
TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DS, AND GS MAINTENANCE MANUAL

TRUCK, FORK LIFT; GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES;

6000-LB CAPACITY; 173-IN. LIFT

(BAKER MODEL FJF-060, ARMY MODEL MHE-210)

FSN 3930-235-4674

HEADQUARTERS, DEPARTMENT OF THE ARMY

AUGUST 1970

The format of this manual is not in accordance with established Department of the Army Specifications because of the short lead time involved. The technical content has been furnished by the equipment manufacturer and/augmented with a Maintenance Allocation Chart (MAC), Basic Issue Items List (BIIL), etc., to assure that it provides the essential data needed to operate and maintain the equipment.

Change

No. 5

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

**Operator's, Organizational, DS,
and GS, Maintenance Manual**

**TRUCK, FORK LIFT: GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES;
6000-LB CAPACITY; 173-IN. LIFT (BAKER MODEL FJF-060,
ARMY MODEL MHE-210) NSN 3930-00-235-4674**

TM 10-3930-622-14, 20 August 1970, is changed as follows:

Inside Front Cover. Add the following warning to the inside front cover:

WARNING

Always use an inflation safety cage to inflate tires mounted on multi piece rims and tire/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.

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.

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

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

Page 57, Paragraph e, (4), add the following after last sentence:

"Reference TM 9-2610-200-24, CARE, MAINTENANCE, AND REPAIR OF' PNEUMATIC TIRES AND INNER TUBES for additional information concerning tire maintenance."

Page 57, Paragraph f.

(1) Add the above warnings before the paragraph.

(2) Replace the statement "Reverse e. above." With "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, 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."

Page 58. Paragraph h., add the following warnings before paragraph h.,

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 over40 PSI to seat tire beads. Serious injury or loss of life could result."

"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."

Change "Reverse g. above." to the following: "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. 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 to recommended pressure."

Page 58, Paragraph i., change the sentence after "Tire and tube repair" to the following: "Reference TM 9-2610-200-24, CARE, MAINTENANCE, AND REPAIR OF PNEUMATIC TIRES AND INNER TUBES for additional information concerning tire maintenance."

By Order of the Secretary of the Army:

Official:

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

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

Distribution:
To be distributed in accordance with DA Form 12-25-E, block 2215, Operator and Unit, Direct and General Support maintenance requirements for TM 10-3930-622-14.

* U.S. GOVERNMENT PRINTING OFFICE. 1991--5 4 3 - 0 2 5/ 4 0 0 5 7

PIN: 028317-005

Change

No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D C, 24 June 1982

Operator's, Organizational, DS, and GS Maintenance Manual

TRUCK, FORK LIFT: GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES; 6000-LB CAPACITY; 173-IN. LIFT (BAKER MODEL FJF-060, ARMY MODEL MHE-210) NSN 3930-00-235-4674

TM 10-3930-622-14, 20 August 1970, is changed as follows:

The cover and title pages are changed as shown above.

Page 2. Paragraph 1-3.1 is added after paragraph 1-3.

1-3.1. Reporting of Errors and Recommending Improvements.

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: US Army Tank-Automotive Command, ATTN: DRSTA-MB, Warren, MI 48090. A reply will be furnished to you.

Paragraph 1-3.2 is added after paragraph 1-3.1.

1-3.2. Destruction of Army Material to Prevent Enemy Use

Instructions for destruction of material to prevent enemy use will be in accordance with TM 750-244-3

*This change supersedes Change 1, 26 July 1971.

(Procedures for Destruction of Equipment to Prevent Enemy Use, Mobility Equipment Command).

Paragraph 1-3.3 is added after paragraph 1-3.2.

1-3.3. Maintenance Forms and Records

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

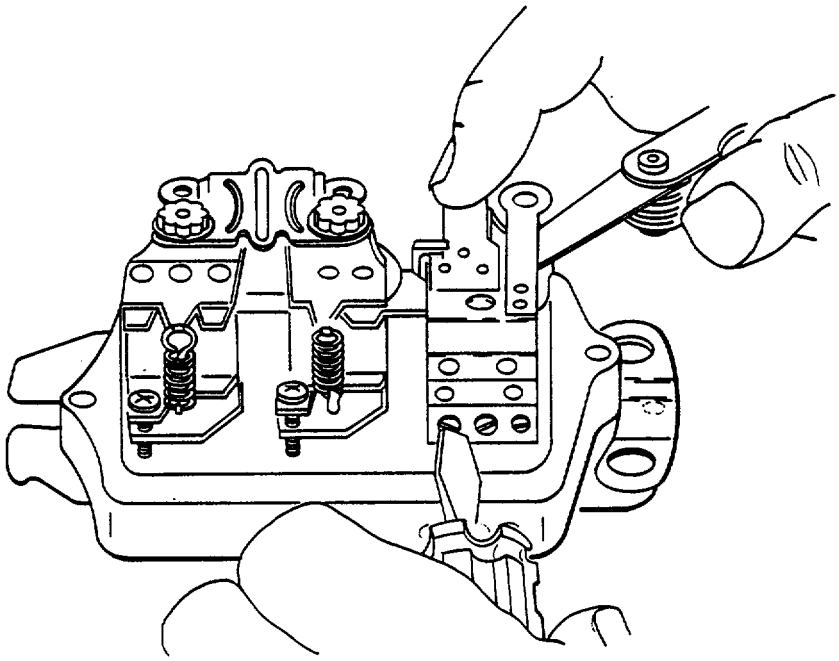
Page 5, paragraph 1-14a. In lines 2 and 3 "wheel brakes for slowing and stopping movement of the truck" is changed to read, "wheel brakes for slowing and stopping."

Page 16. After paragraph 3-4g (27), add the following:

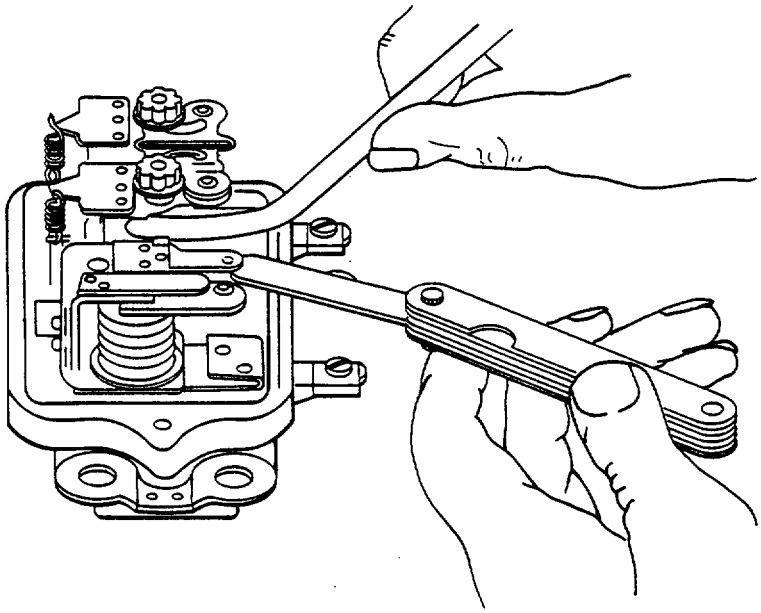
CAUTION

Check transmission inching and brake clutch adjustment before operating truck. Refer to paragraph 6-28(h).

Page 35. Figure 5-7 is superseded as follows:



A. ADJUSTING CUTOUT RELAY ARMATURE AIRGAP.



B. ADJUSTING CUTOUT RELAY POINT OPENING.

TA203759

Figure 5-7. Cutout relay.

Paragraph 5-67 is superseded as follows:.

5-67. Generator Regulator Testing

a. General Before removing generator regulator, perform on-vehicle tests to determine that the regulator is faulty. Electrical settings must be checked and adjusted with the regulator mounted in the operating position and at operating temperature. Run the engine for at least 15 minutes, with no electrical load other than the ignition, to reach operating temperature.

NOTE

The generator should be polarized after any tests or adjustments when the leads are disconnected. Polarize the generator before starting the engine. The cutout relay points must never be closed by hand with the battery connected to the regulator.

b. Removal

(1) Disconnect battery ground lead.

(2) Disconnect and tag the generator and field wires and also the battery lead at the regulator.

(3) Remove the nuts, lock washers, flat washers, and bolts that secure the regulator and capacitor to the bracket and remove the regulator and capacitor.

c. Installation Reverse procedures in b above.

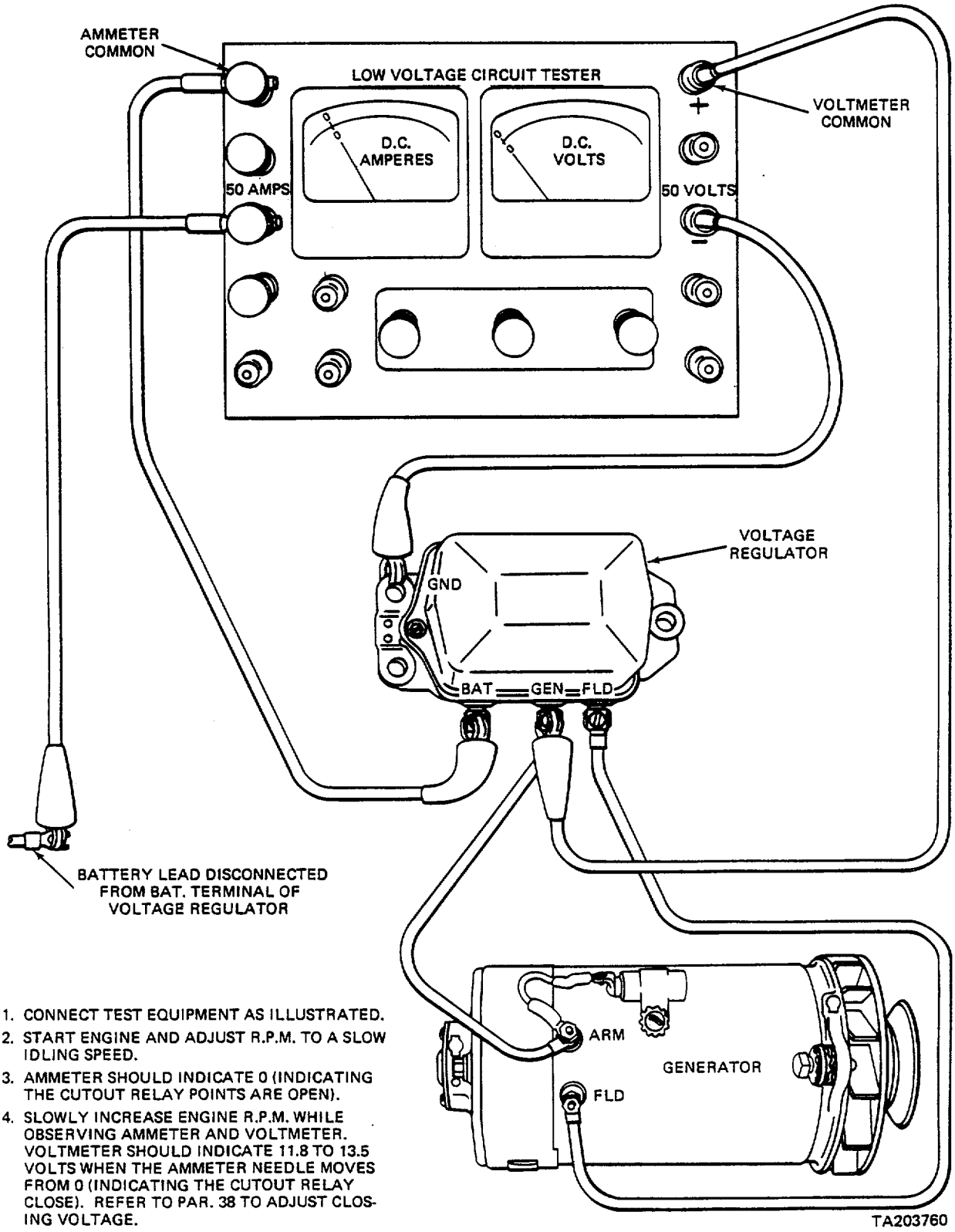
d. Testing and Adjusting.

(1) Cutout relay. The cutout relay requires three checks and adjustments as follows:

(a) Airgap. With the battery disconnected, press the armature down as shown in figure 5-7A until the points just close and measure the airgap between the armature and the center of the core. If adjustment is required, loosen the two armature screws and move the armature up or down until the correct airgap reading of 0.020 inch is obtained. Tighten the armature mounting screws and re-check airgap.

(b) Point opening. Check the point opening and adjust as shown in Figure 5-7B to a correct reading of 0.020 inch by bending the upper armature stop.

(c) Closing voltage. The closing voltage should be 11.8 to 13.5 volts. Hook up the test equipment (fig. 5-7.1) and adjust the closing voltage as shown in figure 5-7.2 by turning the adjusting screw. Turn the screw clockwise to increase spring tension and closing voltage; turn the screw counterclockwise to decrease spring tension and closing voltage. Figures 5-7.1 and 5-7.2 are added as follows:



1. CONNECT TEST EQUIPMENT AS ILLUSTRATED.
2. START ENGINE AND ADJUST R.P.M. TO A SLOW IDLING SPEED.
3. AMMETER SHOULD INDICATE 0 (INDICATING THE CUTOUT RELAY POINTS ARE OPEN).
4. SLOWLY INCREASE ENGINE R.P.M. WHILE OBSERVING AMMETER AND VOLTMETER. VOLTMETER SHOULD INDICATE 11.8 TO 13.5 VOLTS WHEN THE AMMETER NEEDLE MOVES FROM 0 (INDICATING THE CUTOUT RELAY CLOSE). REFER TO PAR. 38 TO ADJUST CLOSING VOLTAGE.

Figure 5-7.1. Test equipment for adjusting cutout relay closing voltage.

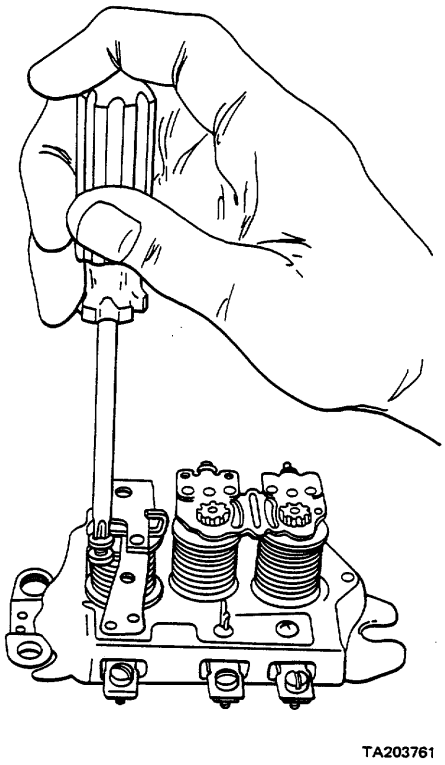


Figure 5-7.2. Adjusting cutout relay closing voltage.

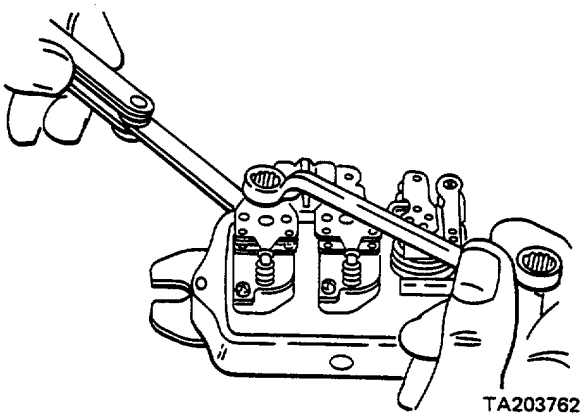
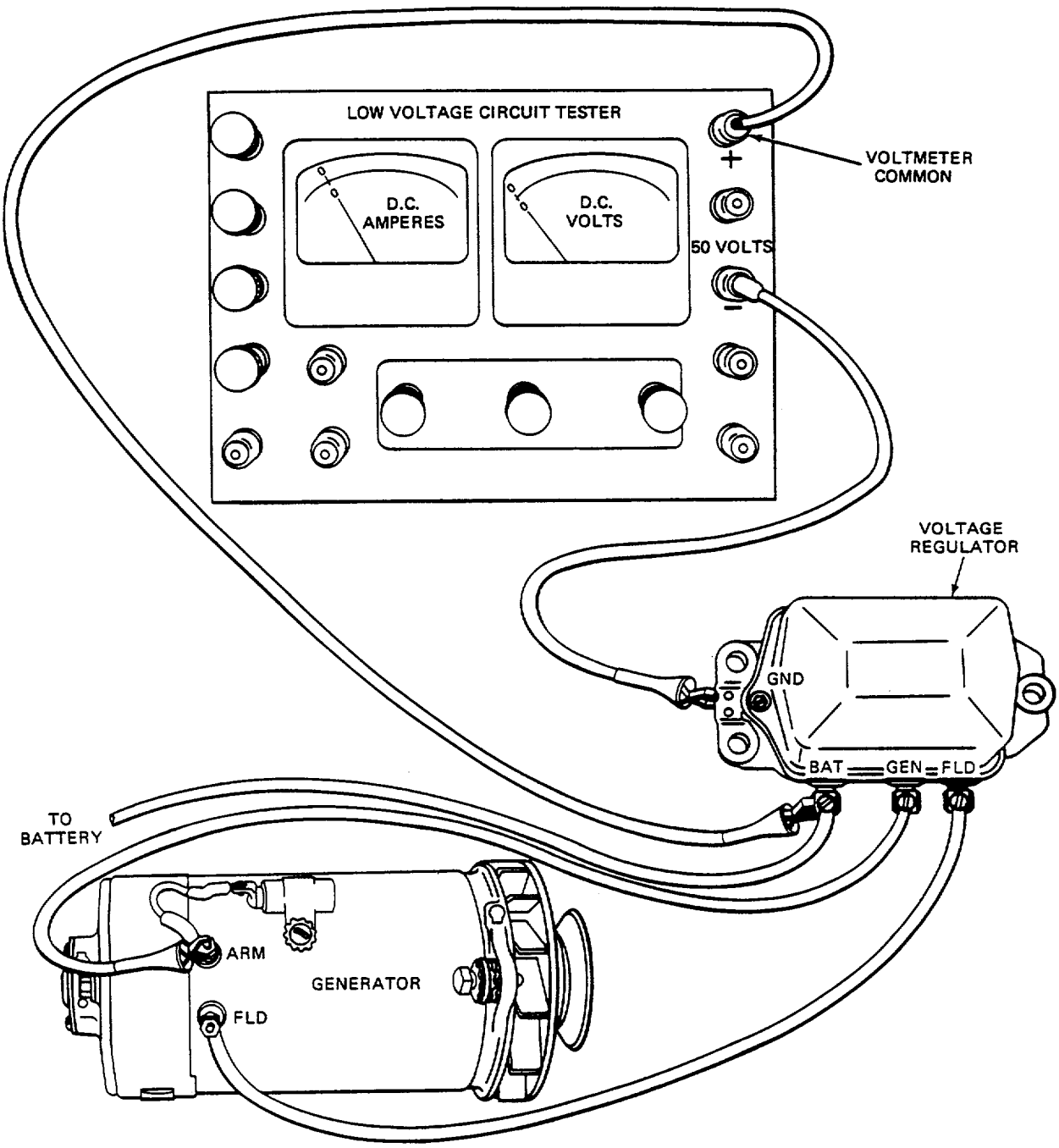


Figure 5-8. Adjusting voltage regulator airgap.

(2) Voltage regulator. The voltage regulator requires two checks and adjustments as follows:

(a) Airgap. With the battery disconnected, check the airgap for a reading of 0.075 inch. If adjustment is needed, use a 3/8-inch box-end wrench as shown in figure 5-8 and turn the adjusting nut to obtain the desired setting. Turn the nut clockwise to decrease the airgap and counterclockwise to increase the airgap.

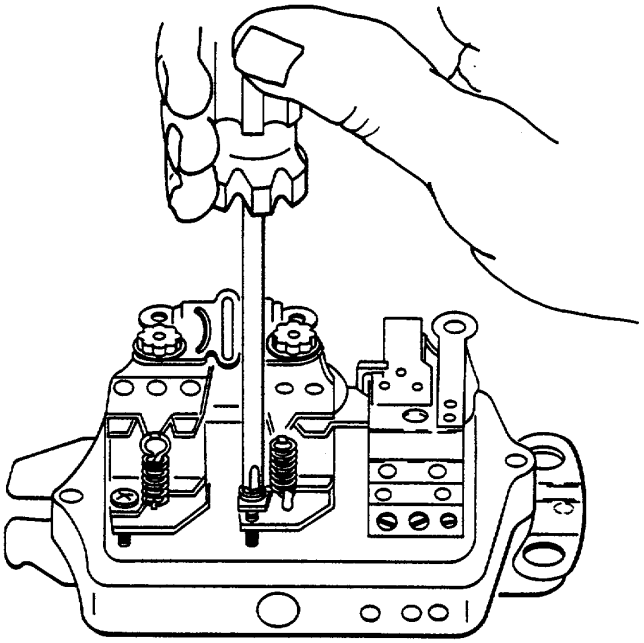
(b) Voltage setting. Hook up test equipment (fig. 5-8.1) and check voltage setting for reading of 14.2 to 15.2 volts. Turn adjusting screw as shown in figure 5-8.2 clockwise to increase the voltage setting and counterclockwise to decrease the voltage setting.



1. CONNECT TEST EQUIPMENT AS ILLUSTRATED.
2. START ENGINE AND ADJUST SPEED TO APPROXIMATELY 1,500 R.P.M.
   RUN ENGINE FOR 15 MINUTES TO REACH REGULATOR OPERATING TEMPERATURE.
3. VOLTMETER SHOULD INDICATE 14.4 TO 15.4 VOLTS.
   REFER TO PAR. 38 TO ADJUST VOLTAGE REGULATOR.

TA203763

Figure 5-8.1. Test equipment for checking and adjusting voltage regulator.



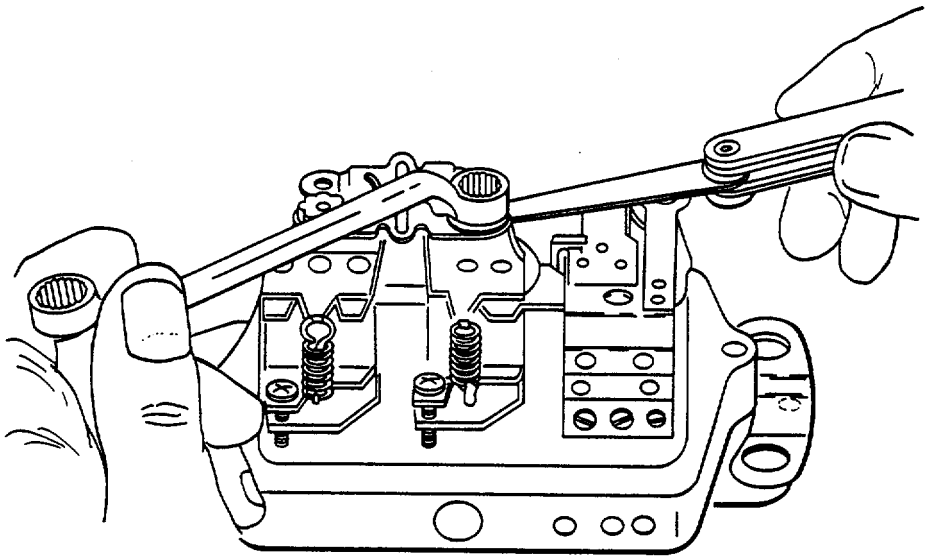
TA203764

Figure 5-8.2. Adjusting voltage regulator.

(3) Current regulator. The current regulator requires an airgap check and current setting as follows:

(a) Airgap. The desired airgap setting is 0.075 in. With the battery disconnected, check the setting. Turn the adjusting nut as shown in figure 5-9 to obtain the desired setting. Turn the nut clockwise to decrease the airgap and counterclockwise to increase the airgap.

(b) Current setting. The desired current setting is 19.5 to 23 amperes. Hook up test equipment (fig. 5-9.1) and turn the adjusting screw as shown in figure 5-9.2 clockwise to increase the ampere setting and counterclockwise to decrease the ampere setting.



TA203765

Figure 5-9. Adjusting current regulator airgap.

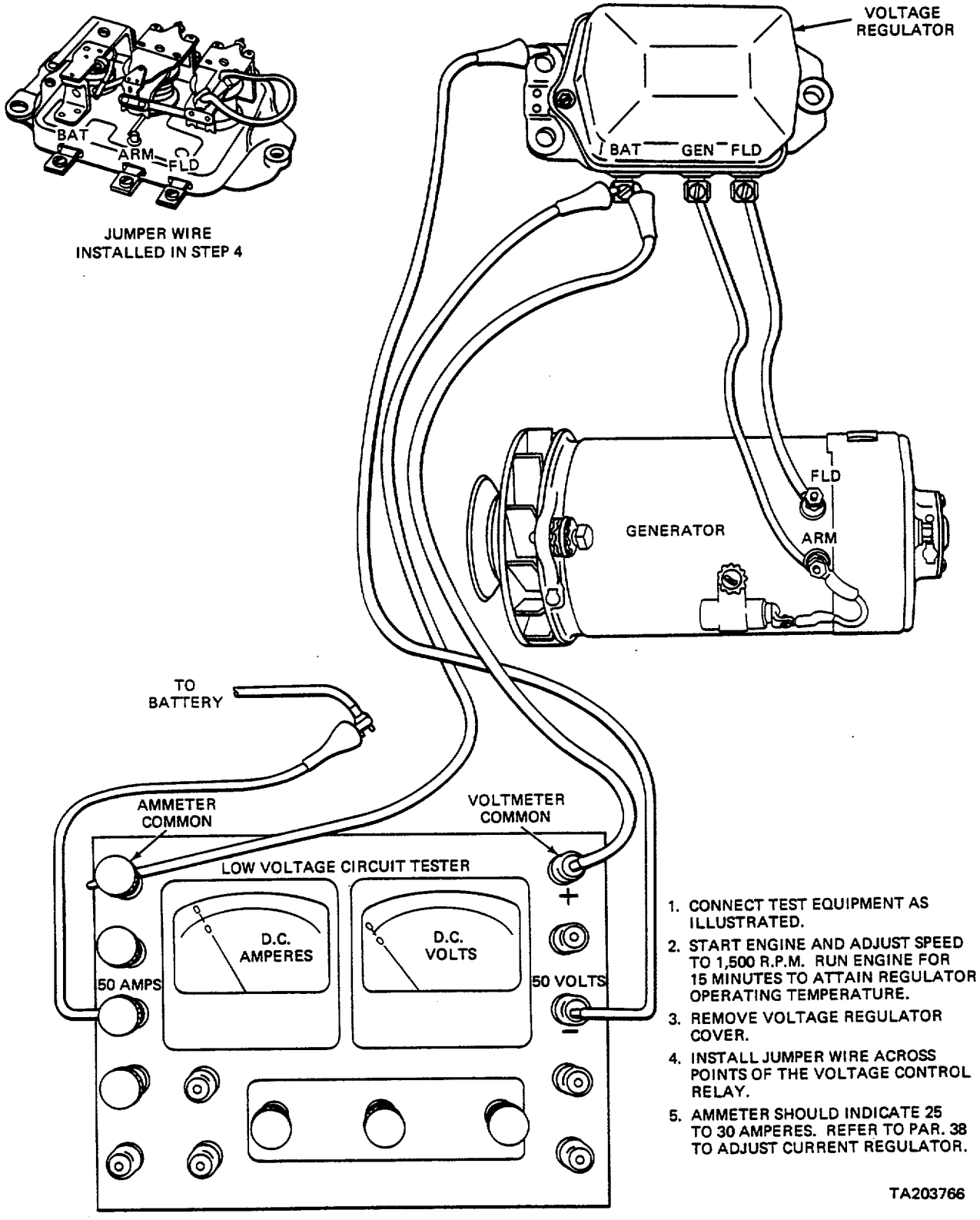
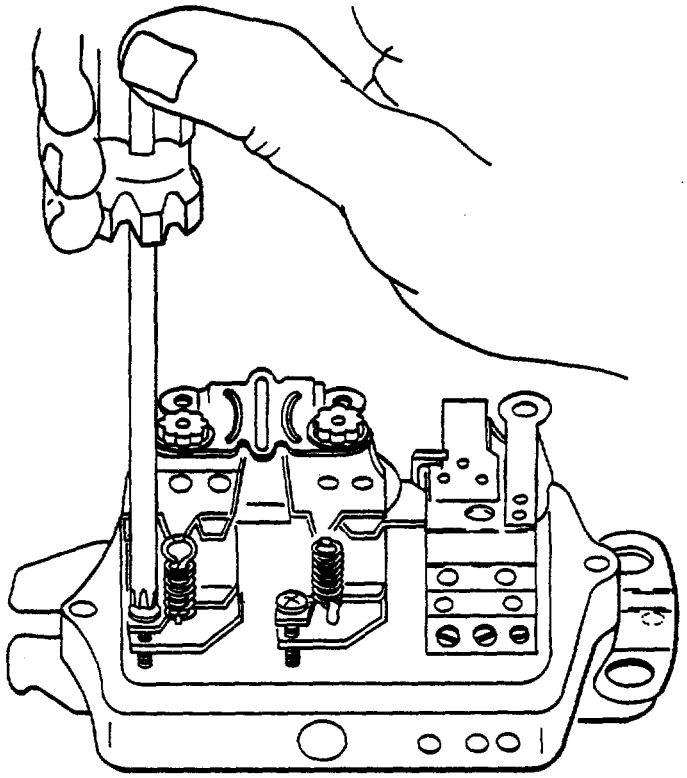


Figure 5-9.1. Test equipment for checking current regulator setting.



TA203767

Figure 5-9.2. Adjusting current regulator setting.

Page 37. Paragraph 5-76 is superseded as follows:

5-76. Wheel Brake Adjustment

Two hexagon heads extend through each backing plates from the adjusting cams. If the drums are worn from long service, to the extent that they cannot be readily removed from the foundation brake for service, turn these cams as necessary to back off the adjustment. The drums can then easily be removed.

Page 73. Paragraph 6-28d is superseded as follows:

d. Removal

(1) Remove propeller shaft and parking brake drum following instructions given in sections 6-21 and 6-27.

(2) Drain oil from transmission. Remove neutral safety switch and remove lead at transmission warning light transmitter.

(3) Disconnect oil cooler hoses at cooler bypass valve (figure 6-15) and cooler return port. Cap hoses and plug ports to exclude dirt.

(4) Disconnect inching and shifting linkage at control valve.

(5) Place wheeled floor jack or equivalent beneath transmission to relieve weight, and remove nuts, screws, and washers from rubber sandwich mountings. Remove mountings.

(6) Remove twelve screws and washers which attach transmission to engine.

WARNING

At this point, the transmission is supported only by the floor jack mentioned. Take all necessary precautions that it does not fall, to cause injury to personnel or damage to equipment.

(7) Draw transmission horizontally from engine until splined shafts leave bore of torque converter on engine flywheel; raise truck as needed to give clearance, and remove transmission from under truck.

(8) Remove bolts mounting torque converter to flywheel. Pull converter from flywheel housing.

Page 76. Paragraph 6-28h is superseded as follows:

h. Installation

(1) Reverse the procedure given in d above.

(a) Place converter in transmission case making sure it meshes and seats with transmission case.

(b) Measure distance from flywheel to face of flywheel housing. It should be the same as the distance from the converter to the face of the transmission case.

(c) Converter should turn in one direction only.

(d) Rotate engine to stop dead center.

(e) Utilizing the mounting holes on the converter drive disk and transmission case, wire both components together at three different points. Rotate converter until decal is at top of converter.

NOTE

Join ends of wire outside of the transmission case.

(f) Install assembly onto engine. When properly aligned, cut and remove wires and bolt the transmission assembly to the flywheel housing.

(g) Align mounting holes on flywheel and converter drive disk through flywheel housing access hole and bolt converter to flywheel. This necessitates turning the assembly by hand so the six mounting bolts can be installed.

(2) Refer to lubrication chart and fill transmission to proper level.
Insure that engine is at operating temperature and 400 to 450 rpm. Place gear shift in neutral position. Add oil if necessary, to bring level to full mark on dipstick.

(3) Test transmission as given in c above.

(4) Check adjustment of inching and shifting linkage for proper operation. Check that on operation of brake pedals with shift lever alternately in FORWARD and REVERSE, that forward and reverse is zero PSI before brake application begins, with pedal free travel between 3/8 inch and 5/8 inch.

(5) Perform operational test of transmission.

(6) Inching and brake-clutch adjustment figure 6-16.1.

(a) Without engine running:

1. Adjust brake clutch pedal against stop (1).

2. Adjust bolt (2) or insert washers at (3) until 1/16 gap is obtained at (4).

(b) With engine running:

1. Adjust tension of the inching spring by turning nut (5) until no movement of the inching spool is detected under all engine speeds.

2. Depress brake clutch pedal to 50 lbs foot pressure and adjust master cylinder push rod until 1/32 gap is obtained at (6).

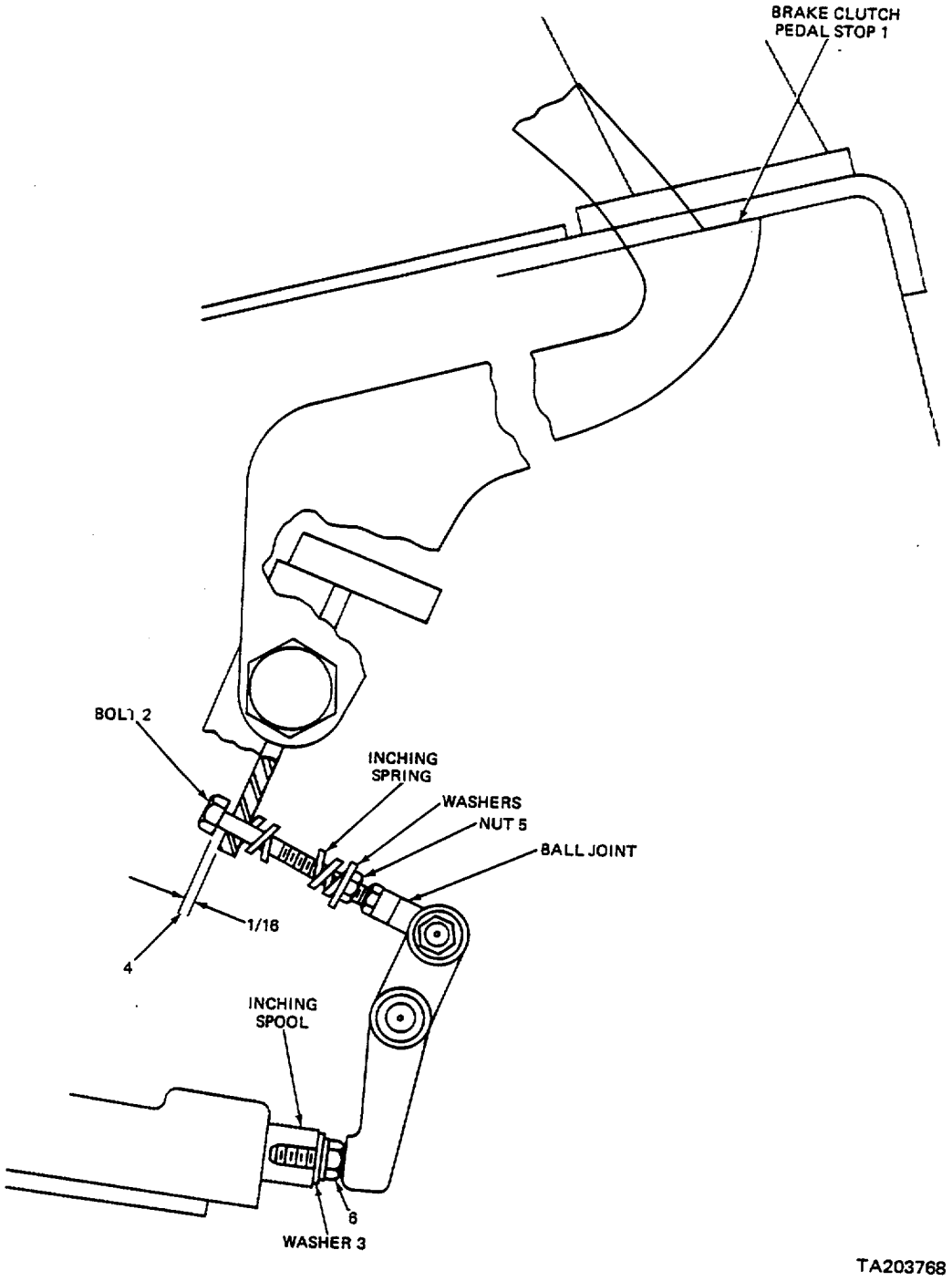


Figure 6-16.1. Inching and brake - clutch adjustment.

Page 114. Appendix A is superseded as follows:

APPENDIX A
REFERENCES

A-1. Publication Indexes and General References.

Indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this publication.

a. Military Publication Indexes.

Consolidated Index of Army Publications and Blank Forms..... DA PAM 310-1

b. General References.

How to Prepare and Conduct Military Training..... FM 21-6
Military Symbols..... FM 21-30
Procedures for Destruction of Equipment to Prevent Enemy Use ..... TM 750-244-6
Hand Portable Fire Extinguisher for Army Users ..... TB 5-4200-200-10
Procedure for Selection, Training, Testing, Qualifying and Licensing Operators of Construction Equipment, Materiel Handling Equipment and Armor-Vehicle-Launched Bridge (AVLB) ..... TB 600-2

A-2. Forms.

Refer to TM 38-750, The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to the material.

A-3. Other Publications.

The following publications contain information pertinent to the major item material and associated equipment.

a. Vehicle.

Lubrication Order ..... LO 10-3930-622-12-1,-2
Organizational Maintenance Repair Parts and Special Tools Lists..... TM 10-3930-622-20P
Direct Support, General Support, and Depot Maintenance Repair Parts and Special Tools Lists..... TM 10-3930-622-35P

Occupational and Environmental Health: Hearing Conservation ..... TB MED 501

b. Camouflage.

Camouflage ..... FM 5-20
Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment and Materials Handling Equipment ..... TB 43-0209

c. Decontamination.

Chemical, Biological, and Radiological (CBR) Decontamination ..... TM 3-220
Chemical, Biological, Radiological, and Nuclear Defense ..... FM 21-40

d. General.

Basic Cold Weather Manual ..... FM 31-70
Manual for Wheeled Vehicle Driver ..... FM 21-305
Northern Operations ..... FM 31-71
Operation and Maintenance of Ordnance Material in Cold Weather (0° to - 65°F.) ..... FM 9-207
Description, Use, Bonding Techniques, and Properties of Adhesives ..... TB ORD 1032
Inspection, Care, and Maintenance of Antifriction Bearings ..... TM 9-214
Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Material and Related Materials Including Chemicals ..... TM 9-247
Welding Theory and Application ..... TM 9-237

e. Maintenance and Repair.

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

f. Administrative Storage.

Administrative Storage of Equipment ..... TM 740-90-1

By Order of the Secretary of the Army:

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

Official:

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

Distribution:

To be distributed in accordance with DA Form 12-25A, Operator requirements for Warehouse Equipment.

*** U.S. GOVERNMENT PRINTING OFFICE: 1982--58416/285**

Changes in force: C 1, C 2, and C 3

TM 10-3930-622-14
C3

CHANGE

HEADQUARTERS
DEPARTMENT OF THE ARMY

No. 3

WASHINGTON, DC, 27 March 1974

Operator's, Organizational, DS, and GS
Maintenance Manual
TRUCK, FORK LIFT; GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES;
6000-LB CAPACITY; 173 IN. LIFT
(BAKER MODEL FJF-060, ARMY MODEL MHE-210)
FSN 3930-235-4674

TM 10-3930-622-14, 20 August 1970, is changed as follows:

Inside Front Cover. Add the following warning to the inside front cover:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 2. Paragraph 1-3.1 is added after paragraph 1-3 as follows:

1-3.1. Recommendation for Maintenance Publications Improvements

You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed direct to: Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished direct to you.

Page 17. Immediately after Section IV title, add the following warning:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 114. paragraph A-4. Add the following reference: "TB MED 251, Noise and Conservation of Hearing". Conservation of Hearing".

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

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

Distribution:
To be distributed in accordance with DA Form 12-25A (qty rqr block No. 893), Operator requirements for Warehouse Equipment.

*** U.S. GOVERNMENT PRINTING OFFICE: 1974-768116/1348**

Page 15. Paragraph 3-4g (7), in line 3, change "OE 10" to read "Automatic transmission hydraulic fluid".

Paragraph 3-4g (7), the Caution is superseded as follows:

CAUTION

When checking transmission oil level, be sure that dipstick is not inserted at an angle, and that the cap on the dipstick is seated on the filler tube.

DO NOT mix two types of oil recommended for different climatic conditions. Drain and fill in accordance with your LO.

Page 124. Appendix C is superseded as follows:

APPENDIX C
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

C-1. Scope

This appendix lists items required by the operator for operation of the fork lift truck.

C-2. General

This list is divided into the following sections:

a. Basic Issue Items List-Section II. Not applicable.

b. Items Troop Installed or Authorized List Section III. A list of items in alphabetical sequence, which at i-he discretion of the unit commander may accompany the fork lift truck. These items are NOT subject to turn-in with the fork lift truck when evacuated.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) Source Code, indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts, special tools and test equipment supplied from GSA/DSA or Army supply system and authorized for use at indicated maintenance levels.
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentially of the end item dictates that a minimum quantity be available in the supply system.

(2) Maintenance Code, indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is

Code	*Explanation*
C	Crew/Operator

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable. Recoverability codes are:

Code	*Explanation*
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis.

b. Federal Stock .Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount of quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished With Equipment (BILL only). This column indicates the quantity of an item furnished with the equipment.

f. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

g. Illustration (BILL only). This column is divided as follows: (1) Figure Number. Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number.* Indicates the callout number used to reference the item in the illustration.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal Stock Number	(3) Description Ref no. & mfr Code / Usable	(4) Unit of on code	(5) Qty Auth Meas
	7510-889-3494	BINDER, LOOSE LEAF	EA	1
	7520-559-9618	CASE, MAINTENANCE AND OPERATING MANUALS	EA	1
	4210-889-2221	EXTINGUISHER, FIRE, 21/2 lb., Fed Spec O-E-95	EA	1

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. 893) operator maintenance requirements for Warehouse Equipment.

GPO 875 341

TM 10-3930-622-14
C2

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 May 1972

Operator, Organizational, Direct Support and General Support Maintenance Manual

TRUCK, FORK LIFT; GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES: 6000 LB CAPACITY; 175 IN. LIFT (BAKER MODEL FJF-060, ARMY MODEL MHE-210) FSN 3930-235-4674

TM 10-3930-622-14, 20 August 1970, is changed as follows:

Page 2. Paragraph 1-6a, in line 1, change "Hercules Model QDX-56" to read "Hercules Model QXLD3ER".

Page 8. Table 2-1, in item 2, ENGINE, change "Hercules QXDL3ER" to read "Hercules QXLD3ER".

Page 14. Paragraph 3-3.1 is added as follows:

3-3.1. Maintenance and Operating Supplies

A list of maintenance and operating supplies received for initial operation of the fork lift truck are contained in table 3-1.

Table 3-1. Maintenance and Operating Supplies

(1) Component Application	(2) Federal Stock No.	(3) Description	(4) Quantity Required F/Initial Operation	(6) Quantity Required F/8 Hrs Operation	(6) Notes
Air Cleaner		Oil lubricating: 5 gallon drum as follows:			(1) Includes quantity of oil to fill engine oil system as follows:
	9150-265-9435(2)	OE 30	1/2qt.	(3)	5 qt.-crankcase
	9150-265-9428(2)	OE 10	1/2qt.	(3)	1 qt.-oil filter
	9150-242-7603(2)	OES	1/2 qt.	(3)	(2) See C9100-IL for additional data and requisitioning procedures.
Crankcase		Oil Lubricating (1)			(3) See current LO for grade application and replenishment intervals.
		OE 30	6 qt.	(1)	
		OE 10	6 qt.	(1)	
		OES	6 qt.	(1)	
Hydraulic Brake Cylinder		Brake Fluid: Automotive 1 gallon call as follows:			(4) Fuel tank capacity. (5) Cooling system capacity.
	9150-252-6375(2)	HBA	1/2 pt.	(3)	
Hydraulic Reservoir		Oil Lubricating: 55 gallon drum as follows:			
	9150-265-9430(2)	OE 10	9.4 gal.	(3)	
	9150-242-7605(2)	OES	9.4 gal.	(3)	
Radiator		Water			
		Antifreeze, 5 gallon can as follows:			
	6850-224-8730	E Ethylene Glycol type 1	13 qt.	(5)	
		Antifreeze: 5 gallon drum as follows:			
	6850-174-1806	Arctic grade	13 qt.	(5)	
Fuel Tank		Fuel, Gasoline: Bulk as follows:			
	9130-160-1818(2)	Automotive Combat 91A	10.4 gal.	(4)	
	9130-160-1830(2)	Automotive Combat 91C:	10.4 gal.	(4)	
Transmission		Oil Lubricating:			
	9150-698-2382(2)	Hydraulic Fluid, 1 qt. can	10 qt.	(3)	
	9150-657-4959(2)	Hydraulic Fluid, 5 gallon	10 (qt.	(3)	
Grease Points		Grease, Automotive and Artillery: 5 lb. can as follows:			
	9150-190-0905(2)	GAA			
Drive Axle		Oil Lubricating Gear: 5 gallon drum as follows:	11 pts.		
	9150-577-5847(2)	GO 140		(3)	
	9150-577-5844(2)	GO 90		(3)	
	9150-257-5440(2)	GOS		(3)	

Technical Manual

No. 10-3930-622-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *20 August 1970*

**Operator's, Organicational, DS,
and GS Maintenance Manual**

TRUCK, FORK LIFT: GASOLINE ENGINE DRIVEN; PNEUMATIC TIRES 6000-LB CAPACITY; 173-IN. LIFT (BAKER MODEL FJF-060, ARMY MODEL MHE-210) FSN 3930-235-4674

Page

SECTION I

INTRODUCTION AND GENERAL DESCRIPTION

1-1. INTRODUCTION.

