverse procedures in a above. Apply a coating of petroleum jelly to the battery posts before connecting the cable terminals.

2-38. Gages and Instruments

All gages and instruments are mounted on the instrument panel and may be removed by disconnecting the wiring from the individual gage or instrument and

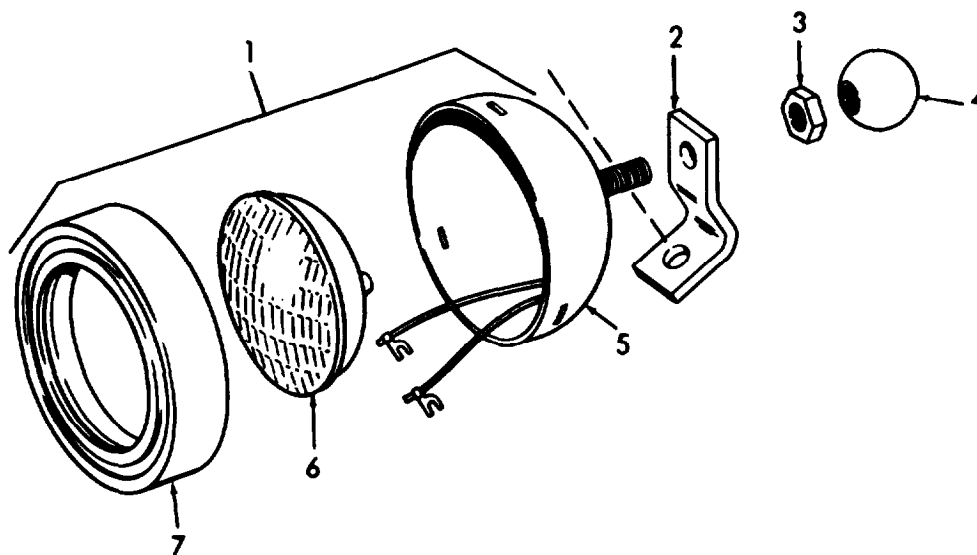
removing the item from the instrument panel. Tag the wires for proper installation. Reference figure 1-3.

2-39. Lights

a. Headlight.

(1) Removal. Refer to figure 2-30 and remove as follows :

- (a) Unplug the wires at the connectors.
- (b) Unscrew the adjusting knob (4).
- (c) Remove the locknut (3).
- (d) Remove the light assembly (1), from the mounting bracket (2).



1. Light assembly
2. Bracket, mounting
3. Nut
4. Knob, adjusting

- ME 3930-618-20/2-30
5. Base
 6. Lamp
 7. Bezel

Figure 2-30. Headlight. exploded view.

(2) *Disassembly.*

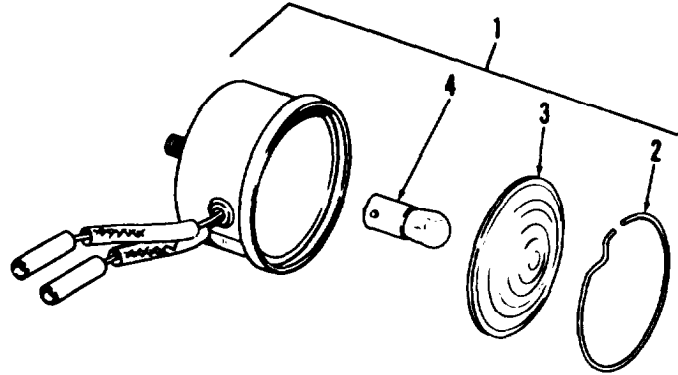
- (a) Pull the rubber bezel (7) from the base (5).
- (b) Loosen the terminal screws and disconnect the wires from the lamp.
- (c) Using care, push the lamp (6) out of the bezel.

(3) *Lamp replacement.* The lamp can be replaced with the light installed on the truck. Refer to (2) above.

b. *Combination Rear Lamp.*

(1) *Removal.* Refer to figure 2-31 and remove as follows :

- (a) Unplug the wires at the connectors.
- (b) Remove the nuts and washers securing the light (1) to its mounting bracket and remove the light.



1. Light assembly
2. Retainer

ME 3930-618-20/2-31

3. Lens
4. Lamp

Figure 2-31. Combination rear light. exploded view.

(2) *Disassembly.*

- (a) Remove the lens retainer (2).
- (b) Remove the lens (3).
- (c) Remove the lamp (4) by pushing in slightly and twisting counterclockwise.

(3) *Bulb replacement.* The bulb can be replaced with the light installed on the truck. Refer to (2) above.

2-40. Horn and Horn Relay

a. *General.* The horn and horn relay are located under the toe plate on the right-hand side. Pressing the horn button actuates the horn relay. The horn relay, when actuated, closes the battery-to-horn circuit. Use of the relay permits a shorter, more direct connection between the battery and horn. This results in higher voltage at the horn and avoids pulling full current through the horn button.

h. *Test and Adjustments.* In event of horn malfunction, always check to be sure that the battery is producing full rated voltage before conducting the following tests.

(1) If the horn produces a weak signal, proceed as follows :

(a) Connect a voltmeter between the horn terminal and ground and press the horn button. Observe the voltage reading on the voltmeter.

(b) If the voltage is between 0- and 10.7-volts, check for an open circuit, defective horn relay, poor wiring, or a shorted horn coil.

(2) If the horn signal is weak and the voltage at the horn terminal is normal, attempt to increase volume with the volume adjusting screw in the horn cover. Turn the screw in to increase volume : out to decrease volume.

(3) If a defective horn relay is indicated: check for proper airgap, point opening, and closing voltage before replacing the relay. Correct settings are as follows :

- (a) Air gap (with points closed)- 0.020 inch.
- (b) Point opening -0.018 inch.
- (c) Closing voltage -8.3-10.2 volts.

c. *Removal.* Refer to figure 2-32 and remove the horn and horn relay as follows:

- (1) Remove the toe plate.
- (2) Disconnect all wires at the horn and the horn relay.

(3) Remove the nut washer, securing the horn mounting bracket, and remove the horn.

(4) Remove the screw, nut, and washer attaching the horn relay and remove the relay.

d. Installation. Reverse procedures in c above.

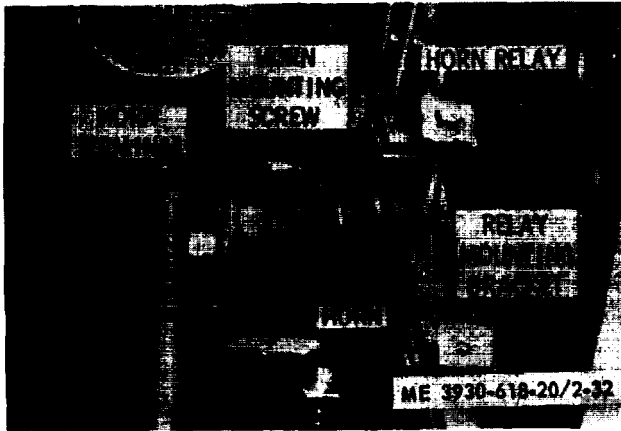


Figure 2-32. Horn and horn relay. installed view.

2-41. Transmission Neutral Switch

a. General. The transmission neutral switch is attached to the underside of the steering column support bracket. The purpose of this switch is to prevent the engine from being started unless the direction shift lever is in neutral (N) position. A cam lever attached to the direction shift lever shaft actuates the switch. Always check the cam adjustment (d below) before replacing the switch when starter motor failures have been traced to the switch circuit.

b. Removal. See figure 2-33. To remove the switch, disconnect the 2 connectors on the switch leads from their mating connectors and then remove the 2 mounting screws.