1-2. This handbook contains operation, service and repair instructions for Model FJF-060, 6000-pound, pneumatic tired, gasoline engine powered fork lift truck with power shifted transmission.

1-3. The fork lift truck covered in this handbook is designed to lift loads up to a height of 173 inches. Being equipped with pneumatic tires, this truck is suitable for outdoor use on normally firm terrain; as found in warehouse yards. The Model FJF-060 is not designed as a rough terrain vehicle.

1-4. PURPOSE OF EQUIPMENT.

1-5. Model FJF-060 is a nontactical fork lift truck designed for the handling and warehousing of materials. In its capacity as a self-contained, rider-type, mechanized piece of handling equipment, the fork lift truck is completely equipped to lift loads up to a 6000-pound capacity at a 24 inch load center (the load center is measured from the heel of the fork), for transporting loads from one area to another, and for depositing and stacking loads, both indoors and outdoors.

1-6. GENERAL DESCRIPTION.

a. The truck is powered by a Hercules Model QDX-56 gasoline engine equipped for radio interference suppression and fungus proofed. The engine mounted hydraulic pump powers the lifting and tilting of the boom, and the power steering. Drive power for the truck is supplied to the two dual front wheels through a torque converter and single ratio transmission to a double reduction drive axle. Refer to Section II, Table of Specifications for additional data covering the overall truck, its major components and accessories.

b. Handling of materials is accomplished by a two pronged 40 inch fork on an upright boom lift. The boom can be tilted three degrees forward to ten degrees backward as required by the nature of the load or operation. Maximum height to which a load can be raised is specified in paragraph 1-3. Turning radius of the truck is 104 inches. Speed of the vehicle is limited by an engine governor to 12-1/2 miles per hour. An overhead guard is provided to protect the operator against falling objects. Steering of the two rear wheels is hydraulic power assisted.

1-7. DETAILED DESCRIPTION.

1-8. ENGINE ASSEMBLY.

a. General. A six cylinder, four-cycle, in-line, "L"-head engine assembly is used to power the fork lift truck. The engine has a displacement of 236.7 cubic inches and develops 65 brake horsepower at 2400 rpm. Accessories mounted on and normally considered part of the complete engine assembly are the generator and pulley assembly, starting motor, water pump, fuel pump, governor, carburetor and distributor. The engine assembly complete with mounts, radiator and accessories, in conjunction with ., the single-speed torque converter transmission, propeller shaft and power axle assembly, forms an integrated unit generally referred to as the drive line or drive train assembly.

b. Cylinder numbering. The engine cylinders are numbered consecutively from one to six, starting at the rear, or fan end, of the engine. The bellhousing end of the engine is toward the front of the truck, and right and left sides are those seen when viewing the engine from the vehicle rear. The fork lift truck is a front-wheel drive vehicle, therefore the fan end, normally the front of the engine, is at the rear of the vehicle.

c. Engine lubrication system. The lubricating system of the engine assembly is the forced feed type to all main and connecting rod bearings. This is accomplished by means of a gear type pressure pump. The oil pump is driven by a suitable gear arrangement at the center of the camshaft. The pump picks up oil from the center sump of oil pan and delivers it to a drilled passage in the engine block. From here the oil flows through various leads to main bearings. From the main bearings the oil flows through suitable drilled holes in the crankshaft to connecting rod bearings. Valve tappets, valve stems, and cylinders are lubricated by a mist of oil thrown off by the main and connecting rod bearings.

d. Oil filter. A replaceable-element oil filter is mounted on the right-hand side of the crankcase. The oil filter is of the by-pass type, a constant flow of pressure oil being directed to and from the oil filter body assembly through flexible inlet and outlet hoses.

1-9. FUEL SYSTEM.

a. The fuel system consists of an air cleaner, fuel tank, fuel pump, governor and carburetor, together with control linkages, interconnecting lines and fittings.

b. Air cleaner assembly. An oil-bath type air cleaner is mounted above the left-hand side of the engine on the engine cowl. The air cleaner provides filtered air for the carburetor assembly.

c. Fuel tank assembly. A 10.4 gallon, welded steel tank, provided with a tank unit float assembly and shut-off cock is mounted on the right side of the truck frame. The fuel tank is connected with tubing directly to the fuel pump.

d. Fuel pump assembly. A diaphragm-type fuel pump is mounted on the left side of the engine assembly and is actuated by a rocker arm that contacts an eccentric on the engine camshaft to deliver fuel to the updraft carburetor assembly.

e. Carburetor assembly. An updraft carburetor is mounted on the left center side of the engine. The carburetor consists of a die cast main body assembly containing fuel metering parts such as the idle tubes, main well tubes, main jets, floats and fuel inlet valve.

f. Governor assembly. The governor assembly, located at the fan end of the engine, is of the mechanical type and operates in conjunction with the carburetor assembly. The purpose of the governor assembly is to regulate engine speed under variable loads to protect the engine against inadvertent overspeeding. The governor does not limit the power output of the engine: when loaded, the engine receives as much fuel as needed for the load. When unloaded, the engine is protected against overspeed damage.

1-10. COOLING SYSTEM.

a. General. The engine assembly uses a pressure-type liquid cooling system consisting of a rear mounted radiator, water pump, thermostat, water manifold, bypass lines, drive belt and fan assembly.

b. Radiator assembly. The radiator assembly is composed of a fin-and-tube type core with internal torque converter heat exchanger, pressure-type cap, overflow tube and drain cock.

c. Water pump assembly. A centrifugal-type water pump and pulley assembly is mounted on the rear of the engine assembly and driven by belt from the crankshaft pulley. The water pump draws coolant from the radiator and pumps it into water jackets which extend the full length of the cylinders.

d. Water outlet pipe, thermostat and by-pass line. The water outlet pipe is mounted on the rear end of the cylinder head. A bellows-type thermostat internally mounted in the water outlet pipe contains a restriction valve which prevents free return of the coolant to the radiator upper area at temperatures below 177 deg F. With the thermostat valve closed, coolant is returned directly to the water pump inlet through a bypass line. This bypass line enables the coolant to circulate through the engine assembly until the coolant temperature exceeds 177 deg F. The thermostat valve starts to open at this temperature and is fully open at 182 deg F. permitting free circulation of the coolant to the radiator.

e. Fan assembly. A fan assembly and pulley adapter are attached to the water pump pulley. With the engine in operation, the fan assembly pushes cooling air through the radiator core.

1-11. IGNITION SYSTEM.

a. General. The ignition system is a conventional 12 volt battery supplied system and consists of a distributor assembly, ignition coil, spark plugs and cable assemblies and radio interference components.

b. Distributor assembly. The distributor assembly is mounted on the rear of the engine cylinder block and gear-driven by the engine camshaft. The distributor is fully automatic for control of the timing. A radio noise suppression bypass capacitor is connected between the ignition coil positive terminal and ground. The only internal adjustment provided is the point opening. Proper engine timing is obtained by rotating the distributor in its mounting.

c. Spark plugs and cables. Six spark plugs are installed along the centerline of the cylinder head assembly. Each spark plug is shielded with a rubber cover. Six cables connect the spark plugs to the high-tension outlets of the distributor.

1-12. STARTING AND CHARGING SYSTEM.

a. General. The starting and charging system consists of a starting motor, generator and pulley assembly, generator regulator, radio interference components and a 12-volt battery.

b. Starting motor assembly. The starting motor is located on the lower right side of the engine assembly. The starting motor is a 12-volt, 4-pole, 4-brush unit. The motor drive assembly, mounted on the armature shaft, is provided with a pinion which is shifted by screw action to engage the starter with the flywheel ring gear. When

the engine starts, the pinion turns faster than the threaded sleeve on the armature shaft and is screwed back out of mesh with the flywheel ring gear. The operator controls the starting motor by a button on the instrument housing. The control circuit to the starter includes a neutral safety switch which permits operation of the starting motor only when the truck transmission is in neutral.

c. Generator. The generator is a two-brush shunt wound circuit A type 12-volt dc generator with external current and voltage limiting regulator. The generator is belt-driven by the engine crankshaft, pivot mounted in a way that provides for adjustment of the drive belt tension by positioning the generator on its mountings. The generator uses a rotating armature, mounted on bearings at each end. The armature turns in a magnetic field between two pole shoes to induce a voltage in the windings of the armature. The induced voltage in the armature is made available to the external electrical system through two carbon brushes, which both ride on the commutator of the generator and are connected to the external system. Since the electrical system is of the one-wire type, in which the truck frame constitutes one side (the ground or negative) of the circuit, one brush of the generator is connected to the metal end frame of the generator directly, with no attempt to insulate it. The other brush is insulated from the frame at this point, but is connected to an external terminal (marked A, for armature) on the frame of the generator. A wire from the A terminal of the generator to the A terminal of the regulator delivers generator output to the external system via the regulator. Armature voltage is applied to the field windings by connecting one end of these windings to the insulated brush within the generator. The other end of the field windings are led outside the generator to the F terminal, which is also insulated from the frame. The field circuit is completed externally by a wire connecting the generator and regulator F terminals, then through the regulator internal units to ground at the regulator base, and through the truck frame back to the armature via the grounded brush.

d. Regulator. The generator regulator incorporates three units, each with its own function, as follows:

(1) The cutout, or reverse current relay. This unit is a normally open relay, sensitive to generator voltage to close, which will connect the generator armature circuit to the battery and system positive side when the generator voltage exceeds battery voltage, and disconnect the generator from the system when, due to slow speed of the armature, its voltage drops below battery voltage. This operation permits charging the battery and operating electrical units from generator voltage, while preventing battery discharge through the armature windings when there is no voltage in them to oppose battery voltage.

(2) The current regulator. The generator design permits an output capacity adequate to meet the normal electrical needs of the system; however, under certain conditions, such as a fully discharged battery being in the circuit, it could generate currant at a rate high enough to burn up the armature unless protection were provided. The current regulator is a normally closed relay sensitive to armature current flowing through a series coil wound on its core. Generator field current is carried across the contacts of this relay. Armature current flow in excess of a safe value will open the points to interrupt field current. Field strength will decrease, reducing output momentarily, and the points will close again under spring tension, to complete the field circuit. The regulator will cycle in this way as long as necessary to protect the armature. In the instance given, eventually the battery would be recharged, and at a point in recharging armature current demand would drop below the current regulator setting. At this time the current regulator points would remain closed. Note that this unit is only a limiter of maximum generator current output.

(3) The voltage regulator. In a general way this unit compares in design and function with the current regulator described in (2) above, to limit generator voltage when demand of the system for current is low, and generator operating speed is in the normal engine operating speed range. The voltage regulator is a normally closed relay with a shunt coil wound on its core, sensitive to generator operating voltage. The contacts of the voltage regulator are in series with the contacts of the current regulator and carry field current to complete the field circuit. Note that if these points open, they break the field circuit just as did the contacts of the current regulator, to drop generator output. As with the current regulator, when output (in this case voltage) drops spring tension closes the points and the cycles as necessary to limit voltage applied to the system to the preset level. When armature voltage is lower than the value for which the voltage regulator is set the unit operates in a static state only as a section of the generator field circuit.

(4) Maintenance of the units described above consists of adjustment of the various spring tensions which govern the values at which the units operate electrically, checking and adjusting the magnetic air gaps, and cleaning or replacing the contact points when necessary. These procedures are covered at the appropriate place in this manual.

e. Battery and cables. A 12-volt, lead-acid battery supplies the electrical power to the fork lift truck electrical system. The battery, mounted in a tray on the vehicle frame assembly, is located on the right side of the engine, directly adjacent to the generator. Two cables, a positive and negative, are used for battery connections and a negative ground strap is fastened directly to the frame.

1-13. TRANSMISSION ASSEMBLY.

a. The transmission assembly is bolted directly to the engine flywheel bellhousing. The transmission assembly is a single-speed power operated transmission

consisting of a torque converter and hydraulic transmission. The torque converter is bolted directly to the engine flywheel and is completely enclosed by the transmission assembly. The transmission assembly is cooled by hoses from the radiator. The truck has a travel control hand lever mounted on the steering column and connected by linkage to the transmission assembly. This lever controls the direction of motion, forward and reverse. Power is transmitted from the transmission assembly to the power axle assembly by a short propeller shaft.

b. The transmission uses self-adjusting, cork-faced clutch disks for smooth forward-reverse shifting and for high torque level output. Ball and roller bearings are used throughout and all gearing is precision straight spur design. The control valve is integral in this compact, self-contained unit, as is the input pump.

c. The clutches are contained in one large, balanced drum assembly, and the plates drive concentric shafts. The outer shaft has a gear mounted on it which is in direct mesh with the output gear on the output shaft. This transmits forward rotation to the output shaft. The inner shaft has a gear mounted on it which is in mesh with the output gear through an idler gear. This transmits reverse rotation to the output shaft.

d. The main case is of two piece cast construction and the rear half contains a heavy diaphragm midwall which forms one side of a rigid straddle mounted support for the output gear and shaft. Oil passages run within the walls of the case and there are no external lines except for the cooler and safety seat valve.

1-14. BRAKE SYSTEM.

a. Service brakes. The truck uses hydraulically operated, self-adjusting wheel brakes for slowing and stopping movement of the truck. As power is applied to the brake pedal, the movement is transferred through linkage to the master brake cylinder. In the master brake cylinder, the brake pedal movement is applied through a piston to a reservoir of brake fluid. This forces brake fluid from the master cylinder into a tube at high pressure.

b. The brake fluid, under pressure, is ported through a tube to wheel cylinders in the wheel brake assemblies. As the pressure is applied, pistons in the wheel cylinders are forced outward and apply pressure against brake shoes inside the wheel brake drums.

c. The wheel brake drums rotate with the wheels, but the brake shoes are rigidly mounted on the backing plate on the axles. As the shoes are pressed against the inside of the brake drums, the brake drums are slowed and stopped.

d. The service brake assembly, mounted at each wheel end of the power axle assembly, consists of a wheel cylinder assembly, two brake shoe assemblies and a backing plate. The individual wheel cylinder assembly, attached to the backing plate assembly, is fitted between the upper ends of the two brake shoe assemblies and provides equal pressure on the individual brake shoes for a smooth braking action. Each brake shoe is attached to the backing plate assembly by means of an anchor pin which provides the fixed pivot point for the brake shoe assembly. Each brake shoe assembly is equipped with an adjustable eccentric cam for adjusting the brake shoe to compensate for lining wear.

e. Parking brake. The parking brake system is connected through linkage to a brake drum and shoe assembly mounted in the power axle assembly. Mechanical force is used to press the brake shoes against the brake drum and prevent the truck from rolling from the parked position. The manual force is supplied as the hand brake lever is pulled up.

1-15. POWER AXLE ASSEMBLY.

a. The power axle consists of a differential with its housing, two axle shafts which transfer power from the differential to the final drives at the wheels, and the final drive system which transfers power from the axle shafts to the wheels which are mounted on tapered roller bearings. Each shaft has an individual housing which bolts to the differential housing, and holds the differential positioned in its housing.

1-16. UPRIGHT ASSEMBLY.

a. General. The upright assembly consists of four main assemblies as follows:

b. Outer upright assembly. The outer upright assembly is a welded one-piece assembly that is mounted to the power axle assembly and tilt cylinders and encloses the hoist cylinder and inner upright assembly.

c. Inner upright assembly. The inner upright assembly is a welded one-piece assembly that is mounted within the outer upright assembly. The hoist cylinder, mounted in the base of the outer upright assembly, is secured through the top of the inner upright assembly. The inner upright assembly is raised or lowered by action of the hoist cylinder. It serves as a guide for the lift carriage and supports a latch assembly which insures the proper lowering sequence.

d. Crosshead assembly. The crosshead assembly is mounted over the hoist cylinder. Chains attached to the lift carriage assembly, roll over the crosshead assembly and are secured to the hoist cylinder. As the cylinder raises, the crosshead assembly raises, tightening the chains and raising the lift carriage assembly.

e. Lift carriage assembly. The lift carriage assembly is mounted on rollers between the outer upright assembly and inner upright assembly. The rollers are mounted to trunnions welded to the rear of the carriage. Adjustable side thrust rollers are also secured to the carriage assembly to limit its lateral movement. Two lift forks are mounted on the front of the lift carriage assembly for handling of loads.

f. Upright assembly hydraulic system. The complete hydraulic lift system consists of an engine-driven hydraulic pump, reservoir tank, control valve assembly, two tilt cylinders and a hoist cylinder. Power is supplied to the vertical lift by means of a hydraulic cylinder, two chains and rollers. Hydraulic pressure for steering, hoisting, and tilting of the uprights is supplied by an engine-driven hydraulic pump. This pump is driven by a gear which engages the cam-shaft timing gear. The pump is a gear type positive displacement pump, rated to deliver 19.7 gallons per minute at 2000 psi when driven at 2400 rpm. The control valve assembly is a two-spool fluid control valve with a control handle for each spool. The inboard control handle and spool control the raising and lowering of the forks by applying or releasing hydraulic pressure to the hoist cylinder. The outboard control handle and spool control tilting of the upright carriage. Each control handle has two actuating positions with a center neutral position. A pilot operated relief valve limits system pressure to 1800 psi. The levers, mounted to the right of the operator, are plainly marked for identification and are spring-centered to neutral. To hoist, the hoist lever is pushed back. This action forces oil into the lift cylinder and raises the load. To lower, the hoist lever is pushed forward, releasing pressure and allowing the load to lower by means of gravity. If in raising the hoist, the lever is not returned to neutral when top of stroke is reached, an overload bypass in the control valve will open automatically and detour the flow of oil back to the reservoir. The tilt action of the hoist mechanism is operated by the control valve in conjunction with two hydraulic cylinders. Operation is similar to that of the hoist cylinder except that in tilting, both movements are actuated by hydraulic pressure. Pushing the tilt lever back will result in backward tilt and forward will result in forward tilt.

1-17. STEERING MECHANISM.

a. General. The steering mechanism consists of the steering gear assembly, steering booster cylinder and valve assembly, flow divider valve and steering or trailing axle assembly with connecting linkage. The power steering systems recirculating ball steering gear with booster equipment is powered by the truck's engine-driven hydraulic pump. A valve incorporated in the steering gear responds to the operator's effort to turn the steering wheel to direct system pressure to the appropriate end of a booster cylinder. One end of the cylinder is connected to the frame of the truck; the other end is fastened to the steering linkage. In case of loss of system pressure, the truck can be steered manually, but greater effort at the steering wheel will be necessary.

b. Steering axle assembly. The steering axle assembly mounted on the extreme rear of the fork lift truck is mounted on two neoprene blocks located to permit a degree of movement to the axle necessary to pass over irregular surfaces. Two equal length tie rods connect a center-mounted bellcrank to each of the steering knuckles. Steering axle king pins are mounted in true vertical position to provide similar steering characteristics in either forward or reverse travel. The pneumatic tired wheels of the steering axle are not fitted with brakes.

c. Steering hydraulic system. The steering hydraulic system consists of a hydraulic flow divider valve, connecting hoses, steering booster and valve assembly and a steering gear unit.

d. Steering booster cylinder and valve. Movement of the pitman arm on the steering gear actuates the steering valve, which is integral with the steering booster cylinder. The cylinder, in turn, actuates the steering bellcrank on the steering axle assembly.

e. Flow divider valve. The flow divider valve directs the pump output to both the power steering system and the control valve assembly inlet port. A relief valve in the flow divider valve limits hydraulic pressure in the power steering system. The first three gallons of hydraulic fluid from the hydraulic pump go through the flow divider valve to the steering gear assembly. The remaining hydraulic fluid is diverted to the hydraulic system.

1-18. ELECTRICAL SYSTEM.

a. General. The following paragraphs contain descriptions of electrical system components for the fork lift truck with the exception of those assemblies already described dealing with the engine assembly.

b. Combination stoplight-taillight assembly. The combination stoplight-taillight is mounted within a steel guard on the upper rear of the engine compartment. The light is operated both from a toggle switch mounted on the instrument housing and the stop switch on the brake master cylinder. The stoplight is inoperable with the ignition switch in the off position.

c. Ignition switch. The ignition switch is mounted on the instrument housing. Setting the ignition switch to ON position energizes the ignition system, instrument housing gages and torque converter temperature warning light.

d. Neutral safety switch. The neutral safety switch prevents starting the engine while the vehicle is in gear

e. Sending units. Four sending units are used on the truck to provide a means of actuating corresponding gauges on the instrument housing. The following descriptions are given for each sending unit:

(1) The fuel gauge sending unit mounted on top of the fuel tank float assembly contains an arc-shaped resistance coil. A radial contact, operated by a float within the fuel tank, makes contact with the resistance coil. Movement of the radial contact varies the resistance of the fuel gauge circuit, permitting a current flow which is proportional to the float position.

(2) The oil pressure sending unit is connected into the pressure side of the lubricating oil system. This unit contains a coil, the resistance of which varies with pressure. Actuating current to the instrument passes through this resistance coil which varies the current, and thus the indication, in proportion to the pressure on the sending unit.

(3) The temperature sending unit is threaded into the engine cylinder head to sense and respond to engine coolant temperature. This unit contains a temperature sensitive resistance coil which regulates the flow of actuating current to the engine temperature gage in proportion to engine coolant temperature.

(4) The oil pressure sensitive switch mounted on the oil filter assembly closes when pressure exists in the engine lubricating system, to energize the engine hourmeter on the instrument housing. Thus, since engine oil pressure is always (and only) present when the engine is operating, the hourmeter will accurately reflect engine hours of operation.

f. Instruments and controls.

g. Instrument housing assembly. The instrument housing assembly, mounted on the steering column support assembly, includes the following gauges and switches.

(1) An ammeter to indicate the battery charging rate.

(2) A temperature gauge to indicate the engine coolant temperature in degrees Fahrenheit.

(3) An oil pressure gauge to indicate engine oil pressure in the engine crankcase main oil gallery.

(4) A fuel gauge to indicate the fuel level in the fuel tank.

(5) An engine hourmeter to indicate the hours of operation of the truck which determines when periodic service operations are due.

(6) A light switch with ON/OFF positions to activate the taillight.

(7) An ignition switch with ON/OFF positions to activate or deactivate the truck ignition system for operation in addition to energizing the instruments and starter circuit up to the starter button.

(8) A starter button to activate the starter motor.

1-19. FRAME.

a. The basic structure of the fork lift truck is the one-piece welded frame, to which all components and major assemblies of the truck are attached.

b. The running gear is attached to the underside of the frame, the hoisting mechanism is mounted at the frame front end, and a counterweight is fastened to the back of the frame. Since the frame houses much of the mechanism for the truck, access openings for service and maintenance are provided at appropriate locations.

1-20. SHEET METAL.

a. The operator's seat is mounted on top of a hinged compartment cover. A manually operated latch at the front of this cover permits raising the cover for access to the engine compartment from above. Two side engine compartment access doors are hinged and fitted with hand operated latches.

b. A radiator cover plate is bolted to the frame. Since the radiator fill neck protrudes above this cover plate, it is seldom necessary to remove the plate for service; therefore, it is not hinged. The operator's pedal controls, the steering column, and leads to the instruments and switches are mounted on or through a floor plate.

SECTION II

TABLE OF SPECIFICATIONS

2-1. TABLE OF SPECIFICATIONS. Refer to Table 2-1 for the most pertinant specifications and clearances covering the vehicle.

2-2. TORQUE VALUES. Refer to Table 2-2 for the appropriate torque values to be utilized during reassembly and installation of components during replacement and overhaul.

2-3. VEHICLE DIMENSIONS. Refer to figure 2-1 for the most important dimensions related to this vehicle.

TABLE 2-1. TABLE OF SPECIFICATIONS

1. GENERAL	
Type of vehicle	Fork Lift Truck, Gasoline Engine Powered
Rated capacity	6000 lb. at 24 inches from heel of fork
Lift type	Telescopic upright boom, Tiltable 3 deg forward 10 deg backward from vertical
Lift elevation (max)	173 in.
Fork data	4 in. wide prongs, 40 in. long adjustable 11.25 to 48 inches
Wheels	4 drive wheels and 2 steerable wheels
Tires (pneumatic)	Drive, 7:50 x 15 x 12 ply rating Steer, 7:50 x 10 x 14 ply rating
Vehicle turning radius	104 in. min. outside turning radius
Vehicle speed range	1 to 12.5 mph
Overall dimensions	
Height (forks fully lowered)	110 in.
Height (forks fully raised)	221.5 in.
Width	63 in.
Length less forks	109-3/4 in.
Gross vehicle weight	9,620 lb
Attachments	Overhead guard and load safety backrest
2. ENGINE	
Model	Hercules QXDL3ER
No. of cylinders	6
Bore and stroke	3-7/16 in. x 4-1/4 in.
Displacement	236.7 cu. in.
Oil pressure (max)	26 psi @ 1600 rpm
Oil pressure idling (min)	5 to 10 psi
Firing Order	1-5-3-6-24
Main bearing front	2-1/2 in. x 1-5/16 in.
Main bearing center	2-1/2 in. x 1-15/16 in.
Main bearing rear	2-1/2 in. x 1-15/16 in.
Main bearing intermediate	2-1/2 in. x 1-7/32 in.
Connecting rod bearing	2 in. x 1-1/4 in.
Oil capacity	
Crankcase	5 qt
Filter	1 qt
Total	6 qt
Water capacity	13 qt
Weight (Bare engine)	565 lb

TABLE 2-1. TABLE OF SPECIFICATIONS (Cont'd)

3. ENGINE LIMITS AND CLEARANCE DATA	
Valve seat diameter - exhaust	1-1/4 in.
Valve seat diameter - intake	1-3/8 in.
Face of valve seat - exhaust	0.09375/0.125 in.
Face of valve seat - intake	0.09375/0.125 in.
Valve stem clearance in guide, standard	0.002/0.0025 in.
Valve tappet clearance - intake	0.007 in.
Valve tappet clearance - exhaust	0.010 in.
Tappet clearance in guide	0.00075/0.001 in.
Idler bearing clearance	0.00075/0.001 in.
Camshaft bearing clearance	0.0015/0.0025 in.
Water pump shaft clearance	0.0015/0.0025 in.
Crankshaft thrust clearance	0.002/0.004 in.
Connecting rod side clearance	0.005/0.010 in.
Flywheel housing clearance, on chamfer	0.012/0.025 in.
Water pump shaft end thrust	0.002/0.003 in.
Water pump gear back lash to idler gear	0.002/0.004 in.
Camshaft gear back lash to crankshaft	0.000/0.002 -in.
Idler gear back lash to camshaft.	0.0005/0.0015 in.
Oil pump gear back lash to camshaft	0.008/0.010 in.
Piston ring gap	0.015/0.020 in.
Piston ring land clearance	
Top, second and third grooves	0.0015/0.003 in.
Fourth groove (oil)	0.0005/0.0025 in.
Piston pin clearance	0.0001/0.0002 in.
Piston clearance	0.0025/0.003 in.

4. FUEL SYSTEM	
Make	Marvel-Schebler
Part No	TSX887
Type	Updraft, single bore
Adjustments	
Idle mixture screw	1 to 1.5 turns open
Idle speed screw	450 to 500 engine rpm
Fuel tank capacity	10.4 gallons
Governor setting	2400 engine rpm
5. TRANSMISSION	
Make	Baker
Part no	A9020R1
Type	Single-speed with forward and reverse constant mesh power-shifted by selective engagement of clutches in oil
Ratio	1.19 to 1 reduction
Input	From torque converter
Output	Direct to drive axle ring gear
Clutches	2 self-adjusting single cork-faced disks
Fluid	OE 10
Capacity	10 qt (includes torque converter)
6. DRIVE AXLE	
Make	Rockwell-Standard
Part No.	TA199FHX34
Reduction gearing	Double-reduction, ring and pinion plus internal-to-sun gears
Reduction overall	15.05:1
Capacity	11 pt
Outside wheel track	54-7/8 in.
Inside wheel track	36-1/8 in.

TABLE 2-1. TABLE OF SPECIFICATIONS (Cont'd)

Outside wheel (tire) span.....63 in.

Distance between inside tires.....28-3/4 in.

Tire size.....7.50 x 15

Pressure.....85 psi

Brake (service).....Hydraulic, drum type, internal expanding shoes, self-adjusting

Wheels.....Individually demountable disk type

7. STEERING AXLE

Manufacturer.....Baker

Part No. 9004B5

King pin geometry.....Neutral

Tire size.....7.50 x 10

Pressure.....85 psi

8. POWER STEERING

Make.....Saginaw

Part No 5663097

Type.....Rotary valve with booster cylinder

Power source.....Main hydraulic system pressure limited to 1050 psi

9. HYDRAULIC SYSTEM

Fluid capacity of reservoir.....9.4 gal

Fluid..... OE 10

System relief valve setting.....1800 psi

Pump

Make.....Tyrone Hydraulics

Part No GPA/105CMODEL-L

Drive ..... From engine timing gear

Type..... Gear

Rating .....19.7 gpm at 2000 psi and 2400 rpm

Tilt cylinder

Part No.....9025JA1

Bore ..... 4 in.

Stroke ..... 4.125 in.

Type.....Double-acting

Closed length..... 16.625 in.

Hoist cylinder

Part No.....9025HH1

Stroke ..... 85.75 in.

Extended length..... 176.875 in.

Closed length..... 91.125 in.

10. ELECTRICAL SYSTEM

Voltage.....12 volts dc

Engine ignition system ..... Delco-Remy battery, coil distributor type; radio interference suppressed

Distributor..... Delco-Remy 1111870

Rotation ..... Counterclockwise, viewed from above

Point opening..... 0.022 in.

Point dwell (distr shaft rotation).....31 deg to 37 deg

Point spring tension ..... 17 to 21 oz at point

Centrifugal advance ..... 0-2 deg at 375 rpm
5-7 deg at 1000 rpm
9-11 deg at 1500 rpm

TABLE 2-1. TABLE OF SPECIFICATIONS (Cont'd)

Coil	Delco-Remy 1115045
Spark plugs	Champion XJ12
Gap	0.035 in.
Generator	Delco-Remy 1102221
Delco-Remy circuit type	A
Brush spring tension	28 oz
Rotation from drive end	clockwise
Field current draw at 80 deg and 12 volts	1.62-to 1.82-amp
Cold (80 deg F) output	30 amp at 14 volts at 2240 rpm
Voltage regulator	Delco-Remy 1119274
Designed for circuit polarity	Negative

Cutout relay	
Air gap	.0.020 in.
Point opening	0.020 in.
Closing voltage	11.8-to 13.5-v
Voltage regulator	
Air gap	0.075 in.
Voltage setting at 85 deg F	14.2-to 15.2-v
Current regulator	
Air gap	0.075 in.
Current setting at 85 deg F	19.5-to 23.0,amps
Starting motor	Prestolite MDU8007AT
No load test (include solenoid current).	90 amp at 10.5 volts, 4000 rpm during test
Brush spring tension	32-48 oz

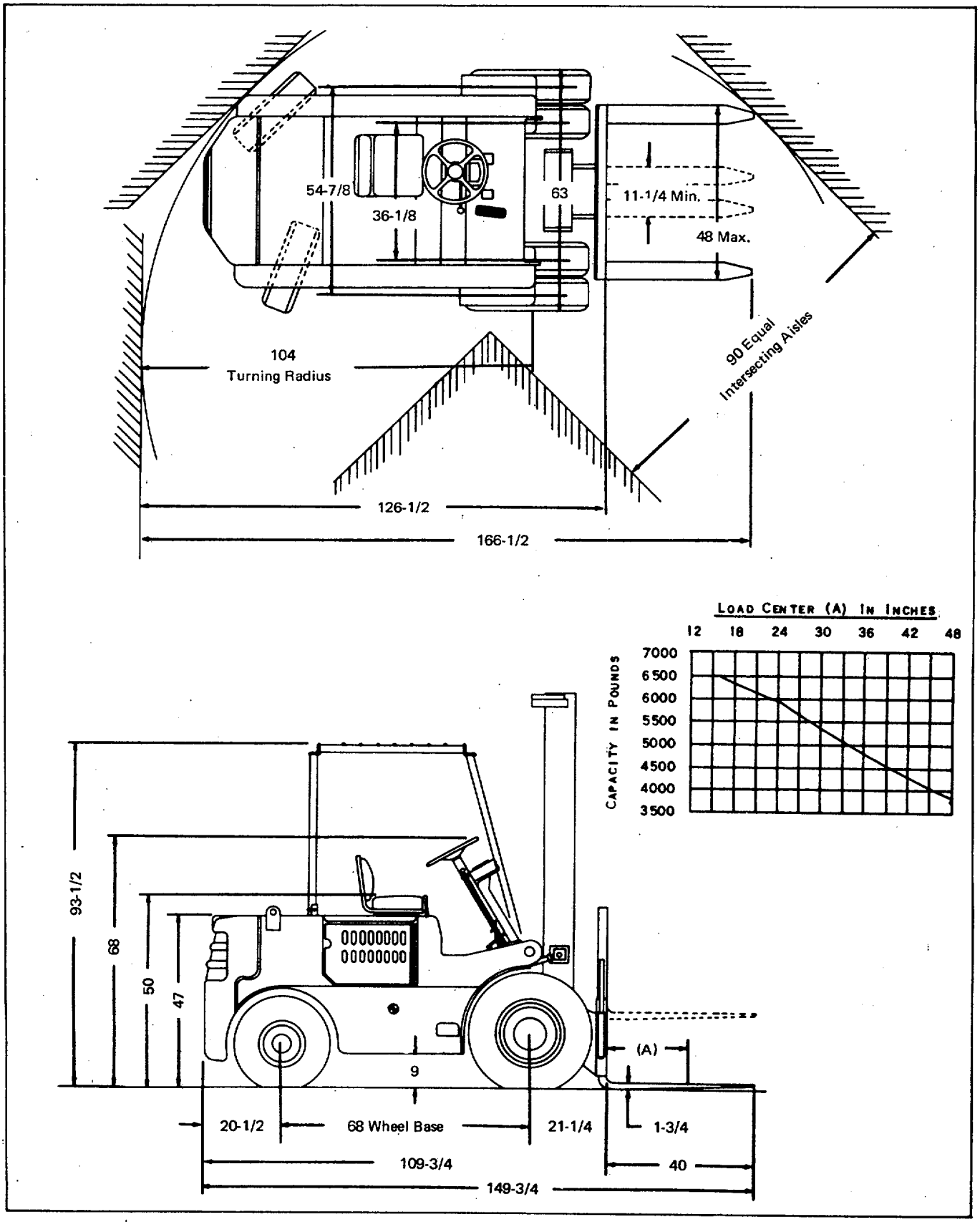


Figure 2-1. Vehicle Dimensions

TABLE 2-2. TORQUE VALUES

Bolt Grade Head Marking	Comm. Low-Carb. SAE-2 None	SAE-5 	SAE-7 	SAE-8 
Bolt size	In. lbs			
4-40	8			
6-32	12			
8-32	20			
10-24	25			
10-32	30			
12-24	35			
	Ft lbs	Ft lbs	Ft lbs	Ft lbs
1/4-20	4	7	9	11
1/4-28	5	9	11	13
6/16-18	9	15	19’	23
5/16-24	10	17	21	26
3/8-16	15	27	35	42
3/8-24	18	33	42	50
7/16-14	25	45	60	70
7/16-20	30	55	70	80
1/2-13	40	75	90	105
1/2-20	45	85	105	120
9/16-12	60	110	135	150
9/16-18	65	120	150	165
5/8-11	80	140	170	200
5/8-18	90	155	200	230
3/4-10	125	240	300	350
3/4-16	140	275	350	400
7/8-9	175	375	500	575
7/8-14	200	400	550	625
1-8	250	575	750	850
1-12	275	650	825	950

Cylinder head screws	100 ft lbs
Cylinder head stud nuts	60 ft lbs
Connecting rod nuts	39 ft lbs
Main bearings - front and intermediate	70 ft lbs
Main bearings - center and rear	60 ft lbs
Piston pin lock screw	35 ft lbs
Flywheel	80 ft lbs

SECTION III

PREPARATION FOR USE

3-1. GENERAL. When the fork lift truck has reached its final destination, a complete check is necessary to determine if the truck running gear, hydraulic hoist and lift system and all attached equipment is in condition for proper operation. This section describes the procedures to follow when receiving and preparing a new fork lift truck for use.

3-2. REMOVAL OF PRESERVATIVES.

a. Remove tape, paper, or other packing. Use extreme care when unpacking and installing separately packaged components.

b. Remove with a drycleaning solvent preservative compound from exposed metal surfaces. Because this compound is not a lubricant, take special care to see that it is completely removed from all wearing surfaces.

c. If any component or system contains preservative oil, drain the oil from it. Fill with proper lubricant as indicated in lubrication chart.

3-3. INSTALLATION OF SEPARATELY PACKED COMPONENTS.

a. Forks. Pull up ring catch on fork, position fork in desired location on carriage and release ring catch to lock fork on carriage. Repeat to install other fork.

b. Battery. The battery is a 12 volt storage type, some shipped dry and some charged. The electrolyte is packed in a separate container. Fill the battery with electrolyte to the level 3/8 inch above the plates. Check specific gravity of electrolyte with a battery hydrometer to learn if battery is sufficiently charged for use. If temperature corrected specific gravity is less than 1.225 (half charged), recharge battery from an external source. Full charge is indicated by a reading of 1.260 to 1.280.

3-4. PRELIMINARY INSPECTION.

a. Inspect the packing list for missing components.

b. Inspect exterior surfaces for broken or dented parts, and for damaged painted surfaces.

c. Inspect visible wiring and hydraulic lines for cuts, breaks, or other damage.

d. Inspect the lift chain and carriage assembly for damage.

e. Inspect the controls and instruments for breaks, cracks, bends, or other defects.

f. Visually inspect all other components of the vehicle for obvious damage and discrepancies such as broken, cracked, dented or missing parts, loose fasteners, dirt and other physical damage.

g. Inspect and service the specific components and systems of the vehicle as indicated below in preparation for use.

(1) Battery. Be certain negative and positive cables of battery are securely fastened.

(2) Fuel System. Fill the fuel tank, located inside the right side engine compartment door, with clean regular grade gasoline of 70 octane rating or higher. Tile engine will operate on higher grades of automotive gasoline, but does not require them.

Do not use aromatic blend aviation gasoline. Components of the fuel system are not designed for aromatic fuels and damage to the system will probably result.

(3) Cooling System. Check that the radiator drain cock at the bottom of the radiator and cylinder block drain cock are closed. Fill cooling system with water, or, if below freezing temperatures are expected, with a mixture of ethylene glycol, inhibited, meeting the requirements of Federal Specification O-A-548A in proportions to provide protection to the lowest expected temperature.

NOTE

If extreme cold is expected, fill the cooling system (after complete draining of water) with Arctic type antifreeze meeting the requirements of specification MILC-11755. This will protect the cooling system against frost damage to -65 Deg F. Start the engine and permit it to reach

operating temperature (about 180 Deg F), as indicated by the gage on the instrument cluster. At operating temperature the cooling system will be under slight pressure. Inspect radiator, water pump, and hose connections for leaks at this time.

(4) Engine Oil. Before starting the engine, open the right side engine compartment door and check the oil level in the crankcase. The oil fill pipe and bayonet type dipstick are located on the right side of the crankcase. Add oil meeting the requirements of MIL-L-2104 as necessary to bring the level to the upper mark on the dipstick. Use a grade of oil appropriate to the lowest expected temperature. Never operate the truck with the oil level below the LOW mark on the dipstick, nor add oil so that the level will be above the upper mark on the dipstick.

(5) Brake System. Check level of brake fluid in brake master cylinder. Maintain level of fluid to within 1/4 inch of top of filler hole with nonpetroleum base hydraulic brake fluid meeting the requirements of SAE Specification 70R1. Check operation of hand brake and complete hydraulic brake system for leaks.

(6) Hydraulic System Tank. Access to this tank is through the left side engine compartment door. With fork fully lowered, remove breather cap from tank and check quantity of fluid. Replenish as necessary with OE 10 lubricating oil. Check tilt cylinder, hoist cylinder, hydraulic pump, control valve and other components in the hydraulic system for leakage.

(7) Transmission. With engine idling, and transmission in neutral, check level of transmission oil with transmission dipstick. Add only OE 10 lubricating oil to replenish.

CAUTION

If truck has been serviced for Arctic conditions(to -65 Deg F) use only OES lubricating oil given on the lubrication chart. Do not mix the two types of oil recommended for different climatic conditions.

(8) Steering Gear. Remove floor plate and remove plug from steering gear housing. Check that lubricant is level with fill hole. Check steering gear, booster cylinder and all lines and fittings for leakage.

(9) Air Cleaner. Inspect oil level of air cleaner. Fill in accordance with lubrication chart.

(10) Engine. Visually inspect engine for obvious indications of damage and insecurely mounted accessories. Start and operate engine at various speeds, noting response and checking for any unusual noises or sluggishness.

(11) Fuel Tank. Inspect fuel tank, lines and fittings for damage and secureness of attachment. Replace components and tighten fittings as necessary.

(12) Fuel Pump. Check fuel pump, lines and fittings for damage and secureness of attachment. Observe any indications of looseness, damage or leakage. Tighten fittings as necessary.

(13) Carburetor. Check carburetor, carburetor mounting, connections and linkages for smoothness of operation and proper attachment. Inspect for leakage and tighten components as necessary.

(14) Exhaust Manifold. Check manifold and gasket for secure mounting. Tighten connections as necessary.

(15) Muffler. Check muffler for damage, secure mounting and connections. Tighten as necessary.

(16) Radiator. Check radiator mounting and hose connections for secure attachment. Check drain cock for tightness and remove any obstructions between core fins. Observe any indications of leakage. Tighten connections or correct discrepancies as necessary.

(17) Engine Water Pump. Inspect water pump for leaks. See that hoses are securely mounted and in good condition.

(18) Fan and Fan Belt. Inspect fan for secure mounting. Note condition of fan belt and check for one-inch deflection midway between pulleys. Adjust as necessary.

(19) Air Cleaner. Inspect air cleaner mounting, base connections and fittings for secure attachment. Tighten connections as necessary.

(20) Crankcase Breather. Inspect crankcase breather for damage and secure mounting.

(21) Distributor Assembly. Check distributor assembly mounting and electrical connections for evidence of damage or insecure attachment. Tighten connections as necessary.

(22) Spark Plugs and Cables. Inspect spark plugs, cables and connections for tightness, proper fit and obvious damage. Secure in position if necessary.

(23) Generator. Check generator for secure mounting. Inspect wiring between generator and regulator for looseness or damage. Tighten as needed.

(24) Regulator. Inspect regulator for evidence of damage, loose connections and insecure mounting. Tighten where needed.

(25) Starting Motor. Check starting motor for secure mounting and smoothness of operation. Inspect electrical connections for proper attachment. Check for evidence of damage and correct as necessary.

(26) Battery. Inspect battery for cracks and other damage. Check battery strap, tray and cable connections for looseness and damage. Tighten as necessary.

(27) Transmission. Visually inspect transmission case for evidence of damage. Check for proper alignment and mounting security.

(28) Power Axle. Inspect for any apparent damage. Check for proper alignment and secureness of mounting. Note any indication of lubricant leakage. Insure that bearing blocks are secure on frame.

(29) Steering Axle. Visually inspect axle for any apparent damage. Insure that mounting brackets are tight on frame and that axle assembly ends are snug in rubber axle blocks. Inspect steering knuckles, ball joints and tie rods for apparent damage and secureness of mounting.

(30) Brake Pedals. Inspect brake pedals and linkage for proper alignment. Check brake pedal travel. Pedal pressure should increase after 1/4 to 1/2-inch travel from start to stroke.

(31) Master Cylinder. Inspect master cylinder for evidence of damage, leaks and looseness of mounting. Tighten as necessary. Tighten tank filler plug and vent line connections.

(32) Wheel Cylinder Connections. Inspect wheel cylinder lines, fittings and connections for looseness, leaks or damage. Tighten as needed.

(33) Steering Mechanism. Visually inspect steering mechanism for any apparent damage or looseness. Be sure that all connections are tight and that steering control works freely.

(34) Hydraulic Hoist Cylinder. Inspect for damage and
insure that mounting is secure. Inspect hoses and fittings and check for fluid leakage.

(35) Tilt Cylinders. Check for proper alignment and secureness of mounting. Check all hoses, clamps and fittings. Inspect for leakage.

(36) Control Valve. Inspect for damage and mounting. Observe action of handles for freedom of movement. Check valve, hoses and fittings for leakage.

(37) Hydraulic Pump. Inspect hydraulic pump, hoses, and fittings for damage and secureness of attachment. Observe any indications of damage or leakage. Tighten as necessary.

(38) Hydraulic Reservoir. Inspect reservoir tank hoses and fittings for obvious damage and proper attachment. Tighten components as necessary.

(39) Upright Assembly. Check for damage or misalignment in rails, chains, sprockets, anchor bolts and rollers. Be certain of secureness of attachment. Tighten as necessary.

(40) Lights. Check combination stop and taillight for proper operation and apparent damage. Tighten - connections as required.

(41) Switches. Check operation of all electric switches. Tighten connections and attaching parts.

(42) Instrument Cluster. Inspect instrument cluster for apparent damage or looseness. Check gauges for proper operation. Tighten connections and attaching parts as necessary.

(43) Wheels and Tires. Check wheels, making sure they are securely mounted and free of damage. Check tires for proper inflation of 85 psi.

SECTION IV

OPERATION

4-1. GENERAL.

4-2. This section contains a general explanation of the principles of operation applicable to the fork lift truck. This section also contains sufficient information concerning the location and use of the various controls and instruments and detailed procedures to be followed to insure proper operation of the vehicle.

4-3. PRINCIPLES OF OPERATION.

4-4. Model FJF-060 is a mobile, rider-type mechanized vehicle, especially designed for the lifting and transporting of materials. The principal assemblies of the unit are as follows.

4-5. DRIVE LINE ASSEMBLY.

4-6. The drive line assembly consists of an engine assembly with accessories, torque converter, transmission assembly, propeller shaft and power axle assembly. Operating controls and mechanical linkage for the drive / line assembly are attached to or extend through the floor plate and are easily accessible to the operator.

4-7. ENGINE ASSEMBLY.

4-8. The engine assembly provides motive power for propelling the fork lift truck and for driving the engine accessories, such as the generator, water pump and hydraulic pump. It is a six-cylinder, four-cycle, in line, "L" Head engine. The timing gears and crankshaft pulleys for driving the accessories are located at the fan end of the engine (rear of the vehicle). The transmission assembly is attached to the bellhousing end of the engine with- the power axle assembly attached to the transmission by a propeller shaft.

4-9. TRANSMISSION ASSEMBLY.

4-10. The transmission assembly is the mechanism by which the operator can determine direction in operation of the vehicle. The transmission used on the fork lift truck is a single-speed torque converter transmission consisting of a torque converter and transmission assembly.

4-11. The purpose of a torque converter is to multiply the torque, or twisting force of the engine to whose output shaft it is applied. The amount of load or (resistance applied to the output shaft of the torque converter determines the extent to which engine (or input) torque is multiplied. There is no multiplication of torque when the load can be moved with the amount of torque being produced by the engine. When the load is increased, however, a re-routing of the fluid occurs inside the torque converter, resulting in increased twisting force.
The torque converter has three basic parts as follows:

a. Impeller. The impeller, or pump, is driven by the engine and consists of a ring of metal blades which turn in the fluid-filled converter.

b. Turbine. The turbine is made up of blades and is directly connected to the shaft of the driven unit.

c. Housing. The housing, or stator, contains stationary blades within a sealed housing assembly.

4-12. When the impeller blades turn in the fluid, they actuate the turbine from where the fluid is redirected to the blades of the housing. These blades, in turn, redirect the fluid to the second set of blades on the turbine. Thus, the fluid is directed and redirected through all of the converter blades.

4-13. Under normal running conditions, the action of the impeller causes the turbine blades to turn almost freely and the fluid passes through the converter easily and quickly, striking each blade at a very slight angle. When a load is encountered, however, the turbine slows down because it is directly connected to the load shaft and the fluid strikes the turbine blades at a sharper angle. As the force of the fluid is relayed from blade to blade, the output torque accumulates.

4-14. The torque converter transmission assembly is controlled by a valve on the top of the transmission case. This valve is attached by linkage to a rod extending through the floor plate and up the steering support assembly to a hand lever mounted directly below the steering wheel. By proper manipulation of the hand lever, the operator can place the vehicle in forward, reverse, or neutral. A second linkage system connects the brake pedal shaft to the inching spool of the transmission control valve. This hook-up allows the operator to speed up the engine for maximum lifting power while inching into position with a load. Complete control of the vehicle is effected at all times because it is only necessary to depress the brake pedals an additional amount to stop inching and apply brakes. A brake pedal is provided for both left and right foot operation.

4-15. The clutches in the transmission are contained in one large balanced drum assembly and the plates drive concentric shafts. The outer shaft has a gear mounted on it which is in direct mesh with the output gear on the output shaft. This transmits reverse rotation to the output shaft. The inner shaft has a gear mounted on it which is in mesh with the output gear through an idler gear. This transmits forward rotation to the output shaft. Therefore, the drive train consists of only four gears. The output flange slips within a sealed grease cavity. This arrangement leads toward long seal life and minimum leakage. The main case is of two piece cast construction and the rear half contains a heavy diaphragm midwall which forms one side of a rigid straddle mounted support for the output gear and shaft. Oil passages run within the walls of the case.

4-16. POWER AXLE ASSEMBLY.

4-17. The power axle assembly contains the gears, shafts, bearings and other components necessary to transmit power directly to the front wheels of the fork lift truck. The power axle also supports the front weight of the vehicle and mounts service brakes which enable a uniform braking force to be applied directly to the wheels. The power axle assembly is mounted directly to the transmission assembly and frame assembly.

4-18. Driving power is applied to the bevel Sear and differential assembly in the power axle through the propeller shaft connected to the transmission assembly. The differential assembly consists of a ring gear, pinion gears and side gears. The inner end of the drive shafts are splined to connect directly to the differential side gears. The truck wheels are rigidly attached to axle hub and drum assemblies mounted at the outer end of the axle shafts.

4-19. SERVICE BRAKE SYSTEM.

4-20. The service brake system consists of the brake pedals and linkage, master cylinder assembly, hydraulic lines to front wheels, wheel cylinder assemblies, brake drums and brake shoes.

4-21. Brake pedal pressure forces hydraulic fluid from the master cylinder assembly through the brake line, into the wheel cylinder assemblies. The pressure of hydraulic fluid within each wheel cylinder body displaces pistons which are coupled to the upper ends of the hinged brake shoes. The brake shoes are forced outward, and the lining of each brake shoe applies friction force to the brake drum. When the brake pedal is released, the hydraulic fluid pressure from the master cylinder assembly is released and the pistons and brake shoes return to their original positions by spring pressure. The surplus hydraulic fluid in the system then returns to the master cylinder.

4-22. STEERING BOOSTER AND VALVE.

4-23. The rod end of the steering cylinder piston is anchored to the vehicle. The cylinder and valve body are connected to the wheels through linkage and the valve is linked to the steering gear by a control rod. Road shock forces on the wheels tend to move the cylinder, but this action also moves the valve body in relation to the spool, which is being held by the control rod. Movement of the valve body relative to the valve spool directs oil to the cylinder to compensate for the road shock loads and to maintain vehicle directional control at the steering wheel.

4-24. When the valve spool is moved in either direction by movement of the steering wheel and control rod, oil is directed to the cylinder. This causes the cylinder and valve body to move in the desired direction relative to the piston and rod which is anchored to the vehicle. Movement of the cylinder and valve body, which, through linkage, are connected to the wheels, steers the vehicle.

4-25. Movement of the steering wheel in either direction is transmitted through mechanical linkage to the control valve ball stud. Movement of the ball stud causes movement of the control spool. Oil flow is directed by spool position to either the head end or rod end of the cylinder which causes the cylinder to extend or retract. Movement of the cylinder will continue as long as the control spool is offset by continued turning of the steering wheel. When the steering wheel stops turning, the control spool stops and the cylinder and valve body move to center (neutral) position and stop. This is true in any position of the steering wheel as steering pitman arm stops are provided to prevent the cylinder from bottoming with the wheels against the wheel stops. in the event of power source failure, the ball check in the steering control valve body will permit free flow of oil throughout the steering unit. This permits the steering system to be operated manually.

4-26. CONTROLS.

a. Ignition Switch and Starter Button. The ignition switch is located on the lower right side of the instrument cluster case. Push the switch upward to the ON position to activate the electrical system. (The direction shift lever must be in the N (neutral) position.) Depress the starter button located on the lower left side of the instrument cluster case to activate the starter solenoid which in turn will cause the starter motor to crank the engine. Release starter button when engine commences to operate. Push the ignition switch to the OFF position to shut off the supply of electric current to the ignition system and to the electrically operated gages.

b. Choke Control. The choke control is located on the lower right side of the operator's seat on the cowl. The normal operating position for the choke control is pushed in as far as it will go. Pull out the choke control to

close the choke valve in the carburetor when starting a cold engine. As the engine warms, push in on the choke control as required to insure smooth engine operation.

c. Horn Button. The horn button is located in the center of the steering handwheel. Depress the button to sound horn.

d. Parking Brake Lever. The parking brake lever located to the right of the operator's seat in front of the cowl, operates the brake mounted on the power axle assembly. Pull up on the lever to apply the brake and hold the truck in a stationary position. When the lever is pulled up, it is held in position by an over-center toggle action. Tightness is controlled by a screw adjustment in the lever handle. Move the lever downward to release brake.

e. Steering Handwheel. The steering handwheel controls the direction of travel of the truck. The steering wheel transmits movement through the steering gear, drag link, booster cylinder, steering arm and ball joints to the rear wheels. Turn the handwheel to the right (clockwise) to move the truck to the right; turn the handwheel to the left (counterclockwise) to move the truck to the left.

f. Accelerator Pedal. The accelerator pedal, attached to the carburetor throttle shaft, is located on the floorboard, convenient to the operator's right foot. Depress the pedal to increase the engine speed; release the pressure on the pedal to decrease the engine speed. The engine operates at a preset idling speed when the pedal is completely released.

g. Light Switch. The light switch is located on the upper right side of the instrument cluster case. Push the light switch up to turn on the taillight. Push the light switch down to turn off the taillight.

h. Lift Control Lever. The lift control lever is located on the cowl to the right of the operator's seat. Move the lever to the rear to lift the forks. Move the lever forward to lower the forks. The lever is spring centered to return to neutral when released. Engine speed determines the lift rate. Lowering rate is regulated by the control valve and is no way affected by engine speed.

i. Tilt Control Lever. The tilt control lever is located directly to the right of the lift control lever. Move the tilt control lever forward to tilt the forks forward. Move the lever backward to tilt the forks backward. The lever is spring centered to return to neutral when released.

j. Direction Shift Lever. The direction shift lever is located on the right side of the steering column. Move the direction shift lever forward to the F (forward) position to allow the truck to move forward. Move the lever back to the R (reverse) position to allow the truck to move backward. Leave the lever in the N (neutral) position when the truck is parked.

NOTE

The direction shift lever must be in the N (neutral) position in order to start the engine. The lever must not be shifted while the truck is in motion.

k. Braking and Inching Pedal. The braking and inching pedal is located on the floor to the right of the steering column. When the brake pedal is depressed, the stoplight will glow. Depress the braking and inching pedal to actuate the control valve, thus reducing the hydraulic pressure against the piston of the engaged clutch. This slows the transmission gear speed without affecting the engine speed and provides delicate control of the truck for traveling or inching. Further depression of the inching pedal will cut off pressure on the clutch piston and disengage the clutch discs in addition to applying the wheel brakes.

Avoid prolonged stall or inching operation as this tends to overheat the transmission assembly.

l. Seat Adjuster. The seat adjuster is located on the lower left side of the operator's seat. Move the adjuster lever toward the seat and move the seat f sward or backward as desired. Release the adjuster level when seat is in position.

4-27. INSTRUMENTS.

a. Engine Hourmeter. The engine hourmeter is located on the uppermost part of the instrument cluster case. This meter operates only when the engine oil pressure is in the normal operating range. The figure (extreme right) records 10ths of an hour. The small indicator (upper right) visibly turns when the meter is recording.

b. Fuel Indicator. The fuel indicator is located on the left side of the-instrument cluster. This indicator registers the amount of gasoline in the fuel tank. The indicator dial is marked E division, 1/2 division, and F. These symbols plus the divisions indicate that the fuel tank is either empty, one-quarter full, one-half full, three-quarters full, or full. The ignition switch must be in the ON position to activate the fuel indicator.

c. Ammeter. The ammeter is located at the top of the instrument cluster. The ammeter indicates the amount of current flowing to or being withdrawn from the battery. When the engine is started, the ammeter needle should move far to the right side of the dial and should fall back gradually to a position near the center or slightly to the charge (+) side of the dial. If the ammeter needle shows a constant discharge (-) stop the engine and report to organizational maintenance personnel.

d. Engine Oil Pressure Indicator. The engine oil pressure indicator is located on the right side of the instrument cluster. This indicator indicates the working pressure of the engine lubricating oil while the engine is in operation. It should indicate 25 to 35 psi at normal operating speed. Normal pressure readings may range from 5 to 10 psi at idle to 26 psi at 1600 rpm with the engine hot, or slightly higher with a cold engine or higher speeds. A higher pressure indication is normal for a cold engine. If the pressure reading is low or excessively high, stop the engine and report this trouble to the proper authority.

e. Engine Temperature Indicator. The engine temperature indicator is located on the bottom of the instrument cluster. This indicator registers the temperature of the engine coolant in degree Fahrenheit. During operation the indicator should register 160 Deg to 180 Deg F. If the indicator fails to show any temperature gain after the engine has been operated for a reasonable length of time, or if the needle registers above 200 Deg F., stop the engine and report the trouble to the proper authority.

4-28. OPERATION.

4-29. GENERAL.

The following paragraphs contain detailed instructions for operating the fork lift truck under normal conditions.

NOTE

Make certain all "Before Operation Service" specified in section 5 has been performed before attempting to start the engine.

4-30. STARTING TRUCK.

a. Pull up on parking brake lever to make certain truck will remain in a stationary position while it is being started.

b. Make certain the direction shift lever is in N (neutral) position.

c. At initial starting, or if engine is cold, pull choke control all the way out.

d. Press down on accelerator pedal approximately one-third the distance from its normal raised position.

e. Push the ignition switch up and depress the starter button to start the engine. The starter motor will crank the engine. When engine starts, release the starter button.

CAUTION

Do not operate the starter motor continuously for more than 30 seconds. If the engine fails to / start after 30 seconds, allow the starter motor to cool for at least 2 minutes before attempting to start the engine again.

f. Hold accelerator pedal steady and allow engine to warm up at a fast idling speed. Immediately observe engine oil pressure indicator and ammeter for normal readings. As engine begins to warm up, gradually push in on choke control; when engine is warm, push choke control all the way in.

(1) Ammeter. When the engine is first started, the ammeter should indicate a high charging rate. The charging rate will normally decrease after a reasonable length of time unless the battery is defective or excessively discharged. If the ammeter registers a discharge rate when the engine is operating or if the ammeter remains at zero or moves erratically, stop the engine and investigate.

(2) Temperature Gauge. When warmed up, the engine should operate at a coolant temperature of 165 to 190 Deg Fahrenheit. If the temperature does not reach this range after a reasonable warm-up period has elapsed, or if the temperature is exceeded during normal operation, stop the engine and investigate.

(3) Oil Pressure Gauge. Pressure should register on the oil pressure gauge as soon as the engine is started and be maintained at all times while the engine is operating. Normal pressure readings may range from 5 to 10 psi at idle to 26 psi at 1600 rpm with the engine hot, or slightly higher with a cold engine or higher speeds. If there is no indication of oil pressure, or if the pressure is low or erratic, stop the engine immediately and investigate.

g. Warm engine until it will idle smoothly with the choke control pushed all the way in. Check for proper readings on ammeter, engine oil pressure indicator, engine temperature indicator, and fuel indicator. Be sure hourmeter is operating properly.

h. Remove foot pressure from accelerator pedal.

4-31. DRIVING TRUCK.

a. Accelerate the engine slightly and move the lift control lever gradually to the rear and raise the forks to normal traveling position (only high enough to clear obstructions while traveling).

b. Move the tilt control lever backward and tilt the forks backward.

c. Move the direction shift lever from N (neutral) to F (forward) or R (reverse) position, depending on desired direction.

d. Place foot on the accelerator pedal and release the parking brake lever. Gradually depress the accelerator pedal until truck begins to travel. Continue to depress the accelerator pedal until safe operating speed is attained. If the truck fails to move, shut off engine immediately and report this to the proper authority.

4-32. PICKING UP LOAD.

a. Approach the load squarely and halt the truck. Move the tilt control lever forward and bring the mast assembly to the vertical position. Raise or lower the forks to the proper height to pick up the load.

NOTE

Never under any circumstances attempt to operate a fork lift truck with a load so heavy that steering becomes uncertain.

b. Move the truck forward until the forks are positioned under the load. Make certain the forks are fully inserted in the pallet or under the load.

NOTE

If the load is placed out near the tips of the forks, the rated capacity of the truck will be greatly reduced. This procedure is especially important with long loads, to prevent loss of traction on the trailing wheels.

c. Apply the parking brake to prevent the truck from shifting position during the lifting operation.

d. Move the direction shift lever to N (neutral).

e. Move the lift control lever to the rear and accelerate the engine to raise the load only high enough to clear obstructions while traveling. Do not carry loads so high as to cause instability. Release the lift control lever. Move the tilt control level backward to tilt the forks backward. Release the lever and decelerate the engine.

f. Move the direction shift lever from N (neutral) position to the proper position for the desired direction of travel.

g. Release the parking brake lever, depress the accelerator pedal, and move the load to the desired location.

h. Back the fork lift truck down steep inclines so that the load will not slip off the forks.

i. Always reduce speed gradually, as sudden stops are unnecessarily hard on the truck and the load may fall forward.

4-33. STEERING.

a. Make turns smoothly and gradually. Avoid sudden turns which may cause loss of control or spilling the load.

b. A loaded fork truck usually steers easier than an empty one. The truck operator should accustom himself to these changes in steering.

c. Don't go around corners too fast, especially when there is no load on forks, as truck may overturn.

d. When turning sharp corners, start from the inside corner rather than from the middle of the aisle.

e. Operators should note that with rear steering, the rear of the truck swings out on turns. Take care to allow for this characteristic when near potential obstacles, edge of loading dock, etc. Practice maneuvering in a clear area until familiar with truck response to travel controls.

f. Avoid steering when truck is standing still. The slightest travel speed will make steering much easier, and reduce wear on tires and steering linkage.

4-34. DEPOSITING LOAD.

a. Depositing Load on Tiered Stack.

(1) Move the lift control lever to the rear and accelerate the engine until the load reaches the desired height above the tier.

(2) Drive the truck forward until the load is above its resting place. To slowly maneuver the truck forward while high engine speed is needed, use the braking and inching pedal.

(3) Pull up on the parking brake lever to apply the parking brake.

(4) Move the direction shift lever to N (neutral) position. Move the tilt control lever forward and tilt the forks forward until the load is aligned with the tier.

(5) Move the lift control lever forward and carefully lower the load into position on the tier. Continue to lower the forks until they can be easily withdrawn from the pallet.

(6) Move the direction shift lever to R (reverse) position. Release the parking brake lever, and slowly back the truck away from the tiered stack until the forks are clear.

(7) Move the lift control lever forward to lower the forks into normal traveling position (8 to 10 inches above surface).

b. Depositing Load in Storage Area.

(1) Carefully drive up to the position at which the load is to be deposited. Depress the brake pedal to halt the truck.

(2) Apply the parking brake, and move the direction shift lever to N (neutral) position.

(3) Move the tilt control lever forward and bring the mast assembly to the vertical position.

(4) Move the lift control lever forward and carefully lower the load to the ground. Continue to lower the forks until they can be easily withdrawn from under the load.

(5) Place the direction shift lever in R (reverse) position. Release the parking brake lever, and slowly back the truck away from the deposited load.

4-35. STOPPING TRUCK.

a. Remove foot from the accelerator pedal.
b. Apply gradual pressure on the brake pedal to bring the truck to a safe smooth stop. Avoid sudden stops.
c. Apply the parking brake. Move the direction shift lever to N (neutral) position.
d. Move the tilt control lever forward to bring the mast to the vertical position.
e. Move the lift control lever forward and lower the forks to the ground.
f. Push the ignition switch to OFF position to stop the engine.

4-36. SAFETY PRECAUTIONS.

4-37. The fork lift truck is inherently safe in its design. Only negligent operation can cause an accident or damage. In general, it can usually be assumed that if a mishap occurs, the operator was careless or not competent to use equipment. Practice the basic rules for fork lift truck operation, any additional rules peculiar to the application of the truck, and the general rules of the road which apply to any vehicle. In any case, safety depends entirely on the operator's good judgment.

4-38. ATTRIBUTES OF A GOOD OPERATOR.

4-39. Every good vehicle operator knows what to look for, where to find it and when the truck requires maintenance service. Such conditions as wobbly wheels, defective brakes, worn and uneven chains, defective horn, oil leaks, and defective steering apparatus should be reported immediately. In general, it is best to run a daily check at the end of the shift so that in the event extra work is required, it can be done before the truck is needed for another eight hours duty.

4-40. SAFETY RULES FOR TRUCK OPERATORS.

4-41. Rigid adherence to the following safety rules will result in safe vehicle operation and minimum maintenance.

a. Perform a quick visual inspection of the truck before use to note obvious conditions requiring correction such as lubrication, hydraulic oil supply, battery condition and liquid level, operation of horn and other electrical equipment.
b. Report at once faulty equipment performance, defective brakes, steering, etc.
c. Know rated capacity of the equipment. Overloading is damaging and costly. Also, floor load limits and overhead clearances must be observed.
d. Watch blind corners, stop at intersections, and sound horn. The other fellow cannot see around the corner either.
e. Lift, lower, and carry loads with upright vertical or tilted backward, never forward.
f. Under no circumstances should unauthorized riders be permitted on equipment.
g. Watch rear end swing and use low speed when descending ramps or steep grades.
h. Never "butt" loads with forks or rear end of truck. This practice usually causes cargo damage.
i. Be careful when high tiering.
j. Keep arms and legs where they belong. Never place them between the uprights of the mast or outside the running lines of the vehicle.
k. Do not use any fork lift as a personnel elevator unless there is a safety platform attached to the forks.
l. Operate at authorized speeds. Flying starts and screeching stops cause trouble.
m. Weight of vehicle should be stenciled on two sides.
n. Observe fire prevention rules. Fire extinguishers should be on each piece of equipment and each driver should know how to operate them.

o. Avoid sudden stops. They cause spilling of cargo, personnel injury and equipment damage.

p. Always face in the direction of travel for better vision. When going downhill, and load blocks vision, put the truck in reverse and back down. Reverse driving is also recommended where forward vision is obstructed by bulky loads.

q. Be sure that bridge plates into trucks or freight cars are sufficiently wide, strong, and secured properly.

r. When leaving equipment, be certain that brakes are set and holding.

s. Travel carefully over rough spots.

t. Use care, common sense, and courtesy at all times when operating the truck.

u. Never permit unauthorized personnel to handle or drive the truck.

v. Report accidents.

w. Be continuously alert when operating the truck.

SECTION V

SERVICE INSPECTION, MAINTENANCE, LUBRICATION AND TROUBLE SHOOTING

5-1. GENERAL

5-2. To insure that the equipment 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 fork lift truck shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded with the corrective action taken at the earliest possible opportunity.

5-3. This section contains information for performing scheduled inspection, lubrication and preventive maintenance services. Perform the indicated inspection, lubrication and maintenance at the designated intervals. All inspections of assemblies, subassemblies or parts must include any supporting members and connections and must determine that the unit is in good condition, correctly assembled, securely mounted or requires repair or replacement.

5-4. The periodic service inspection and specific portions of the preventive maintenance services must be performed following each functional use of the fork lift truck to maintain' the vehicle. The fork lift truck must be operated occasionally during periods of infrequent use.

5-5. The maintenance operations described herein are to be considered as minimum operations on vehicles which are in operating condition and require only periodic checkup and service. If, upon inspection, a component requires more than adjustment, cleaning or simple replacement, refer to Section VI for more complete information.

5-6. PERIODIC SERVICE INSPECTION.

5-7. The following paragraphs contain the periodic service inspection procedures to be performed at designated intervals. References are made to maintenance procedures where necessary to complete the inspection services.

a. Intervals. Each truck will be inspected by its assigned operator, each day it is operated. This service is divided into three parts.

(1) Before-operation service. This is a brief service to ascertain that the truck is ready for operation; it is mainly a check to see if conditions affecting the truck's readiness have changed since the last after-operation service.

(2) During-operation service. This service consists of detecting unsatisfactory performances. While driving or operating, the driver should be alert for any unusual noises or odors, steering irregularities, or any other indication of malfunction of any part of the truck. Every time the operator picks up or deposits a load, applies the brakes, accelerates or turns the truck, it should be considered a test and any unusual or unsatisfactory performance noted.

(3) After-operation service. This is the basic daily service for all trucks. It consists of correcting, so far as possible, any operating deficiencies, so that the truck is prepared to be operated again, upon a moment's notice, should the situation so require.

b. General procedures for all services and inspections.

(1) The general procedures [(2) below] apply to all inspections and are just as important as the specific procedures.

(2) Inspections to see if items are in good condition, correctly assembled, secure, not excessively worn, not leaking, and adequately lubricated apply to most items in the preventive-maintenance and inspection procedures. Any or all of these checks that are pertinent to any item (including supporting, attaching, or connecting members) will be performed automatically as general procedures, in addition to any specific procedures given.

(a) Inspection for good condition is usually visual inspection to determine if the unit is safe or serviceable. Good condition is explained further as meaning: .not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not deteriorated.

(b) Inspection of a unit to see if it is correctly assembled is usually a visual inspection to see if the unit is in its normal position in the truck and if all its parts are present and in their correct relative positions.

(c) Inspection of a unit to see if it is secure is usually a visual, hand-feel, pry-bar, wrench, or screwdriver inspection for looseness in the unit. This inspection will include any brackets, lockwashers, locknuts, locking wires, and cotter pins as well as any connecting tubes, hoses, or wires.

(d) Excessively worn is understood to mean worn beyond serviceable limits, or likely to fail if not replaced before the next scheduled inspection. Excessive wear of mating parts or linkage connections is usually evidenced by too much play (lash or lost motion). It includes illegibility as applied to markings and data plates, and printed matter.

c. General Cleaning. Any special cleaning instructions required for specific mechanism or parts are contained in the pertinent section. General cleaning instructions are shown in (1) through (4) below.

(1) Use dry-cleaning solvent or volatile mineral spirits to clean or wash grease or oil from all parts of the truck.

(2) A solution of one part grease-cleaning compound to four parts of dry-cleaning solvent or volatile mineral spirits may be used for dissolving grease and oil from chassis, mast and other parts. Use cold water to rinse off any solution which remains after cleaning.

(3) After the parts are cleaned, rinse and dry them thoroughly. Apply a light grade of oil to all polished metal surfaces to prevent rusting.

(4) Before installing new parts, remove any preservative materials, such as rust-preventive compound, protective grease, etc.; prepare parts as required (oil seals, etc.); and for those parts requiring lubrication, apply the lubricant prescribed in the lubrication order.

d. General precautions in cleaning.

(1) Dry-cleaning solvent and volatile mineral spirits are inflammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well ventilated places.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.

(3) Avoid getting petroleum products, such as dry-cleaning solvent, volatile mineral spirits, engine fuels, or lubricants on rubber parts as they will deteriorate the rubber.

(4) The use of diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

5-8. VEHICLE APPEARANCE.

Inspect entire truck. Check panels and covers for proper closing.

Inspect body and chassis for missing or damaged parts.

5-9. ENGINE ASSEMBLY.

Check oil level in crankcase.

Check oil pressure reading.

Inspect oil pan for leakage.

Inspect oil filter element. Replace as necessary.

Check tightness of cylinder head nuts.

Check tightness of manifold nuts.

Test engine compression.

Maintenance Reference	After Use	Daily	Weekly	Quarterly	Semi Annual
----	X	----	X	----	----
----	----	----	----	X	----
Lube Chart	----	----	----	----	----
----	----	X	----	----	----
----	----	----	X	----	----
Lube Chart	----	----	----	----	----
542	----	----	-----	X	----
----	----	----	----	X	----
----	----	----	----	X	----

	Maintenance Reference	After Use	Daily	Weekly	Quarterly	Semi Annual
Inspection engine mounting and support brackets.	----	----	----	----	X	----
Inspect plugs and drain cock for leakage.	----	----	X	----	----	----
Tighten as necessary.	----	----	X	----	----	----
Inspect engine operation.	Lube Chart	----	----	----	----	----
Inspect crankcase breather air cleaner and vent pipe air cleaner.	----	----	----	X	----	----
5-10. FUEL SYSTEM.						
Inspect fuel lines and connection, replace or tighten as necessary.	----	----	----	----	X	----
Check carburetor mounting and leakage.	----	----	----	----	----	X
Check fuel pump mounting and connections.	----	----	----	----	X	----
Check mounting and connections to air cleaner.	Lube Chart	----	----	----	----	----
Clean carburetor air cleaner.	5-46					
Check fuel supply level.	5-55	X	----	X	----	----
5-11. EXHAUST SYSTEM.	5-50	----	----	----	----	X
Inspect exhaust system for leakage.	----	----	----	----	X	----
Check exhaust system components for secure connections.	5-54	X	X	----	----	----
5-12. COOLING SYSTEM.	5-57	----	----	----	X	----
Inspect cooling system for leakage.	5-59	----	----	----	----	X
Clean cooling system.	5-60	----	----	----	----	X
Check connections of radiator hoses and clamps.	----	----	----	----	----	X
Check coolant level.	Lube Chart	----	----	----	----	----
Check tension of fan belt.						
5-13. IGNITION SYSTEM.						
Check timing and spark advance.						
Check and adjust distributor points.						
Check distributor connections and mounting.						
Lubricate distributor.						

	Maintenance Reference	After Use	Daily	Weekly	Quarterly	Semi-Annual
Clean spark plugs and check gap adjustment.	5-61	----	----	X	----	----
Check condition of spark plug cables.	----	----	----	----	X	----
5-14. STARTING AND CHARGING SYSTEM.						
Check tightness of cables and connections.	----	----	----	----	X	----
Check engine starter brushes for wear and spring tension.						
Check engine starter for tightness of mounting bolts.	5-63	----	----	----	----	X
Inspect engine starter commutator.	Lube Chart	----	----	----	----	----
Lubricate engine starter.	----	----	----	----	X	----
Inspect generator mounting and connections.	5-67	----	----	----	X	----
Check generator output amperage.	5-66	----	----	----	X	----
Inspect generator commutator and brushes.	----	----	----	----	X	----
Check generator regulator mounting and connections.	5-68	----	----	----	----	X
Check generator regulator operation.	----	----	----	X	----	----
5-15. BATTERIES.	----	----	----	X	----	----
Check battery tray for damage and corrosion.	----	----	----	X	----	----
Check battery hold-down clamps, nuts, and washers for corrosion and tightness.	----	----	----	X	----	----
Inspect batteries for cracks and electrolyte leakage.	----	----	----	----	X	----
Check electrolyte level.	----	----	----	X	----	----
Check tightness of terminal posts and connections.	----	----	----	----	X	----
Check battery cables for condition and corrosion.	----	----	----	----	X	----
5-16. GOVERNOR ASSEMBLY.						
Check secureness of mounting.						
Inspect levers for looseness.						

	Maintenance Reference	After Use	Semi-Daily	Weekly	Quarterly	Annual
Lubricate governor linkage.	Lube Chart	----	----	----	----	----
5-17. TRANSMISSION ASSEMBLY.						
Inspect for transmission fluid leaks.	----	----	----	X	----	----
Check transmission fluid level. Add if required.	Lube Chart	----	----	----	----	----
Inspect for secure mounting at engine and propeller shaft.	----	----	----	----	x	----
Inspect coolant lines for leakage or looseness.	----	----	----	x	----	----
Check gear shift linkage for wear or damage.	----	----	----	----	x	----
5-18. DRIVE AXLE ASSEMBLY.						
Inspect for secure mounting at frame and propeller shaft.	----	----	----	----	x	----
Check lubricant level.	Lube Chart	----	----	----	----	----
Lubricate propeller shaft.	Lube Chart	----	----	----	----	----
Check tightness of wheel mounting bolts.	----	----	----	----	x	----
5-19. STEERING AXLE ASSEMBLY.	----	----	----	----	x	----
Inspect for secure mounting.	Lube Chart	----	----	----	----	----
Clean, inspect and repack wheel bearings.	Lube Chart	----	----	----	----	----
Clean, inspect and lubricate steering linkage.	----	----	----	----	x	----
Check tightness of wheel mounting nuts.	----	----	----	----	x	----
5-20. STEERING GEAR.	----	----	----	----	x	----
Check mounting of steering gear.	----	----	----	x	----	----
Check ball joints, tie rods and bellcrank for damage or looseness.	Lube Chart	----	----	----	----	----
Check lines and fittings for leakage or looseness. Tighten or replace as necessary.	----	----	----	----	x	----
Check lubricant level and add if required.	----	----	----	----	x	----
5-21. HYDRAULIC PUMP.						
Inspect pump belt for wear and proper tension.						
Inspect for secure mounting.						

	Maintenance Reference	After Use	Semi-Daily	Weekly	Quarterly	Annual
Inspect fluid hoses for leakage and looseness.	----	----	----	X	----	-----
Check fluid level in reservoir.	Lube Chart	----	-----	-----	-----	----
Check pump for fluid leakage.	----	----	----	X	----	----
5-22. STEERING CYLINDER ASSEMBLY.						
Inspect for secure mounting.	----	----	----	----	X	----
Inspect fluid hoses for leakage and looseness.	----	----	----	X	----	----
Check cylinder for fluid leakage.	----	----	----	X	----	----
5-23. SERVICE BRAKES AND HYDRAULIC SYSTEM.						
Inspect brake linings	5-74	----	----	----	----	X
Inspect master cylinder for fluid leakage.	----	----	----	X	----	----
Check hydraulic lines and connections for damage or leakage.	----	X	----	----	----	----
Test operation of brakes and service as necessary.	----	----	X	----	----	----
Check fluid level in master cylinder.	Lube Chart	----	----	----	----	----
5-24. INSTRUMENT AND CONTROLS.	----	X	----	----	----	----
Check all indicating instruments for proper operation.	----	X	----	----	X	----
Check instrument connections and mountings.	----	X	----	----	X	----
Check mounting and connection of sending units.	----	X	----	----	X	----
Check mounting and connection of all control linkage.	----	----	----	----	X	----
5-25. TILT AND HOIST CYLINDERS.						
Check for secure mounting.	----	----	----	X	----	----
Check for fluid leakage.	----	----	----	X	----	----
Inspect piston rods for excessive scoring.						
5-26. CONTROL VALVE.						
Check for fluid leakage.						
Check for secure mounting.						

Maintenance Reference	After Use	Semi-Daily	Weekly	Quarterly	Annual
----	----	X	----	----	----
----	----	----	X	----	----
Lube Chart	----	-----	----	----	----
----	----	-----	X	----	---
----	----	----	----	X	----
----	----	X	----	----	----
----	----	X	----	----	----
Lube Chart	----	----	----	----	----

Check levers for proper operation.

5-27. LIFT CHAINS.

Inspect for worn or broken links.

Lubricate complete chain.

Check for secure mounting.

5-28. UPRIGHT ASSEMBLY.

Check for secure mounting on drive axle assembly.

Inspect for free operation with no binding during tilt and hoist operations.

Check for proper latching operation (where applicable).
Lubricate carriage and crosshead rollers.

5-29. BEFORE OPERATION SERVICE.

5-30. The before operation service detailed below must be performed before attempting to start the engine prior to operating the fork lift truck.

a. Fill the fuel tank with the proper grade of fuel.

b. Check and fill the radiator with the proper coolant.

c. Check level of lubrication oil in crankcase. Add proper weight and grade oil as necessary.

5-31. ROAD TEST PROCEDURES.

5-32. Road tests on the fork lift truck should be conducted following maintenance and service operations. Periodic road tests should also be scheduled if the vehicle is subjected to infrequent use. The road test should provide sufficient operational time to insure proper operation of the vehicle. When the engine is started observe the indicating instruments as described in the subsequent steps. Before attempting to drive the vehicle, but while the engine is operating, check the operation of the brakes, steering wheel, truck lighting system and hydraulic system in accordance with their respective operating instructions. Observe the following instruments during the road test to determine proper operation.

a. The oil pressure gauge should normally indicate pressure as explained in paragraph 4-27d. If there is no oil pressure indication after the engine has operated for 30 seconds, stop the engine and determine the cause.

b. When the engine is started, the ammeter will normally indicate a high charging rate and then gradually return to a slight charging rate. If a discharge indication or absence of indication is noted, stop the engine and investigate the cause.

c. The normal coolant temperature range for engine operation should be between 165 to 190 degrees Fahrenheit. If the temperature gauge indicates temperature outside these limits, stop the engine and investigate the cause.

5-33. ENGINE. Check engine at various speeds for evidence of overheating, lubricant leakage and other abnormal conditions. Note any excessive noise or vibration of the engine over its entire speed range.

5-34. TRANSMISSION. Place the fork lift truck in motion and check forward action of transmission. Check reverse drive operation. The transmission shift lever should slide smoothly into position without a tendency to slip out of gear. Note any excessive vibration of shift lever when decelerating or accelerating the vehicle.

5-35. SERVICE AND HAND BRAKES. Test .operation of service brakes at start of road test while traveling at various vehicle speeds. Brake action should be positive

and equally applied to both front wheels. Note any "mushiness" or "creeping" of. the brake pedal or A tendency of the wheels to lock, pull to one side or produce unusual noises. Test the hand brake with the vehicle on an incline, noting if there is any tendency to creep.

5-36. STEERING. Check the steering wheel travel for hard steering, poor return to center and noises. The rear wheels should have a tendency to straighten out when pressure on the steering wheel is relaxed.

5-37. UPRIGHT ASSEMBLY HYDRAULIC SYSTEM. Check the hydraulic system with a substantial load on the forks by testing operation of both the tilt and hoist cylinders through their complete area of movement. Pushing the control valve handle marked "HOIST" back raises the forks to the extreme top of the upright assembly. With load raised and control in neutral position, check for any creep-down of the loaded fork. After test, inspect hydraulic system for leaks. Slowly push lever forward and allow the forks to bottom by gravity. If, in raising hoist, the lever is not returned to neutral when top is reached, the over-load bypass in the control valve will open automatically and detour the flow of oil back to the reservoir tank. This action is indicated by a buzzing sound which is normal. Note if there is any tendency of channels to bind and be sure there is complete freedom of the crosshead assembly, both up and down. In testing of the tilt operation, when lever marked "TILT" is pulled back to its extreme, the forks should tilt up and back. When the tilt lever is pushed forward, the forks should tilt out or down. Both tilting actions are accomplished by hydraulic pressure. Note any tendency for either the hoist or tilt action to hesitate or mush.

5-38. LIGHTS. Turn on ignition switch and check operation of stoplight by pressing brake pedal. Turn on taillight.

5-39. ORGANIZATIONAL MAINTENANCE.

5-40. The following maintenance services are to be performed by the using organization personnel and are referenced to the periodic service inspection starting with paragraph 5-8. The operations listed can be completed with the tools and equipment normally available at the using organization.

5-41. ENGINE ASSEMBLY.

5-42. CYLINDER HEAD TIGHTENING.

a. Using a torque wrench, tighten cylinder head nuts and stud nuts in the sequence shown in Figure 5-1.

b. Tighten cylinder head nuts to a torque of 35 to 40 foot-pounds.

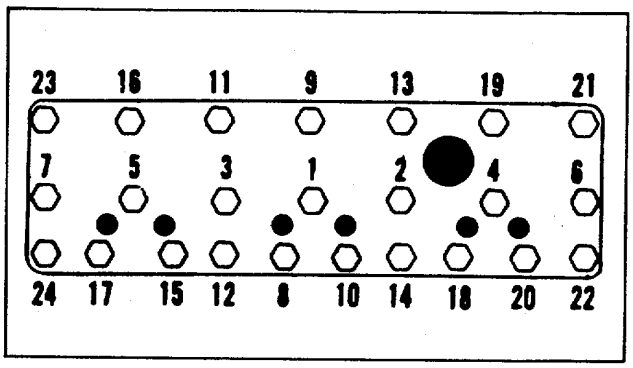


Figure 5-1. Cylinder Head Screw Tightening

c. A final tightening and checking of torque should be made after the engine has been run and is still warm.

5-43. INTAKE AND EXHAUST VALVE TAPPET ADJUSTMENT.

a. Start engine and allow it to run until normal operating temperature is reached. Stop engine, remove valve cover assembly and cover gasket.

b. Start engine and insert feeler gauge between valve tappet and valve stem. (See Figure 5-2) Loosen the tappet, adjusting lock nut, and adjust tappet until there is a clearance of 0.007 inch on the intake and 0.010 inch on the exhaust. Tighten the tappet adjusting lock nut when properly adjusted.

c. Repeat the above adjustment procedures on all intake and exhaust valve tappets. Stop the engine and inspect all visible valve components for wear or weakness.

d. Install valve cover assembly and a new cover gasket.

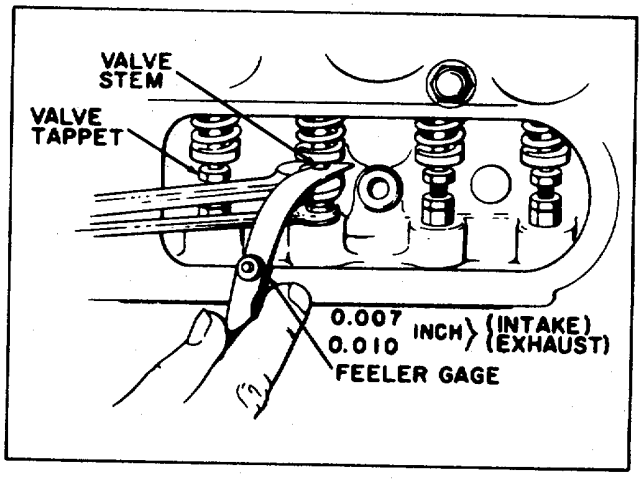


Figure 5-2. Valve Tappet Adjustment

5-44. FUEL SYSTEM.

5-45. CARBURETOR ADJUSTMENT.

a. With the fork lift truck on level ground, turn the idle adjusting needle with the fingers until it is barely seated, then back off exactly one turn.

NOTE

Do not seat the idle adjusting needle too tightly since the tip of the needle will groove and prevent smooth engine idling. Discard .grooved needle and install new idle adjusting needle as necessary.

b. Start engine and run until normal operating temperature is reached. Adjust idle speed screw as required to obtain an idle speed of 500 rpm (just enough to prevent stalling during the warmup period).

5-46. AIR CLEANER SERVICING.

a. To maintain low resistance to air flow, the filter element must be inspected periodically and cleaned thoroughly when dirty.

b. Unscrew wing-nut, remove hood and lift off filter. Wash filter in solvent. Allow to dry.

c. Pour old oil from filter body and replace with clean oil.

d. Reassemble unit.

5-47. COOLING SYSTEM.

5-48. PREVENTIVE CLEANING. To clean the cooling system of scale, rust or sludge, use engine cooling system cleaning compound and inhibitor. Be sure to flush system thoroughly after cleaning as the cleaner contains a strong acid which, if not completely removed, may attack the parts of the cooling system.

CAUTION

Do not pour cold coolant into the radiator when engine temperature is above 200 deg. Fahrenheit. Cold coolant, regardless of engine temperature, will close the thermostat and prevent the complete filling of the engine water jackets and passages. When filling the system with a cold coolant, always operate the engine until normal operating temperature is reached (thermostat opens), then add coolant as required.

5-49. DRAIN SYSTEM. Operate the engine at a fast idle until normal engine operating temperature is reached. A fast idle will stir up any loose rust, scale or other formations in the cooling system. Stop engine and remove radiator filler cap. Open cylinder block and radiator drain cocks and allow cooling system to drain.

5-50. CLEAN SYSTEM. Close radiator and cylinder cocks. Be sure temperature of engine is below 200 deg Fahrenheit. Pour cleaning compound into radiator and fill coolant system with water. Install pressure-type cap on radiator. Start engine and operate it at fast idle until solution is heated to at least 180 deg Fahrenheit. Use a cardboard to cover radiator, if necessary, but do not allow the solution to boil. Continue to operate the engine at least 30 minutes. Stop the engine, remove radiator cap, open radiator and cylinder block drain cocks and allow system to drain completely.

5-51. NEUTRALIZE SYSTEM. Close radiator and cylinder block drain cocks. Pour inhibitor into radiator, fill system with clean, fresh water and install radiator cap. Start engine at a fast idle, using radiator cover, if necessary, to bring engine operating temperature to at least 180 deg Fahrenheit. Continue to operate engine for at least ten minutes. Remove radiator cap, open radiator and cylinder block drain cocks and allow system to drain completely.

5-52. FLUSH SYSTEM. Close radiator and cylinder block drain cocks. Fill system with clean, fresh water (soft, if possible) and install radiator cap. Start engine and operate at a fast idle, using radiator cover as necessary to bring engine operating temperature to at least 180 deg Fahrenheit. Continue to operate engine for at least five minutes. Remove radiator cap, open radiator and cylinder block drain cocks and allow system to drain. If water is discolored to any extent, repeat this flushing operation.

CAUTION

Do not flush system by inserting a hose in the radiator with the engine running and drain cocks open. This procedure will close the thermostat and stop circulation of coolant through the engine.

5-53. CLEANING RADIATOR. Clean the radiator cap by spraying a stream of water (hot, if possible) through the holes in the valve cage while moving the valve up and down with a pencil or a blunt wooden instrument. Clean out dirt, trash and insects imbedded in the air passages of the radiator, using compressed air or a stream of water. Do not use steam.