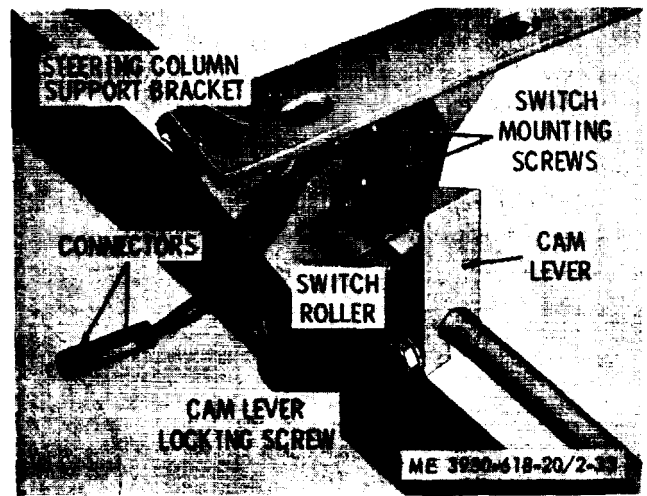


Figure 2-33. Transmission neutral switch. installed view.

c. Installation. Reverse procedures in b above.

d. Adjustment.

(1) Place the direction shift lever in neutral (N) position.

(2) Loosen the locking screw on the cam lever (fig. 2-33) and position the cam lever so the switch roller is at the low point of the cam.

(3) Tighten the cam lever screw, making sure the cam lever does not move.

(4) Check adjustment by attempting to start the engine with the direction shift lever in either forward (F) or reverse (R) position. The starter motor should not operate unless the direction shift lever is in neutral (N) position.

2-42. Hour Meter Switch

a. General. The hourmeter switch is located on the lower right hand side of the engine near the flywheel. This switch is activated by engine oil pressure. The hourmeter on the instrument panel, operates only when the engine is running.

h. Inspect. Inspect hourmeter switch for a leaking or otherwise damaged condition. Replace a defective hourmeter switch.

c. Removal. Refer to figure 2-34 and remove the hour meter switch as follows:

- (1) Tag and disconnect the wiring.
- (2) Remove the hour meter switch.

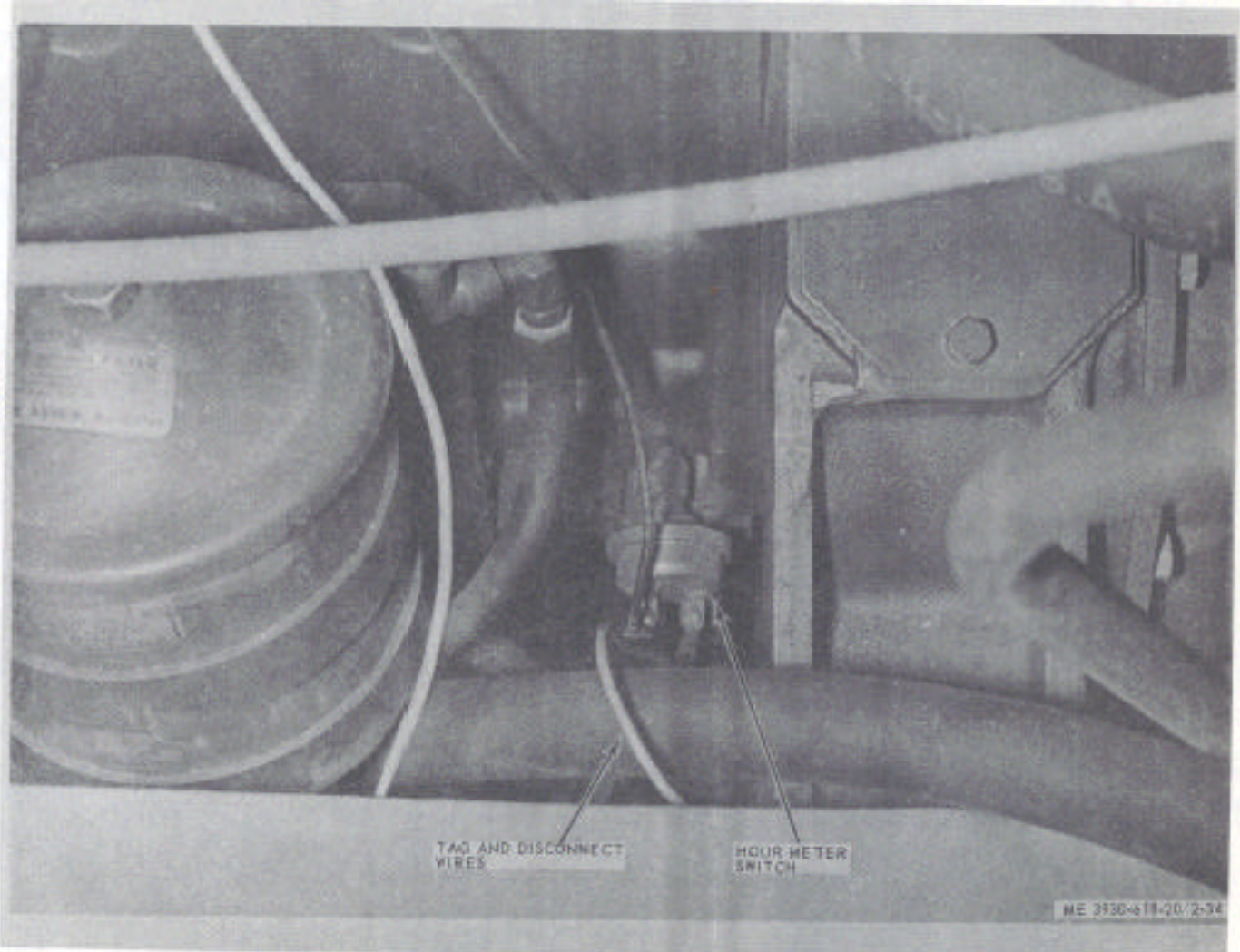


Figure 2-34. Hour meter switch, installed on engine. Reverse procedure in c above.

Section X. MAINTENANCE OF THE TRANSMISSION

2-43. General

The transmission consists of three major components, a torque converter, a hydraulically actuated clutch pack, and a single speed constant mesh transmission.

2-44. Transmission Oil Filter

a. Removal of Filler Element.

(1) Operate transmission until oil temperature reaches operating temperature (about 10-15 minutes).

(2) Use oil filter removing tool. unscrew and discard filter. See figure 2-12.

(3) Clean dirt and sediment from filter base. Be sure all lint, etc., is removed if a rag is used to clean parts.

(4) Apply a light coat of oil to the rubber gasket on the filter. Screw filter to filter base until hand tight.

CAUTION

Do not use removing tool to replace filter.

(5) Start engine and run engine for about 5 minutes. With engine running and transmission in neutral (N) check transmission oil level with dipstick.

CAUTION

Be sure parking brake is set.

(6) Add transmission oil (prescribed on the lubrication order) until oil reaches full level on dipstick, about 1 quart.

CAUTION

Do not overfill transmission, overfilling can cause damage to transmission seals.

(7) After filling transmission with oil, check for oil leakage around the gasket area, tighten filter sufficient to stop leakage.

b. Removal of Filter Assembly.

(1) Refer to figure 2-12 and remove filter assembly RR follows: Disconnect oil lines from fittings on filter base. Tag lines to aid in reassembly. Plug the open end of oil lines to keep dirt out of lines and prevent leakage of oil from lines.

(2) Remove capscrews and washers securing filter bracket to engine block.

(3) Remove filter assembly.

c. Installation of Filter Assembly. Reverse procedure in b above. Service transmission as described in II above.

2-45. Transmission Torque Converter Servicing

Every 1000 hours remove torque converter and transmission drain plug and drain. Remove spring and screen, which are held in place by drain plug. Wash screen in SD before reinstalling. Access to converter drain plug is gained through timing covers opening on engine flywheel housing. Rotate flywheel until drain plug is in opening, remove plug, and rotate flywheel until plug is aligned with drain opening at bottom of flywheel housing. Drain and install plugs. Fill transmission to FULL mark; operate transmission for 5 minutes; check for leaks: check oil level and bring to FULL mark.

Section XI. MAINTENANCE OF THE FRONT DRIVE AXLE

2-46. General

The front axle consists of two components; the front axle assembly and the differential.