CAUTION

Do not hold air or water hose too close to radiator or use too great a pressure as damage to the radiator may result. Clean out any stoppage in drain cocks with a soft wire.

5-54. FILL 'SYSTEM. Close radiator and cylinder block drain cocks. Fill system to suit climate conditions as follows: If the prevailing temperature is above 32. deg Fahrenheit, partially fill the system with clean, fresh water (soft, if possible). Add corrosion inhibitor compound and fill system with water until coolant is evident at radiator opening. If there is a possibility that temperatures below 32 deg Fahrenheit will be encountered, pour about one gallon of water into the radiator and add anti-freeze as required to safeguard cooling system freezing at lowest expected temperature (See Figure 5-3). Fill with water to level of filler neck, install radiator cap, start engine and operate at fast idle until temperature gauge shows normal operating temperature. Stop engine and check coolant level. Add water, if necessary.

LOWEST ANTICIPATED TEMPERATURE (FAHRENHEIT)	ETHYLENE GLYCOL (QTS.)
+30	1
+20	2
+10	3
0	4
-10	5
-20	5 1/2
-30	6

Figure 5-3. Anti-freeze Requirements

5-55. LEAKAGE TESTS. Air in the cooling system or exhaust gas leaking into the system, causes rapid corrosion and rust formations which will eventually clog the system and cause overheating and loss of coolant. Air may be drawn into the system due to low liquid level in the radiator, leaky water pump or loose fittings. Exhaust may be blown into the cooling system, past the cylinder head gasket or through cracks in the cylinder head and crankcase.

a. Air suction test. Bring level of coolant to maximum capacity in radiator. Drain out one and one-half pints of coolant to prevent overflow during test. Be sure radiator cap is in good condition and will make an air-tight seal. Attach a length of rubber tubing to the end of the overflow tube, being certain the connection is air-tight. Operate engine until temperature gauge stops rising and remains stationary. Without changing engine speed, put end of rubber tube in bottle of water. Be sure there are no kinks or sharp bends to restrict air flow. Watch for air bubbles in the water as an indication that air is entering the cooling system. Correct the condition by tightening cylinder head screw assemblies, water pump mounting bolts, hose clamps and all fittings. Replace all hose that is cracked, swollen or otherwise deteriorated.

b. Gas leakage test. Start test with a cold engine. Remove thermostat and reinstall thermostat housing without thermostat or water outlet hose. Add water to level of housing outlet. Disconnect drive belt from fan and water pump pulley. Start engine, accelerate several times and watch for bubbles in thermostat housing. The appearance of bubbles or the sudden rise of liquid when accelerating is evidence of exhaust gas leakage into cooling system. Make test quickly before coolant reaches boiling point as steam will give misleading results. Correct the condition by replacing cylinder head gasket and repeat test. If leakage is still evident, a cracked cylinder head, requiring a major engine overhaul, is indicated. Install thermostat and connect radiator hose. Fill radiator. Install and adjust fan and alternator drive belt.

5-56. RUST PREVENTIVES. The cooling system must be free of rust and scale to maintain efficiency of the system. The use of corrosion inhibitor compound reduces or prevents corrosion of metals and prevents formation of scale. Inhibitors are not cleaners and do not remove rust or scale already formed. Treating the cooling system with the inhibitor consists of adding the compound to the coolant. The inhibitor should be renewed periodically, especially if the system has been cleaned or flushed.

5-57. FAN BELT ADJUSTMENT. Loosen the two cap screws attaching generator to the mounting bracket. Loosen the cap screw attaching generator to the adjusting arm and move generator either away from or toward the engine as necessary to obtain correct belt tension. A light pressure applied to the belt mid-way between the generator and water pump must produce a one-inch belt deflection. When properly adjusted tighten the cap screw attaching generator to the adjusting arm and then tighten the two cap screws between generator and mounting bracket.

5-58. IGNITION SYSTEM.

5-59. IGNITION TIMING. Ignition timing requires adjustment of the distributor assembly so that high voltage impulses are delivered to the spark plugs in proper time relation to piston position. Efficient operation of the engine requires that a spark be produced in the combustion chamber when the piston is in top dead center on the compression stroke. Timing is checked by means of a timing hole through the bellhousing for

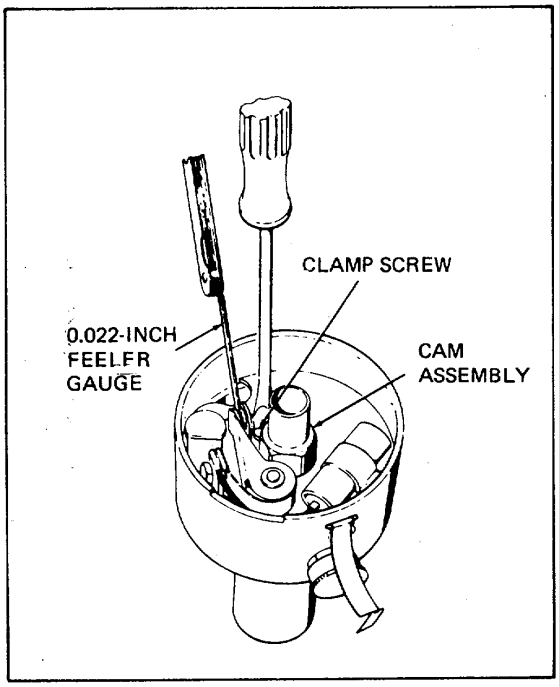


Figure 5-4. Contact Gap Adjustment

spotting the engine. When the dead center mark on the flywheel lines up with the mark across the center of the hole in the bellhousing, the pistons for No. 1 and No. 6 cylinder are in top dead center position.

a. The first step in setting or checking the ignition timing is to locate the dead center mark and line it up with the mark on the bellhousing. To determine whether the engine is in firing position for No. 1 or No. 6, the engine can be cranked with spark plugs removed to determine the compression stroke of one of these cylinders or the valve cover assembly can be removed and the position of valves noted. If both tappets for No. 1 cylinder are clear, indicating that the valves are closed and exhaust on No. 6 is not completely closed, this will indicate firing position for No. 1 cylinder.

b. To check accurately the exact point of contact opening, use a test light. Connect the test light in series with primary circuit (when ignition switch is on). The test light will be lighted when ignition contacts are closed and not lighted when contacts are open.

c. To change ignition timing, loosen screw holding advance arm to distributor and turn distributor until correct timing is obtained and then tighten screw. Clockwise rotation will advance spark and counter-clockwise rotation will retard it. If distributor is being retimed after having been removed, it is necessary to see if distributor lines up with distributor cap segment connected to No. 1 cylinder and that the remaining ones are connected in the firing order of 1-5-3-6-24.

5-60. DISTRIBUTOR ADJUSTMENTS.

a. Contact gap adjustment (See Figure 5-4). The contact point opening must be set to specification. Points set too close tend to burn and pit rapidly. Points with excessive separation tend to cause a weak spark at high speed. Rotate breaker cam until breaker lever rubbing block is on the high point of the cam lobe, thus giving the maximum point opening. Loosen the clamp screw, holding the contact support and adjust point opening by turning screw on contact support. Contact opening should be 0.022 inch. Tighten clamp screw and check with feeler gauge again. The cam angle of the distributor is 31 deg to 37 deg.

NOTE

The contact points should be cleaned before adjusting if they have been in service.

b. Contact point pressure check. Contact point pressure must fall within the limits given. Weak tension will cause point chatter and ignition miss at high speed, while excessive tension will cause undue wear of contact points and cam. Check the contact point pressure with a tension gauge calibrated to indicate ounces of pull, as shown in Figure 5-5. The amount of pull required to open the gap must be between 17 to 21 ounces. Replace the contact support arm if it is not within these limits.

5-61. SPARK PLUG SERVICING.

a. Clean spark plugs with standard spark plug cleaning equipment. If the electrodes are excessively burned, install new spark plugs. Tighten to 30 foot-pounds torque.

b. Using a round feeler gauge, check for proper gap between the spark plug electrodes. Adjust the gap to 0.030 inch by bending the side electrode only.

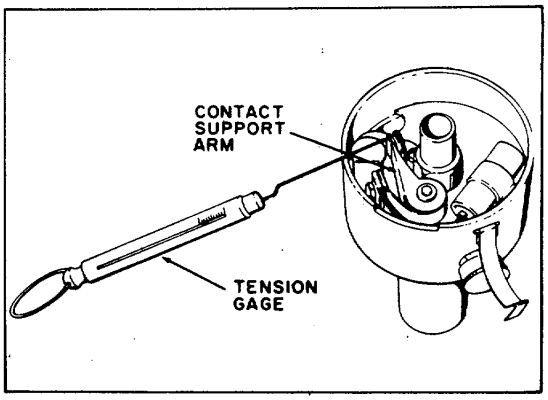


Figure 5-5. Contact Point Pressure Check

5-62. STARTING AND CHARGING SYSTEM.

5-63. STARTING MOTOR INSPECTION AND CLEANING. Remove the commutator end cover. Inspect the commutator for dirty condition, roughness, high spots and high mica. If the commutator is dirty, remove the brushes and carefully clean the commutator with a commutator stone. Blow out dust with compressed air and replace brushes in their original brush holders. If the commutator is rough, out-of-round or has high mica, replace the starting motor.

5-64. STARTING MOTOR BRUSH INSPECTION. Inspect brushes and replace if they are excessively worn or oil soaked. Brush spring tension should be checked with a spring scale. To check the tension of brush spring, hook scale 'under the brush spring near the brush and pull on a line parallel with the side of the brush. Take the reading just as the spring leaves the brush. Spring tension should be 35 ounces. If the spring tension is too low, there will be a loss of efficiency due to poor brush contact. If tension is too great, the commutator and brushes will wear excessively and have short life. It is, therefore, important the brush spring tension be kept within the limits specified. To adjust spring tension, twist the spring at holder with a long-nosed pliers.

5-65. GENERATOR REMOVAL.

a. Disconnect and tag leads at generator lead terminals. (See figure 5-6).

b. Remove adjustment screw, nut and washer at strap.

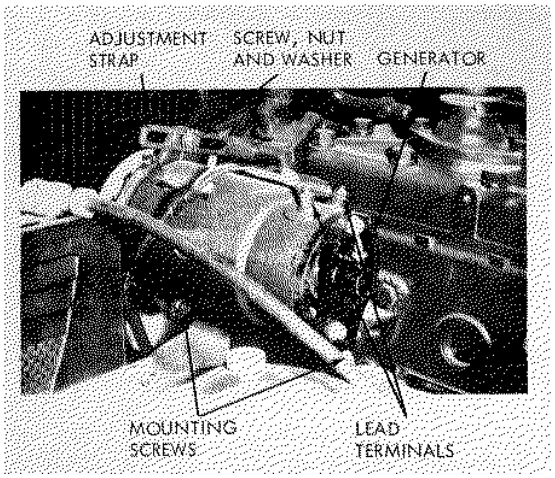


Figure 5-6. Generator, Installed

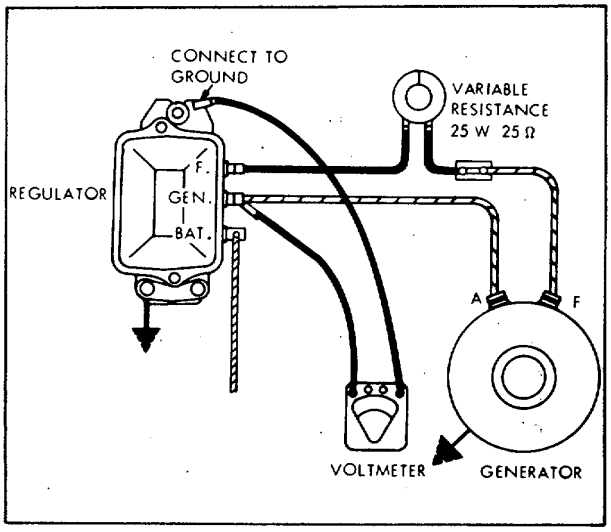


Figure 5-7. Cutout Relay Test Setup

c. Remove mounting screws at underside of generator. Disengage generator from fan belt and remove generator.

5-66. GENERATOR INSTALLATION.

a. Reverse para 5-65 above, tightening generator belt to 1/2-inch deflection under thumb pressure, midway in long span.

b. Repolarize generator, after all electrical connections have been made, by briefly shorting together the BAT and GEN terminals of the generator regulator with a jumper wire, or a screwdriver blade, just long enough to cause a spark.

5-67. GENERATOR REGULATOR TESTING.

a. Cutout Relay Test.

(1) Disconnect lead at regulator F terminal and connect 0.25 ohm 25 watt variable resistor in series with F terminal and lead (Fig. 5-7).

(2) Connect voltmeter from GEN terminal to ground on frame. Remove regulator cover and operate engine at fast idle.

(3) Increase field resistance until cutout relay opens, then decrease it until points close. Observe voltage at which points close (refer to Table 2-1). Perform step b. below next.

b. Voltage Regulator Test.

(1) Disconnect battery lead from BAT terminal (fig. 5-8) of regulator and connect 1-1/2 ohm 25 (or more) watt resistor between the BAT terminal and ground on frame.

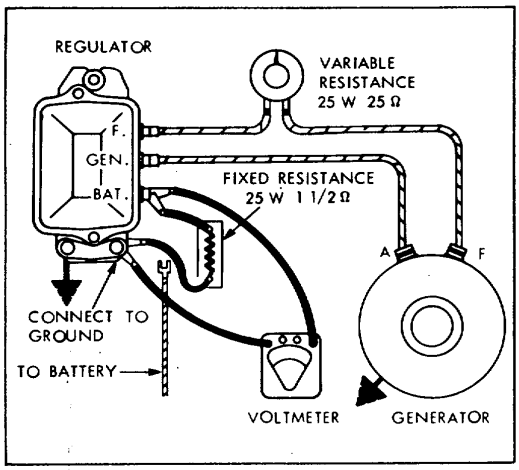


Figure 5-8. Voltage Regulator Test Setup

(2) Move voltmeter lead from GEN to BAT terminal. Operate generator at charging speed for 15 minutes.

NOTE

Disregard amount of current flowing during this test: however, it is important that the ignition be the only electrical load on the system at this time.

(3) Cycle the generator with the variable resistor, to a 4 volt reading at the GEN terminal, then cut out the resistor and note voltage reading at the BAT terminal. Compare with values in Table 2-1.

c. Current Regulator Test.

(1) Connect ammeter into charging circuit, as in figure 5-9.

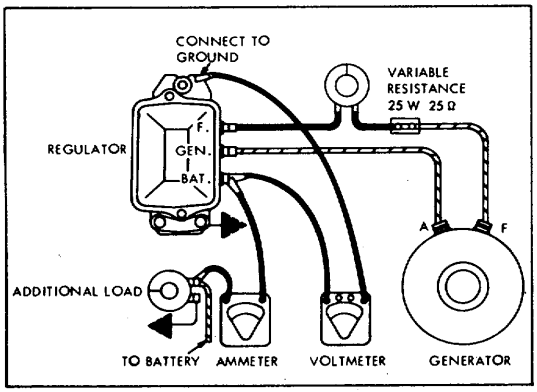


Figure 5-9. Current Regulator Test Setup

(2) Turn on all accessory load (lights) and connect an additional load across the battery (such as a carbon pile or bank of lights) so as to drop the system voltage approximately one volt below the voltage regulator setting.

(3) Operate generator at specified speed for 15 minutes with cover in place. (This stabilizes operating temperature.)

(4) Cycle generator with variable resistor and note current setting.

5-68. GENERATOR REGULATOR REPLACEMENT.

a. Removal.

(1) Disconnect and tag leads at BAT, GEN and F terminals of regulator (fig. 5-10).

CAUTION

Lead at BAT terminal is a hot lead. Do not let it contact the vehicle frame.

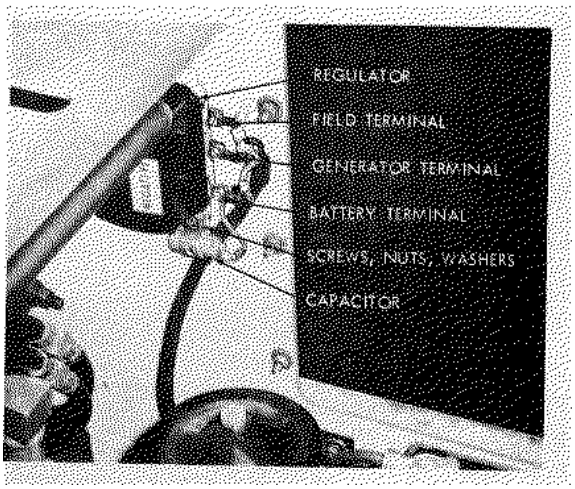


Figure 5-10. Regulator, Installed

(2) Remove three holddown screws, nuts and washers, and remove regulator and radio suppression capacitor.

b. Installation. Reverse procedure in a. above, connecting capacitor lead to the regulator BAT terminal.

5-69. BATTERY SERVICING.

5-70. SPECIFIC GRAVITY TEST. Specific gravity testing of the battery electrolyte determines the state of charge in each battery cell. Use a hydrometer and thermometer, correcting the hydrometer reading for temperature. A corrected specific gravity reading of 1.275 in each cell

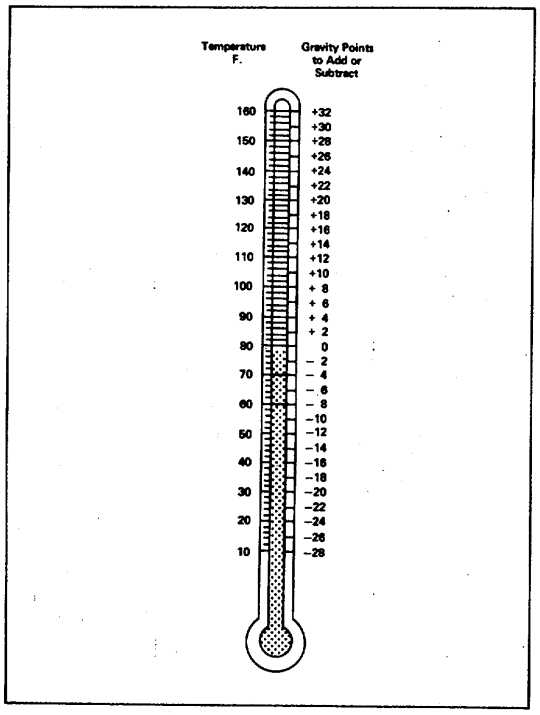


Figure 5-11. Battery Test

indicates a fully charged battery. A specific gravity reading of 1.220 or less in each cell indicates that the battery must be recharged or replaced.

NOTE

A temperature-corrected specific gravity measurement is obtained by adding 0.004 to the actual hydrometer reading for each 10 deg F the electrolyte is above 80 deg F or subtracting 0.004 from the actual hydrometer reading for each 10 deg F the electrolyte is below 80 deg F, as shown in figure 5-11.

5-71. ADDING WATER TO BATTERY. The water in the battery electrolyte solution evaporates at high temperatures or with excessive charging rates. Inspect the electrolyte level and add distilled water when necessary to bring electrolyte level to 3/4 inch above the plate separators.

5-72. BATTERY CLEANING. The top of the battery must be kept clean. Tighten vent plugs and clean battery with a brush dipped in an alkaline solution such as ammonia or a solution of bicarbonate of soda and water. If terminals and cable clamps are corroded, disconnect cables and clean in same manner as battery.

5-73. STEERING SYSTEM.

5-74. STEERING LINKAGE ADJUSTMENT (FIGURE 5-12).

a. Assemble ball joint (1) on the cylinder so that the thread engagement is approximately 1-1/2 inches.

b. When performing adjustments in c. and d. below, there should be no restraint on the cylinder or pitman arm due to stops on trailing axle. To insure this, ball joint (2) should be removed from the steering axle bellcrank, but should be maintained in line with the hole in the bellcrank.

c. With drag link (3) in place, turn steering wheel full right with stop screw (4) backed off. Remove ball joint (5) from pitman arm and pull drag link until the cylinder (6) is at the end of stroke. Adjust ball joint and temporarily assemble in pitman arm. Turn stop screw until it touches pitman arm. Disconnect ball joint from pitman arm and then three turns counterclockwise to increase drag link length. Assemble to pitman arm. Back off pitman arm with steering wheel, turn stop screw one additional turn and lock in position with locknut.

d. Turn steering wheel full left with stop screw (7) backed off until steering cylinder has extended 11-1/2 inches from adjusted position for right turn, as in c. above. Bring stop screw in contact with pitman arm and lock in place with lock nut.

e. Adjust rod (8) so that equal angles of steering wheels are obtained when steering wheel is turned from full right to full left. Major adjustment of rod (8) length must be made using only ball joint (2) while rod is threader into cylinder to make dimension 12-3/4 inches. Final adjustment may be made by turning rod (8) with ball joint (2) assembled in bellcrank. Do not turn rod more than one turn in either direction or the thread engagement will be below minimum required.

f. Before final clamping of rod (8), position cylinder as shown.

NOTE

After final adjustment, the entire linkage and wheels must be stopped only on the pitman arm stop screws (4 and 7). Cylinder should have approximately 1/4 inch of stroke left at full right or full left turn.

5-75. SERVICE BRAKE SYSTEM SERVICING.

5-76. WHEEL BRAKE ADJUSTMENT. Since the wheel brakes used on the trucks are self-adjusting, no manual adjustment is required for the life of the brake linings. However, two hexagon loads extend through each backing from the adjusting cams. If the drums are worn from long service, to the extent that they cannot be readily removed

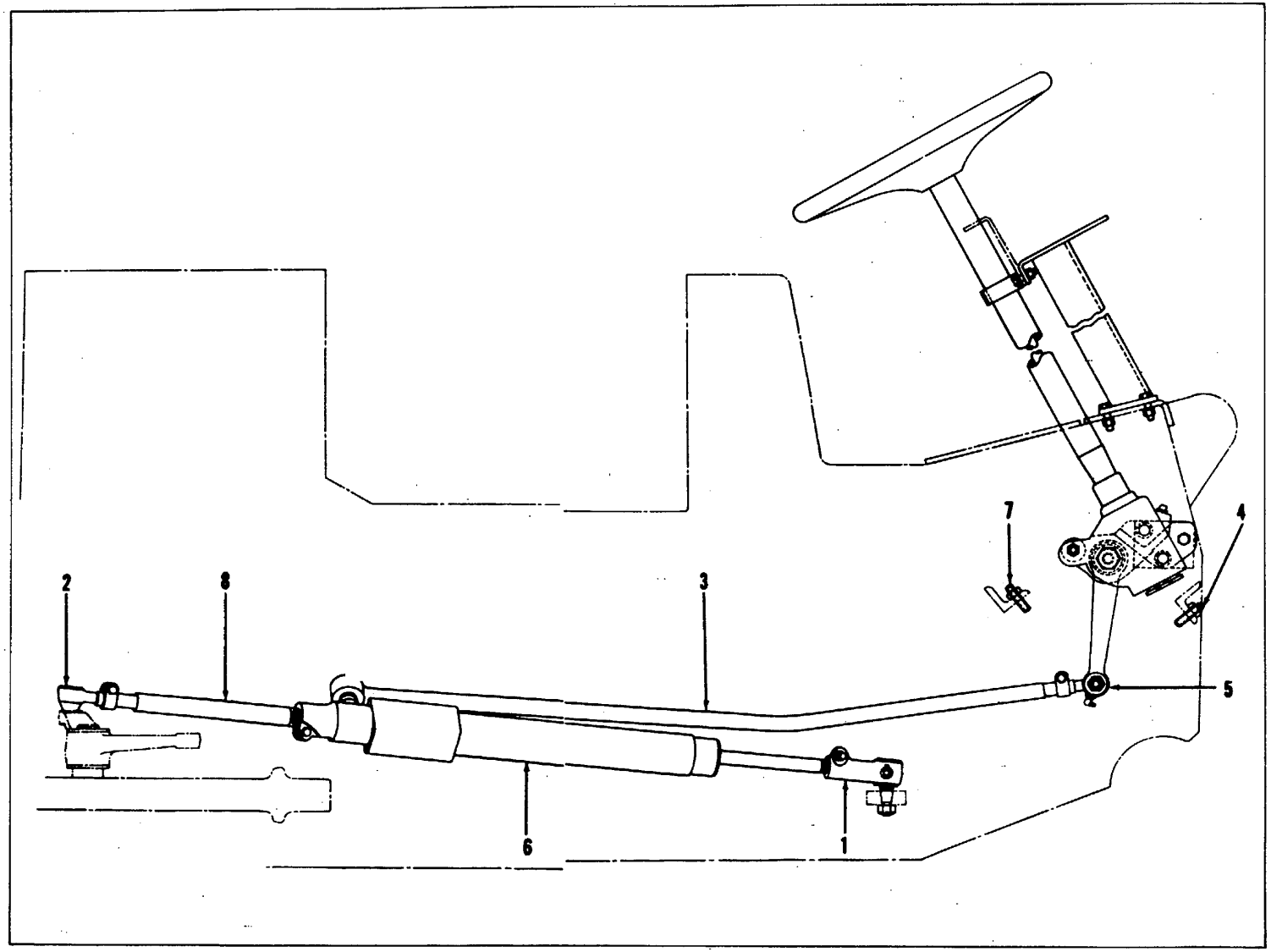


Figure 5-12. Steering Linkage Adjustment

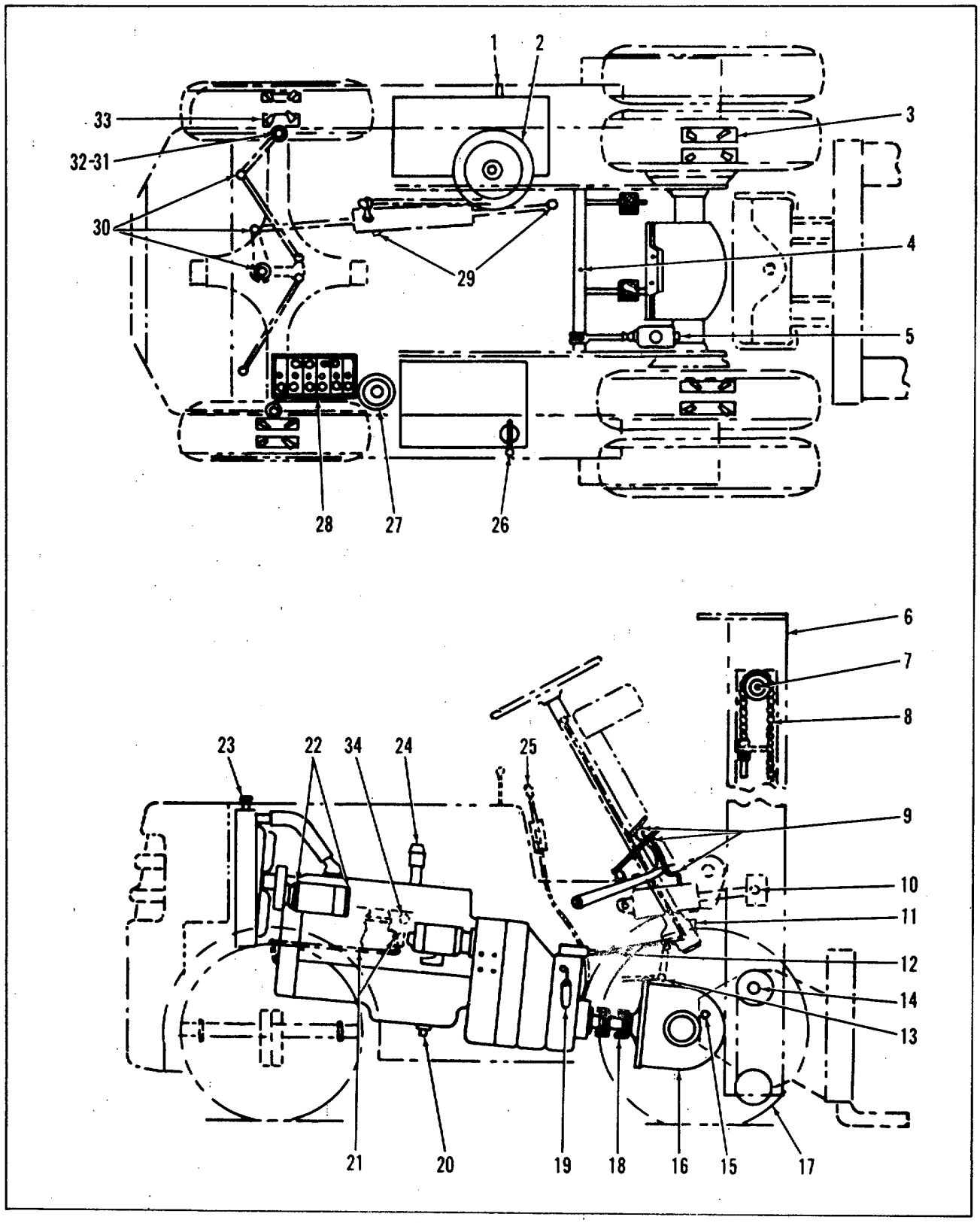


Figure 5-13. Lubrication Chart (Sheet 1 of 3)

SERVICE KEY

C = CHANGE X = SERVICE O = INSPECT

ITEM NO.		500 HRS	250 HRS	50 HRS	10 HRS	QUANTITY REQUIRED	LUBRICANT
1	HYDRAULIC SYSTEM	C		(X)		9.4 GALS	OE 10
2	AIR CLEANER		X			1 QT	OE
3	WHEEL BEARINGS (PER 1000 HRS)					NONE	GAA
4	NOT USED		X			HAND GUN	GAA
5	MASTER BRAKE CYLINDER			(X)		FILL	HB
6	UPRIGHTS (MATING SIDES)		X			HAND BRUSH	GAA
7	CROSSHEAD (2)		X			HAND GUN	GAA
8	CHAIN (BRUSH CLEAN)		X			HAND BRUSH	OE
9	BRAKE AND ACCELERATOR PIVOTS		X			HAND OIL	OE
10	TILT CYLINDER (4)		X			HAND GUN	GAA
11	STEERING GEAR		(X)			FILL	GAA
12	GEAR SHIFT LINKAGE		X			HAND OIL	OE
13	PITMAN ARM		X			HAND GUN	GAA
14	CARRIAGE ROLLERS (4)		X			HAND PACK	GAA
15	TILT PIVOT (2)		X			HAND GUN	GAA
16	POWER AXLE	C	O			11 PTS	GO
17	TIRES (ALL WHEELS)				(X)	85 PSI	AIR
18	PROPELLER SHAFT (2)		X			HAND GUN	GAA
19	TRANSMISSION		C	(X)		10 QTS	OE 10
20	ENGINE		C		(X)	5 QTS	OE
21	CARBURETOR AND GOVERNOR LINKAGE		X			HAND LUBE	OE
22	GENERATOR	X				HAND LUBE	OE
23	RADIATOR				(X)	13 QTS	W OR AF
24	DISTRIBUTOR CAM, ROTOR AND SHAFT		X			HAND LUBE	OE
25	PARKING BRAKE AND CABLE (5)		X			HAND LUBE	OE
26	GASOLINE TANK				X	10.4 GALS	GAS
27	OIL FILTER CARTRIDGE		C			1 QT	OE
28	BATTERY				(X)	FILL	DW
29	POWER STEERING CYLINDER (2)		X			HAND GUN	GAA
30	STEERING LINKAGE AND BELLCRANK (6)		X			HAND GUN	GAA
31	SPINDLE PIN (4)		X			HAND GUN	GAA
32	SPINDLE PIN THRUST BEARING	X				REPACK	GAA
33	WHEEL BEARINGS	X				REPACK	GAA
34	CRANKCASE VENTILATING VALVE		X			REMOVE & CLEAN	

NOTE: NUMBERS IN PARENTHESES INDICATE NUMBER OF LUBRICATION POINTS.

Figure 5-13. Lubrication Chart (Sheet 2 of 3)

KEY					
LUBRICANTS	Capacity	EXPECTED TEMPERATURES			INTERVALS
		Above +32 F	+40 to -10 F	0 F to -65 F	
OE - LUBRICATING OIL, Internal combustion engine.		OE 30	OE 10	OES	Intervals given are in hours of normal operation.
TORQUE CONVERTER & TRANSMISSION		OE 10	OE 10	OES	
GO - LUBRICATING OIL, Gear.		GO 90	GO 90	GOS	
HB - HYDRAULIC FLUID, Nonpetroleum.		HB	HB	HBA	
GAA - GREASE, Automotive & Artillery (All Temperature). OES - LUBRICATING OIL, Internal Combustion Engine (Sub-Zero). GOS - LUBRICATING OIL, Gear (Sub-Zero). HBA - HYDRAULIC FLUID, Nonpetroleum, Automotive (Arctic Type). AF - ANTI-FREEZE DW - DISTILLED WATER W - WATER					

Figure 5-13. Lubrication Chart (Sheet 3 of 3)

from the foundation brake for service, turn these cams as necessary to back off the adjustment. The drums can then easily be removed.

5-77. BLEEDING SERVICE BRAKE SYSTEM. The hydraulic brake system must be bled to expel air that enters when the lines have been broken or disconnected. The need is generally indicated by springy or spongy brake pedal action. Two men are required to bleed the system. One to maintain a constant supply of fluid in the master cylinder and to pump the brake pedals. The other man is necessary to perform the bleeding operation.

a. Remove filler plug from master cylinder and fill with hydraulic brake fluid.

b. Clean the bleeder screws. Attach one end of bleeder hose to bleeder screw and place other end of hose in clean container partially filled with hydraulic brake fluid. Be sure end of hose is submerged in the hydraulic fluid.

c. Turn bleeder screw counter-clockwise three-quarters of a turn. Apply a steady pressure to the brake pedal. Hydraulic fluid containing air bubbles should be forced through the bleeder hose into container.

d. Maintain the fluid level in master cylinder and continue to operate brake pedal until the fluid flows in a steady solid stream without air bubbles. Close bleeder screw by turning in clockwise direction. Remove bleeder hose.

e. Repeat the bleeding procedure at the other wheel, replenishing brake fluid supply in master cylinder before each wheel cylinder is bled. Replace filler plug in master cylinder.

CAUTION

Hydraulic brake fluid bled from the brake system must not be reused.

5-78. LUBRICATION.

5-79. The lubrication chart (Figure 5-13) for the fork lift truck includes information pertaining to the type of lubricant, lubricating time interval and location of lubricating points. The service intervals specified in the lubrication chart are for normal operation where moderate temperature, humidity and atmospheric conditions prevail. Reduce the service intervals when operating the truck under unusual conditions to compensate for abnormal or extreme conditions.

NOTE

For breaking in a new or reconditioned engine, an SAE 30 non-detergent oil is recommended for the first 40 hours of engine operation. Vehicles are shipped from the factory with a break-in oil which should be changed after 40 hours of operation.

5-80. AIR CLEANER. The air cleaner on this vehicle prolongs the life of the engine by preventing dirt and grit from being drawn through carburetor and manifold into the engine and causing excessive wear. The air cleaner

is an oil-bath type. Proper attention and regular maintenance of the air cleaner is important to engine life.

5-81. SERVICING. (EVERY 40 HOURS OR OFTENER DEPENDING ON ATMOSPHERE)

a. Remove filter from vehicle. Pour off dirty oil and clean entire filter and element in kerosene. Refill filter to proper level with SAE 30 engine oil and reinstall on vehicle.

b. Frequency of air cleaner servicing is dependent on vehicle operating conditions; however, the minimum servicing should be at least as described above. In dusty operations, more frequent cleaning is necessary. Under extreme dusty conditions, it may be necessary to service air cleaner once or twice daily. In some abnormal dusty conditions, a pre-cleaner may be necessary to insure engine life.

c. Make certain that when servicing air cleaner, hose (clamps are checked for tightness and hoses inspected for holes.

5-82. TROUBLE-SHOOTING.

5-83. The following pages contain trouble-shooting information concerning troubles that may be encountered on the fork lift truck. Each symptom is followed by a listing of possible causes and suggested remedies. To isolate the possible cause, proceed in a systematic manner to determine the faulty component. These paragraphs do not cover all possible troubles or deficiencies that may occur under the conditions of operation.

TROUBLE	PROBABLE CAUSE	REMEDY
5-84. ENGINE.		
a. Engine will not turn	1. Defective battery	Replace or charge.
	2. Loose terminals	Clean and tighten.
	3. Damaged or defective cables	Replace cables.
	4. Defective starter switch	Replace switch.
	5. Defective starter motor	Overhaul starter motor.
	6. Incorrect oil viscosity grade.	Drain and refill with proper
	7. Mechanical seizure of parts	Replace parts.
	8. Defective neutral safety switch	Replace switch’
b. Starting motor turns but engine will not	1. Stripped starter drive	Replace starter motor.
	2. Stripped flywheel ring gear	Replace ring gear.
c. Engine turns but will not start	1. Starting operation overlooked	See starting operation
	2. Defective coil	Replace coil.
	3. Defective condenser	Replace condenser.
	4. Defective points	Replace points.
	5. Defective rotor	Replace rotor.
	6. Ignition switch	Replace ignition switch.
	7. Defective spark plugs	Replace spark plugs.
	8. Defective spark plug cables	Replace cables.
	9. Weak battery	Replace or charge.
	10. Damaged battery cables or ground strap.	Replace cables.
	11. Loose or corroded battery terminals or connections.	Clean and tighten.
	12. Loose connections on ignition switch.	Clean and tighten.
	13. Improper distributor timing	Time distributor properly.
	14. Improper valve timing	Adjust tappets.
	15. Loose fuel line	Tighten fittings.
	16. Plugged fuel line	Disconnect and clean.
	17. Clogged fuel filter	Remove and clean.
	18. Lack of fuel	Fill fuel tank.

TROUBLE	PROBABLE CAUSE	REMEDY
d. Engine sluggish, misses, 'backfires.	1. Defective spark plugs.	Replace, or clean and regap plugs, tighten properly.
	2. Spark plug wires off, faulty or misplaced.	Replace wires.
	3. Spark plug gaskets broken or not seating.	Replace gasket. (Clean plug well)
	4. Spark plugs not tightened properly.	Tighten properly.
	5. Breaker points dirty or improper gap.	Dress, clean and regap points.
	6. Distributor rotor corroded, pitted, dirty.	Clean or replace rotor.
	7. Spark retarded.	Adjust distributor timing.
	8. Distributor advance not operating properly.	Clean and adjust or overhaul distributor as necessary.
	9. Worn distributor shaft.	Replace shaft.
	10. Ground strap loose or damaged.	Clean, tighten or replace strap.
	11. Weak condenser	Replace condenser.
	12. Weak coil	Replace coil.
	13. High tension cable grounded or loose.	Clean and tighten or replace cable.
	14. Low tension cable grounded or loose.	Clean and tighten or replace cable.
	15. Rich carburetor mixture.	Adjust carburetor.
	16. Lean carburetor mixture.	Adjust carburetor.
	17. Dirty or restricted air cleaner.	Clean air cleaner.
	18. Water in fuel.	Drain fuel tank.
	19. Poor grade of fuel.	Drain fuel tank and refill with proper grade.
	20. Fuel pump malfunction	Replace or overhaul fuel pump.
	21. Leak in manifold or gasket.	Tighten or replace gasket.
	22. Cylinder head loose.	Tighten head.
	23. Cylinder head warped.	Replace cylinder head.
	24. Cylinder head gasket leaking.	Tighten or replace gasket.
	25. Sticky valves.	Clean or replace valves.
	26. Valves not seating properly.	Grind valves.
	27. Valves out of adjustment.	Adjust tappets.
	28. Exhaust valve heads too thin, causing hot spots.	Replace valves.
	29. Weak or broken valve springs.	Replace springs.
	30. Valve timing incorrect.	Correct timing.
	31. Overheating.	Check cause and correct.
	32. Air cleaner restricted.	Clean air cleaner.
	33. Restricted exhaust.	Remove obstruction.
	34. Brakes dragging.	Adjust brakes.
e. Engine overheats.	1. Insufficient coolant.	Add coolant.
	2. Late ignition timing.	Check timing adjustment.
	3. Lean fuel-air mixture.	Adjust carburetor; check for air leaks.
	4. Improper valve timing.	Adjust valves.
	5. Thermostat defective.	Replace thermostat.
	6. Water pump not working properly.	Replace or overhaul pump.
	7. Fan not working properly.	Check fan mounting.
	8. Fan belt slipping or broken.	Adjust fan belt or replace as necessary.

TROUBLE	PROBABLE CAUSE	REMEDY
	9. Lack of oil.	Fill crankcase to proper level.
	10. Exhaust pipe restricted.	Clean and remove restriction.
f. Engine temperature too low (overcooling)	1. Defective thermostat.	Replace.
	2. Weather or climatic conditions too cold to allow thermostat to hold temperature.	Cover radiator sufficiently to bring coolant into proper range or use winter front.
g. Engine overspeeds.	1. Defective governor.	Replace or overhaul governor.
h. Engine noises.		
(1) Sharp ping.	1. Wrong ignition timing.	Adjust ignition timing.
	2. Wrong grade of fuel.	Fill tank with proper grade of fuel.
	3. Excessive carbon deposits.	Overhaul or replace engine.
(2) Sharp hollow slap when starting.	1. Worn pistons.	Overhaul or replace engine.
(3) Continuous knock timed with engine RPM	1. Loose piston pins.	Overhaul or replace engine.
	2. Loose connecting rods.	Overhaul or replace engine.
(4) Dull, heavy pounding timed with engine RPM	1. Worn or burned out main bearings.	Overhaul or replace engine.
(5) Continuous squeal or squeak.	1. Lack of lubrication at generator, water pump or distributor.	Lubricate.
(6) Intermittent squeal or squeak.	1. Loose drive belt.	Tighten belt.
i. Low oil pressure indication.	1. Insufficient oil.	Fill crankcase properly.
	2. Oil too thin.	Drain and refill with proper grade of oil.
	3. Oil line leaking.	Tighten connections or replace oil line.
	4. Pump screen clogged.	Clean or replace pump screen.
	5. Restricted oil line.	Clean or replace line.
	6. Defective pressure gauge.	Replace gauge.
	7. Oil pump defective.	Replace or overhaul oil pump.
j. Excessive oil consumption.	1. Leak in oil lines.	Tighten or replace oil lines.
	2. Leaking oil seal.	Replace seal.
	3. Defective gasket.	Replace gasket.
	4. Piston rings worn, broken or frozen.	Overhaul or replace engine.
	5. Cylinder wall worn or scored.	Overhaul or replace engine.
	6. Excessively tight crankshaft bearings.	Overhaul or replace engine.
5-85. IGNITION SYSTEM.		
a. No spark.	1. Defective breaker points.	Adjust or replace points.
	2. Defective coil.	Replace coil.
	3. Defective ignition wiring.	Test wiring; replace as necessary.

TROUBLE	PROBABLE CAUSE	REMEDY
	4. Defective high tension cables.	Test and replace cables as necessary.
	5. Defective spark plugs.	Replace plugs.
	6. Defective ignition switch.	Replace switch.
	7. Defective condenser	Replace condenser.
	8. Defective distributor cap.	Clean or replace cap as necessary.
	9. Defective rotor.	Replace rotor.
	10. Discharged battery.	Charge battery.
b. High speed miss.	1. Spark plug gap too wide.	Clean and regap or replace.
	2. Breaker points improperly adjusted.	Regap points, dress or replace as necessary.
	3. Weak condenser.	Replace condenser.
	4. Weak coil.	Replace coil.
	5. Weak spring on points.	Replace points.
c. Slow speed miss.	1. Defective breaker points.	Adjust or replace points as necessary.
	2. Spark advanced too far.	Adjust timing.
	3. Spark plug gaps too wide.	Clean and adjust or replace plugs as necessary.
	4. Fouled spark plugs.	Clean and adjust or replace plugs as necessary.
	5. Weak coil.	Replace coil.
d. Generator not charging.	1. Defective generator.	Replace or overhaul generator.
	2. Brushes not making proper contact.	Clean and adjust or replace brushes as necessary.
	3. Defective voltage regulator.	Replace regulator.
e. Generator output low or erratic.	1. Loose or worn drive belt.	Tighten or replace belt.
	2. Generator loose.	Tighten mounting screws.
f. Improper ammeter indication.	1. Battery discharged.	Check battery and charge if necessary.
	2. Loose cable connections.	Check connections at terminals of battery, ammeter, generator and voltage regulator.
	3. Defective ammeter.	Replace ammeter.
	4. Generator not operating.	Replace or overhaul generator.
	5. Defective voltage regulator.	Replace regulator.
5-86. FUEL SYSTEM.		
a. Fuel does not reach carburetor.	1. Restricted fuel lines or filter.	Clean or replace lines and filter.
	2. Loose or broken fuel lines.	Tighten or replace lines.
	3. Defective fuel pump.	Replace or overhaul pump.
b. Fuel does not reach cylinders.	1. Carburetor jets plugged.	Clean, replace, or overhaul carburetor.
	2. Fuel flow restricted.	Clean or replace lines or filter.
	3. Fuel leaks.	Tighten or replace parts as necessary.
5-87. TRANSMISSION.		
a. Lubricant leakage.	1. Loose drain plug.	Tighten plug.
	2. Defective gaskets or seals.	Replace gaskets or seals.