2-47. Front Axle Assembly Servicing

Every 50 hours, turn drive wheel until oil plugs are in position 90° from bottom dead center. Remove plugs and check oil level. Add oil as necessary. Every 1000 hours, turn drive wheels until oil plugs are at the

bottom. Remove plugs and drain all oil turn drive wheels until filter openings are at the top. See lubrication order for quantity and weight of oil to be added.

2-48. Differential Servicing

Every 100 hours check oil level in differential. Every 1000 hours oil in differential is to be drained and re-filled. See lubrication order for quantity and weight of oil to be used.

Section XII. MAINTENANCE OF THE REAR STEERING AXLE

2-49. General

The rear axle consists of an axle and two wheels. See Lubrication Order LO-3930-618-12.

2-50. Steering Axle

Every 50 hours the steering axle trunnions and king pins will be lubricated. See lubrication order for location of grease fittings.

Section XIII. MAINTENANCE OF THE BRAKES

2-51. Hand Brake Lever, Cable and Linkage

a. Removal

(1) Level assembly. Refer to figure 2-35 and remove the level assembly as follows:

(a) Disengage the handbrake.

(b) Remove the 2 screws and lockwashers from the cover and remove the cover.

(c) Remove the small setscrew from the adjusting knob on the lever and turn the knob counterclockwise to disengage the brake cable.

(d) Remove the 2 rapscrews securing the lever assembly to the truck.

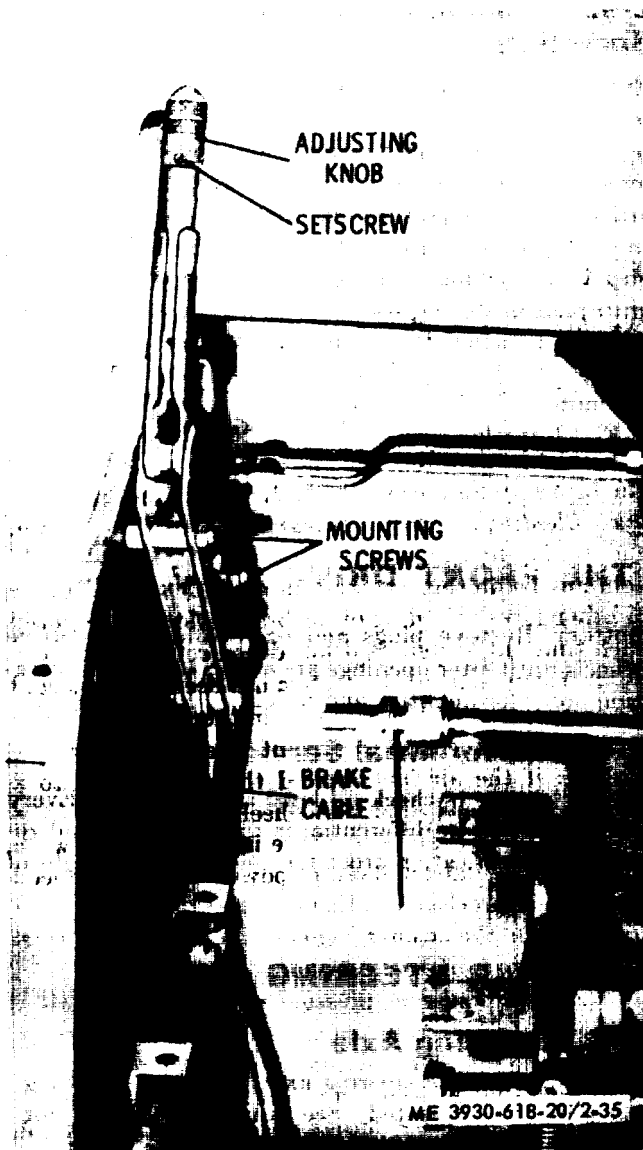


Figure 2-35. Handbrake lever, installed view.

(2) Brake cable.

(a) Perform (1) (a) and (b) above.

(h) Remove the pin and detach the cable clevis from the lever assembly.

(c) Remove the floor plate to expose the brake assembly.

(d) Remove the yoke pin and detach the yoke from the brakeshoe actuating lever (fig. 2-36).

(P) Remove the two cable clamps and remove the cable.



Figure 2-36. Handbrake lower cable yoke adjustment.

b. Installation. Reverse procedure in a above. Make final adjustment as instructed in c below. Yoke adjustment should be such as to allow approximately 5 turns on the adjusting knob for future periodic adjustment.

c. Adjustment. Up to a point, the adjusting knob on the handbrake lever can be used to compensate for brake lining wear. When the adjusting knob will no longer provide the necessary brake adjustment, and sufficient brake lining still remains, further adjustment can be made at the lower cable yoke.

(1) Adjustment using the hand brake lever adjusting knob :

(a) Set the lever in fully released position.

(b) Remove the setscrew from the adjusting knob.

(c) Turn the adjusting knob one or two turns clockwise, check adjustment by engaging the brake.

(d) Repeat step (c) if necessary and reinstall the setscrew in the adjusting knob.

(2) Adjustment of lower cable yoke.

(n) Disengage the brake and remove the setscrew from the adjusting knob. Turn the adjusting knob 4 or 5 turns counterclockwise.

(b) Remove the floor plate and remove the pin from the lower cable yoke. Loosen the yoke locknut figure 2-36.

(c) Turn the yoke 3 or 4 turns clockwise to shorten the cable length.

(d) Install the yoke on the brake lever and check adjustment by engaging the brake. Readjust as necessary to prevent the brakeshoes from dragging when disengaged.

(e) Tighten the yoke locknut and install the pin.

(f) Install and tighten the setscrew in the adjusting knob.

2-52. Brake Pedal and Linkage Adjustment

The ideal pedal free play is $\frac{1}{2}$ -inch. Too little free travel will prevent the master cylinder piston from returning to full OFF position and the brakes will begin to drag after several applications. Excessive free travel will reduce the usable stroke of the master cylinder. Refer to figure 2-37 and adjust as follows:

- Remove the floor plates.
- Slowly depress the brake pedal and check for $\frac{1}{2}$ -inch free travel. Also observe push rod action.
- To obtain the proper free travel, loosen the locknut on the clevis and then turn the adjusting nut.
- Tighten the locknut and reinstall the floor plates.

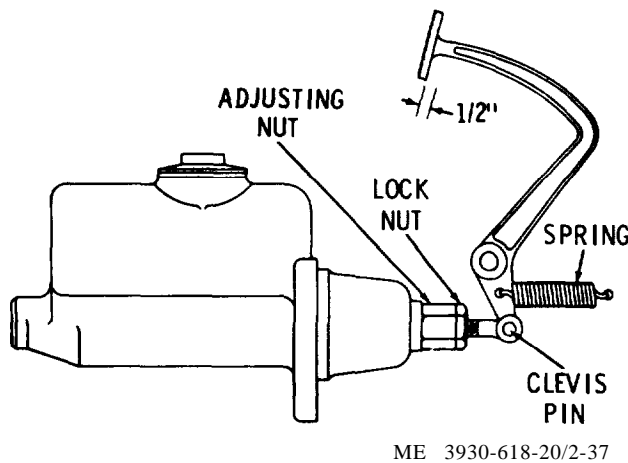


Figure 2-37. Brake pedal adjustment.

2-53. Brake Master Cylinder

a. *Removal.* Refer to figure 2-38 and remove the master cylinder assembly as follows :

- Remove the floor plate.
- Disconnect the electrical wires at the stop-light switch.
- Remove the power booster (para 2-54).
- Remove the clevis pin holding the pushrod to the brake pedal.

(5) Remove the screws holding the master cylinder assembly to the inside of the frame and remove the cylinder.

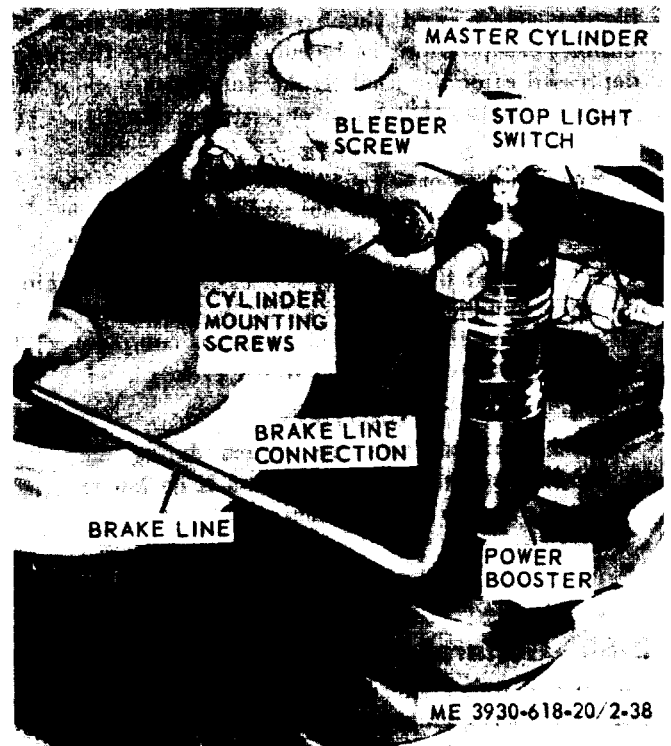


Figure 2-38. Brake master cylinder and brake power booster. installed view

b. *Installation.* Reverse procedures in a above. Bleed the brake hydraulic system as instructed in c below.

c. *Bleeding the Brake Hydraulic System.* The fluid in the brake hydraulic system must form a "solid" column. To do this, the system must be bled of all air or other gases. Bleeding of the brake system is required each time the system is drained and refilled with new fluid ; if some part of the system has been disconnected for any reason; if the fluid level in the master cylinder is allowed to decrease to a point where air enters the system; if the air has entered the system due to a defective master cylinder or wheel cylinders; or if the brake pedal feels spongy. There is a bleeder screw on each wheel cylinder and on the power booster. To bleed the system, proceed as follows :

- Fill the master cylinder to the proper level ($\frac{3}{8}$ - to $\frac{1}{2}$ -in. from the reservoir top).
- If a refiller or pressure bleeder is used, place the proper adapter in the master cylinder filler cap opening and install the refiller or pressure bleeder.
- Install a bleeder hose on the bleeder screw of either wheel cylinder. Submerge the loose end of the hose in brake fluid in a glass jar.
- Open the bleeder screw one turn.

(5) If a pressure bleeder is used, permit the fluid to drain from the bleeder hose until no bubbles appear in the fluid. Then close the bleeder screw.

(6) If manual bleeding is being employed, slowly depress the brake pedal to the stroke limit, close the bleeder screw, and then release. Repeat until no bubbles escape from the bleeder hose. Keep the pedal depressed after the final stroke and quickly close the bleeder screw so that no air enters the system.

NOTE

Manual bleeding quickly depletes the fluid supply in the reservoir. Continually check the fluid level and keep the reservoir at least 1/2 full at all times or air will enter system.

(7) Repeat the bleeding procedure at the remaining wheel cylinder and then at the power booster.

(8) When the bleeder operation is complete refill the master cylinder reservoir to the proper level.

CAUTION

Fluid salvaged from the system during the bleeding operation is aerated and is no longer suitable for use in this system.

2-54. Brake Power Booster

a. General. The brake power booster is connected to the master cylinder outlet through a pipe nipple and is operated by pressure produced in the master cylinder. It multiplies the pressure produced in the master cylinder end applies this increased pressure to the wheel cylinders, resulting in more positive braking.

b. Removal. Refer to figure 2-38 and remove the power booster as follows :

(1) Remove the floor plate.

(2) Disconnect the brake line at the power booster.

(3) Using an open-end wrench of the proper size, hold the connecting nipple to the master cylinder while removing the power booster.

c. Installation.

(1) Reverse procedures in b above.

(2) Use a suitable thread compound on thread connections and make sure connections are tight.

(3) Bleed the brake system (para 2-53).

Section XIV. MAINTENANCE OF THE WHEELS

2-55. General

The drive wheel rim and tire assembly consist of 2 wheels, 2 tires, and tubes. The steer wheel assemblies consist of a wheel, tire and tube, and bearings.

2-56. Drive Wheels

a. Removal.

(1) Raise the front of the truck so the wheel clears the floor. This may be done by tilting the mast to full backward position and inserting a block under

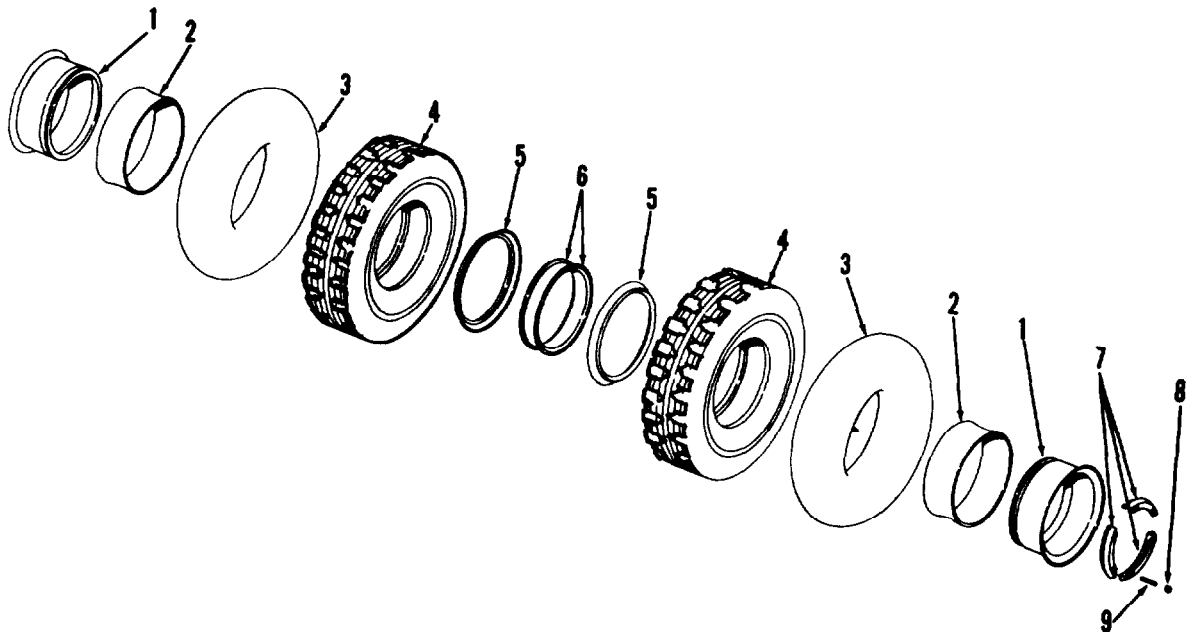
the mast assembly and then tilting the mast to the vertical position.

(2) Remove the 3-segment wedge ring (7) figure 2-39.

(3) Slide the outer tire and rim assembly from the hub.

(4) Remove the rim spacer and then the inner tire and rim assembly.

b. Installation. Reverse procedures in a above.



ME 3930-618-.20/2-39

1. Rim base
2. Flap
3. Tube
4. Tire
5. Spacer, rim

6. Ring, lock
7. Ring, wedge
8. Nut
9. Stud

Figure 2-39. Drive wheel, rim, tire and tube, exploded view.

2-57. Steering Wheels

a. Removal.

(1) Raise the rear of the truck until the wheels clear the floor. Block front wheels securely to prevent the truck from rolling.