TROUBLE	PROBABLE CAUSE	REMEDY
b. Coolant leakage.	1. Worn or damaged hoses. 2. Loose fittings.	Replace hoses. Tighten or replace as necessary.
c. High stall speed.	1. Low oil level. 2. Low converter pressure. 3. Slipping clutch. 4. Foaming oil.	Add oil to proper level. Check converter pressure and, if low, check main regulating valve, and cooler bypass valve to see if they are in "stuck open" position. (A) Actuate other clutches to verify slipping of particular clutch being checked. (B) Observe main pressure at clutch lines to determine if within limits. (C) Overhaul transmission. (A) Too low or too high oil level. (B) Water in oil. (C) Air leak on intake side of pump. (D) Improper oil.
d. Continuously high oil temperature.	1. Low or high oil level. 2. Foamed oil. 3. Engine cooling system inoperative. 4. Improper vehicle operation. 5. Low oil flow through converter.	Add or drain oil. Check for proper oil and whether or not air leak exists on intake side of pump. (A) Check radiator coolant level. (B) Eliminate restricted water or oil flow through cooler. Operate away from stall more frequently. Converter pressure regulator valve stuck in near closed position.
e. Slow or erratic clutch	1. Improper shift linkage arrange- ment or adjustment. 2. Low main pressure. 3. Internal oil leaks.	Free linkage and adjust. Main pressure regulator valve stuck. Clean, check springs, free up in valve bore. (A) Check other clutches. (B) Check shaft seal rings. (C) Overhaul transmission.
f. Low clutch pressures and slow engagement at idle.	1. Worn main pump. 2. Low oil level. 3. Leak on intake side of main pump.	Inspect pump and repair if worn. Add oil. Check intake line.
g. Loss of power.	1. Cold oil. 2. Parking brake on. 3. Low converter pressure.	Warm and recheck. Release parking brake. Same as "low clutch pressure" above.
h. Vehicle drives in one direction and creeps in that direction in neutral but stalls when shifted to opposite direction.	1. Failed direction clutch in direction vehicle will move.	Overhaul transmission.

TROUBLE	PROBABLE CAUSE	REMEDY
5-88. HYDRAULIC PUMP.		
a. Pump fails to start pumping.	1. Damaged pump	Replace or overhaul pump.
b. Low pump pressure	1. Hose leaks 2. Truck engine malfunction 3. Low fluid level 4. Damaged pump	Tighten or replace hoses and/or clamps as necessary. Refer to engine trouble-shooting. Add sufficient fluid or proper type. Replace pump.
c. Undue pump vibration	1. Clogged pump 2. Power take-off bearings defective 3. Loose mounting	Clean pump. Replace bearings. Tighten mounting bolts.
5-89. UPRIGHT ASSEMBLY HYDRAULIC SYSTEM.		
a. No movement of upright assembly	1. Defective hydraulic pump 2. Excessive fluid leakage 3. Truck engine malfunction	Replace or overhaul pump. Correct and replenish fluid supply. Refer to engine trouble-shooting.
b. Excessive "drift" of hoist and tilt cylinders	1. External cylinder leakage 2. Internal cylinder leakage 3. Leakage at hydraulic lines and fittings	Replace packings. Replace packings. Repair, replace or tighten loose fittings and lines.
c. Hoist cylinder will not maintain raised position with load	1. Leakage at hydraulic lines and fittings 2 Cylinder leakage	Repair, replace or tighten loose fittings and lines. Replace packings.
d, Excessive hydraulic fluid consumption	1. Excessive fluid leakage 2 Cylinder leakage 3 Defective hydraulic pump	Repair, replace or tighten loose fittings and lines. Replace packings. Replace or overhaul hydraulic pump.
e. Will not lift full rated load	1 Excessive fluid leakage 2 Low fluid level 3 Incorrect pressure relief	Check fittings, lines and cylinders, replace or tighten as necessary. Add sufficient fluid of proper type. Correct pressure.
5-90. BRAKES.		
a. Excessive pedal travel	1 Linings worn 2 Fluid low in master cylinder 3 Air in system 4 Pedals improperly adjusted	Replace brake linings. Replenish fluid and check for leaks. Bleed hydraulic system. Adjust linkage.
b. Weak braking action	1 Oil on linings 2 Incorrect lining	Replace brake linings. Replace brake linings.
c. Heavy braking action	1 Brake lining grease soaked	Replace brake linings.

TROUBLE	PROBABLE CAUSE	REMEDY
	2. Brake backing plate loose	Tighten or replace backing plate.
d. Brake releases slowly	1. Hydraulic fluid congealed 2. Master cylinder maladjusted or dirty 3. Retraction of brake shoes restricted by weak return springs or dirt.	Drain, flush and replace with proper brake fluid. Drain, clean or adjust as necessary. Clean, adjust or replace springs as necessary.
e. Truck pulls to one side	1. Brake linings grease soaked	Replace brake linings.
f. Brakes drag	1. Mineral base oil in brake system 2. Linings grease soaked	Drain and flush system, replace parts and service brake system. Replace brake linings.
5-91. STEERING.		
a. Difficult steering or wandering	1. Steering gear out of adjustment 2. Damaged drag link 3. Defective steering gear 4. Excessive leakage of fluid	Readjust steering gear. Replace drag link. Replace or overhaul steering gear. Check for leaks, correct and fill with proper fluid.
b. Fluctuating pressure	1. Faulty operation of relief valve	Flush and refill system. if condition still exists, overhaul valve assembly.
c. Loss of system pressure	1. Slippage of pump drive, other pump malfunction	Check pump, replace or overhaul pump as required
d. Cylinder piston rod	1. Cramping of linkage binding or sticking	Replace defective unit and readjust pitman arm stops.
e. Chatter conditions	1. Loose mountings or linkage 2. Relief valve set too low 3. Insufficient pump flow	Make certain all ball stud mounting and other linkage is tight. Check pitman arm stops to be certain the arm strikes the stops slightly before the steering knuckles contact the stops on the axle. Set relief valve at least 150 psi higher than normal steering requirements of the vehicle. Bleed air from system. Insufficient pump flow at idle speeds can be corrected by increasing engine idle rpm.
f. Unsatisfactory steering in either direction	1. Air in system 2. Excessive wear in steering cylinder 3. Incorrect system pressure	Replace cylinder packings. Replace or overhaul cylinder. Reset pressure.

TROUBLE	PROBABLE CAUSE	REMEDY
	4. Worn pump	Replace pump or overhaul. Check to be sure air is not entering system through poor threads, hoses, pump seals, "O" rings, gaskets and loose connections. Excessively worn cylinders result in leakage past the piston. Correct by replacing cylinder. Set relief valve at least 150 psi higher than normal steering requirements of the vehicle. Repair or replace pump.
5-92. ELECTRICAL EQUIPMENT.		
a. Lamps will not light	1. Loose connections 2. Burned out lamp 3. Defective switch 4. Blown fuse	Check connections and correct. Replace lamp. Replace switch. Replace fuse.
b. Engine hour meter does not operate	1. Defective engine hour meter 2. Loose electrical connections 3. Defective engine hour meter sending unit.	Replace hour meter. Check connections and correct. Replace sending unit.

SECTION VI

REPAIR INSTRUCTIONS

6-1. GENERAL.

6-2. This section contains instructions for repairing the major components and accessories of the truck. The need for repair or replacement of parts is determined by performing the inspections and checking the dimensions specified. If the serviceability of a worn or damaged part cannot be restored by the repair procedures specified in the following text, install a new part. The general instructions are applicable to each' assembly being repaired and/or reassembled unless otherwise specified in the text. Where repair instruction for a part or unit is not covered, the part or unit is not subject to rework and defective parts must be replaced with new ones. Where related to reassembly, checks for clearances, backlash and lubrication are included in the text.

6-3. LUBRICATION. Before installing or assembling internal metal parts, coat each part with a thin film of lubricating oil OE-10, except where such application would impair operation of the assembled unit. Such lubrication provides easier installation, reduces the possibility of damage during installation, and assures immediate lubrication of the assembly when the equipment is first started.

CAUTION

Never apply OE-10 lubricating oil to rubber parts, electrical contacts, or internal parts of the hydraulic brake system.

6-4. GASKET REPLACEMENT. Use new gaskets throughout when reassembling. Soak cork gaskets in lubricating oil OE-10, or clean, fresh water for fifteen minutes before installing. Apply approved gasket cement to one side of paper gaskets, when required.

6-5. INSTALLATION OF BEARINGS. Exercise extreme care when installing or removing ball, roller or needle bearings. Failure to comply with installation and removal procedures listed below could result in damaged bearings and consequent malfunctioning of an assembled unit.

a. Make sure bearings, bearing seats, and tools are thoroughly cleaned before attempting to install bearings.

b. Apply a thin film of lubricating oil OE-10, Military Specification MIL-L-2104, to contact surfaces of bearing and bearing seats before installation.

c. Carefully align bearing with bearing seat before installing to avoid cocked or distorted bearings.

d. Carefully press bearings into their seats with an arbor press or appropriate removing and replacing tool. Always apply pressure to the race which determines the fit when installing bearings.

e. If bearing must be tapped into its seat, use a rawhide hammer or cushion the bearing with a block of wood to prevent damage.

6-6. REPAIRING DAMAGED THREADS. If slight thread damage is found on any threaded surface, repair the threads with a tap or die of the correct size, as follows:

a. Correct internal or tapped thread damage by carefully turning the correct size tap into existing threads. Carefully remove tap and inspect threads again to see if thread damage is obvious. If so, the damage is too extensive to repair and the part must be discarded.

b. For damage to external threads, select a die of correct size and carefully turn die onto existing threads. Remove die and inspect threads. If damage is still obvious, the part must be discarded.

6-7. PAINTING.

6-8. Overhaul procedures will include painting as a necessary step in the completion of the procedure. Before the paint is applied, prepare the surface to be painted in accordance with paragraph 6-10.

6-9. **SOLVENT HANDLING**. Solvents used for removing paint are generally toxic and volatile. Avoid inhaling the vapor and take precautions to keep such compounds from coming in contact with unprotected areas of the face or body. Confine the use of such compounds to a well ventilated room, or apply out-of-doors.

CAUTION

Never use paint removing solvents from damaged or leaking containers or solvents that have been exposed to the air for long periods of time. Do not permit paint removing solvent to come in contact with bearings, rubber, insulated wires, or plastic materials as the solvent will quickly deteriorate such materials.

6-10. SURFACE PREPARATION. Painting previously painted surfaces necessitates the partial or complete removal of' the old paint before a satisfactory covering can be achieved.

a. Use paint removing solvents, abrasives, scrapers or wire brushes, as necessary, to remove old paint, dirt, and rust from the area to be painted. Wash the cleaned area with a paint thinner to remove wax deposits or abrasive particles.

b. If paint removal is not necessary, a thorough washing and degreasing job must be accomplished before paint can be applied. This can be performed by washing surfaces with soap and water, rinsing with paint thinner, and drying with compressed air.

c. In the case of new metal surfaces, wash with paint thinner and use abrasive blasting to remove remaining dirt, oil, casting sand, mill scale, slag, or other foreign material. Wash with paint thinner again after blasting.

d. Apply paint and varnish remover with a good bristle brush, stroking in one direction only. Brushing out causes rapid evaporation of the volatile solvents, thus decreasing the effectiveness of the remover.

e. Allow the remover to remain on the painted surface until the old paint begins to wrinkle and soften. After paint softens scrape or brush off.

f. Wash all traces of paint remover wax deposits from surface with paint thinner.

g. Sandblast, wire brush, or sandpaper remaining paint or rust from the surface being worked. Rinse with paint thinner.

6-11. NOT APPLICABLE.

6-12. DRIVE AXLE.

6-13. GENERAL. This assembly is a double reduction drive axle. Periodic overhaul of the entire assembly is not anticipated. Rather, service will generally be required either at those elements of the axle outboard of the differential assembly, or to the differential assembly itself. The following instructions treat each of these areas separately.

6-14. DRIVE AXLE, LESS DIFFERENTIAL. .

a. Removal and disassembly.

(1). Raise front of truck so drive wheels clear floor.

(2). Remove wheel bolts and draw dual wheel, tires and drum from drive axle.

NOTE

Removal may be easier if weight of wheel is supported by a wheeled floor jack or dolly.

(3). Disconnect brake lines from wheel cylinders, and handbrake cable at propeller shaft.

(4). Drain axle lubricant.

(5). Remove nuts, washers and tapered bushings, holding final drive gear case (Figure 6-1) to axle housing. Tap studs as necessary to separate, and remove gear case with attached parts. Axle will stay in housing.

(6). Remove and discard gasket. Remove bolts and washers, and axle shaft bearing retainer, and pull out axle shaft and ball bearing. Take retaining collar from within axle housing. If to be serviced, press bearing from axle shaft.

(7). Take cotter pin, nut and washer from end of final drive gearshaft, and remove final drive gear, final drive gearshaft, bearing cups and cones, and rollers from gear case.

(8). Remove screws and nuts to wheel adapter, and separate gearshift, adapter, oil seals and washer. Remove wheel bolts, and remove brake drum.

b. Inspection.

(1) Check oil seals for any imperfection.

(2) Examine bearing rollers, cups and cones for wear. Replace if rollers, are worn, ridged or pitted.

(3) Inspect final drive gear and axle shaft pinion for chipping cracks, or scoring.

c. Assembly and installation. Assemble and install by reversing a. above, noting the following: (1) Coat wheel bearings and oil seals with GAA before assembly.

(2). After gear, washer, and nut have been installed on final drive shaft, tighten nut until slight drag is felt when turning case. This is wheel bearing adjustment, with correct final result of no endplay, but slight bearing drag. If cotter pin will not enter hole with this adjustment, stake nut into spline slot on shaft.

6-15. DIFFERENTIAL ASSEMBLY.

a. Removal.

(1) Remove entire mast assembly as a unit, as follows:

(a) Attach a chain hoist to mast assembly (or use the forks of another lift truck), and relieve the weight of the assembly. on its supporting parts. Arrange to brace the assembly against tipping as disconnections are made. The forks are to be fully lowered at this time.

(b) Disconnect hydraulic hose from lift cylinder and cap hose and cylinder to exclude dirt.

(c) To remove tilt cylinder assembly, disconnect hoses from the tilt cylinder. Tag hoses for position and ease of reassembly.

(d) Remove four screws and washers, releasing two plates. One plate is located at the forward end of the cylinder, one upright assembly, and the other on frame assembly at rear of cylinder.

(e) Remove plates. Grasp cylinder firmly and pull shafts from their position. Lift tilt cylinder assembly from vehicle.

(f) Remove capscrews, washers and angle brackets which secure outer uprights to bearing bracket on frame and lift mast assembly from truck. Disconnect brake lines.

(2) Drain lubricant from axle. Support front end of truck so axle can be rolled free, and remove screws, washers and bearing caps, holding axle to frame. Disconnect propeller shaft from parking brake drum-y removing two screws from each top and bottom needle bearings. Raise truck front and roll axle free.

CAUTION

Support axle, when truck weight is relieved, to prevent sudden turning of the axle due to unbalance, which could cause injury to personnel.

b. Disassembly.

(1) Remove nuts, washers, and tapered bushings from studs (Figure 6-1) attaching axle and differential housings. Tap parts with a soft mallet, if necessary, to free bushings from grip on studs, for disassembly. Studs may be left in place, if not to be serviced.

(2) Remove gaskets from studs and measure the thickness removed from each side. If no new parts are needed in the differential, the same thickness of new gaskets can be installed at assembly. This will eliminate the need for certain ring and pinion adjustments. Take differential bearing cup from bore of axle housing, and keep it with cone and rollers with which it was used.

(3) Remove cotter pin and nut holding parking brake drum to pinion (Figure 6-8). Remove drum and key from pinion. Remove screws and washers, and take off seal and retainer, parking brake bracket with brake assembly attached, and gasket. Remove cover screws and washers, and take off cover with pinion and spacer gaskets. Press pinion from cover. Measure gaskets before discarding, as in (2) above.

(4) Take remainder of differential assembly from housing. Pull differential side bearings from case halves, if they are to be replaced. Remove bearings from pinion, if they are to be replaced.

(5) Remove screws holding differential case halves together and separate case halves. Remove spider, gears, spring washers and thrust washers.

(6) If necessary to replace ring gear, center punch each rivet, drill a pilot hole through, and drill off head of rivet from bevel end. Punch out rivet.

NOTE

Ring gear and pinion must both be replaced as a set, if one is defective.

c. Inspection.

(1) Inspect gears for wear or damage.

(2) Inspect for pitted, scored, or worn thrust faces of face halves, thrust washers, spider trunnions.

(3) Inspect spider trunnions also for looseness in differential case bores. Check for free rotation of bevel gears on spider trunnions.

d. Assembly. Assembly of the differential is essentially the reverse of the disassembly procedure in b. above, for sequence in which parts are installed. However, in the course of assembly, various checks and adjustments are to be made. Assemble by reversing the procedure in b. as appropriate, and incorporate the checks and adjustments in e. below in the assembly procedure.

NOTE

At assembly, use press where necessary. Install all new seals and gaskets. Replace ring gear and pinion as a set, if either is to be replaced. Replace thrust washers only in complete sets.

e. Assembly checks and adjustments. Three basic adjustments are to be made when the differential has been reassembled after replacement of parts. These are the

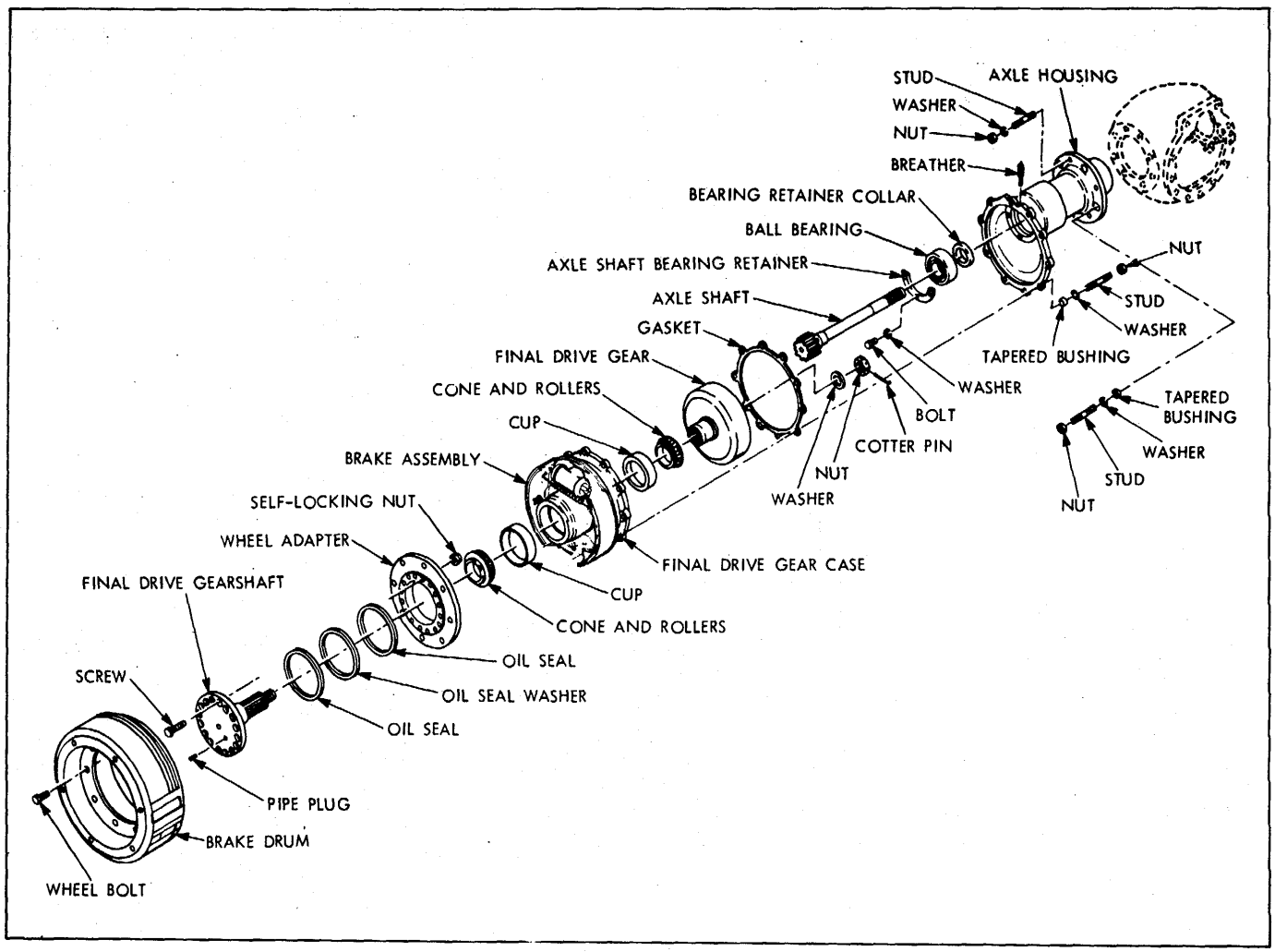


Figure 6-1. Front Axle, Exploded View

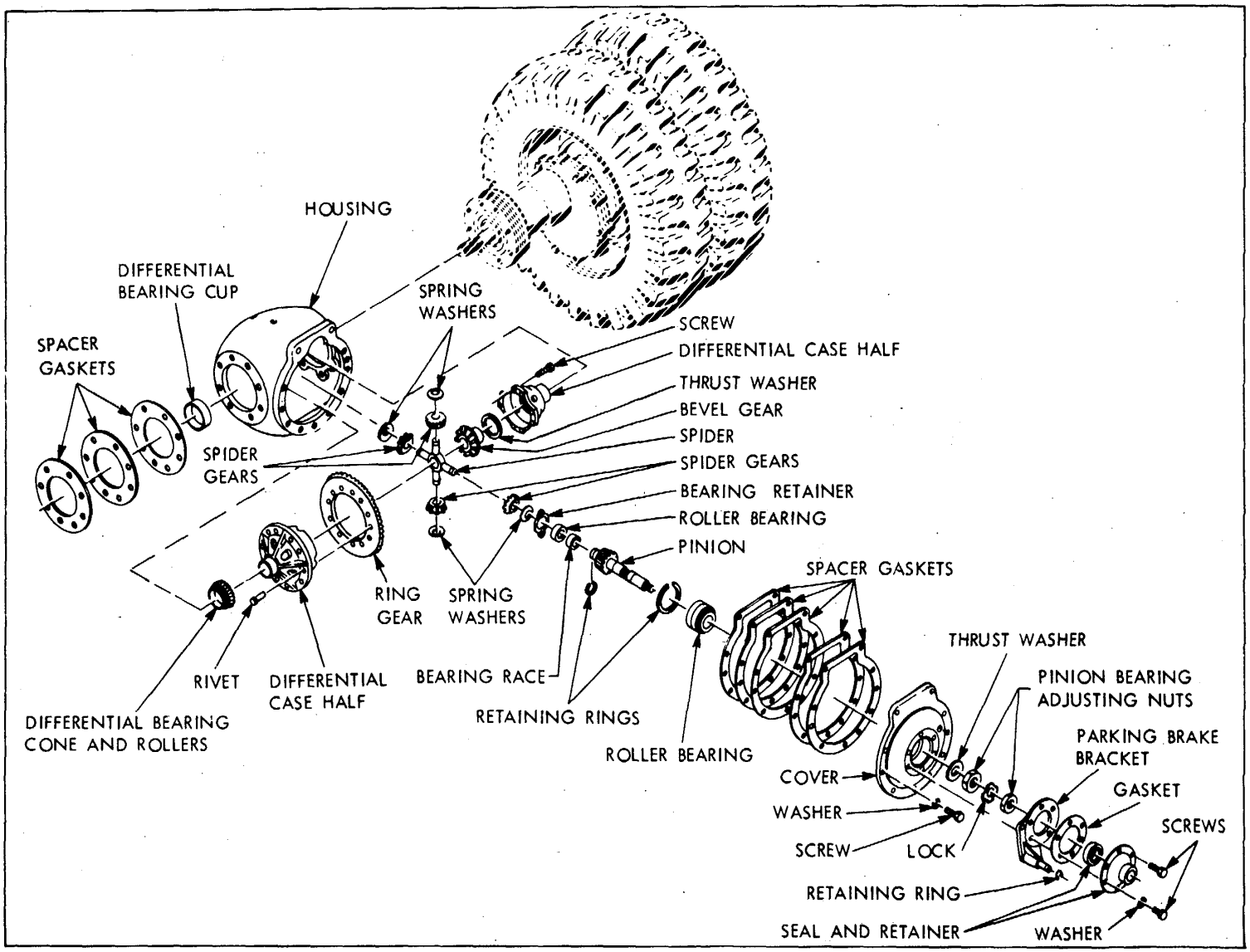


Figure 6-2. Differential, Exploded View

differential bearing preload adjustment, the ring gear and pinion backlash adjustment, and the tooth contact adjustment. Pinion backlash is to be 0. 006 to 0. 012 inch.

(1) Adjust differential bearing preload to between 0. 005 inch and 0. 008 inch as follows:

(a) With bearing cones in place, install both axle housing (Figure 6-1) to differential housing, with differential assembly installed. Use about 0. 030 inch total gaskets at each side initially.

(b) Turn ring gear by hand, testing for noticeable drag, due to preload on bearings. If no drag exists, reverse (a) above and remove gaskets one at a time and repeat test until drag is noticed. Gaskets 0. 005 inch thick and gaskets 0. 0075 inch thick are used. Decrease total gasket thickness in 0. 0025 inch steps by removing two 0. 005 inch gaskets and installing one 0. 0075 inch gasket.

(c) If drag is noticeable on first trial, reverse procedure for decreasing gasket thickness in (b) above until no drag is present, then decrease thickness to get drag. Preload is now between 0. 000 and 0. 0025 inch. Remove one more 0. 005 inch gasket to get specified preload.

(2) Adjust ring gear and pinion relationship after performing (1) above, as follows:

NOTE

Several adjustments of both pinion and ring gear setting may be necessary before the correct adjustment is achieved. It is not possible to specify the exact thickness of gaskets to be added, removed, or exchanged at any stage. This must be determined by trial and error.

(a) Apply a thin coating of oiled red lead to drive face of teeth of ring gear, and install pinion with bearing and cover assembled to differential housing. Put heavy drag on ring gear, and turn it one revolution in the forward direction by turning pinion.

(b) Remove pinion and cover, and compare contact marks made in red lead on ring gear teeth with examples shown in Figure 6-3.

NOTE

Ring gear is on left side of pinion. References to follow consider this.

(c) If marks in red lead compare with those in view A, Figure 6-3, indicating high, narrow tooth contact (pinion too far out), correct by removing one or more gaskets from under cover, and transferring one or more gaskets as indicated by the degree of adjustment needed, from left side of housing to right side.

NOTE

Do not change total thickness of axle housing gaskets used, once preload has been established. Merely exchange them from side to side to make adjustment.

(d) Repeat (a) and (b) above to check results of adjustment.

(e) If marks in red lead compare with those in view B, Figure 6-3, reverse adjustment procedure in (c) above and recheck adjustment.

(f) To correct condition shown in view C, Figure 6-3, perform (c) and (d) above.

(g) To correct condition shown in view D, Figure 6-3, reverse procedure in (c) above, and recheck adjustment.

f. Installation. Install drive axle by reversing procedure indicated in a. above.

6-16. STEERING AXLE.

a. Removal.

(1) Jack or hoist truck high enough to provide enough space in which to work. Block truck so it cannot fall after being raised.

(2) Disconnect power booster cylinder and drag link from steering axle. (Paragraphs 6-25 and 6-26).

(3) If steering axle is raised from ground, support it against falling when the attaching parts are removed in the next step. The flat retainer bars across the bottom of each neoprene axle block are now the only items holding the axle in place. Remove the two nuts, washers and screws holding each retainer bar in place and remove the retainer bars. Axle is now free of the truck when lowered.

(4) Lower axle, or hoist truck, to get clearance and roll axle from beneath truck.

b. Disassembly.

(1) Dismount complete wheel and tire assembly (paragraph 6-17).

(2) Remove small retainer plate under each king pin, take king pin out of axle from the bottom, and remove the steering knuckle at each side of the axle. Do not remove the king pin bearings from the axle unless new bearings are to be installed, but take care to keep them clean until reassembly of the axle.

(3) Remove screws, washers, support plate and axle blocks.

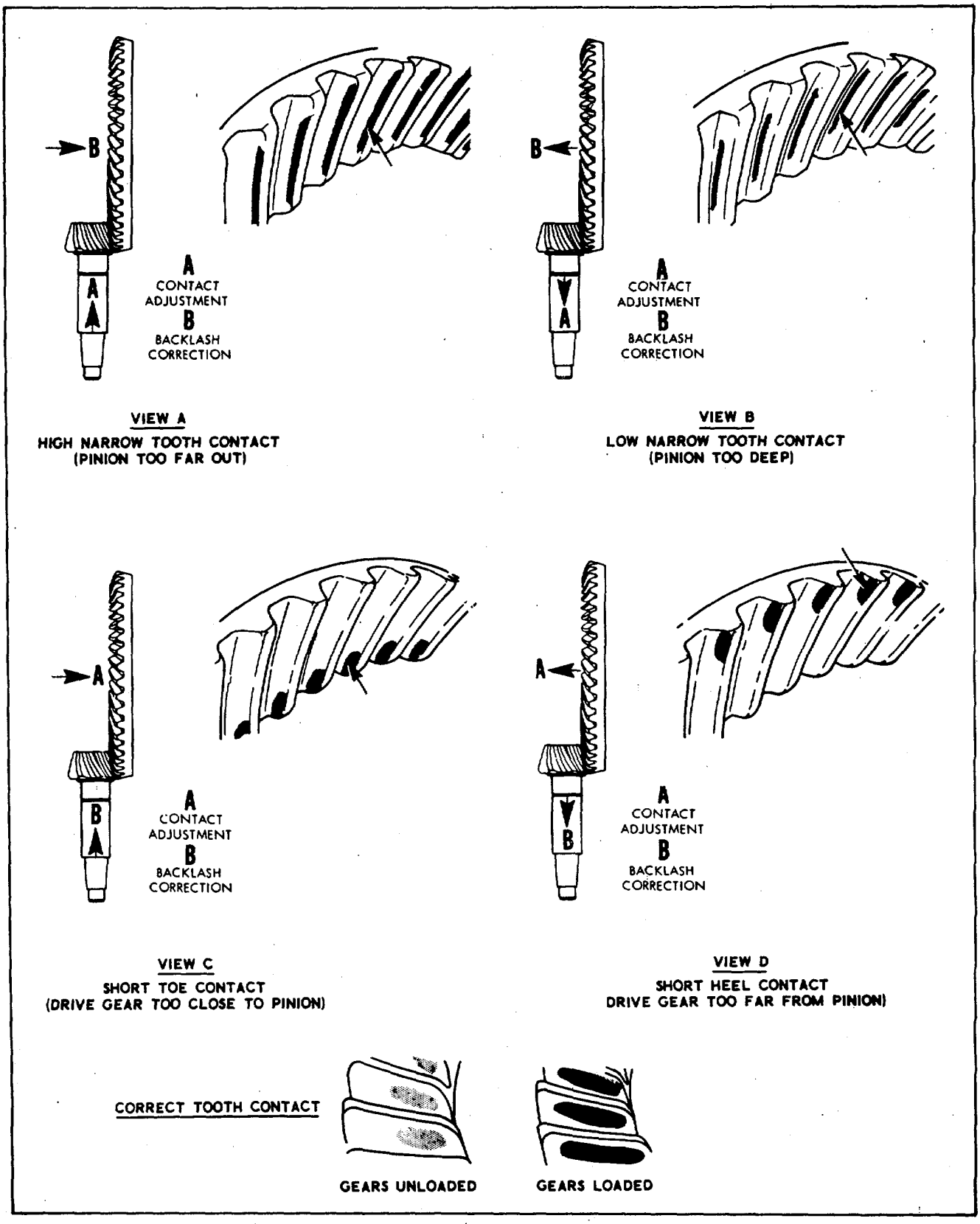


Figure 6-3. Differential Adjustment Test Indications

c. Cleaning, inspection, and repair.

(1) Clean all parts in dry-cleaning solvent (SD) except sealed bearings.

(2) Inspect threaded parts for damage. Inspect all bearings for wear. If practicable, repair damaged threads with a tap or thread chaser.

d. Assembly. Reverse procedure in b. above.

e. Installation. Reverse procedure in a. above.

f. Adjustment. Adjust tie rods, drag link and power steering cylinder reach (paragraph 6-25 and 6-26).

6-17. WHEEL ASSEMBLIES, TIRES AND TUBES.

a. Removal of drive wheels.

(1) Raise front of truck so drive wheels clear floor.

(2) Remove wheel bolts (Figure 6-1) and draw dual wheel, tires and drum from drive axle.

NOTE

Removal may be easier if weight of wheel is supported by a wheeled floor jack or dolly.

b. Installation of drive wheels. Reverse a. above.

c. Removal of rear wheels.

(1) Raise truck so rear wheels are off ground.

(2) Completely deflate tire on wheel to be removed.

(3) Remove wheel mounting nuts and draw wheel free of truck.

d. Installation of rear wheels. Reverse c. above.

e. Front (drive) tire removal.

(1) Remove drive wheel.

(2) Fully deflate tires on drive wheel removed.

(3) Remove clamp nuts and clamps and separate drum and wheel from spacer and rim and the tire assemblies (Figure 6-4).

(4) Using service equipment designed for this operation, remove rim ring from rim. Pull rim free, and remove flap and tube from tire.

f. Installation. Reverse e. above. Inflate tires to 85 psi. Rotate rim while mounting to insure that rim is square with wheel. Torque clamp nuts to 170 to 180 ft lbs.

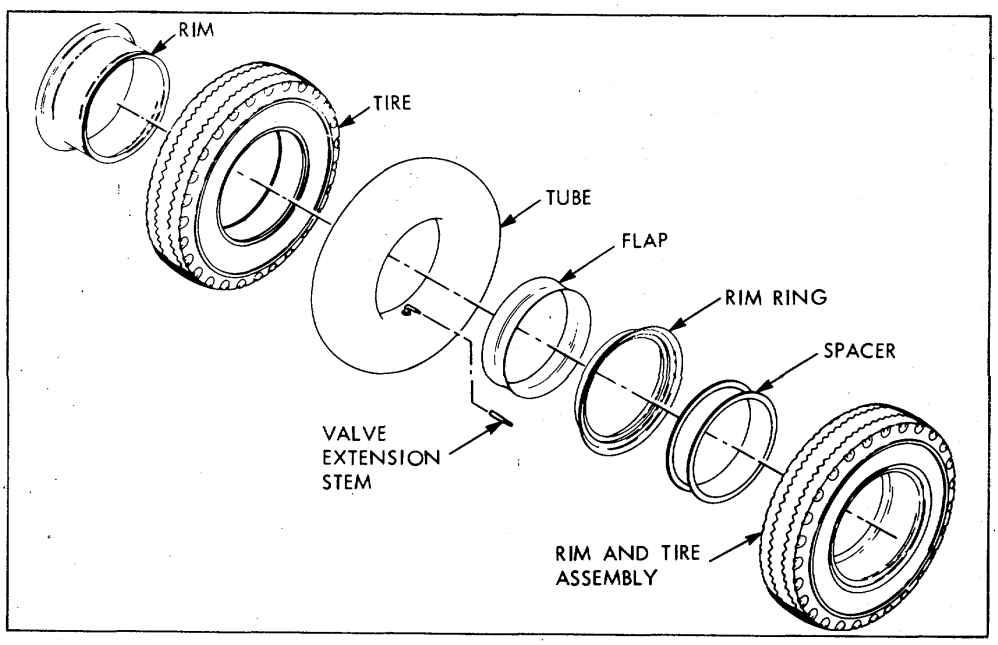


Figure 6-4. Drive Wheel Disassembly

g. Rear tire removal.

(1) Remove rear wheel.

WARNING

Be sure tire is fully deflated before proceeding with next step.

(2) Remove screws, nuts and washers (Figure 6-5) holding rim halves together, separate rim halves and remove flap, tube and tire.

h. Rear tire installation. Reverse g. above.

i. Tire and tube repair. Repair punctures of tire or tube less than 3/8 inch in greatest dimension by application of a patch on tube, or rubber plug in tire casing puncture.

j. Brake drum repair. If brake drum is scored on interior friction surface, remove it, and machine surface to next standard oversize bore which will provide smooth friction surface. Use brake drum lathe, if available. Do not exceed 0. 060 inch oversize bore. After truing up brake drums install brake shoes fitted with proper oversize linings.

6-18. WHEEL BEARINGS.

a. Rear wheel bearing removal.

(1) Remove rear wheels (paragraph 6-17).

(2) Remove grease cap from wheel hub and take cotter pin, nut, and washer from spindle.

(3) Pull wheel hub and bearings, with grease retainers from spindle.

b. Cleaning. Clean all parts with SD. Dry and coat unpainted surfaces with OE immediately. Relubricate per lube chart.

c. Installation and adjustment. Reverse a. above. Install hub nut snugly, then back off not over 1/6 turn to align slot in nut with hole in spindle and insert new cotter pin.

6-19. HANDBRAKE, LEVER AND LINKAGE.

a. Removal.

(1) Remove truck floor board, and remove cotter pin and clevis pin that attach control assembly to lever and pin which applies brake (Figure 6-6).

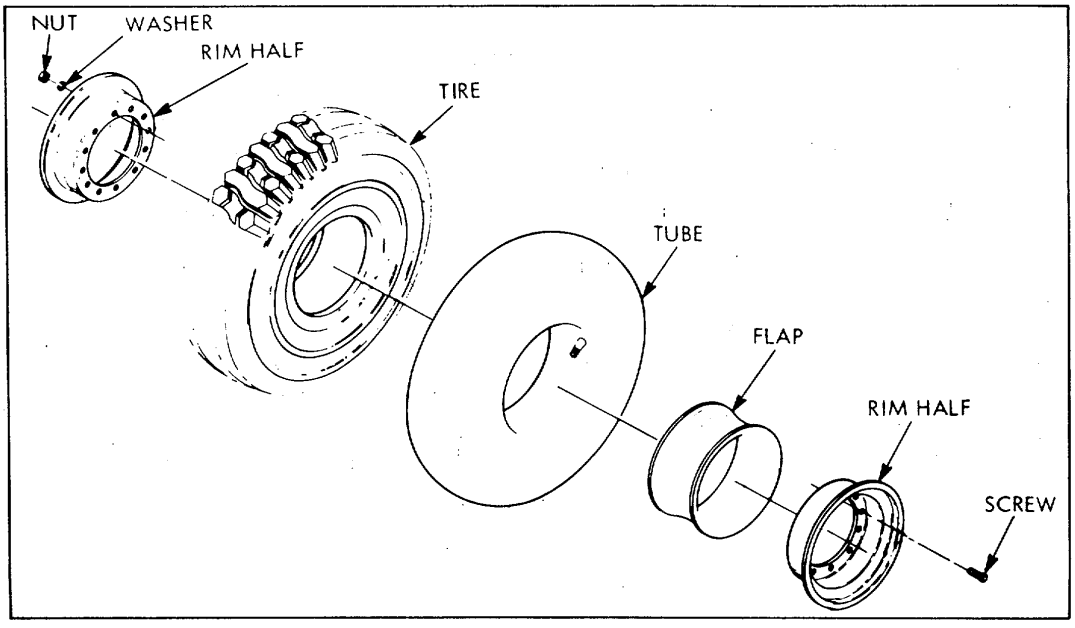


Figure 6-5. Rear Wheels and Tires, Exploded View

(2) Remove nuts, washers and screws attaching lever to truck body. Take brake lever and' linkage from truck.

b. Installation. Reverse a. above.

c. Adjustment. Make overall adjustment of parking brake system as follows: (1) Turn. adjusting knob on lever handle full counterclockwise to slack off adjustment.

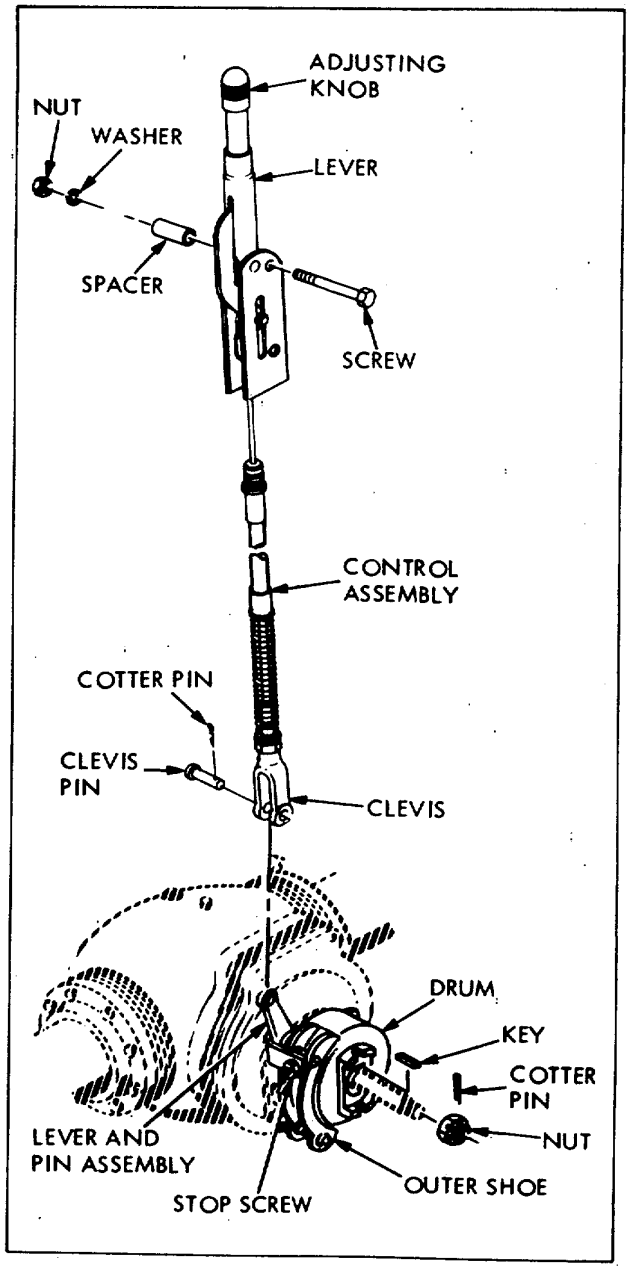


Figure 6-6. Handbrake, Partly Exploded View

(2) Loosen locknut on brakeshoe stop screw, tighten stop screw until both brakeshoes grip drum, then slack it off just enough to release drum. Tighten locknut.

(3) Set lever to position in which brakes are applied and turn adjusting knob clockwise until snug. Release brakes and tighten knob further until a firm pull is required to draw lever over center and brake application is adequate to hold truck.

6-20. PEDAL AND LINKAGE.

a. Removal.

(1) Remove five screws, nuts and washers, and remove floorboard.

(2) Remove pedal nuts and washers, and pedals (Figure 6-7). Remove cotter pin and pin from master cylinder clevis. Do not unscrew clevis from master cylinder unnecessarily to avoid disturbing pedal adjustment excessively.

(3) Remove inching valve adjustment screw and spring, brake lever mounting screws and bearings, and brake lever.

b. Installation.

(1) Reverse a. above.

(2) Perform procedure in paragraph 6-23b. (4).

(3) With drive wheels raised off floor and forward clutch engaged, turn adjusting nut, or add washers, until no movement of the inching spool is detected at all engine speeds.

6-21. BRAKE SHOES (PARKING BRAKE).

a. Adjustment.

(1) Fully release parking brake lever and turn adjustment knob at top of brake handle counterclockwise to slack off linkage adjustment.

(2) Loosen nut on brake shoe stop screw (Figure 6-8) and adjust screw until lining of both shoes contacts brake drum.

(3) Back off brake shoe stop screw two turns and tighten nut to hold adjustment.

(4) Apply parking brakes and tighten adjustment knob snugly, to the extent a firm push is required to release the parking brake.

b. Removal.

(1) Remove twelve capscrews and remove as much of propeller shaft as necessary to get access to nut holding on parking brake drum.

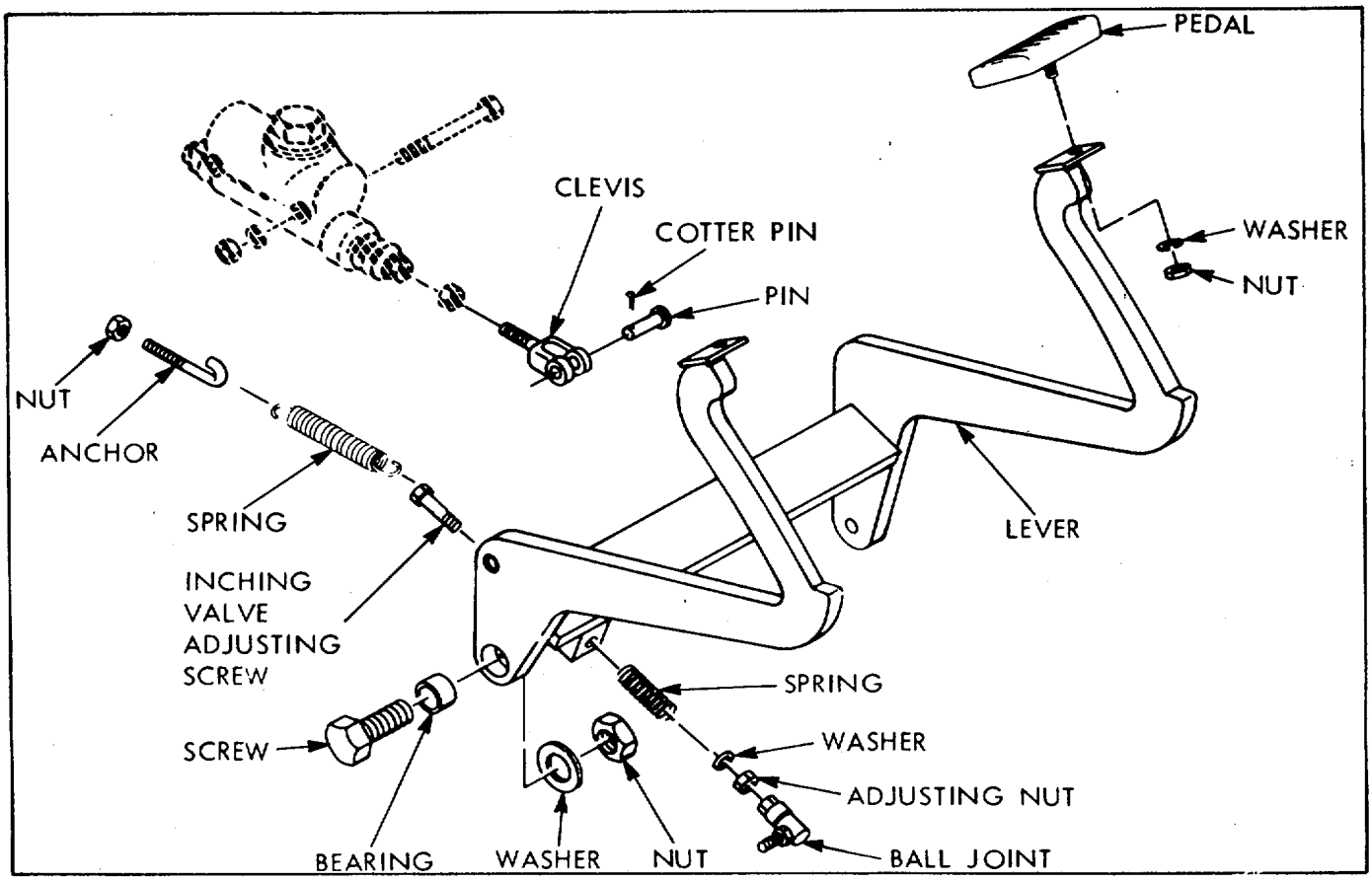


Figure 6-7. Brake Pedals and Linkage, Exploded View

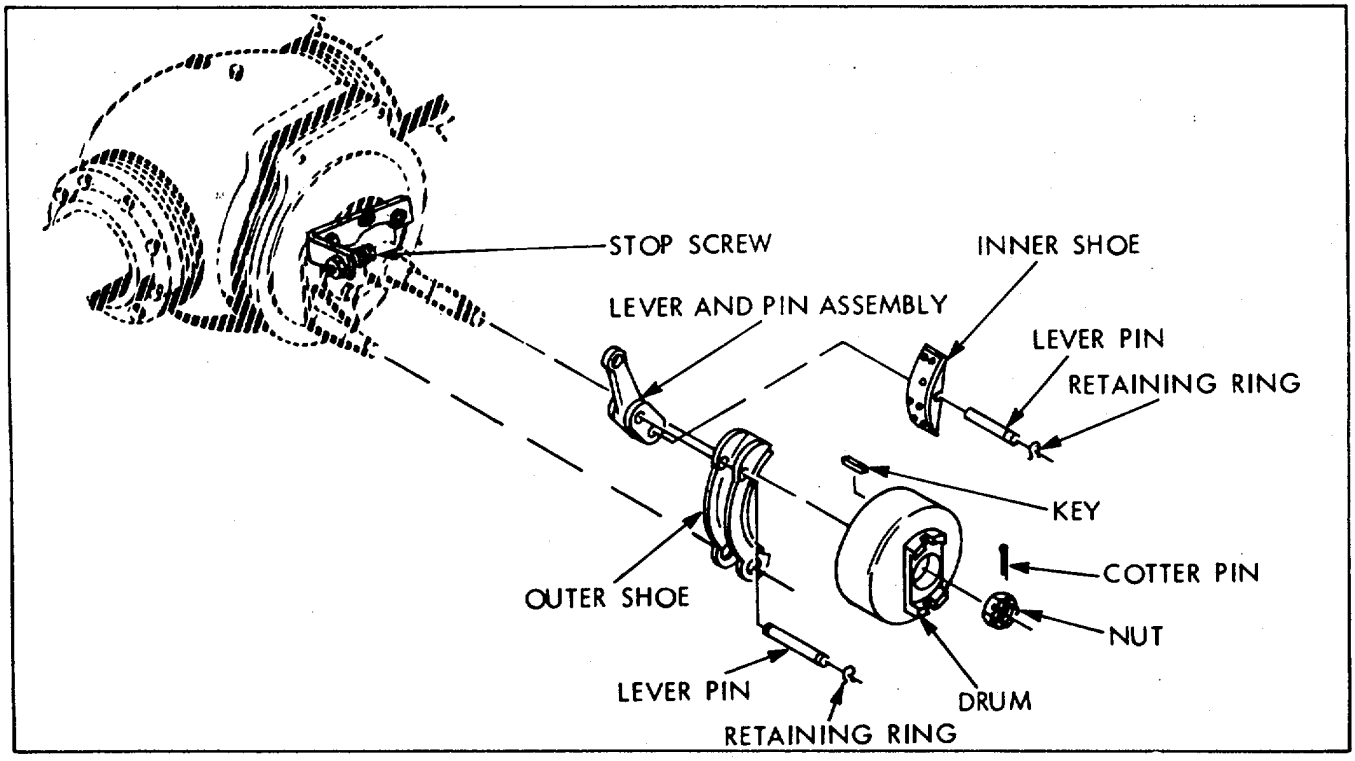


Figure 6-8. Parking Brake, Partly Exploded View

(2) Remove drum retaining nut and pull off drum.

(3) Loosen brake shoe stop screw nut, and back off screw adjustment fully.

(4) Remove retaining rings and pins, and remove brake shoes.

c. Repair, Attach new lining to shoes in accordance with good automotive practice.

d. Installation. Reverse b. above, and adjust brakes as in a. above.

6-22. WHEEL BRAKESHOES AND WHEEL CYLINDER.

a. Removal.

(1) Disassemble front axle (paragraph 6-14) to the extent required to gain access to the wheel brake (Figure 6-9).

(2) Remove brakeshoe return spring and retainer spring, using special brake service tools designed for this, if available.

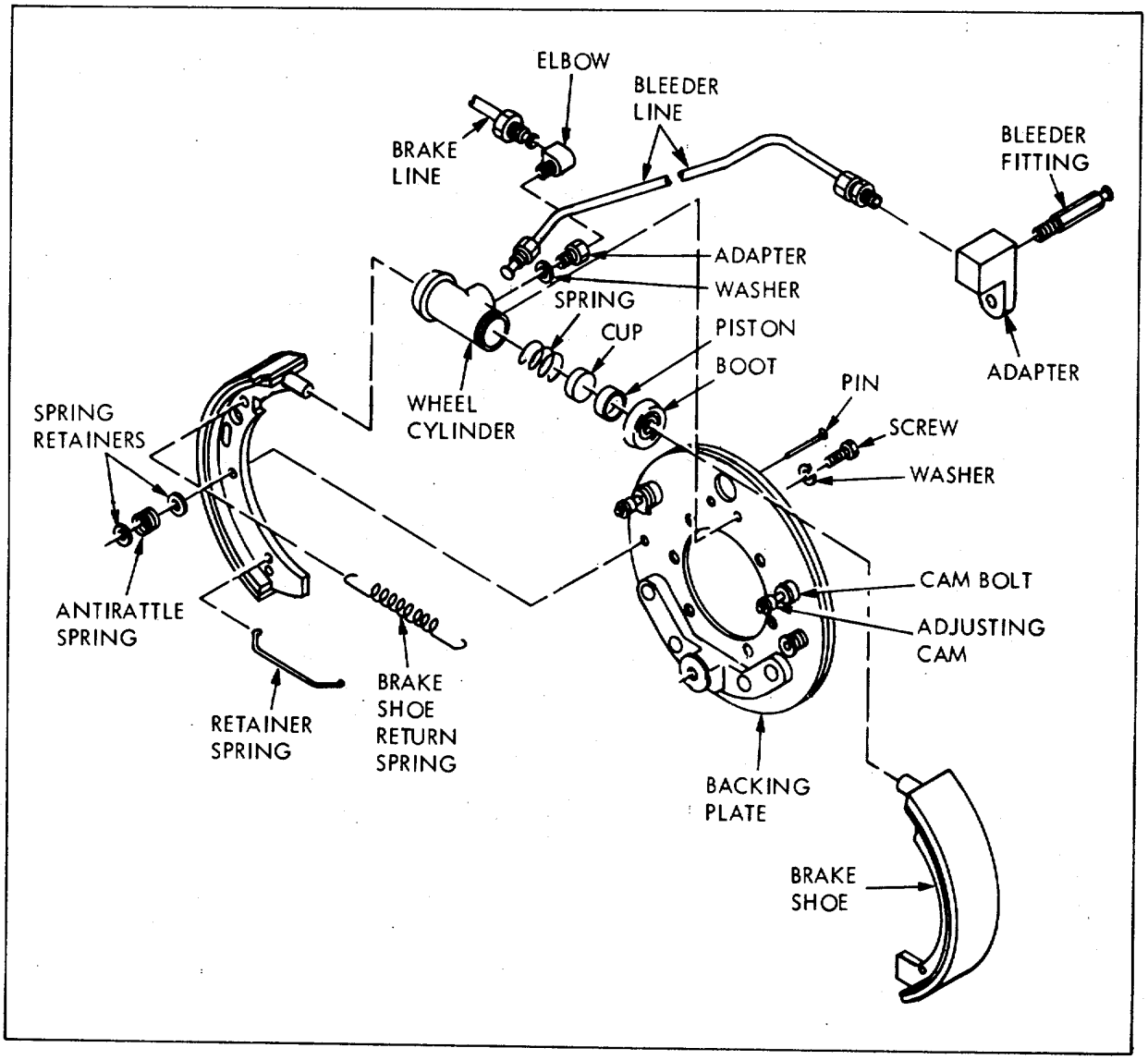


Figure 6-9. Wheel Brake Assembly, Exploded View

CAUTION

Do not use cutting pliers to grasp springs for removal. Any resulting nicks make spring subject to failure.

(3) Hold pin from rear of backing plate, press outer antirattle. spring retainer in to compress spring, and rotate it a quarter turn, to release it. Take off pin, spring and retainers, and remove brakeshoes.

(4) Disconnect brake line, remove elbow, adapter and washer from wheel cylinder. Disconnect bleeder line at cylinder. Remove two capscrews and lockwashers and lift off wheel cylinder.

b. Wheel cylinder disassembly and inspection.

(1) Remove boots and push out cups, pistons and spring from wheel cylinder. Discard boots and cups.

(2) Inspect cylinder bore for rust pits or scoring. Discard cylinders which cannot be cleaned up with light honing.

c. Wheel cylinder reassembly. Wet internal parts in specified hydraulic brake fluid, and reverse b. (1) above.

d. Brakeshoe. Inspect brakeshoe lining and replace shoe and lining assembly as required. I e. Installation. Turn cam bolts so brakeshoes will be held at furthest in position, and reverse a. above.

f. Brake bleeding. After assembly, bleed air from system at bleeder fitting as follows:

(1) Fill master cylinder with specified brake fluid.

(2) Remove screw in bleeder fitting and slip piece of small hose about 18 inches long over end of fitting.

(3) With a second man applying pressure to pedal, crack open bleeder fitting to permit fluid to escape through hose into container of brake fluid. Look for bubbles in escaping fluid.

(4) Continue pumping fluid until discharged fluid is clear and free of bubbles, meanwhile maintaining level of fluid in master cylinder reservoir. Repeat at other wheel if both brakes were serviced.

g. Adjustment. Brake lining-to-drum operating clearance is automatically adjusted with each application of the brakes. There is no need to adjust the brakes manually.

6-23. MASTER CYLINDER.

a. Removal.

(1) Unscrew bolt, fitting and stoplight switch from master cylinder. Do not disassemble this group of parts.

(2) Remove cotter pin (Figure 6-7) and clevis pin from push rod yoke, remove two nuts and washers, through bolts, and master cylinder.

b. Repair.

(1) Remove boot (Figure 6-10) and push rod, take out retaining ring, and remove washer, piston, cup, spring and check valve.

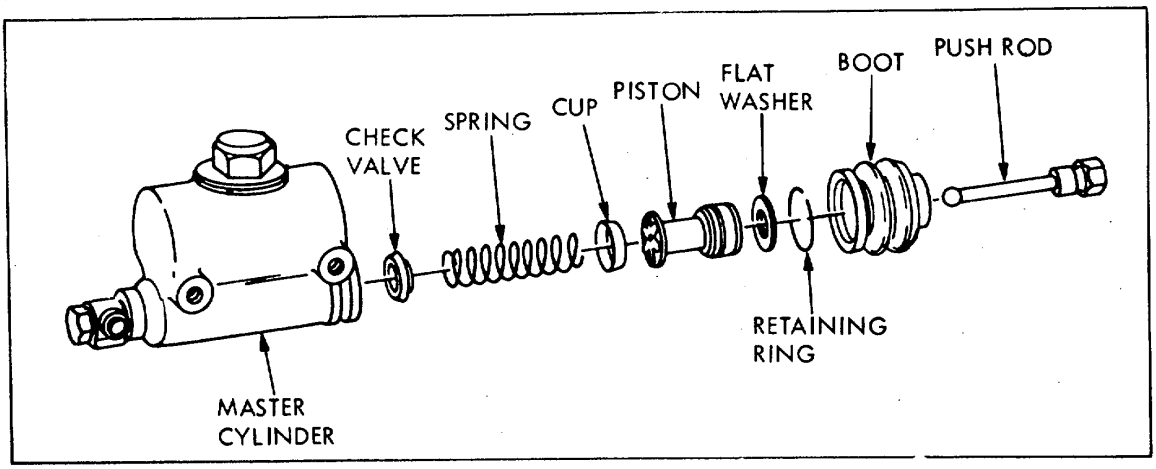


Figure 6-10. Master Cylinder, Exploded View

(2) If bore of cylinder is scored or pitted, smooth bore by light honing.

(3) Reverse (1) above to reassemble, using all new nonmetal parts.

c. Installation.

(1) Reverse a. above.

(2) Fill master cylinder with brake fluid.

(3) Bleed air from brake hydraulic system, using procedure appropriate for brake bleeding equipment available.

(4) Loosen jam nut on push rod clevis, and adjust effective length of push rod to give between 3/8 inch and 5/8 inch free travel of brake pedal before resistance is felt.

Tighten jam nut.

6-24. STEERING GEAR ASSEMBLY.

a. Removal.

(1) Remove truck floor boards.

(2) Remove screws and washers holding steering gear bracket to truck frame.

(3) Disconnect horn wiring at side of column.

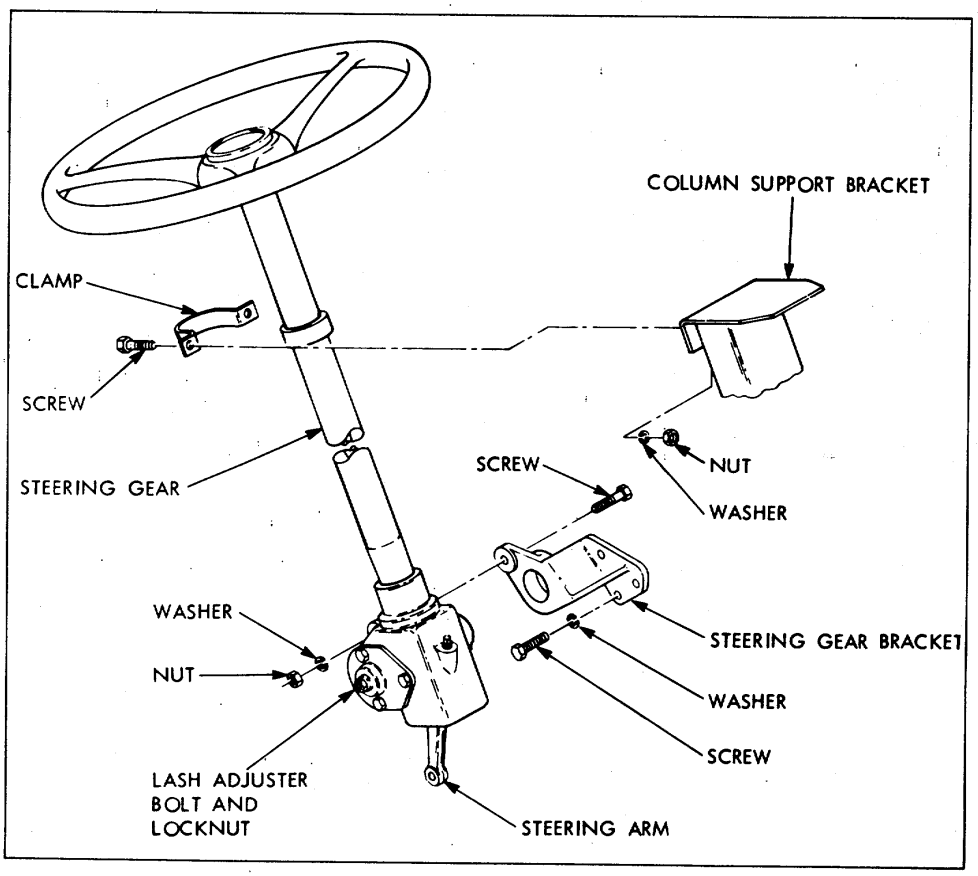


Figure 6-11. Steering Gear Removal, Exploded View

(4) Disconnect drag link at steering arm (paragraph 6-26).

(5) Remove screws, nuts and washers holding gear column to support bracket by clamp (Figure 6-11). Lift out gear.

(6) To remove steering gear bracket, remove nut and washer holding steering arm to shaft, and pull off steering arm with a puller. Remove screws, nuts and washers attaching bracket to gear.

b. Lash adjustment. The following adjustment refers to gear adjustment only. Refer to paragraph 6-25 for linkage and stop adjustments.

(1) Turn steering wheel from one extreme to the other, noting total number of turns. Position wheel at midpoint of travel (wheels straight ahead position).

(2) Loosen lash adjuster locknut, and turn adjusting bolt clockwise while noting lash through steering arm, until all lash has been taken up. With pull scale at steering wheel rim, tighten adjuster further until 2-3/4 to 3-1/4 pounds pull is needed to turn through center position. Tighten locknut.

c. Steering wheel removal and installation.

(1) Remove four attaching screws and lift off horn button assembly.

(2) Remove steering wheel nut, and pull steering wheel from shaft with a steering wheel puller.

CAUTION

Do not hammer on shaft to free wheel.

(3) Remove key from steering shaft.

(4) Install by reversing (1), (2) and (3) above.

d. Mast jacket upper bearing removal and installation.

(1) Disconnect horn wire at connector on outside of mast jacket.

(2) Remove horn button, then remove steering wheel (c. above).

(3) Remove cover plate from mast jacket. Attach a piece of tie wire to the end of horn wire which enters the mast jacket.

(4) Screw puller into top of mast jacket upper bearing.

Tightening the center screw in the puller removes the bearing from the mast jacket.

(5) Transfer tie wire to end of wire attached to new bearing assembly. Start bearing into mast jacket and drive it into place with piloted driver.

(6) Pull wire through opening in mast jacket and install the cover plate.

(7) Install the steering shaft upper bearing spring seat (with flared end up) and spring. Install steering wheel and insert horn button, insulator, contact and spring assembly in opening provided in steering wheel hub. Install contact cup, positioning the tang on the lower side, in the opening provided in the steering wheel hub.

(8) Install steering wheel washer and nut and tighten. Install horn button, connect horn wire at mast jacket, and. test operation of horn.

e. Steering gear disassembly. As with any ball or roller bearing unit, the steering gear parts must be kept free of dirt. Clean paper or rags should be spread on the bench before starting disassembly of the steering gear.

(1) Loosen the locknut (see figure 6-11) on the lash adjuster bolt; then turn the lash adjuster a few turns counterclockwise. This will remove the load from the worm bearings caused by the close meshing of the rack and sector teeth.

(2) Loosen the large locknut on the worm beading thrust adjuster at the lower end of the steering column and turn the thrust adjuster counterclockwise a few turns.

(3) Place a pan under the assembly to catch the lubricant and remove the screws and washers attaching the side cover to the housing.

(4) Pull the side cover with the gearshaft from the housing.

NOTE

If sector gear of gearshaft does not clear the opening in the housing easily, turn the worm shaft by hand until the sector will pass through the opening in the housing.

(5) Place the steering housing in a bench vise and remove the upper worm bearing.

NOTE

Do not clamp the housing too tightly in vise, as damage may result from excessive pressure.

(6) Draw the worm shaft and nut assembly from the housing. Lay this assembly flat on the bench, so that the ball nut will not thread down to either end. Damage will be done to the ends of the ball guides if the nut is allowed to rotate until stopped at the end of the worm.

(7) Remove the locknut from the lash adjuster and unscrew the lash adjuster from the side cover. Slide the lash adjuster out of slot in the end of the sector gearshaft.

f. Disassembly of ball bearing nut. Disassembly of the ball bearing nut will not be necessary, if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

(1) Remove the bolt and clamp retaining the ball guides to the nut. Draw the guides out of the nut.

(2) Turn the nut upside down and rotate the worm shaft back and forth until all the balls have dropped out of the nut into a clean pan. With the balls removed, the nut can be pulled endwise off the worm. Count and note number of balls removed. Be sure same number is installed at assembly.

(3) With the steering gear completely disassembled, wash all parts in SD. Dry them thoroughly with clean rags. With a magnifying glass inspect the roller bearings, cones, worms and nut grooves and the surfaces of the balls for signs of indentation. Also check for any signs of chipping or breakdown of the surface.

(4) Any parts that show signs of damage should be replaced. Balls must be replaced with genuine parts made according to special specifications for this steering gear. No other balls should be used regardless of grade or quality.

(5) Inspect the sector gearshaft for wear and check the fit in the housing bushing.

(6) Inspect the fit of the pilot on the end of the gearshaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed, as it is impractical to replace this bushing.

(7) Check the ball guides for any damage at the ends where they deflect or pick the balls from their helical path. Any damaged guides should be replaced.

g. Sector shaft seal replacement.

(1) Pry old seal out of housing.

(2) Press new seal into place using a suitable size socket.

h. Sector gearshaft bearing removal.

(1) Remove the side cover, sector gearshaft and worm shaft as outlined under e. above.

(2) Support housing on suitable arbor press, then use piloted driver to press both bearings from housing.

i. Sector gearshaft bearing installation. Reverse h. above.

j. Ball nut assembly.

(1) Place the worm shaft flat on the bench and slip the nut over the worm, with the ball guide holes up and the shallow end of the rack teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.

(2) Place one half number of balls removed in f. (2) above into a clean container. This is the proper number of balls for one circuit. Drop the counted balls from the container into one of the guide holes while turning the worm gradually away from that hole. Continue until the ball circuit is full from the bottom of one guide hole to the bottom of the other or until stopped by reaching the end of the worm.

> In cases where the balls are stopped by the end of the worm, hold down those balls already dropped into the nut with the blunt end of a clean rod or punch, and turn the worm in the reverse direction a few turns. The filling of the circuit can then be continued. It may be necessary to work the worm back and forth, holding the balls down first in one hole then the other, to close up the spaces between the balls and fill the circuit completely and solidly.

(3) Lay one-half of the ball guide, groove up, on the bench and place the remaining balls from the count container in it. The number of the balls remaining should just fill the guide.

(4) Close this half of guide with the other half. Hold the two halves together and plug each open end with Vaseline so balls will not drop out while installing guide.

(5) Push the guide into the guide holes of the nut. This completes one circuit of balls. If the guide does not push all the way down easily, tap it lightly into place with the wooden handle of a screwdriver.

(6) Fill the second ball circuit in the same manner as described.

(7) Assemble the ball guide clamp to the nut, being sure to use lockwashers under the clamp screws, then tighten the screws securely.

(8) Check the assembly by rotating the nut on the worm to see that it moves freely. Do not rotate the nut to the end of the worm threads, as this may damage the ball guides. If there is any stickiness in the motion of the nut, some slight damage to the ends of the ball guides may have been overlooked.

k. Steering gear assembly. After a major service overhaul, where all of the original factory installed lubricant has been washed out of the steering gear assembly; the threads of the thrust bearing adjuster, side cover bolts and lash adjuster

should be coated with a suitable nondrying, oil-resistant sealing compound. This is to prevent leakage of gear lubricant from the steering gear assembly. The compound should not be applied to female threads and extreme care should be exercised in applying this compound to the bearing adjuster, as the compound must be kept away from the bearing race.

(1) Place the lower roller bearing in place in the housing, then, place the worm shaft and nut assembly into the housing.

(2) Install the upper roller bearing and install the adjuster into the housing.

(3) Assemble the lash adjuster with shim in the slot in the end of the sector shaft. Check the end clearance, which should not be greater than 0. 002 inch. For the purpose of adjusting this end clearance a steering gear lash adjuster shim unit is available. It contains four shims: 0. 063 inch, 0. 065 inch, 0. 067 inch and 0. 069 inch thick.

(4) After the lash adjuster end clearance has been adjusted, start the sector shaft pilot into the bushing in the side cover. Then, using a screwdriver through the hole in the cover, turn the lash adjuster in a counterclockwise direction to pull the sector shaft pilot into its bushing as far as it will go.

(5) Rotate the worm shaft by hand until the ball nut is about in the center of travel. This is to make sure that the rack and sector will engage properly with the center tooth of the sector entering the center tooth space of the nut.

(6) Place a new gasket on side cover, then push the side cover assembly, including sector shaft, into place. After making sure there is some lash between the rack and sector teeth, assemble and tighten the side cover bolts.

(7) Turn in on the thrust bearing adjuster until the adjuster bottoms then back off 1/4 to 1/2 turn. Tighten locknut.

1. Adjustment on bench.

(1) Tighten the thrust bearing adjuster until all worm shaft and play has been removed. Then tighten the locknut.

(2) Install the steering wheel on the worm shaft temporarily. Carefully turn the steering wheel all the way in one direction and then turn back about one turn.

(3) Using pull scale, at right angles to one spoke at wheel rim, measure the pull required to keep the wheel in motion. This should be between 1 and 1-1/2 pounds. If necessary, adjust the thrust bearing adjuster until proper pull is obtained.

(4) Turn the steering wheel from one stop all the way to the other, counting the number of turns. Then turn the wheel back exactly half the number of turns to the center position and mark the wheel at the top or bottom with a piece of tape.

(5) Turn the sector lash adjuster screw clockwise to remove all lash between rack and sector teeth. Tighten the locknut.

NOTE

Be sure adjustment is not changed while tightening the locknut.

(6) Using pull scale, check the pull at the rim of the steering wheel. Take the highest reading on the scale as the wheel is pulled through the center position. This should be between 2-3/4 and 3-1/4 pounds.

(7) If necessary, readjust the lash adjuster screw to obtain the proper pull. Tighten the locknut to 10 to 15 ft. lbs. torque and again check the pull.

(8) Fill the assembly with gear lubricant to the level of the filler plug hole and replace filler plug.

m. Installation. Reverse a. above.

6-25. STEERING CYLINDER.

a. Removal.

(1) Disconnect, cap and tag hoses at cylinder.

(2) Remove hose clamp holding hoses to cylinder, disconnect drag link end at cylinder (Figure 6-12).

(3) Remove cotter pins and nuts attaching front and rear ends of cylinder to truck and remove cylinder.

b. Control valve disassembly (see Figure 6-13). Do not disassemble a unit further than is necessary to correct a malfunction. During disassembly, special attention should be given to identification of parts for proper reassembly. Place all disassembled parts on a clean, lint-free surface for inspection. Carefully remove any burs by light stoning with a medium India stone. Clean all parts except packing and seals in a clean mineral oil solvent. After drying thoroughly, lay the parts on a clean, lint-free surface. All internal oil passages of the unit must be thoroughly cleaned. All packing and seals should be replaced for reassembly. Soak them in hydraulic fluid prior to being used. Refer to Figure 6-13 and proceed with disassembly.

CAUTION

Before removing unit or parts of unit to be serviced, be certain the unit is not subject to hydraulic pressure. Never use an air hose on or near the exposed parts because of the presence of water and dirt in the air system.

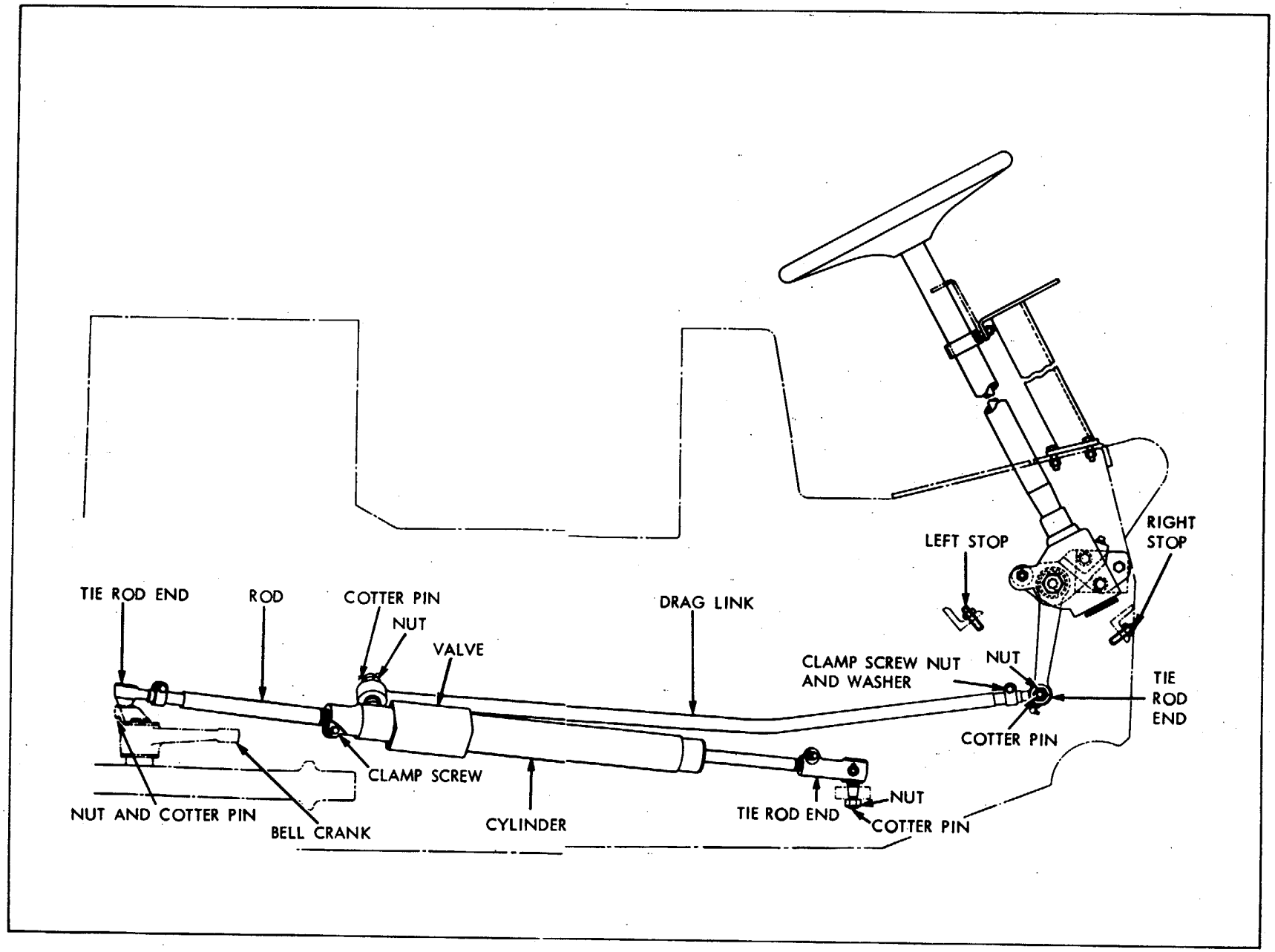


Figure 6-12. Steering Linkage

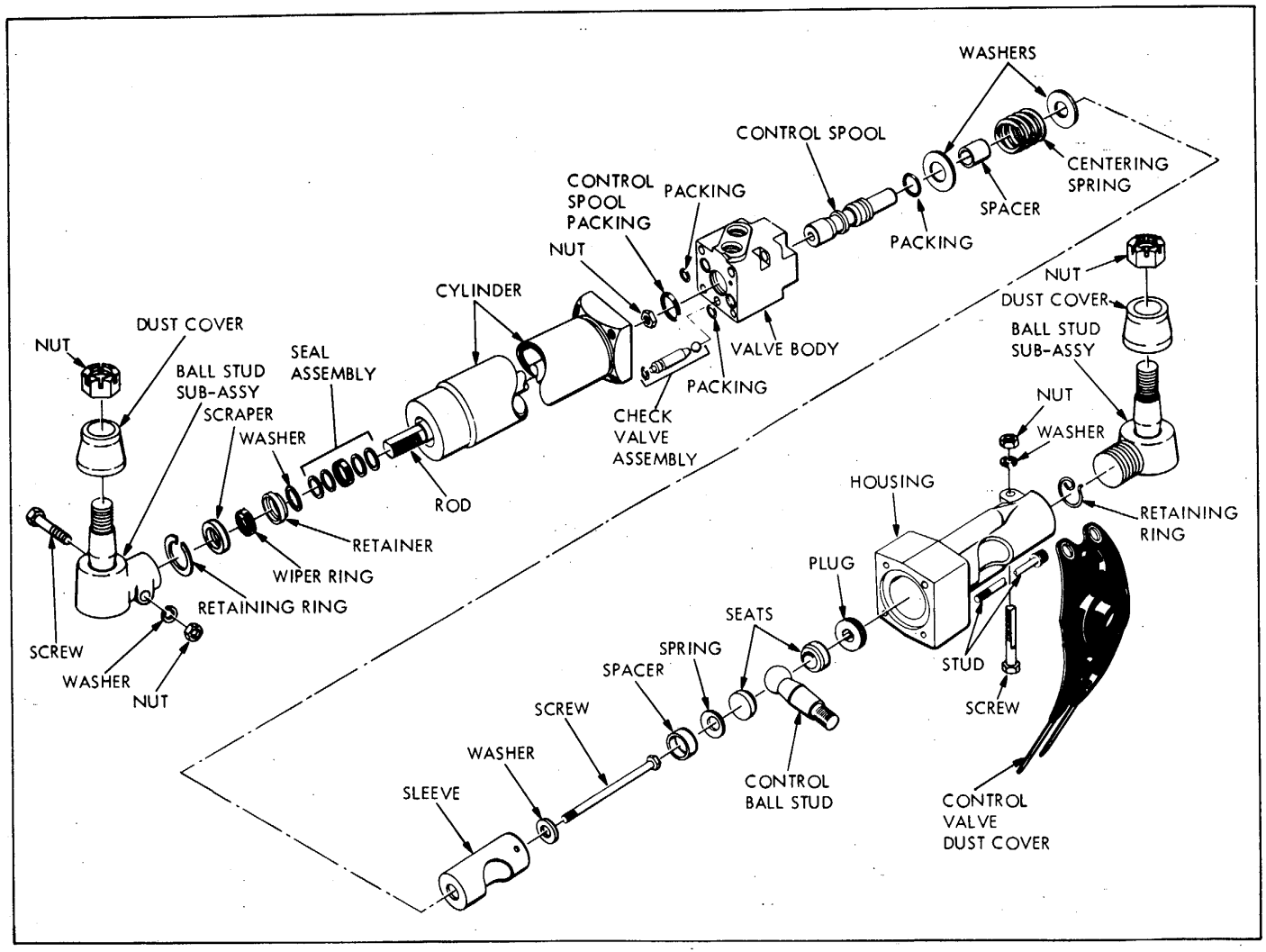


Figure 6-13. Control Valve Disassembly

(1) Remove ball stud used on the control valve end of the cylinder by removing the dust cover, and split collar clamping bolt on the ball stud housing, and unscrewing the ball stud from the housing.

(2) Loosen and remove the four capscrews that secure the control ball stud housing and valve assembly to the cylinder. Remove the control ball stud housing and valve assembly from the cylinder. Remove three packings from recesses in the body.

CAUTION

Care must be taken not to score or otherwise damage the cylinder or valve mating surfaces.

(3) Hold control ball stud housing and valve assembly in a vise, by lightly clamping valve body. Use care not to distort spool bore in valve body. Remove the wire ring which locks the control ball stud sleeve plug and remove plug. Remove control ball stud, two ball stud seats, spring washer and spacer.

(4) Remove self-locking nut from capscrew. Remove capscrew, washer and control ball stud sleeve. Then lift the two centering spring retaining washers, centering spring and spacer from the valve body. Remove control spool from the control ball stud end of body. Remove packing from valve body and from spool to complete disassembly.

NOTE

The check valve retaining plug with integral valve body-cylinder locating pin should be removed for inspection.

c. Cylinder disassembly. The cylinder assembly is a sealed unit. Overhaul procedures are restricted to replacing the sealing parts on the rod end.

(1) Remove anchor ball stud by removing nut, bolt, and lockwasher from the ball stud housing and unscrewing the ball stud.

(2) Remove retainer snap ring with snap ring pliers. Rotate the rod and withdraw it far enough from the cylinder to expose scraper, wiper ring, retainer and washer. The shaft seal assembly may be removed with a hooked scriber.

(3) Steel seat ball stud assemblies used can be disassembled for inspection. First remove the cotter pin,, plug, spring and outside seat. Then remove the ball stud nut, spring, shield and dust cover. Remove the ball stud, the other seat and the grease fitting.

d. Inspection.

(1) Discard all sealing elements and scrapers and replace with new, upon reassembly. Wash all parts in a good grade of mineral spirits.

(2) Inspect all fluid passages in valve body and cylinder to be certain they are clean and free from obstructions.

(3) Check each disassembled part for excessive wear, cracks, or pitting that would render them unfit for continued use. Replace all defective parts.

(4) Inspect valve spool for. deep scoring and excessive wear. Check valve spool bore for similar scoring or pitting. Replace these parts if badly damaged or worn. Do not rework or attempt to "touch-up" the valve spool. This practice will only result in improper steering unit operation and performance.

(5) Inspect cylinder shaft for damage and straightness to insure proper sealing.

e. Control valve assembly.

NOTE

Immerse all parts in clean hydraulic fluid to facilitate reassembly. Refer to Figure 6-13 and proceed with reassembly. Be sure that all oil seals, wipers, and packing are discarded and replaced with new parts for reassembly. Remember that a seal can only do its job when properly seated to prevent fluid leakage and entrance of air into the system. Coat all seals with liberal amounts of GAA or petroleum jelly prior to assembly.

(1) Install new packing (coated with grease or petroleum jelly) in cylinder end of valve body and on control ball stud end of valve spool. Install spool in bore from the control ball stud end to avoid packing interference during assembly.

(2) Install washer, spacer, centering spring, washer, control ball stud sleeve, capscrew washer and capscrew. Install self-locking nut and tighten until play between parts is removed. Be sure that nut is in good condition and that the centering spring remains aligned between the two remaining washers. Back nut off one flat (1/6 turn or 60 degrees).

(3) Start control ball stud sleeve plug in control ball stud sleeve.

(4) Slide the control ball stud housing over the ball stud sleeve.

(5) Install the studs which attach the valve to the cylinder, if they were removed.

(6) Install three new packings in recesses in the valve body. Mate surfaces of valve and cylinder. The locating pin on the check valve retaining plug must engage a recessed hole in the cylinder mating face, to insure proper port alignment between cylinder and valve.

(7) Locate control ball stud housing in desired position relative to control ball stud. Install four nuts, while holding valve and control assembly in place to prevent misalignment of packings. Tighten capscrews to 30 to 40 lbs. ft. torque.

(8) Install control ball stud spacer. The spring washer must be installed with its convex (raised inside diameter) face toward ball stud to provide spring tension on ball stud. Next install ball stud seats and control ball stud. Position the stud and sleeve so that the stud is centered in the sleeve opening.

(9) Tighten control ball stud sleeve plug snugly against seat. Back plug off until slot in plug lines with one of retaining ring anchor holes in sleeve which are spaced at 60 degrees intervals in control ball stud sleeve. Install hooked end in anchor hole and engage retaining ring in groove in sleeve plug. This can most easily be done by engaging tang in hole in sleeve and then applying pressure with small screwdriver opposite tang on outside edge of retaining ring.

(10) Install head-end mounting ball and clamping bolt and nut. Tighten clamp nut to 30 to 40 lbs. ft. torque.

(11) Grease control ball stud housing with GAA under low pressure, through grease fitting.

f. Cylinder reassembly.

(1) Coat the rod seal assembly parts with petroleum jelly. Install two back-up rings over the rod and in the cylinder cap bore. Be sure that the split ends are staggered. Install the seal ring and two outer back-up rings, again with split ends staggered. Install the washer, retainer, wiper and scraper. Install the snap ring.

(2) Screw the rod end ball stud subassembly on to the end of the rod. Align the split collar with the flat of the rod and install the locking bolt, nut and lockwasher. If steel seat ball stud subassembly was disassembled, reassemble by reversing the order of disassembly in e. (3) above, before assembling to the rod.

g. Installation. Reverse a. above.

h. Adjustment of steering linkage.

(1) Assemble front tie rod end (figure 6-12) on cylinder so that the thread engagement is approximately 1-1/2 inches.

(2) When performing adjustments in (3) and (4) below, there should be no restraint on cylinder or pitman arm due to stops on trailing axle. To insure this, rear tie rod end should be removed from steering axle bellcrank, but should be maintained in line with hole in bellcrank.

(3) With drag link in place, turn steering wheel full right with right turn stop screw backed off. Remove tie rod end from steering arm and pull drag link until the cylinder is at the end of stroke. Adjust tie rod end and temporarily assemble in steering arm. Turn stop screw until it touches steering arm. Disconnect tie rod end from steering arm and turn three turns counterclockwise to increase drag link length. Assemble to steering arm. Back off steering arm with steering wheel, turn stop screw one additional turn and lock in position with locknut.

(4) Turn steering wheel full left with left turn stop screw backed off until steering cylinder has extended 11-1/2 inches from adjusted position for right turn, as in (3) above. Bring stop screw in contact with pitman arm and lock in place with locknut.

(5) Adjust rod so that equal angles of steering wheels are obtained when steering wheel is turned from full right to full left. Major adjustment of rod length must be made using only rear tie rod end while rod is threaded into cylinder to make dimension 12-3/4 inches. Final adjustment may be made by turning rod with rear tie rod end assembled in bellcrank. Do not turn rod more than one turn in either direction or the thread engagement will be below minimum required.

(6) Before final clamping of rod, position cylinder as shown.

NOTE

After final adjustment, entire linkage and wheels must be stopped only on stop screws. Cylinder should have approximately 1/4 inch of stroke left at full right or full left turn.

i. Test.

(1) Road test truck, under all combinations of steering conditions, inspecting operation for symptoms given in the troubleshooting chart.

(2) With engine running, and steering wheel alternately turned full right and full left, observe for external leaks of hydraulic fluid.

6-26. DRAG LINK.

a. Removal. Raise truck. Working from below, remove the cotter pins and nuts (Figure 6-12) at each end of the drag link and remove the drag link.

b. Repair. Repairs to drag link are limited to replacing defective parts. To replace tie rod end, loosen clamp screw, unscrew tie rod end, install new tie rod end and tighten clamp screw.

c. Installation. Reverse a. above.

d. Adjustment. Refer to paragraph 6-25h.

6-27. PROPELLER SHAFT.

a. Removal and disassembly.

(1) Remove lock wire and take out screws (1 and 10, figure 6-14).

(2) Tap or pry stub yoke (12), as needed, to free bearings (2 and 11) from arced pilot surfaces of yoke, and coupling plates (8). Remove bearing (2) with rollers (3), collar (4), cork washer (5), and dust shield (6). Remove rear spider (9).

(3) Pry coupling plate from front spider (9) and pry spider from handbrake' drum to free remaining bearings. Remove bearings. Discard cork washers (5).