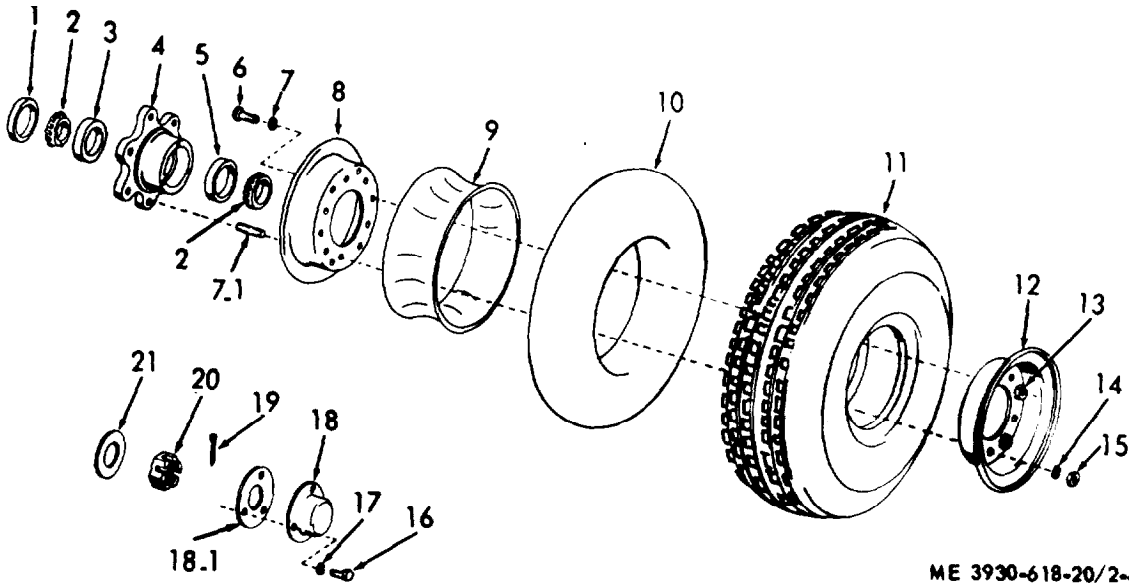
(2) Remove the nuts and lockwashers attaching the rims to the studs in the hub assembly (fig. 2-40).

(3) Pull the tire and rim assembly from the hub assembly.

b. Installation. Reverse procedures in a above.

c. Tire and Tube Repair. If a tire is excessively worn or badly damaged, replace it as follows :

- (1) Remove the appropriate wheel.
- (2) Deflate the tube completely.
- (3) Remove the outer rim (drive wheel) from the inner rim and remove the tire, tube and Hap.
- (4) To remove the steer wheel tire, tube, and flap, remove the nuts and lockwashers and separate the inner and outer rims.
- (5) Replace or repair the defective tire, tube, or flap and reassemble in reverse order of removal.
- (6) Install tire and rim assembly.
- (7) Inflate to proper pressure (100 psi).



ME 3930-618-20/2-40

- 1. Seal
- 2. Cone
- 3. Cup
- 4. Hub assembly
- 5. Cup
- 6. Screw
- 7. Washer, lock
- 7.1. Stud
- 8. Rim, inner
- 9. Flap
- 10. Tube
- 11. Tire

- 12. Rim, outer
- 13. Nut, lock
- 14. Washer, lock
- 15. Nut, lock
- 16. Screw
- 17. Washer, lock
- 18. Cap
- 18.1. Gasket
- 19. Pin, cotter
- 20. Nut
- 21. Washer, flat

Figure 2-40. Steer wheel, rim tire and tube exploded view.

2-58. Bearings and Seals (Steer Wheels Only)

a. Removal.

- (1) Remove the steering wheel (para 2-57).
- (2) Remove the hub cap (fig, 2-40).
- (3) Remove the cotter pin (19) from the bearing adjusting nuts (20) and remove the nut and washer.
- (4) Remove the outer bearing cone (2).
- (5) Slide the hub assembly (4) from the steer axle spindle.
- (6) Remove the inner bearing cone and grease retainer from the hub assembly.
- (7) Carefully top both bearing cups (3 and 5) from the hub assembly.

b. *Cleaning and Inspection.* Every 1000 hours wheel bearings and races are to be lubricated. Clean bearings

and bearings races. Check for excessive wear or damage. Check grease seals for leaks.

c. Installation and Adjustment.

- (1) Install cleaning cups with the taper to the outside. Tap into place using a brass drift pin. Tap evenly around the edge of the cup. Use care to prevent cup from binding.
- (2) Lubricate wheel bearings with bearing grease.
- (3) Install the bearing cones and hub assemblies in reverse order of rim oval. Hold the hub assemblies in position while installing the outer bearings.
- (4) Install the washer and nut.
- (5) Rotate wheel six times in each direction while torquing nut to 50 ft-lbs. Hack nut off to 0-ft-lb. then retorque to 25 ft-lb. while, turning the wheel. Finally hack nut off 30 minimum to 60 maximum and install the cotter pin.

Section XV. MAINTENANCE OF THE STEERING SYSTEM

2-59. General

The steering system consists of the power steering unit, power steer cylinder, and the steering axle assembly. The steering axle is located beneath the engine at the rear of the truck. The steering unit is mounted in the truck chassis in front of the operator.

2-60. Power Steering Cylinder

a. *Inspection.* Inspect the steering cylinder, for leaks or damaged condition. Replace power steer cylinder if damaged.

b. *Removal.* Refer to figure 2-41 and remove the power steering cylinder.

(1) Disconnect hydraulic lines at the cylinder.
Plug lines to keep out foreign matter.

(2) Remove bolt, cotter pin, and pin and remove
cylinder from bracket.

(3) Loosen locknut.

(4) Rotate the cylinder to remove it from fitting
on steering axle pivot arm.

c. *Installation.*

- (1) Reverse procedure as outlined in *b.* above.
- (2) Refill and bleed hydraulic cylinder before tightening hydraulic lines.
- (3) Operate the cylinder through several cycles and check for leaks before final installation of pin and cotter pin.

2-61. Tie Rods

a. *Removal.*

- (1) Loosen the adjusting plug and disconnect the tie rod from the pivot arm.
- (2) Remove the nuts from the ball socket on the opposite end of the rods and remove the tie rods from the truck.

b. *Disassembly.* To disassemble tie rods, remove the adjusting plugs and withdraw the internal parts (fig. 2-42). If desired, unscrew the ball sockets. Note the position of each part to assure proper assembly.

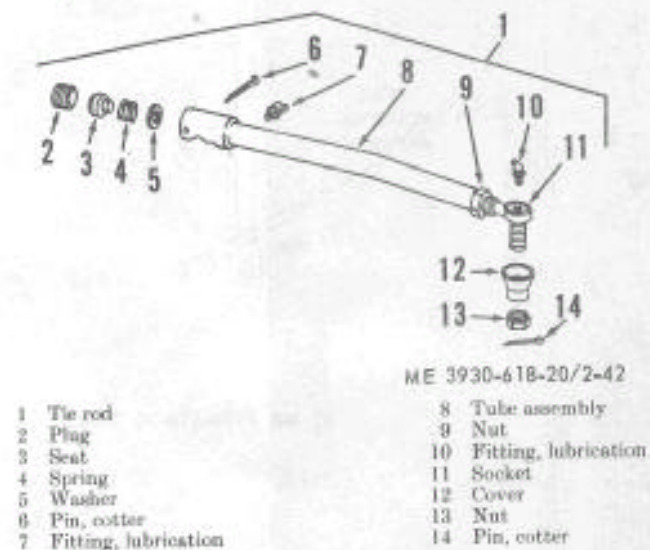


Figure 2-42. Tie rod, exploded view.

c. *Cleaning and Inspection.* Wash all parts in SD and dry with compressed air. Inspect for damaged springs and ball seats. Inspect for defective threads.

d. *Repair and Replacement.* Replace defective parts and lubricate.

e. *Reassembly.* Reverse procedures in *b* above.

f. *Installation.* Reverse procedure in *a* above.

g. *Adjustment.*

- (1) Raise the rear end of the truck so that the steering wheel clears the floor. Block in position.
- (2) Disconnect the steering cylinder from the steering cylinder pivot arm.
- (3) Turn the steering wheels full right and full left. Measure the distance between the wheel and the

axle at both wheels. Clearance should be $\frac{1}{4}$ inch. While holding this distance, adjust the spindle stops to allow approximately .030" clearance between the stop and the spindle (fig. 2-43).

- (4) Center the steering gear. Count the number of turns of the steering wheel from extreme right to extreme left; and vice versa. Turn the steering wheel back half this number of turns to its mid-position-of travel.