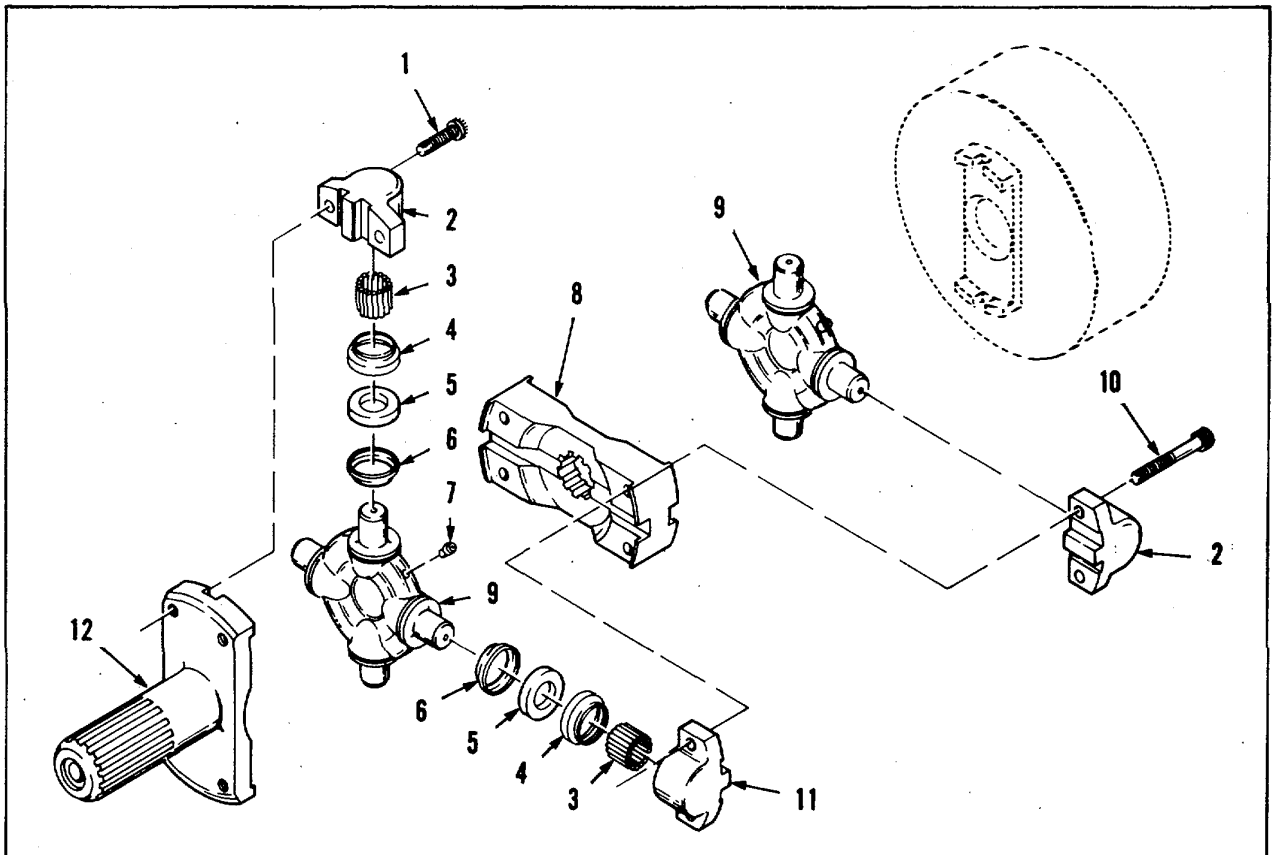
b. Cleaning. Clean all parts thoroughly in SD. Probe lubrication passages through fitting (7) and spiders, to be sure no foreign matter or hard grease soap will prevent lubrication. Coat reusable parts with OE or specified lubricant immediately on drying. Avoid handling dry parts with bare hands before applying lubricant.

c. Inspection. Inspect bearings, rollers, and bearing surfaces of spiders for galling, rust, or signs of wear or failure. Inspect all splines for signs of damage or wear. Check all threads for stripping or cross-thread damage. Check all flanges and machined surfaces for nicks or dents.

d. Assembly and installation.

(1) Install stub yoke splined end as far as it will go into transmission output shaft.

(2) Install items 2, 3, 4, 5, 6 and 11 as illustrated horizontally in Figure 6-14, to both spiders (9). Squeeze



1. Capscrew
2. Needle bearing
3. Rollers
4. Collar
5. Washer
6. Dust shield
7. Lubrication fitting
8. Coupling plate
9. Universal joint spider
10. Capscrew
11. Needle bearing
Stub yoke

Figure 6-14. Propeller Shaft, Exploded View

these items with two C-clamps to compress dust shield (6). This will permit entry of the assembly into coupling plate (8).

(3) Fasten both assemblies to coupling plate (8) with screws (10) and install lock wire as required. Remove C-clamps.

(4) Install items 2, 3, 4, 5 and 6 as shown vertically in Figure 6-14, and compress with C-clamps.

(5) Fasten items assembled thus far to stub yoke with screws (1), slide stub yoke, as assembled, forward to meet handbrake drum of drive axle, and attach drive shaft to handbrake drum with screws. Secure with lock wire and remove C-clamps.

6-28. TRANSMISSION.

a. Testing. Testing of the transmission is best done in two phases, when possible, as given below in this paragraph. Perform the general operational test to determine areas of unsatisfactory performance, then make the pressure tests to isolate the cause of malfunction to a particular unit, part, or system. Tests given are performed with the transmission installed in the truck.

b. Operational test. Operate truck, checking for troubles given in transmission part of the trouble-shooting chart. Where incorrect pressures might be a factor in malfunction, perform pressure tests in c below.

c. Testing pressures.

(1) To test pressures of hydraulic supply system of transmission, remove truck floor pan for access and connect pressure gage into CONVERTER CHARGING PRESSURE port (figure 6-15), start engine and run at 2000 rpm until transmission oil reaches 180 deg to 200 deg F. Gage should read 84 to 101 psi.

(2) Connect gage to either MAIN PRESSURE port. Gage should read 120 to 135 psi.

(3) With inching valve in (brake pedal released), plug CONVERTER OIL OUT line to cooler. Increase. speed slowly from idle. Gage at COOLER BYPASS VALVE port should rise to maximum of 50 to 70 psi.

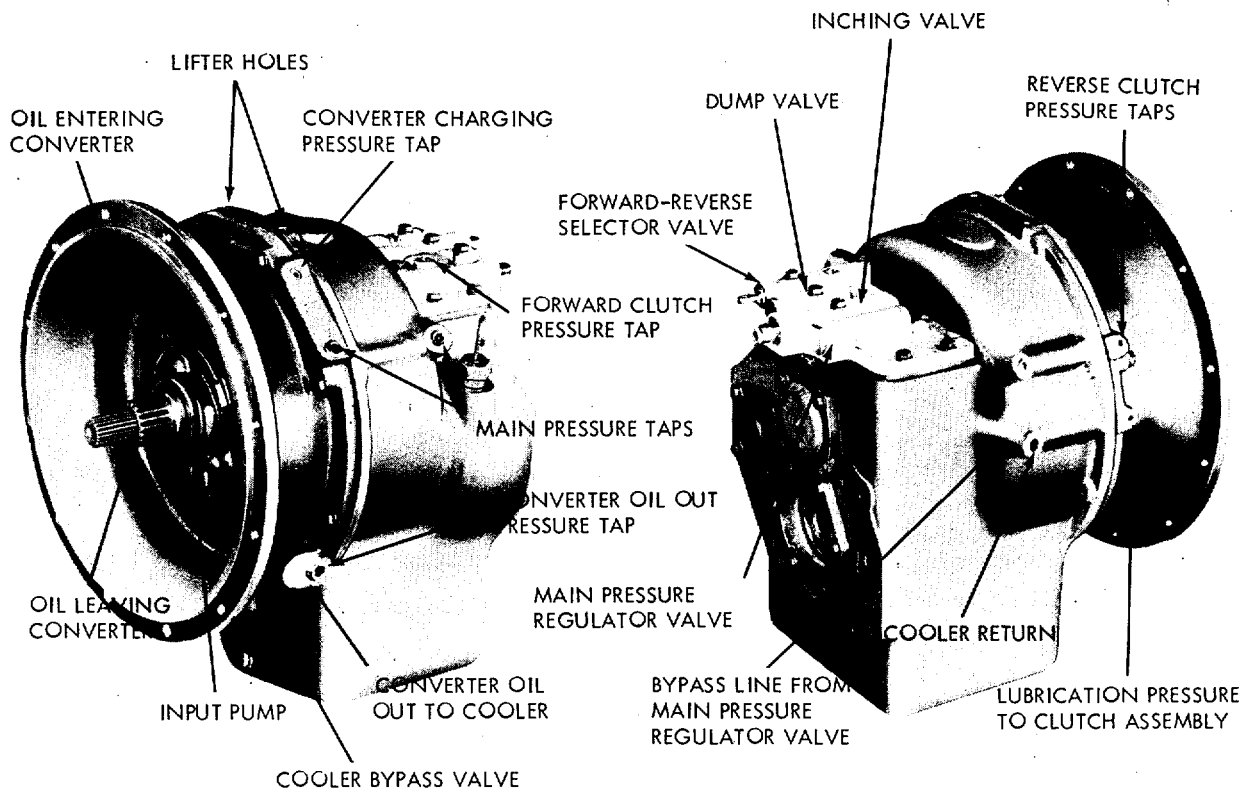


Figure 6-15. Transmission, Showing Pressure Check Points

TABLE 6-1. TRANSMISSION PRESSURES

Engine RPM	Main line pressure		Converter charging pressure		Forward clutch		Reverse clutch	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
500	20	30	15	25	15	25	15	25
1000	58	68	42	50	50	58	50	58
1500	110	120	74	84	77	87	77	87
2000	120	135	84	101	80	93	80.	93
Idle rpm for this vehicle is 450 to 500 maximum. Maximum rpm is 2400 and stall rpm is 1615 to 1785 at 200 deg. oil temperature.								

(4) With inching valve out (brake pedal depressed), both FORWARD CLUTCH PRESSURE and REVERSE CLUTCH PRESSURE must be 0 psi at all engine speeds.

(5) Test pressures listed in table 6-1 at all engine speeds listed.

d. Removal.

(1) Drain oil from transmission. Disconnect leads at neutral safety switch and at transmission warning light transmitter.

(2) Disconnect oil cooler hoses at cooler bypass valve (figure 6-15) and cooler return port. Cap hoses and plug ports to exclude dirt.

(3) Disconnect inching and shifting linkage at control valve.

(4) Place wheeled floor jack or equivalent beneath transmission to relieve weight, and remove nuts, screws and washers from rubber sandwich mountings. Remove mountings.

(5) Remove twelve screws and washers which attach transmission to engine.

WARNING

At this point, the transmission is supported only by the floor jack mentioned. Take all necessary precautions that it does not fall, to cause injury to personnel or damage to equipment.

(6) Draw transmission horizontally from engine until splined shafts leave bore of torque converter on engine flywheel, raise truck as needed to give clearance, and remove transmission from under truck.

e. Transmission disassembly.

(1) Remove capscrews (23 and 24, figure 6-16) and washers (5) from valve (22) body block and remove valve from transmission.

(2) Mark oil pump (78) and case front half (73) to insure proper reinstallation, and remove capscrews (80) and washers (79) holding pump to case front half.

(3) Lay transmission on case rear half (45) and remove capscrews (71 and 72), and washers (70) holding case front half (73) to case. Lift off case front half and clutch assembly (2) as a unit.

NOTE

Be careful not to damage the seal rings (3) in the collector ring (6).

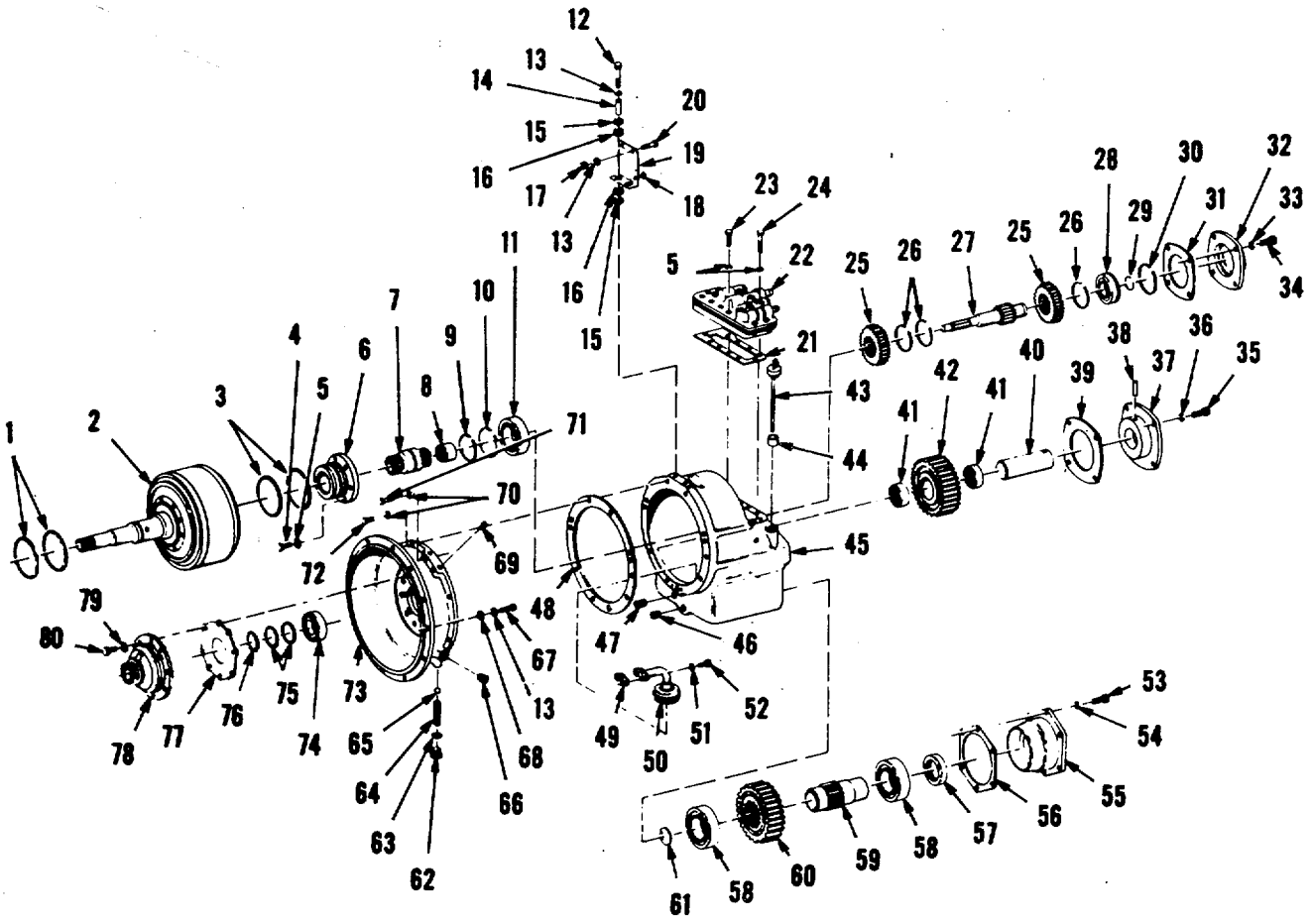
(4) Remove case front half from clutch assembly by removing retaining ring (75) on the turbine shaft and sliding case front half from clutch assembly.

(5) Remove the forward gear (25) and forward shaft (27) in the following manner:

(6) Remove capscrews (34) and lockwashers (33) holding forward shaft cover (32) and remove cover and gasket (31).

(7) Remove retaining ring (26) on the forward side of the forward gear.

(8) Tap the forward shaft on the front end, while holding the forward gear through the valve block opening and pull the shaft (27) and bearing (28) assembly rearward from the gear box.



1. Metal seal ring
2. Clutch assembly
3. Clutch shaft seal ring
4. Bolt
5. Washer
6. Bearing retainer and collector
7. Drive shaft
8. Drive shaft bearing
9. Retaining ring
10. Retaining ring
11. Bearing
12. Screw
13. Washer
14. Tube
15. Washer
16. Washer
17. Nut
18. Washer
19. Support
20. Screw
21. Gasket
22. Control valve assembly
23. Screw
24. Screw
25. Forward and reverse gear
26. Retaining ring
27. Reverse drive gearshaft
28. Bearing
29. Retaining ring
30. Retaining ring
31. Gasket
32. Shaft cover
33. Washer
34. Bolt
35. Bolt
36. Washer
37. Idler shaft retainer
38. Pin
39. Gasket
40. Idler gear shaft
41. Idler shaft bearing
42. Idler gear
43. Gage
44. Tube
45. Case
46. Plug
47. Plug
48. Gasket
49. Gasket
50. Strainer element
51. Washer
52. Screw
53. Bolt
54. Gasket
55. Bearing retainer cage
56. Gasket
57. Output shaft seal
58. Output shaft bearing
59. Output shaft coupling
60. Gear
61. Expansion plug
62. Plug
63. Copper gasket
64. Spring
65. Pressure relief ball
66. Plug
67. Screw
68. Washer
69. Plug
70. Washer
71. Screw
72. Screw
73. Case front half
74. Case bearing
75. Retaining ring
76. Input shaft seal ring
77. Gasket
78. Pump assembly
79. Washer
80. Screw

Figure 6-16. Transmission, Exploded View

(9) Remove the reverse gear and shaft in the following manner:

(10) Remove retaining ring (26) on the rear side of the reverse gear (25).

(11) Identify the collector ring (6) with the gear case to insure proper reinstallation.

(12) Remove bolts (4) and lockwashers (5) that retain the collector ring and remove the collector ring from the housing. Remove seal rings (3) if excessive wear is noted.

(13) Remove the reverse shaft (7), and bearing (8) assembly while holding the reverse gear through the valve block opening.

(14) Remove idler gear (42) and shaft (40) in the following manner: (15) Remove bolts (35) and lockwashers (36) retaining the idler shaft retainer (37) to the housing and remove retainer and shaft. Be sure to note the position of the pin (38) holding the retainer to the shaft to insure proper reinstallation.

(16) Remove idler gear and bearings (41) through the valve block opening.

(17) Remove output gear (60) and shaft (59) in the following manner:

(18) Remove bolts (53) and gaskets (54) holding the output shaft seal and bearing retainer (55) to the case.

(19) Remove output shaft, retainer, and gasket (56) by tapping lightly on the forward end, while holding the output gear through the valve block opening.

(20) Remove the strainer element (50) by removing retaining capscrews (52) and washers (51) inside the case.

(21) Place clutch assembly in an arbor press and apply pressure on the front end of the input shaft, until the front cylinder is depressed enough to allow removal of the large retaining ring from the pressure plate.

(22) Release press pressure and remove the front cylinder and input shaft assembly.

(23) Remove the piston, drive disc, and springs.

(24) Turn the drum assembly over and remove the other large snap ring, cylinder, piston and drive disc.

(25) Invert valve. Remove pipe plug, screws and washers which retain valve bedplates and gaskets.

(26) Remove bedplates and gaskets. Spring, ball and bushing, and the piston stops are now uncovered. Remove them.

(27) Unscrew hex head retainer plugs and remove washers, springs and pistons from the valve body.

(28) Remove control plunger seals and plungers, springs and pistons from valve body.

f. Cleaning, inspection, and repair.

(1) Clean all metal parts in SD. Discard all used nonmetal parts, such as seals and gaskets.

(2) Inspect parts for wear and damage. Replace defective parts with new parts. Do not attempt to repair parts by reworking.

g. Assembly.

NOTE

Lightly lubricate all internal metallic parts with clean engine oil to facilitate reassembly.

(1) Install inching valve locator spring in valve body, followed by inching valve inner piston, spring and inching valve piston. Press seal in place and with valve body inverted, install piston stops in body to engage grooves in pistons.

(2) Install both regulator valve pistons, springs, washers, and retainer plugs.

(3) Install selector valve plunger and seal, piston stop, detent bushing, ball and spring. Place gasket and valve bedplate on valve body and install washers and screws. This bedplate retains the piston stops and detent parts in the valve body.

(4) Install gasket and valve bedplate.

(5) Place clutch plates on pressure plate. Install springs. Put rings on pistons.

(6) Attach input shaft to cylinder. Enter piston in cylinder and install this assembly in pressure plate. Secure with retaining ring.

(7) Install clutch piston in cylinder, place assembly in pressure plate and secure with retaining ring. Clutch assembly is now ready for installation.

(8) Remaining assembly of the transmission is accomplished by reversing the procedures e.(l) through e.(20) above, paying particular attention to the points listed below.

(9) Make sure a gasket is in place at the suction inlet opening and not damaged when installing the oil filter screen.

(10) Machined relief's in idler shaft retainer (37, figure 6-16) must be positioned down, so that the oil can drain into the housing.

(11) As gears and bearings are being installed, coat them with lubricant and make certain that they rotate freely.

(12) Be sure match marks are aligned on the oil pump assembly (78) with the case front half, and rear collector ring with the case front half (73) or oil passages will not be open.

(13)' Be sure retaining rings are properly installed and thoroughly seated.

(14) Use a new gasket (21) when replacing the control valve assembly (22).

h. Installation.

(1) Reverse the procedure given in paragraph d. above.

(2) Refer to Lubrication Chart and fill transmission to proper level. Insure that engine is at operating temperature and 450 to 500 rpm. Place gear shift in neutral position. Add oil if necessary, to bring level to full mark on dipstick.

(3) Test transmission as given in paragraph c. above.

(4) Check adjustment of inching and shifting linkage for proper operation. Check that on application of brake pedal, with shift lever alternately in FORWARD and REVERSE, that forward and reverse clutch pressure is zero psi before brake application begins, with pedal free travel between 3/8 inch and 5/8 inch.

(5) Perform operational test of transmission.

6-29. HYDRAULIC PUMP AND DRIVE ASSEMBLY.

a. Removal. Drain hydraulic tank, disconnect hydraulic lines and then remove pump by removing nuts at top and bottom of hydraulic pump mounting flange. Pull drive assembly from hydraulic pump.

b. Disassembly.

(1) Remove and discard mounting gaskets.

(2) Remove smaller retaining ring from groove in drive gear, and remove gear and bushing from drive sleeve.

(3) Remove larger retaining ring from groove in drive sleeve, and remove bearings and spacer from pump drive sleeve.

(4) Remove pump mounting flange retaining ring and eight capscrews, the seal and mounting flange cover.

(5) Remove driven and drive gearshafts, four bearings, and two dowel pins.

(6) Remove all backup rings and packings.

(7) Remove two pins from pump housing only if replacement is necessary.

c. Cleaning, inspection, and repair.

(1) Clean all metal parts in SD..

(2) Discard all nonmetal items removed.

(3) Inspect bearings for tight spots, during rotation for looseness, seals for wear, and gears for chipped teeth and other damage. Replace gears in matched set.

(4) Correct any slight irregularities in mating surfaces which can be cleaned up by removal of less than 0.005 inch of metal.

(5) Inspect end covers, housing, and center section for cracks and damage. Inspect bearing counterbores and shaft bearing surfaces in housings and covers for excessive wear and damage. Inspect all machined surfaces for scoring, wear and damage.

(6) Inspect shafts for loose keys, worn bearing surfaces, and damage.

(7) Inspect thrust plates for wear, scoring, and damage.

d. Assembly.

(1) Install two mounting flange aligning dowel pins in pump housing.

(2) Install all performed packings and backup rings.

(3) Assemble aligning pins and bearings. Put them onto pump gearshafts and install assembly in pump housing.

(4) Install mounting flange cover on pump housing, and retain it with screws. Install seal and retaining ring in cover.

(5) Assemble pump drive assembly in the reverse order of disassembly.

e. Installation. Reverse the procedure in a. above. Fill hydraulic tank in accordance with the Lubrication Chart.

6-30. HYDRAULIC LIFT CHAIN.

a. Removal.

(1) With carriage and fork assembly completely bottomed, release chains at hydraulic lift cylinder by removing two adjusting screws and four nuts.

(2) Lift off load backrest, and reach behind carriage unhook chains at lift carriage. Pull chains free of unit.

b. Cleaning. After removal clean chain by soaking in SD, at the same time scrubbing with a wire brush to remove encrusted lubricant. Dry with clean dry cloths, or dry compressed air. Lubricate by soaking in OE 10.

c. Inspection. Inspect chain for worn or damaged side plates or link pins, damage from lack of lubrication or rust.

d. Installation.

(1) Feed chains over rollers of crosshead assembly and hook in position on carriage assembly.

(2) Install adjusting screws through holes provided on lift cylinder and install four nuts on adjusting screws.

e. Adjustment.

(1) With no load on forks move forks to their extreme width.

(2) Lower forks completely.

(3) Move upright to vertical position.

(4) Turn the nuts up on the adjusting screws as far as threads will allow.

(5) Fork to floor clearance will range from 0 to 3/4 inch, depending on tire wear and machine tolerances.

(6) Raise the inner rail assembly to its fullest height and check the clearance between the inner rail stops and the outer rail stop blocks. If the stop blocks are touching, readjust the nuts until a clearance of at least 1/8 inch is obtained.

(7) Adjust nuts until deflection is equal with the same tension applied to each chain at the same height. Keep nut and jam nut as close to end of screws as possible and still obtain above adjustments. This will allow lowest possible position of forks. Tighten jam nuts.

6-31. HYDRAULIC OIL TANK.

a. Removal.

(1) Raise truck to permit removal of hydraulic oil tank from beneath truck.

(2) With truck lift lowered and tilted back, remove drain plug and drain oil into a container.

(3) Disconnect all tubing at tank and filter flange.

(4) Remove four nuts, flat and lock washers, and screws, securing tank to chassis.

b. Cleaning.

(1) Remove four screws and washers which fasten filter mounting flange to tank. Lift off flange and gasket.

(2) Lift out filter element and tube.

(3) Wash all parts removed from tank in SD, and dry with dry compressed air.

(4) Flush interior of tank with SD, and drain dry. Be sure no SD is left in tank after cleaning.

(5) Steam clean exterior of tank, dry thoroughly and install items removed in steps (1) and (2) above.

c. Installation. Reverse a above.

6-32. HYDRAULIC FLOW CONTROL VALVE.

a. Removal.

(1) Disconnect hoses and tubing at control valve, remove fittings from valve, and cap or plug open hydraulic lines to exclude dirt.

(2) Remove screw, nut and washers securing valve to chassis.

b. Disassembly.

(1) Remove large hex head plug, valve piston and spring.

(2) Remove smaller hex head, shims, spring and valve. Note arrangement of parts for ease of assembly.

c. Cleaning, inspection, and repair. Clean all parts in SD. Inspect piston and bore of valve body for wear or burs. Inspect valve for damage that might cause leakage. Repair slightly dam aged threads with a tap.

d. Assembly.

(1) Install valve in spring, shims and smaller plug in top part of body.

(2) Install spring, piston and largest plug in horizontal part of body.

e. Test after assembly. With lift and steering ports temporarily plugged, apply increasing hydraulic pressure to the inlet port. The relief valve should crack open at 650 to 750 psi, and be held fully open at 1000 to 1100 psi. Adjust setting, if necessary, by adding or removing shims.

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

6-33. HYDRAULIC LINES AND FITTINGS. Maintenance of the hydraulic lines and fittings is limited to removal of defective parts and replacement with new hydraulic lines and fittings. Visually inspect hydraulic lines and fittings during operation for signs of hydraulic fluid leakage or restrictions signified by operational malfunction. Tag hydraulic lines as they are disconnected to facilitate installation and cap hoses or plug parts, as required, to exclude dirt or other contamination.

6-34. TILT CYLINDERS.

a. Removal.

(1) Remove truck floor plate.

(2) Tag and disconnect hoses (figure 6-17) from tilt cylinders. Cap hoses and plug ports in cylinders to exclude dirt.

(3) Support mast so it will not suddenly tilt on removal of tilt cylinders.

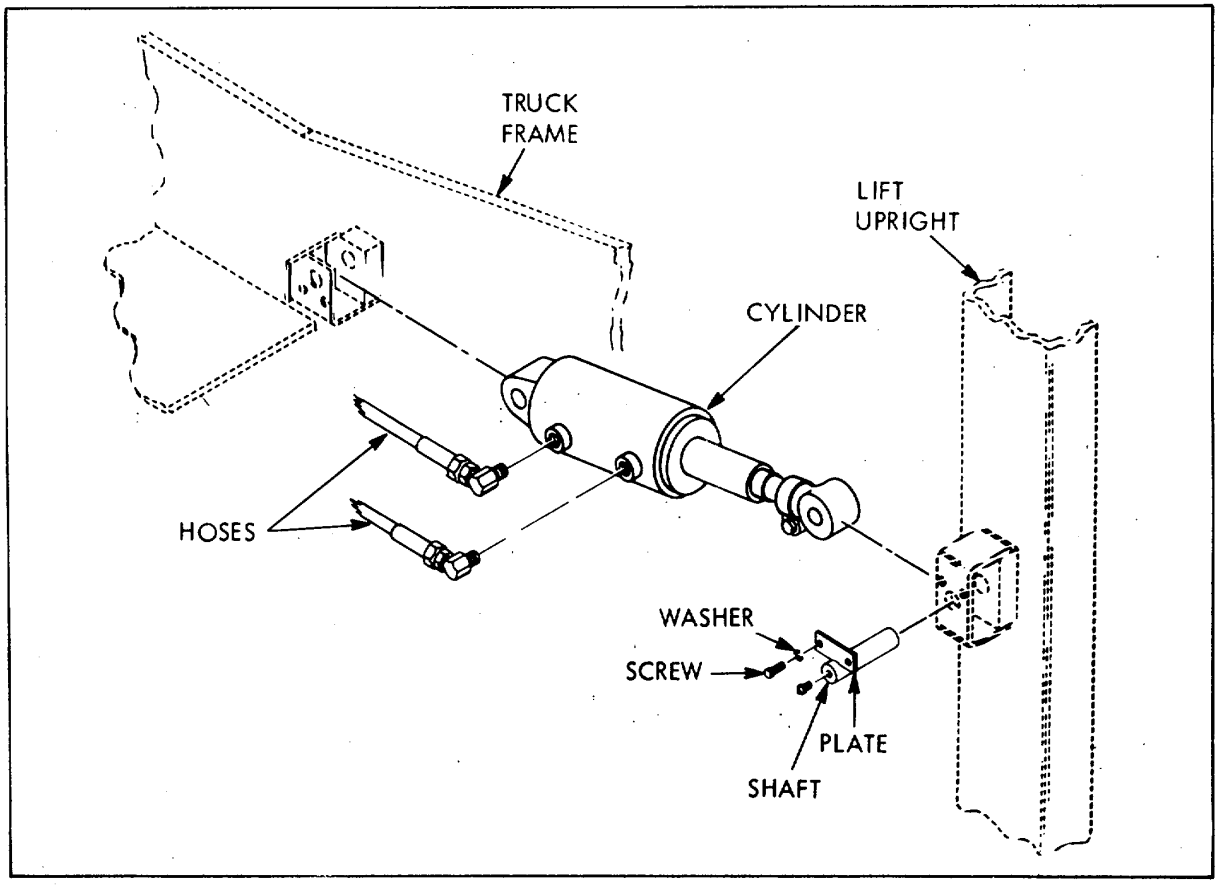


Figure 6-17. Tilt Cylinder Removal

WARNING

If not supported the mast will fall forward when the tilt cylinders are disconnected.

(4) Remove screws attaching shafts to brackets on truck frame and on uprights.

(5) Pull or drive shafts from cylinder ends. Be careful not to let cylinder fall as shafts are removed.

b. Disassembly.

(1) Remove nut, washer and screw from rod end. Remove rod end from piston and rod.

(2) Remove screw, washer and retainer from stuffing box. Remove wiper ring and packing. Unscrew stuffing box from cylinder and take out piston and rod, and remove packings from piston.

c. Repair. Repair of the tilt cylinders is accomplished by installation of new parts to replace defective items found during disassembly.

d. Assembly.

(1) Install packings on piston, and install in cylinder. Screw stuffing box snugly into cylinder with a pin spanner's wrench.

(2) Position packing in stuffing box and install packing retainer with screws and washers only tightly enough to prevent seepage of fluid. This item can be further tightened later, after installation of the cylinder, if necessary to stop leakage.

(3) Install wiper ring on piston rod, replace rod end, screw, washer and nut.

e. Installation.

(1) Position tilt cylinder (back end) in U shaped bracket on truck frame (figure 6-17).

(2) Aline bracket holes and cylinder end hole. Insert shaft through bracket and cylinder end hole. Secure shaft with screws.

(3) Remove plugs from ports and caps from hoses and connect hydraulic hoses to cylinders.

(4) Check oil level in reservoir.

(5) After installation, operate tilt control lever several times to purge air from cylinders. Check cylinders and hose fittings for leakage while operating.

(6) Retract both tilt pistons fully. With mast tilted 10 deg. to rear of vertical and pistons retracted fully, repeat step (2) above. Secure front end of tilt cylinders to upright brackets with shafts and attaching screws.

6-35. LIFT AND TILT CONTROL VALVE, LEVERS AND LINKAGE.

a. Removal of levers and linkage.

(1) Open engine cover and right side door for access to control valve.

(2) Remove cotter pins, links and pins securing levers to control valve.

(3) Remove lift control levers free of valve.

b. Removal of lift and tilt control valve.

(1) Disconnect tube at elbow (figure 6-18) after draining hydraulic tank.

(2) Disconnect tee fittings at control valve.

(3) Loosen hose clamp and remove upper hose.

(4) Disconnect lower hose from control valve.

(5) Remove capscrews, nuts, and washers, and remove valve from truck.

(6) Remove elbows and adapters from valve. Replace them on hoses for safekeeping, as they can be reused if not damaged. Be certain to plug or cap all hoses to excludes dirt.

c. Disassembly.

(1) Unscrew plug and seal at bottom of relief valve. Remove cap nut, and locknut and seals on top of relief valve. Back out setscrew and remove spring and pilot plunger. Remove relief valve cap and packing.

(2) Remove packing and retainer, pilot seat, spring, poppet assembly, plunger and seat from relief valve bore in body.

(3) Remove check valve cap and packing, spring and poppet.

(4) Remove screws and bracket from both TILT and HOIST valves. Remove valve spool wipers, packing retainers and packing from valve body.

(5) Take off both spool caps, and remove retaining rings, four spring retainers; springs and washers.

(6) Remove packing retainers and packings. Remove valve spools only for inspection and cleaning. They are not replacement items. Spools are not interchangeable. Replace each in its original position in valve.

d. Cleaning, inspection, and repair.

(1) Clean all parts in SD, and wipe thoroughly with a dry, lint-free cloth, or -dry, warm air. Blow valve passages dry of SD.

(2) Inspect all steel parts for rust spots or corrosion, scratches and wear. Check threads for damage and repair those which show only moderate damage, with a tap or die.

(3) Discard all nonmetal items removed during disassembly. All repairs to the valve beyond thread repairs consist of installation or new parts to replace defective ones.

(4) Inspect control valve assembly inlet and outlet ,bodies for cracks and damage. Inspect all threaded surfaces for damage and crossed threads.

(5) Inspect handles and control linkage for wear, distortion, and damage. Repair or replace parts as necessary.

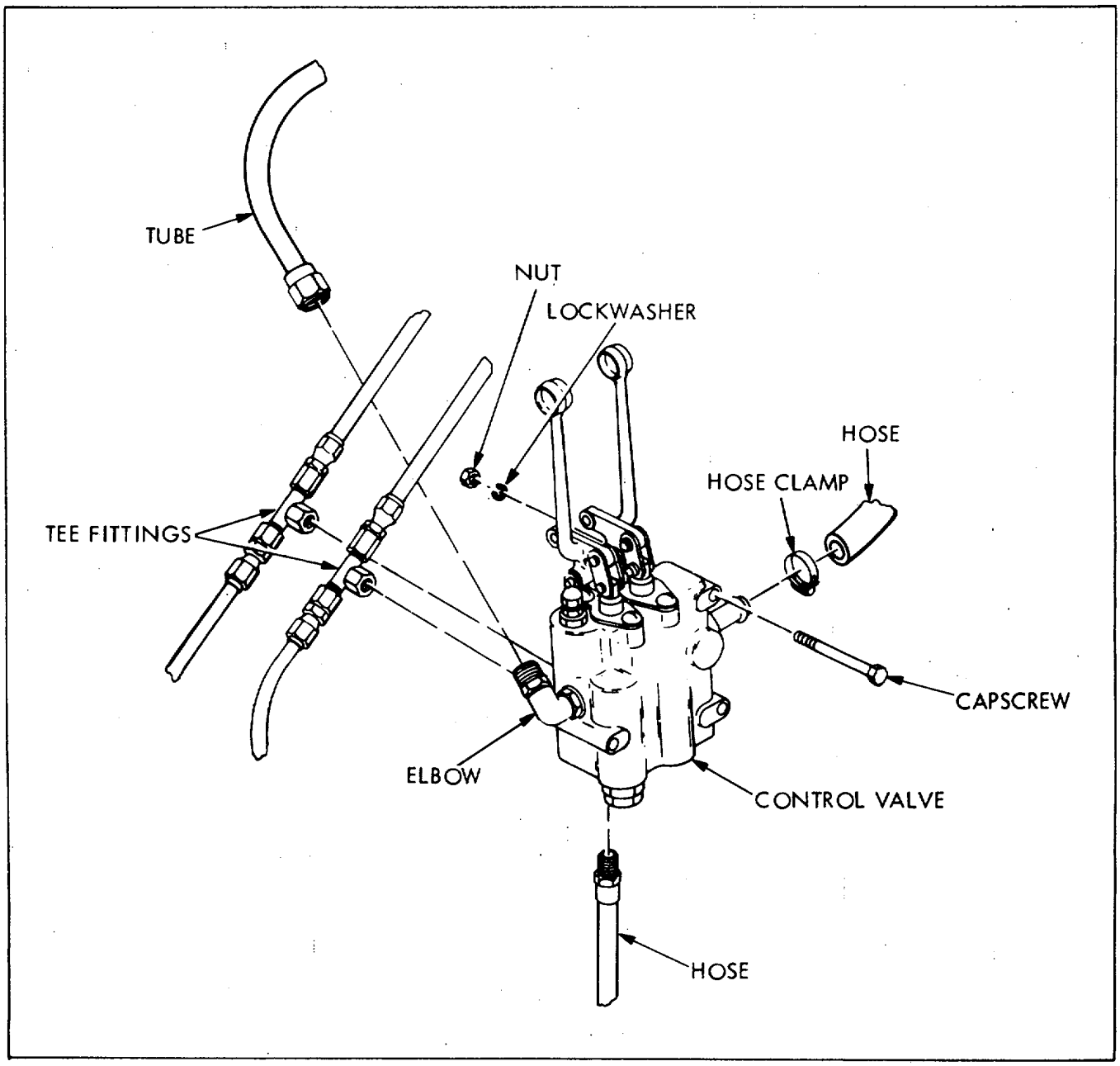


Figure 6-18. Lift and Tilt Control Valve Removal

(6) Inspect valve spools for scoring, wear and damage. Check valve body bore in same manner. Check springs for loss of pressure and damage. If spools or body are damaged, replace entire valve assembly.

e. Reassembly.

(1) Replace spools in valve body. Seat packings in counterbore, and place packing retainers over them. Assemble spring and washer within retainers, install over spool, and secure with retaining ring. Install spool cap. Repeat this procedure with corresponding parts at other spool.

(2) Install packings at top of each spool, followed by packing retainers, and wipers. Install brackets with screws.

(3) Place packing on check valve cap. Install poppet, spring and cap and packing.

(4) Press plunger seat into position, install plunger and poppet assembly, spring and pilot seat. Put packing on retainer and install retainer.

(5) Position pilot plunger, and spring. Put packing on cap and install cap.

(6) Install setscrew, seals and nut. Install nut, and install handles and linkage by reversing a. above.

f. Adjustment.

(1) On a hydraulic test bench, apply fluid pressure from a source with a 3 gpm capacity, to 2000 psi, to the inlet port of the valve.

(2) Operate either handle to shut off flow and operate the regulator valve. Valve must relieve at 1650 to 1750 psi. To adjust, remove cap nut, loosen plain nut, and turn setscrew clockwise to raise setting, or counterclockwise to lower setting. Tighten locknut and replace cap nut.

g. Installation. Reverse procedure in b above.

6-36. FILTER CARTRIDGES. Two filters are used in the hydraulic system; one in suction line within the hydraulic tank, the other in return line from control valve.

a. Return filter cartridge replacement.

(1) Turn cartridge from filter head by hand.

(2) Install new cartridge by reversing procedure in (1) above.

b. Suction filter element replacement.

(1) Refer to paragraph 6-31 b (1) and (2).

(3) Disconnect .both tilt cylinders at uprights.

(2) Install new element by reversing procedure in (1) above.

6-37. HOIST CYLINDER.

a. Removal.

(1) Remove lift chains (paragraph 6-30).

(2) Drain hydraulic tank and disconnect hydraulic hose from elbow at base of hoist cylinder. Cap hose to keep out dirt.

(3) Remove screws and washers which attach crosshead to hoist cylinder. Raise crosshead free of cylinder.

(4) Remove cylinder from position in bottom member of outer upright and remove flow regulator and both elbows from base of cylinder.

b. Disassembly.

(1) Remove wiper ring, packing retainer, packing set and sleeve bushing from hoist cylinder.

(2) If leakage is apparent, remove cylinder bleed screw and replace gasket.

c. Assembly. Reverse b above, tightening packing retainer (6) just snugly enough to prevent leakage.

d. Installation.

(1) Reverse a.above.

(2) Loosen cylinder bleed screw enough to release trapped air slowly, and operate hoist cylinder until hydraulic fluid is free of air bubble leaks from around screw. Tighten screw.

6-38. TEST AFTER INSTALLATION. Test operation of cylinder. If fluid leaks around packing, tighten packing retainer only enough to stop leak.

6-39. MAST AND CARRIAGE ASSEMBLY.

a. Removal.

(1) Attach a chain hoist to mast assembly (or use the forks of another lift truck), and relieve the weight of the assembly on its supporting parts. Arrange to brace the assembly against tipping as disconnections are made. The forks are to be fully lowered at this time.

(2) Disconnect hydraulic hose from lift cylinder and cap hose and cylinder to exclude dirt.

(4) Remove capscrews, washers and angle brackets which secure outer uprights to bearing bracket

on frame and lift mast assembly from truck.

b. Disassembly.

(1) Remove chains (paragraph 6-30).

(2) Remove hoist cylinder (paragraph 6-37).

(3) Lift off load backrest (figure 6-19).

(4) Raise inner upright slightly, loosen nut at bottom of guide rod and unscrew rod from cylinder bracket on inner upright. Remove rod, tube, nut, and bushing within crosshead. Remove crosshead.

(5) Disassemble crosshead as follows:

(a) Remove retaining rings from ends of crosshead trunnions.

(b) Take off spacers, bearings, and chain rollers.

(6) Remove screws and washers attaching cylinder bracket to inner upright and remove cylinder bracket.

(7) Remove screws, washers, and carriage bar from carriage. Remove forks. Lift carriage out of inner upright.

(8) Remove roller assemblies and shims from carriage trunnions.

(9) Remove plugs and setscrews, and remove inner upright from within outer upright.

c. Repair.

(1) Thoroughly inspect and examine all parts prior to assembling the disassembled uprights. Replace any component which shows evidence of excessive wear; cracks, fractures or damage. Replace any part when in doubt as to its serviceability.

(2) Repair damaged threaded items by cleaning up threads with a tap or die.

(3) Straighten slightly deformed structural items by cold bending.

(4) Inspect rollers and bushings for wear and damage. Check bearings for free rotation. Inspect crosshead for evidence of excessive damage. Replace if in doubt of parts serviceability.

(5) Roller bushings must be smooth without pitting, scoring or other defects. Examine carriage for evidence of excessive wear.

d. Assembly.

(1) Reverse procedures in b above.

(2) Bleed air from hoist cylinder (paragraph 6-37 d).

e. Installation.

(1) Position assembly on bearing bracket on frame. Install angle brackets, washers and cap screws to secure in position.

(2) Connect hydraulic hose to hoist cylinder fitting.

(3) Connect both tilt cylinders to brackets on outer uprights by installing shafts (figure 6-17), lock plates, screws and washers.

6-40. TEST AFTER INSTALLATION. Operate system with gradually increasing loads to check for proper operation and hydraulic leaks.

6-41. ELECTRICAL SYSTEM (CHASSIS). The following paragraphs cover all truck electrical components except those which are included in the engine assembly. For removal and disassembly of electrical assemblies mounted on the engine (starter, generator, ignition system) refer to the coverage of the engine assembly in this manual.

6-42. Repair of the following electrical components is essentially limited to replacement of the defective component except where noted. Installation is the reverse of removal. Refer to the wiring diagram (figure 6-20) as an aid in tracing circuitry problems in the wiring harness, as well as diagnosing and isolating any troubles encountered in the electrical system.

6-43. BATTERY AND CABLES.

a. Removal.

(1) Disconnect ground and starter cables at battery. If necessary use a puller to lift cable terminals from posts with a vertical pull. Do not twist or pry terminals from post.

(2) Disconnect ground cable from frame, and starter cable from starter.

(3) Loosen nuts and washers holding strap and lift battery clear of truck.

CAUTION

Avoid contact with any liquid on the battery. It will probably be electrolyte, which can produce skin burns and damage clothing if not rinsed off quickly with clear water.