- (5) Set the steering wheels straight ahead, parallel with the sides of the truck. It may be necessary to adjust tie rods to obtain this position, as zero degrees toe-in must be maintained at all times.

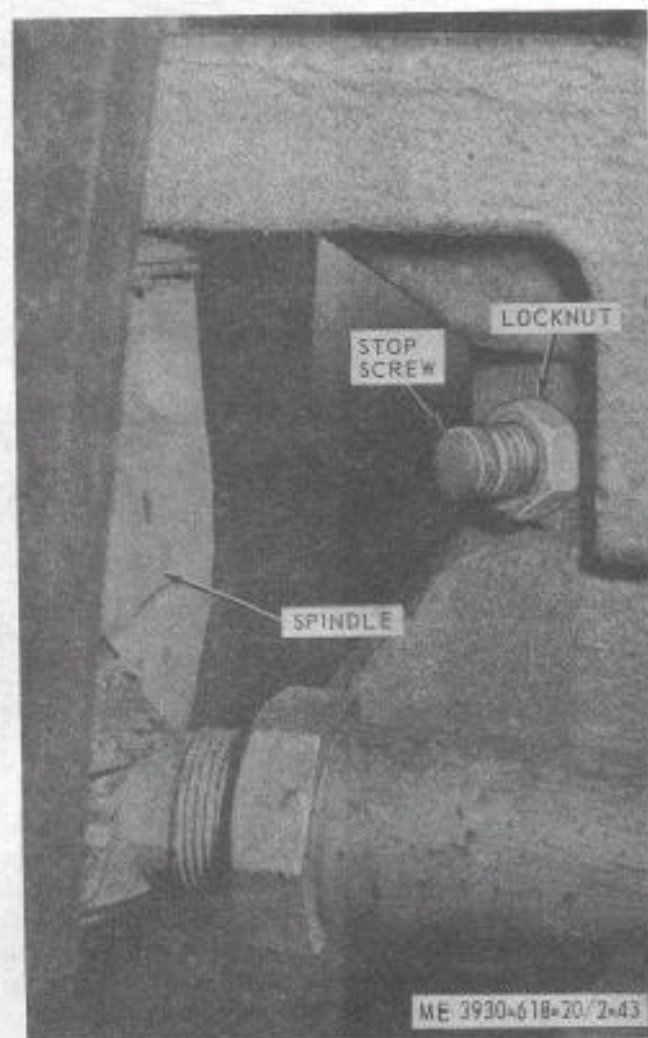


Figure 2-43. Checking clearance between spindle and stop.

Section XVI. MAINTENANCE OF THE BODY AND OVERHEAD GUARD

2-62. Seat and Backrest

a. Removal.

(1) To remove the seat cushion, lift it from the frame.

(2) To remove the backrest cushion, remove the screws and lockwashers securing it to the frame.

b. Installation. Reverse procedures in a above.

2-63. Overhead Guard

a. *Removal.* The overhead guard is removed by removing the screws, nuts, and lockwashers that secure it to the body.

b. *Installation.* Reverse procedure in a above.

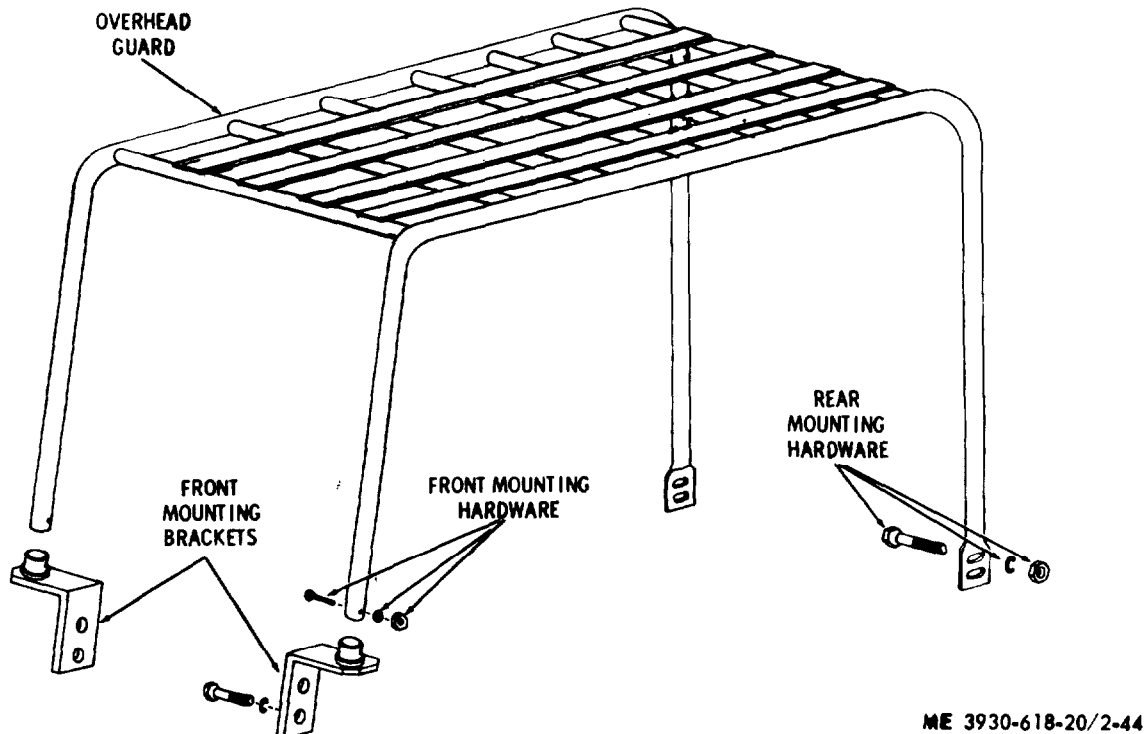


Figure 2-44. Overhead guard. exploded view.

Section XVII. MAINTENANCE OF THE HYDRAULIC LIFT COMPONENTS

2-64. General

All lifting, steering powering of attachments is done by hydraulic pressure. The hydraulic system is comprised of an oil reservoir, a hydraulic pump coupled to the engine at the rear of the truck, dual control valve, lift and tilt cylinders, and the necessary hydraulic lines and hoses. An oil filter is installed in the pump suction line for the purpose of removing contaminants which may have entered the reservoir. The lift cylinder is centrally mounted in the mast assembly. The tilt cylinders are attached to the truck frame and the outer mast channels.

2-65. Hydraulic Pump

Inspect hydraulic pump for leaks or for any other damage. Report a damaged condition to direct support maintenance.

2-66. Tilt Cylinder Adjustment

The correct degree of tilt is 3° forward and 10° backward. Use a protractor to measure the degree of tilt. Proceed as follows :

NOTE

Make sure the truck is standing level when checking tilt.

a. Tilt the mast to the limit of its backward stroke.

b. Set the protractor for 3° and place it on the back of the mast as shown in figure 2-45. The bubble in the level of the protractor will center if tilt is correct.

NOTE

Check both right and left side of the mast and also make sure both cylinders have come to the end of their stroke

c. If adjustment is necessary, tilt the mast to the forward position and loosen the screw (fig. 2-46) on the tilt cylinder yoke. Using a wrench, turn the piston rod by adjusting hex in or out of the cylinder yoke to obtain the correct tilt angle.

d. When the correct tilt angle is obtained, tighten the screw on the yoke.

e. Correct forward tilt is automatically obtained when the backward tilt is correct.

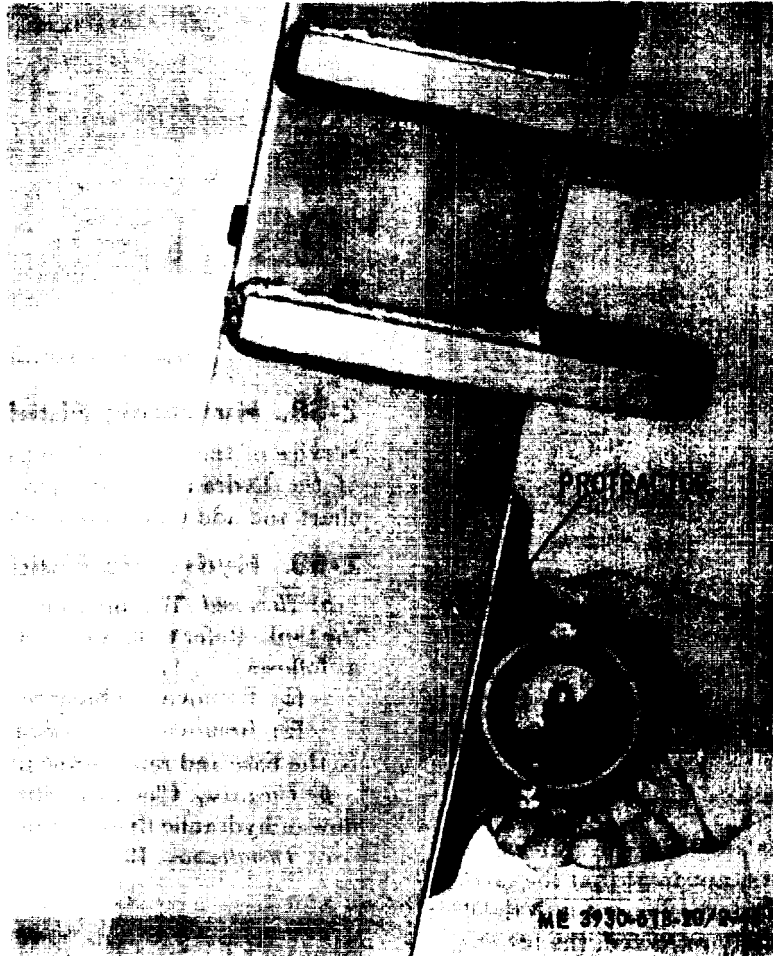


Figure 2-45. Checking mast tilt.

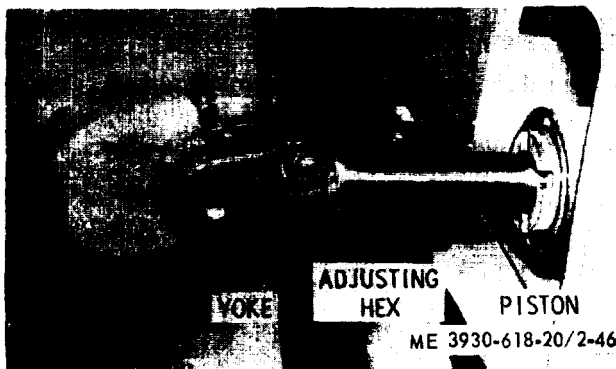


Figure 2-46. Tilt cylinder adjustment.

2-67. Lift Chains

a. Removal. The chains are attached at one end to anchors on the lift cylinder and at the other end to anchors on the carriage assembly; Refer to figure 2-47 and remove the chain as follows:

- (1) Lower the mast to its lower limits.
- (2) Attach a hoist to the carriage to relieve the tension on the chains.
- (3) Remove the cotter pins and chain links from the anchors on the carriage assembly.
- (4) Remove the cotter pins and chain links from the anchors on the lift cylinder.
- (5) The chains are then free for removal.

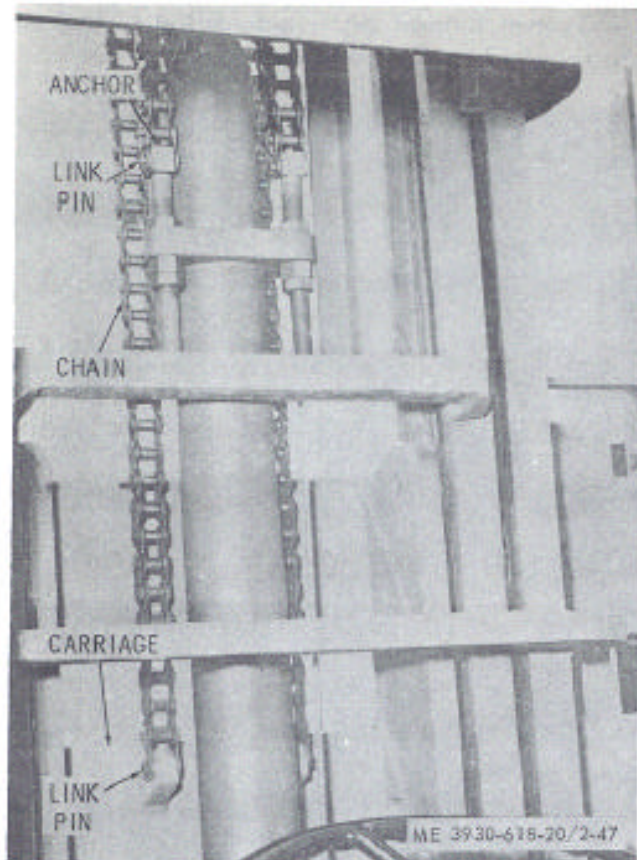


Figure 2-47. Lift chain, installed view.

b. Installation. Reverse procedures in *a* above.

c. Adjustment. When it is apparent that the carriage assembly is not level or the forks do not touch the floor when the lift cylinder is fully retracted, the lift chains must be adjusted. Refer to figure 2-48 and proceed as follows:

(1) Make sure that the mast is vertical and the inner mast and lift cylinder are fully retracted.

(2) Loosen the locknuts and adjusting nuts at the chain anchors on the lift cylinder.

(3) Adjustment is made by turning the adjusting nuts. Tighten or loosen one side and then the other until the chains are a snug fit.

(4) Make sure the tension is equal and the carriage assembly is level.

(5) Tighten locknuts. Make sure the adjustment is not disturbed.

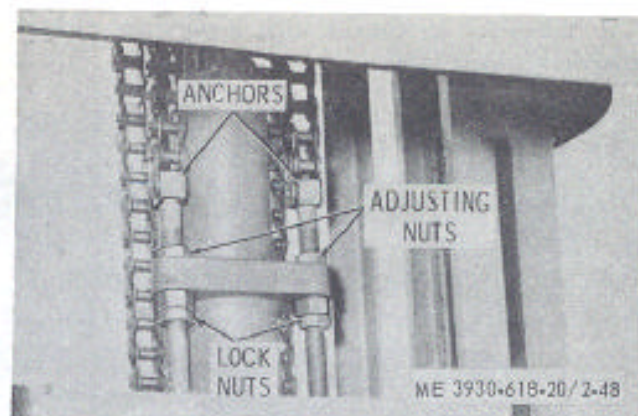


Figure 2-48. Lift chain adjustment.

2-68. Hydraulic Fluid Tank

Service of the tank shall consist of checking the level of the hydraulic fluid. Refer to current lubrication chart and add fluid as required.

2-69. Hydraulic Fluid Tank Breather

a. Removal. The breather is attached to the top of the tank. Refer to figure 2-49 and remove the breather as follows:

(1) Remove the breather as shown.

(2) Remove the screw attaching the breather cap to the base and remove the filter element.

b. Cleaning. Clean the filter element with a reverse flow of hydraulic fluid or compressed air.

c. Installation. Reverse procedures in *a* above.

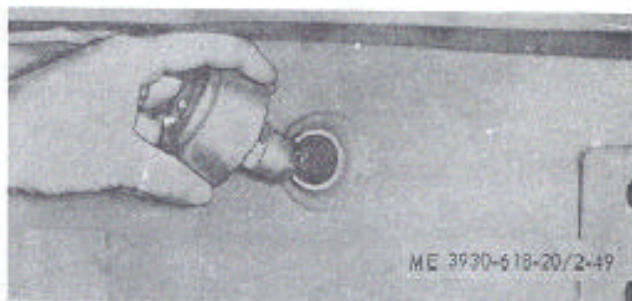


Figure 2-49. Removing hydraulic oil tank breather.

2-70. Lines and Fittings

Inspect hydraulic lines for leaks or other damage. Inspect fittings to make sure they are tight. Replace defective fittings.

2-71. Hydraulic Fluid Filter

Filter element replacement. The filter element is a paper type and cannot be washed. If dirty, it must be replaced.

a. Removal. Refer to figure 2-50 and proceed as follows :

- (1) Remove the seat and seat support.
- (2) Separate the shell assembly from the head assembly.

- (3) Remove the element, from the shell assembly.

b. Cleaning and Inspection. Clean the head assembly and shell assembly and inspect for defects.

c. Installation.

- (1) Install a new element in the shell assembly.
- (2) Position a new gasket on the shell assembly and install on the head assembly. Tighten the attaching nut.
- (3) Operate the system and check the filter carefully for leaks.

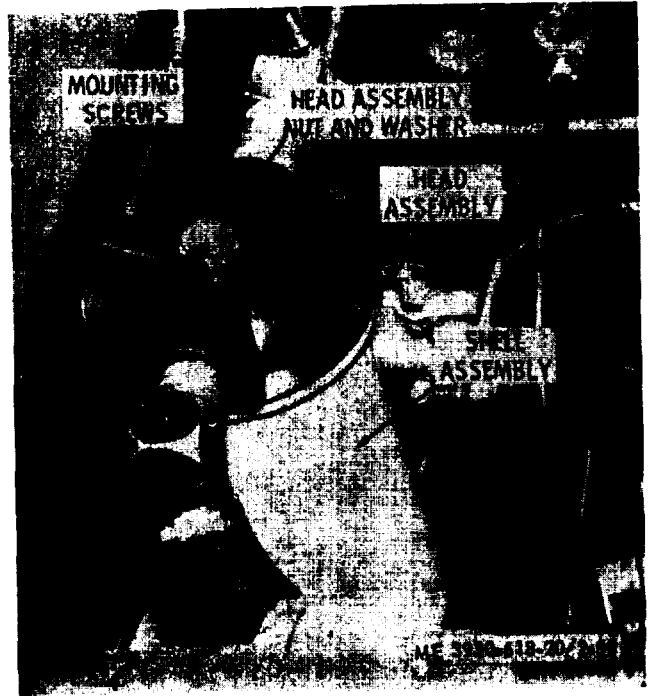


Figure 2.50. Micrin-type hydraulic fluid filter. installed view.

APPENDIX A REFERENCES

A-1. Fire Protection

TB 5-4200-200-10

Hand Portable Fire Extinguishers Approved for Army Users

A-2. Lubrication

C9100-IL

LO 10-3930-618-12

Identification List for Fuels, Lubricants, Oils and Waxes
Lubrication Order; Truck, Lift Fork Allis-Chalmers, Model
FP60-24PS, Army Model MHE-213

A-3. Painting

TM 9-213

Painting Instruction for Field Use

A-4. Radio Suppression

TM 11-483

Radio Interference Suppression

A-5. Maintenance

TB 750-651

Use of Anti-Freeze Solution and Cleaning Compounds in
Engine Cooling Systems

TM 38-750

The Army Maintenance Management System

TM 10-3930-618-10

Operator's Manual for Truck, Lift Fork, Army Model
MHE 213

TM 10-3930-618-20P

Organizational Maintenance Repair Parts Manual for Truck,
Lift Fork, Army Model MHE-213

TM 9-6140-200-15

Operator and Organizational, Field and Depot Maintenance :
Storage Batteries, Lead Acid Type

A-6. Shipment and Storage

TB 740-97-2

Preservation of USAMEC Mechanical Equipment for Ship-
ment and Storage

TM 740-90-1

Administrative Storage of Equipment

A-7. Destruction of Army Material to Prevent Enemy Use

TM 750-244-3

Procedures for Destruction of Equipment to Prevent
Enemy Use

APPENDIX B MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III. Not Applicable.

d. Section IV. Not Applicable.

B-2. Explanation of Columns in Section II

a. *Group Number. Column (1).* The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. *Functional Group. Column (2).* This column contains a brief description of the components of each assembly group.

c. *Maintenance Functions. Column (3).* This column lists the various maintenance functions (A through K) and indicates the lowest maintenance level authorized to perform these functions. The symbol designations for the various maintenance levels are as follows:

C-Operator or crew

O-Organizational maintenance

F--Direct support maintenance

H-General support maintenance

D-Depot maintenance

The maintenance functions are defined as follows :

A-Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

R-Test. To verify serviceability and detect electrical or mechanical failure by use of test equipment.

C-Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air.

D-Adjust. To rectify to the extent necessary to bring into proper operating range.

E-Align. To adjust specified variable elements of an item to bring to optimum performance.

F--Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G--Install. To set up for use in an operational environment such as an emplacement, site, or vehicle.

H-Replace. To replace unserviceable items with serviceable like items.

I-Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each level of maintenance.

J-K--Overhaul/Rebuild. The disassembly, test, and inspection of the operating components and the basic structure to determine and accomplish the necessary rework, rebuild, replacement, and servicing to obtain the desired performance. Overhaul, rework, and rebuild are synonymous.

d. *Tools and Equipment. Column (4).* This column is provided for referencing by code the special tools and test equipment required to perform the maintenance functions.

e. *Remarks. Column (5).* This column is provided for referencing by code the remarks pertinent to the maintenance functions.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks				
		A	B	C	D	E	F	G	H	I	J			K			
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul			Rebuild			
25	FUEL PUMP AND FILTER Pump, Fuel Filter, Fuel	0	O	O					O								
26	THERMOSTAT AND HOUSING Thermostat		O						O								
27	GOVERNOR.	F			O				F	F							
28	WATER PUMP AND FAN Belt, Fan Pump, Water	C C	O		C				O O								
29	DISTRIBUTOR AND WIRING Distributor Ignition Coil Spark Plug	0 0	O O	O O	O O				O O O	O							
30	CYLINDER HEAD COVER AND ROCKER ARMS Rocker Arm				O				F	F							
31	CYLINDER HEAD AND VALVES Cylinder Head, Assy Valves, Engine	F			O				F F	F F	H						
32	OIL PAN AND OIL PUMP Pump, Oil	F			F				F								
33	FLYWHEEL AND HOUSING Flywheel Assembly	H							F F	H							
34	TIMING GEAR COVER								H	H							
35	CRANKSHAFT, PISTON AND CONNECTING ROD Pulley, Crankshaft								F H F H								
36	CAMSHAFT Gear, Camshaft								F H	0							
37	CYLINDER BLOCK								F								
38	TRANSMISSION AND CONVERTER Torque Converter Transmission Assembly		F F	O O O					F F O	F 0	H		D				
39	PROPELLER SHAFT								O								
40	PARKING BRAKE AND LEVER Lever: Cable, Hand Brake. Shoe, Brake				O				O F								
41	POWER STEERING GEAR AND CYLINDER ASSEMBLY Gear Assembly, Steering Cylinder, Steering.	0		O	F				F O	F F							

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks		
		A	B	C	D	E	F	G	H	I	J			K	
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul			Rebuild	
42	HYDRAULIC RESERVOIR FILTER, LINES AND FITTINGS Filter, Hydraulic Fluid Tank, Hydraulic Fluid. Lines and Fittings	0		0 0					0 0 0						
43	HYDRAULIC CONTROL VALVE.								F	F					
44	FUEL TANK			C					0	F					
45	STEERING AXLE AND WHEEL Steering Axle Drag Link Tie Rod Tires and Tubes	0 0 0 0			F 0 0				F 0 0 0	F 0					
46	FRONT WHEELS Tires and Tubes	0 0		0					F 0	0					
47	DRIVE AXLE AND BRAKES Brake Shoes Drive Axle				0				F F	F					
48	FRAME								H						

I N D E X

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By Order of the Secretary of the Army :

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Distribution :

To be distributed in accordance with DA Form 12-25, Section I, (qty rqr block No. 194) Organizational maintenance requirements for Truck, Fork Lift, Gasoline.

★ U.S. GOVERNMENT PRINTING OFFICE: 1971-431104/5184

TM 10-3930-618-20 TRUCK, LIFT FORK—1971

P i n : 0 2 8 3 0 1 - 0 0