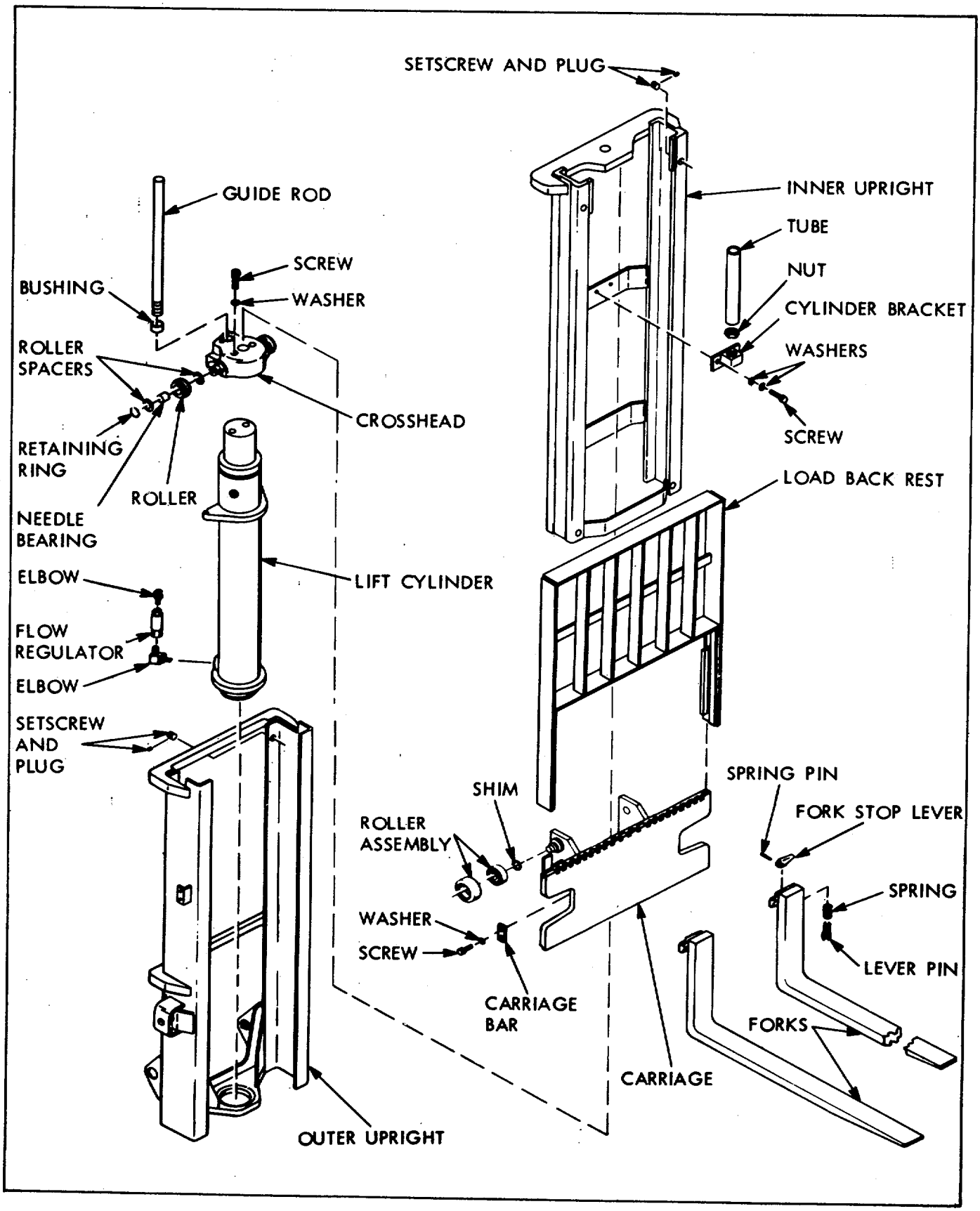


Figure 6-19. Mast Column, Exploded View

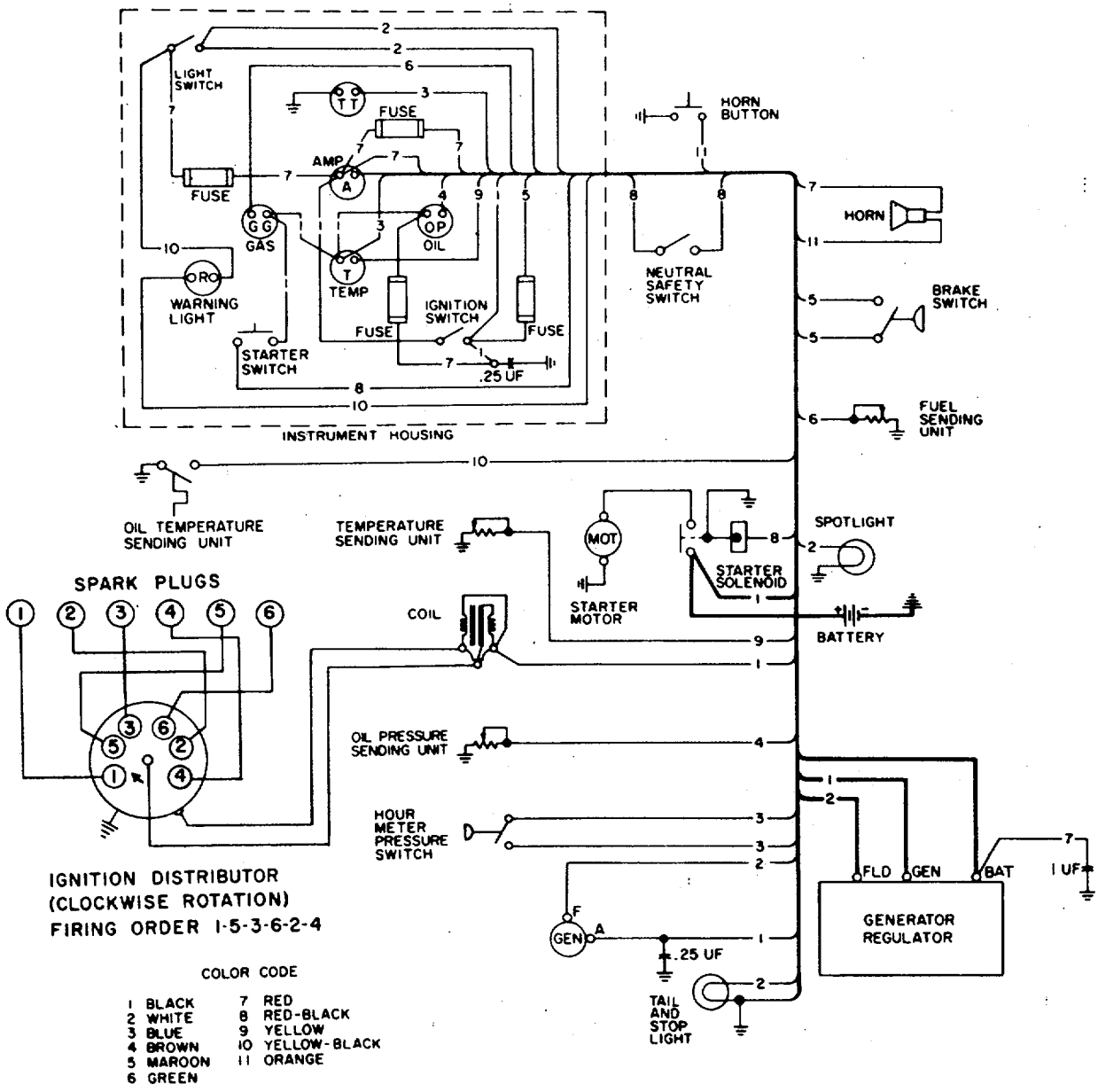


Figure 6-20. Wiring Diagram

b. Cleaning.

(1) Wash battery by flushing freely with water. Use brush if necessary to remove crusted deposits. Brush terminal posts to bright finish without removing metal.

(2) Wash battery cables in hot water to remove dirt and corrosion. Wire brush inside of battery terminals to bright finish.

c. Installation. Reverse a above. Tighten battery strap nuts only tightly enough to hold battery snugly. do not overtighten .

d. Test.

(1) Remove cell caps, and test specific gravity of electrolyte in each cell with battery hydrometer. All cells should read within 10 points of each other. Reading of 1.280 indicates full charge; 1.220 indicates about 50% charged; 1.160 indicates practically complete discharge. Variations in readings among cells indicate the low reading cells are defective, and battery must be replaced.

NOTE

Readings above apply at electrolyte temperature of 80 deg F. At different temperatures, add .004 to reading for each 10 deg F above 80 deg F; subtract .004 from actual reading for each 10 deg F below 80 deg to obtain value for comparison with figures given in (1) above. Also see figure 5-11.

(2) With fully charged battery installed, test cables and connections as follows:

(a) Contact positive battery post (do not touch cable terminal) with positive lead of voltmeter calibrated in tenths of a volt. Contact negative voltmeter lead to starter terminal of starter.

(b) Crank engine. Note voltmeter reading while cranking. Any reading in excess of 0.2 volt indicates electrical resistance due to a bad cable or connection.

(c) Repeat (a) and (b), except contact ground on engine with voltmeter positive lead, and voltmeter negative lead touching battery negative post. Voltmeter reading greater than 0.2 volt indicates bad cable or connection.

6-44. WIRING HARNESS. Repair of the wiring harness is limited to isolating shorted and open circuits and using good commercial practice in their repair. Refer to the wiring diagram (figure 6-20) and conduct a systematic inspection using an ohmmeter to isolate the trouble.

Remedy the trouble by splicing leads where required and applying electrical tape to prevent short circuits from occurring. If failure occurs in one of the wires in the harness, and general damage to the harness has not occurred, as would be the case if one wire burned, repair as follows: a. Disconnect defective wire at both ends and clip off where it enters harness.

b. Select suitable length of correct gage and type wire for replacement.

c. Install wire terminals, equivalent to those used on the original wire, dress the replacement wire neatly along the outside of the loom parallel to the original wire (tie with lightweight cord at four inch intervals) and connect new wire.

6-45. TAILLIGHT

a. Removal.

(1) Remove screws from corners of radiator cover plate and raise cover plate for access to taillight wiring and attaching parts.

(2) Disconnect wiring by unplugging leads at terminal lugs.

(3) Remove nut and washer securing taillight assembly and remove taillight assembly from radiator cover plate.

b. Disassembly. Remove screws securing lens and remove lens and gasket from housing. Remove lamp by pressing it down into socket and turning it to left until it can be lifted free.

6-46. STOP LIGHT SWITCH AND INDICATOR TRANSMITTER REMOVAL.

a. Disconnect electrical lead or leads at unit to be removed.

NOTE

Before removing engine temperature transmitter drain enough coolant to bring level' below tapped mounting hole. Before removing any of the units listed, for replacement, have the replacement unit ready for immediate installation.

b. Unscrew hourmeter switch, engine oil pressure transmitter, engine temperature transmitter or stop light switch as required. None of these units is subject to disassembly or repair.

6-47. FUEL GAGE TRANSMITTER REMOVAL a. Remove five screws and washers from flange of transmitter atop fuel tank. Remove gasket. The transmitter is not subject to disassembly.

6-48. NEUTRAL SAFETY SWITCH REMOVAL.

Disconnect two electrical leads at switch. Remove two screws, nuts and washers attaching switch to truck, and take switch and its mounting insulator from truck. The neutral safety switch is not a reparable item. Replace a defective switch with a new one,

6-49. HORN REMOVAL. Disconnect electrical leads from horn. Remove two screws, nuts and washers retaining horn. Remove horn from truck. The horn is not subject to disassembly.

6-50. ENGINE HOURMETER REMOVAL. Remove two nuts and washers securing hourmeter to instrument cluster. Disconnect leads at back of instrument and remove hourmeter from instrument housing. The hourmeter is not subject to disassembly.

6-51. INSTRUMENT CLUSTER REMOVAL AND DISASSEMBLY.

a. Remove two screws and washers from underside of instrument housing.

b. Raise instrument cluster from housing to extent permitted by attached leads.

c. Remove screws holding back on instrument cluster and remove back.

d. Disconnect and tag leads at each instrument. Remove attaching nuts, washers and clamps at each instrument and remove individual instruments.

6-52. ENGINE ELECTRICAL SYSTEM.

6-53. GENERATOR. This paragraph contains generator overhaul instructions. Do not attempt repairs beyond these given in this paragraph. Make electrical tests described with Generator and Regulator Tester, Federal Stock Number 4910-509-1514 or equal, using the techniques given in the instructions which accompany the Tester.

a. Removal and Installation. Refer to para 5-65 and 5-66.

b. Disassembly.

(1) Remove nut and lockwasher from drive end of shaft.

(2) Remove generator pulley and fan from armature shaft.

(3) Remove bolts and lockwashers from housing and remove drive end frame.

(4) Remove commutator end frame from housing.

(5) Separate generator housing from drive end frame, and withdraw armature from housing.

(6) Remove brush lead attaching screw and lockwasher 'from brush lead.

(7) Lift brush arms and remove brushes.

(8) Release brush springs and remove from brush arms.

(9) Remove brush arms with brackets.

(10) Remove woodruff key from armature shaft.

(11) Remove collar from armature shaft.

(12) Remove drive end frame from armature shaft.

(13) Remove screws and washers from drive end frame, and remove bearing retainer, gasket, washer and bearing from drive end frame.

(14) Press bearing from commutator end frame.

c. Cleaning. Using compressed air, and clean cloth, remove all dirt from component parts of generator before testing.

d. Inspection, Testing, and Repair.

(1) Armature.

(a) Inspect commutator for burs, nicks, wear, and out of round (maximum allowable 0.001 inch). If either condition 'exists, place armature in lathe and turn down commutator. Undercut mica 1/32 inch. Using No. 00 sandpaper, remove all burs and roughness which lathe tool leaves on commutator.

(b) Using lamp and two probes, test armature for ground. Place one probe on commutator and the other probe on the laminated core. If test lamp lights, armature is grounded. Replace it.

(c) Using growler, test armature circuits. If shorted circuit is discovered, clean between all bars of commutator; then retest. If open circuit is indicated, replace armature.

(d) Replace defective items as authorized.

(2) Ball bearing. Inspect ball bearing for nicks, cuts, and noises due to wear. Replace defective bearing as authorized.

(3) Commutator end bearing. Inspect bearing for wear. Place armature in soft-jawed vise and mount commutator end frame head on armature shaft. Shake commutator end frame. Side movement indicates worn bearing or worn armature shaft. Inspect to locate worn part. Replace defective bearing as authorized.

(4) Brushes. Inspect brushes for excessive wear (beyond one-half the length of a new brush), and loose or frayed brush leads. Replace defective brushes with new ones. Sand new brushes with No. 00 sandpaper. Hold sandpaper against commutator, grit side against brush, and pull sandpaper so that the brush is drawn to the brush arm. As brush is sanded, it assumes the contour of commutator.

(5) Springs. Inspect springs for wear, rust or corrosion, loss of tension, and evidence of overheating. Springs should hold brushes against commutator with 28 ounces pressure. Replace defective springs with new ones.

(6) Field frame.

(a) Using a test light, check field frame, field coils, and terminal studs for ground. Hold one test probe on the terminal stud and the other test probe on the field frame. If lamp lights a ground is present. To locate the ground, remove terminal stud and field coil lead from frame. Place one test probe on terminal stud and other test probe on field frame. If lamp fails to light, ground is between terminal stud and field frame. If lamp does light, ground is between field coils and pole shoes on field frame.

(b) Using same test light, test field coils for open circuit by placing one test probe on each of the leads coming from the field coils. If lamp lights, no open circuit is present. If lamp does not light, an open circuit is present.

(c) Replace defective items as authorized.

e. Assembly. Reverse procedures in b. above.

f. Final Testing. Mount assembled generator on generator-regulator tester, Federal Stock Number 4910-509-1514 or equal, and check generator thoroughly for noise, output, and arcing. Be certain the generator meets all test specifications.

g. Specifications.

Make	Delco-Remy
Model	1102221
Rated volts	12
Type	Circuit "A"
Rotation	Clockwise at drive end
Control	Vibrating-type current-voltage regulator
Ground polarity	Negative Brush spring tension 28 oz Field current (80 deg F) 1.62 + 1.82 amps @12 volts
Cold output Amps	20
Volts	14.0
Rpm	1625

6-54. STARTER.

a. Removal.

(1) Disconnect battery cable first at battery, then at starter terminal. Disconnect starter switch lead at solenoid terminal.

(2) Remove three nuts and washers securing starter to engine and remove starter.

b. Disassembly.

(1) Remove nut and two washers from solenoid coil terminal. Remove cover and stud assembly attaching screws and remove cover and stud assembly. Disconnect contact lead from switch.

(2) Remove through bolts, draw brush end frame back, lift insulated brushes from holders, and remove brush end frame. Remove insulated brush set from field windings in housing, and grounded brushes from plate in brush end frame.

(3) Remove drive end frame. Take washers and retaining ring from armature shaft, and remove pinion stop, clutch and assembled parts shown, moving core and solenoid parts from armature.

(4) Remove armature from housing.

c. Cleaning. Use compressed air or clean cloths to remove all dirt from components before inspection

.

d. Inspection and test.

(1) Inspect field coils for worn or frayed insulation; corroded, loose or burned terminal stud assembly; and loose and/or corroded connections.

(2) Inspect brushes for excessive wear and oil saturation and brush springs for corrosion and lost tension.

(3) Using .lamp and two probes, test armature for ground. Place one probe on commutator and the other probe on the laminated core. If test lamp lights, armature is grounded. Replace it.

(4) Using growler, test armature circuits. If shorted circuit is discovered, clean between all bars of commutator; then retest. If open circuit is indicated, replace armature.

(5) Replace defective items.

(6) Inspect brushes for excessive wear (beyond one-half the length of a new brush), and loose or frayed brush leads. Replace defective brushes with new ones. Sand new brushes with No. 00 sandpaper. Hold sandpaper against commutator, grit side against brush, and pull sandpaper so that the brush is drawn to the brush arm. As brush is sanded, it assumes the contour of commutator.

(7) Springs. Inspect springs for wear, rust, or corrosion, loss of tension, and evidence of overheating. Springs should hold brushes firmly against commutator. Replace defective springs with new ones.

(8) Field frame.

(a) Using a test light, check field frame, field coils, and terminal studs for ground. Hold one test probe on the terminal stud and the other test probe on the field frame. If lamp lights, a ground is present. To locate the ground, remove terminal stud and field coil lead from frame. Place one test probe on terminal stud and other test probe on field frame. If lamp fails to light, ground is between terminal stud and field frame. If lamp does light, ground is between field coils and pole shoes on field frame.

(b) Using same test light, test field coils for open circuit by placing one test probe on each of leads coming from the field coils. If lamp lights, no open circuit is present. If lamp does not light, an open circuit is present.

e. Repair.

(1) Turn commutator on lathe, if more than 0.002 inch out of round, burned, or if mica projects above 88 commutator copper segments. Do not undercut mica between segments.

(2) If burned contact disc can be cleaned up without removal of much metal, clean by filing to bright finish.

f. Assembly. Reverse b above.

g. Installation. Reverse a above.

6-55. DISTRIBUTOR.

a. Removal.

(1) Loosen screw at distributor primary terminal and remove primary circuit lead-in wire.

(2) Snap clips from distributor cap and lift cap from distributor. Do not remove wires from cap.

(3) Chalk mark edge of distributor to indicate location of rotor tip before removal, loosen clamp screw and lift out distributor.

NOTE

Do not turn engine crankshaft until distributor is reinstalled.

b. Disassembly.

(1) Remove distributor cap and rotor. Remove seal from distributor body.

(2) Disconnect lead from contact set and remove contact set and condenser.

(3) Remove breaker plate. Remove centrifugal advance springs carefully.

CAUTION

The tension of these springs is calibrated to control the automatic spark advance mechanism. They must not be stretched or distorted, or engine performance will be affected. Lift advance weights from pivots on shaft plate.

(4) File or grind off peened overhead of pin and drive out pin. Remove gear, shims and washer, then take shaft from distributor body.

c. Distributor Inspection.

(1) Inspect the distributor cap for cracks, carbon streaks, corroded terminals, and dirt.

(2) Inspect the rotor for cracks and the metal strip for burned condition.

(3) Inspect cap electrodes for burning or corrosion.

(4) Inspect contact set. Point contact faces must be clean and unburned in appearance (frosty appearance of used points is normal, not cause for replacement), and contact surfaces must be aligned and parallel.

(5) Check wear of shaft bearing in housing. If shaft can be moved sideways more than 0.003 inch, replace distributor assembly.

d. Repair. If contacting area of points is slightly burned or pitted, clean area with a few strokes of a point file. Do not try to remove all roughness, or dress the points down smooth; only remove scale or dirt. Do not use sandpaper or emery to dress the points.

e. Assembly. Reverse procedure given in step b. above and adjust contact gap as given below.

f. Contact point adjustment. (Refer to Figure 6-21)With the distributor cap, rotor, and housing cover seal removed, and the rubbing block of movable contact at the high point of the cam, check the contact point gap by inserting a 0.022 inch feeler gauge between the contact points. If an adjustment is necessary, loosen the mounting screw and turn slotted head eccentric to move the stationary point contact support until the proper gap is attained. After adjustment is completed, tighten the mounting screw. Also, check points for alignment.

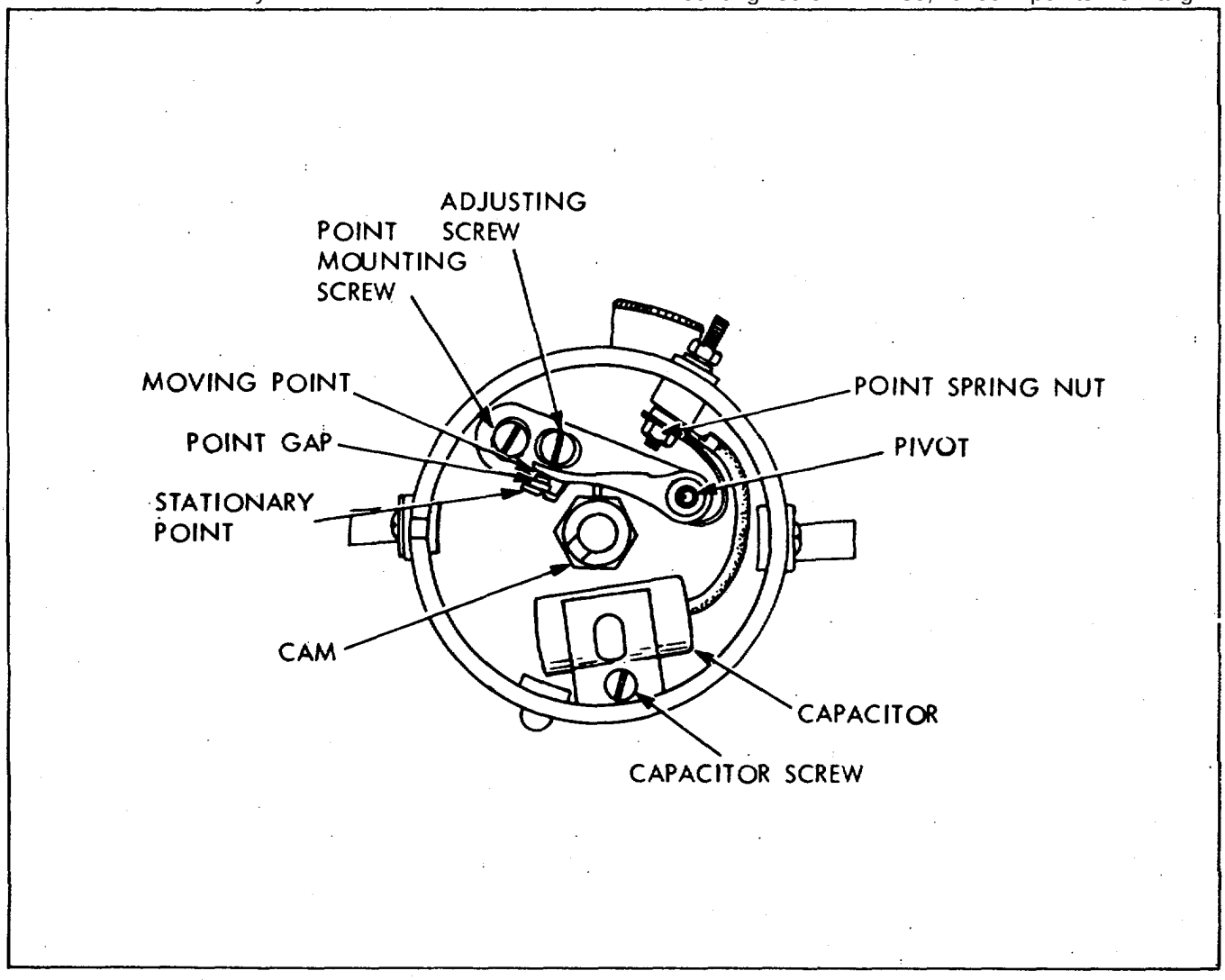


Figure 6-21. Distributor, Cap Removed

g. Installation.

(1) Position rotor so tip points to chalk mark made in a.(3) above, and replace distributor in engine. Connect primary lead wire.

(2) Tighten distributor clamp screw only enough to put a drag on distributor body if turned. Turn engine until D-C mark on flywheel appears at hole in flywheel housing.

(3) Turn distributor body clockwise until points are definitely closed.

(4) Turn on ignition, remove coil wire from center of cap and hold it about 1/4 inch from cylinder head.

(5) Turn distributor slowly counterclockwise, stopping at exact point at which coil wire sparks. Tighten clamp screw, turn off ignition and reinstall distributor cap and coil wire in cap.

(6) With breaker points closed, and ignition on, connect a voltmeter across each connection in the ignition low voltage circuit. Wiggle accessible connections, looking for a deflection of the meter. Any reading in excess of 0.1 volt indicates a substandard connection. Clean or tighten as required.

h. Ignition Timing.

(I) Attach a timing light lead to No. I1 spark plug. Install tachometer and run engine at 500 rpm. The No. 1 plug should fire at 9 degrees before top dead center. The light should flash each time the mark on the flywheel passes the pointer. If an adjustment is necessary to obtain correct timing, loosen the clamp nut and turn the distributor on its mounting. Rotate the distributor clockwise to advance timing; rotate it counterclockwise to retard timing. Tighten the clamp nut to secure adjustment.

6-56. COIL, CAPACITOR, SPARK PLUGS.

a. Coil and capacitor removal.

(1) Disconnect primary and secondary leads at coil, and capacitor lead to positive coil terminal.

(2) Remove screws and washers holding coil and capacitor to engine, and remove coil and capacitor.

b. Coil and capacitor test. Test coil on an approved coil tester.

c. Coil and capacitor installation. Reverse a. above.

d. Spark plug removal. Remove spark plug cables from plugs, blow all loose dirt from spark plug area and unscrew spark plugs. Remove spark plug gaskets.

e. Spark plug cleaning and test.

(1) Clean spark plugs with an abrasive type spark plug sand blaster. After cleaning remove all traces of abrasive from inside spark plug.

(2) Test spark plugs with an approved spark plug tester.

f. Spark plug adjustment. After cleaning, adjust gap with a round spark plug gauge to 0.030 inch by bending side electrode only.

g. Spark plug installation. Reverse d. above, installing plugs to 25 to 30 foot pounds torque.

6-56a. ENGINE LUBRICATION SYSTEM.

6-57. OIL PAN.

a. Removal.

(1) Drain crankcase oil.

(2) Disconnect starter cable and remove starter. Tape any "hot" cable terminals.

(3) Remove bayonet gauge assembly.

(4) Remove cap screws from oil pan and lift oil pan away from engine.

b. Installation

(1) Clean oil pan thoroughly; remove old gaskets. Install baffle plate and strainer.

(2) Inspect inside of engine for loose nuts, screws, cotter pins and lock wires.

(3) Cement new gaskets in place and allow cement to set so gaskets will not skid. If lower part of bellhousing gasket is damaged, cut at oil pan intersection at block and replace with similar part of new gasket.

(4) Put oil pan in place and carefully start all screws. Be sure lock washers are on screws.

(5) Draw up all screws very lightly. Make sure pan is centered at crankshaft oil seal so as not to damage rubber ring.

(6) Tighten progressively the five screws in the bellhousing and the three screws next to the bellhousing (both sides) in the crankcase, alternating between vertical and horizontal screws until tight. This is to pull the corner of the pan in against the corner formed by the bellhousing and cylinder block or crankcase.

(7) Check alignment of oil pan at front seal and tighten four cap screws at front in gear cover.

(8) Tighten all remaining screws.

(9) Put in drain plugs.

(10) Reinstall starting motor and cables.

(11) Reinstall bayonet gauge assembly.

(12) Refill with oil to correct level.

6-58. OIL PUMP.

a. Removal. Remove oil pan (paragraph 6-57). Remove three mounting screws and' washers securing oil pump to crankcase and remove oil pump and gasket.

b. Disassembly.

(1) Remove pin (Figure 6-22) from drive gear, pull gear from shaft and remove key.

(2) Remove screws and pump cover.

(3) Remove idler gear and shaft.

(4) Pull main shaft down through pump body to remove it.

(5) Press idler gear shaft out of gear.

(6) Press main shaft through oil pump gear approximately 3/8 inches and remove snap ring. Then press shaft out of gear.

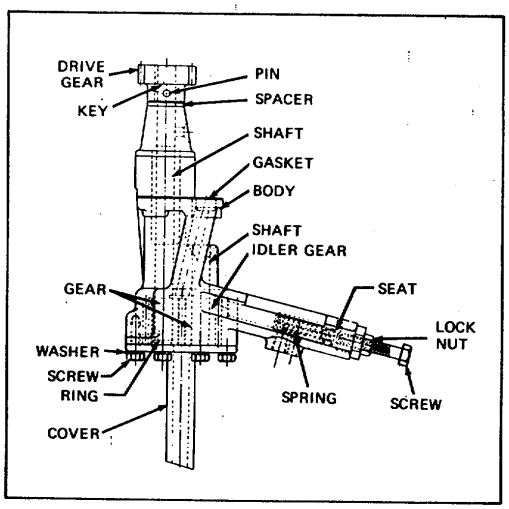


Figure 6-22. Oil Pump

c. Reassembly.

(1) Insert key in shaft, press pump gear on shaft, install snap ring, then press shaft back so that snap ring seats in gear.

(2) Assemble shaft in body, install thrust washer, insert Woodruff key and press on drive gear. This shaft must have 0.0015 inch to 0.003 inch end thrust.

(3) Insert drive gear pin and peen over ends of pin. (If new shaft is used, it must be drilled for pin. Use holes in gear as guide.)

(4) Insert idler gear and shaft.

(5) Rotate shaft and check for tight places. Shaft should rotate freely. If pump shaft does not rotate easily, disassemble and check for dirt or chips in gear teeth or between gear ends and body before proceeding.

(6) Install cover and tighten screws.

d. Installation. Reverse a. above.

e. Adjustment. Adjust pump pressure with the engine running after reassembly, as follows:

(1) With engine warmed up, and operating at a fast idle speed, remove plug at side of oil pan, as shown.

(2) Loosen locknut on pump with crowfoot wrench, and adjust screw so pressure gauge indicates 26 psi at 1600 rpm with oil at operating temperature of about 140 deg F.

(3) Tighten locknut to hold setting, check pressure after tightening, and replace oil pan side plug.

6-59. OIL FILTER.

a. Element replacement.

(1) Unscrew bolt in center of oil filter cover (figure 6-23) and remove cover and cover gasket. Discard gasket.

(2) Lift out filter element carefully to avoid getting dirty oil on truck or clothing. Discard element.

(3) Clean residue from inside filter housing, wipe outside clean, install new element and cover gasket, and reinstall cover and cover screw.

b. Filter and lines removal.

(1) Remove and tag leads to hourmeter switch and oil pressure transmitter, and remove switch and transmitter from cross.

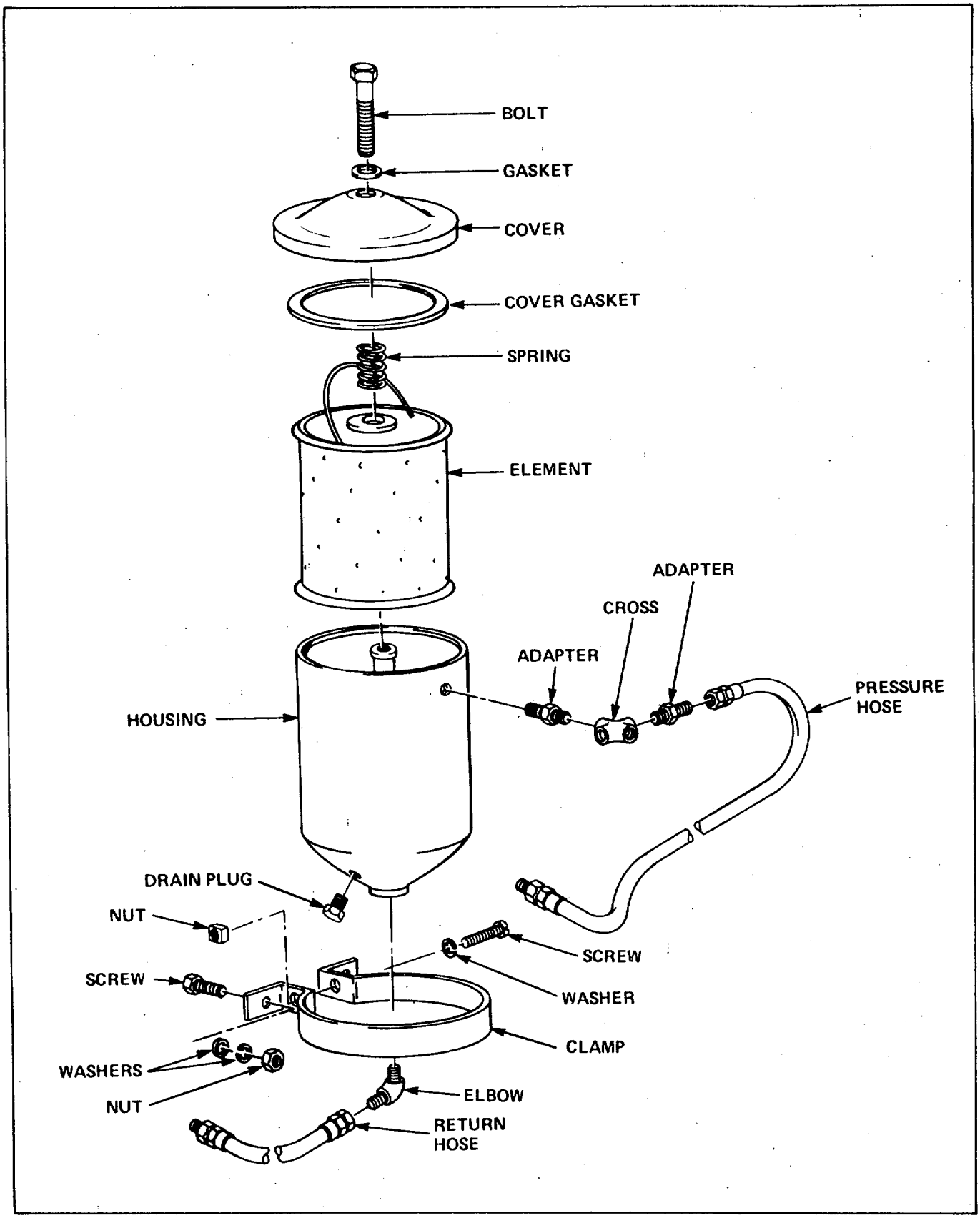


Figure 6-23. Engine Oil Filter, Exploded View

(2) Remove pressure line, bushing and cross fitting. Remove return line from bottom of filter housing, and from elbow.

(3) Remove nuts, screws and washers that mount filter and remove filter from truck.

c. Filter and lines installation. Reverse b. above.

6-60. EXHAUST SYSTEM.

6-61. MUFFLER AND PIPES.

a. Inspection. Inspect installation for leaks, corrosion and security of attachment.

b. Removal. Remove two nuts and washers holding exhaust elbow flange to manifold. Remove two nuts holding muffler strap to truck. Remove muffler with exhaust pipes attached from truck.

c. Installation. Reverse b. above.

6-62. COOLING SYSTEM.

6-63. RADIATOR.

a. Testing, cleaning and preventive maintenance. Refer to paragraph 5-47 for servicing the radiator and cooling system prior to removal of any of the component parts or assemblies.

b. Removal.

(1) Remove radiator cap (Figure 6-24). Remove four screws securing radiator cover on rear deck of truck and remove cover.

(2) Drain cooling system (Paragraph 6-63d.)

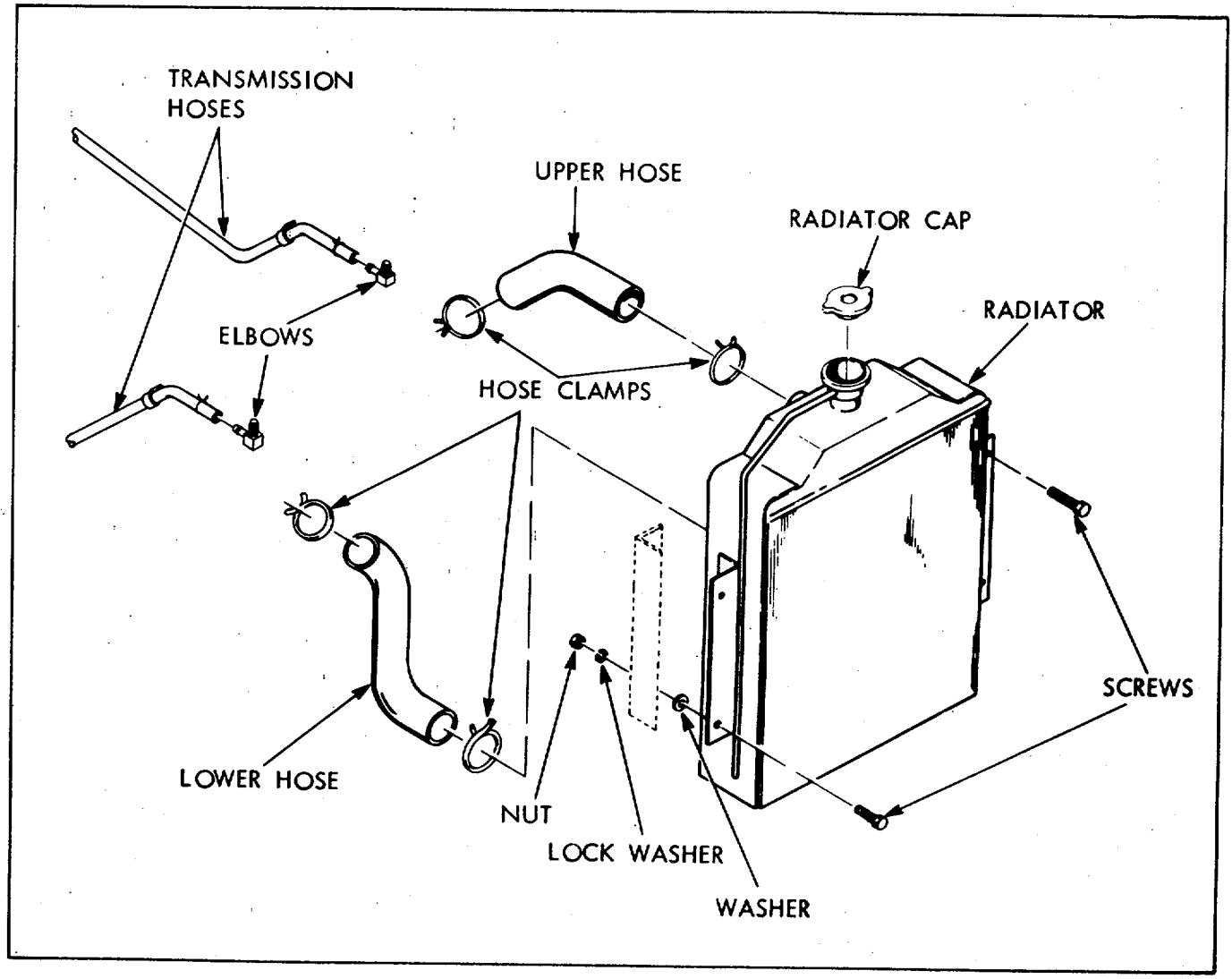


Figure 6-24. Radiator and Lines, Exploded View

(3) Disconnect inlet (upper) radiator hose and outlet (lower) radiator hose secured with clamps.

(4) Disconnect transmission cooling lines secured with clamps and cap the lines.

(5) Remove four screws, nuts, lockwashers and flat washers securing radiator. Lift radiator from truck.

c. Inspection and external cleaning.

(1) Raise the hood.

(2) Clean dirt, insects, and trash from the exterior of the core, using compressed air or a stream of water applied carefully from the engine side of the core.

(3) If the core fins are bent, use a piece of wood or a blunt instrument to straighten them. Be careful not to puncture the tubes.

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

(5) Be sure radiator hose clamps are tight.

(6) Inspect radiator and hoses for leaks.

d. Repair.

(1) Repair leaks by soldering.

(2) If radiator core is clogged with deposits which do not respond to cleaning solution, unsolder upper and lower tanks , and rod out each water passage in core with a length of welding rod. Take care not to puncture core, which is made of thin, soft metal. Resolder upper and lower tanks to core and test radiator for leaks.

(3) Carefully straighten any bent or damaged core cooling fins.

e. Draining and refilling.

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

(2) To refill the cooling system, close drain cocks and add water, corrosion inhibitor, and antifreeze as required. Operate the engine, inspect the coolant level, and add coolant as necessary. Install the radiator cap.

f. Installation. Reverse removal procedure in b. above.

6-64. WATER PUMP, FAN, AND BELT.

a. Removal.

(1) Loosen generator adjusting strap bolt.

(2) Loosen generator mounting bolts securing generator to mounting support and remove belt from generator and crankshaft pulleys.

(3) Work fan belt over fan blade and rotate fan until belt can be removed from the fan.

(4) Remove bolts and lockwashers that secure fan to hub. Remove fan.

(5) Drain radiator.

(6) Disconnect bypass tube at water pump and at thermostat elbow and remove from engine.

(7) Loosen outlet (lower) radiator hose clamp and separate hose from water pump.

(8) Remove mounting nuts and lockwashers, remove adjusting strap capscrews, and remove water pump and gasket from engine block.

b. Inspection.

(1) Inspect the pump for secure mounting.

(2) Inspect the water pump bearing for noise.

(3) Inspect the fan for secure mounting, bent or cracked blades.

(4) Inspect the fan belt for wear, frays, and proper adjustment of 1/2-inch finger-pressure deflection at midpoint between the crankshaft pulley and the fan pulley.

c. Adjustment of belt. Refer to paragraph 5-57.

d. Installation. Reverse procedure in a. above and replace gasket.

6-65. THERMOSTAT AND ELBOW.

a. Removal.

(1) Drain cooling system.

(2) Loosen hose clamp and remove upper hose from elbow.

(3) Remove bypass tube from truck.

(4) Remove screws and lockwashers that secure water outlet to cylinder head and remove water outlet with thermostat and adapter. Separate thermostat and adapter from water outlet and remove recirculating tube water outlet. Remove outlet gasket from the cylinder head.

b. Testing.

(1) Suspend thermostat in a container of water so that it does not touch the bottom of the container.

(2) Heat water and check temperature with a thermometer. The thermostat valve should start to open at about 160 deg. F and should be fully open at 180 deg. F.

(3) If the thermostat opens before the water temperature reaches 160 deg. F or does not open until after the water temperature reaches 180 deg. F, it should be replaced.

c. Inspection. Inspect adapter for deterioration. Inspect elbow (housing) for cracks and thread for damage.

d. Installation. Reverse procedure in a. above, using a new gasket between the elbow and the cylinder head. Make sure split in adapter aligns with bypass hole in elbow.

6-66. FUEL SYSTEM.

6-67. AIR CLEANER.

a. Removal. Loosen clamp securing air cleaner to air cleaner bracket and lift off air cleaner.

NOTE

Don't tip air cleaner, to avoid spilling oil.

b. Cleaning.

(1) Unscrew wing bolt, remove cover and element, and pour off old oil from air cleaner body.

(2) Wash all parts of air cleaner in SD, and dry.

(3) Saturate mesh of element in OE. Permit excess to drain.

(4) Reinstall body of air cleaner, fill to OIL LEVEL line with OE, and install cover and element and wing bolt.

c. Installation. Reverse procedure in a. above.

6-68. CARBURETOR.

a. Adjust.

(1) Connect vacuum gauge to intake manifold and tachometer to engine. Start and warm up engine.

(2) With throttle screw, adjust engine idle to 450 to 500 rpm.

(3) Adjust idle mixture screw to setting giving the highest possible vacuum reading.

NOTE

When making idle mixture adjustment, maintain given idle speed with throttle screw.

b. Removal. Refer to paragraphs 6-69a.(1) and (2).

c. Installation. Reverse procedures in paragraph 6-69a.(1) and (2). Carburetor mounting gasket may be reused if it is not damaged.

6-69. INTAKE AND EXHAUST MANIFOLDS.

a. Removal.

(1) Disconnect carburetor air duct, throttle, choke, and governor linkages at carburetor. Remove gas line from fuel pump to carburetor.

(2) Remove two nuts and washers and remove carburetor and gasket.

(3) Remove tube to check valve at manifold and remove check valve and its adapter from the manifold.

(4) Remove two nuts and washers, exhaust elbow flange and gasket.

(5) Remove six nuts and washers and remove manifold and gasket. Discard gaskets removed.

b. Cleaning. Soak manifold in SD long enough to soften crusted deposits. Clean machined surface with flat bladed scraper. Clean bores of passages with scraper and wire brush. Dry with clean cloths.

c. Inspection. Inspect for warpage at machined surface with straight edge. Replace manifold if warpage is bad enough to be possible source of leaks. Check for cracks in casting.

d. Installation. Using new gaskets, reverse a. above.

6-70. FUEL PUMP.

a. Test.

(1) With fuel in tank, disconnect fuel line at carburetor and install fuel pressure gauge.

(2) Crank engine for twenty to thirty seconds and note gauge reading. Pressure between 1-1/2 psi and 2-1/4 psi is required.

b. Removal.

(1) Shut off fuel supply at tank and disconnect both fuel lines at fuel pump

(2) Remove both screws and washers (Figure 6-25) and remove pump and gasket from engine.

c. Disassembly.

(1) Unscrew nut and disconnect bail from pump body.

(2) Remove bowl, screw and gasket. Discard gasket.

CAUTION

Some gasoline will probably be spilled at this time from the bowl. Take precautions against fire.

d. Reassembly. Reverse procedure in c. above using a new gasket.

e. Cleaning. Rinse bowl and screen in SD.

f. Installation. Reverse b. above.

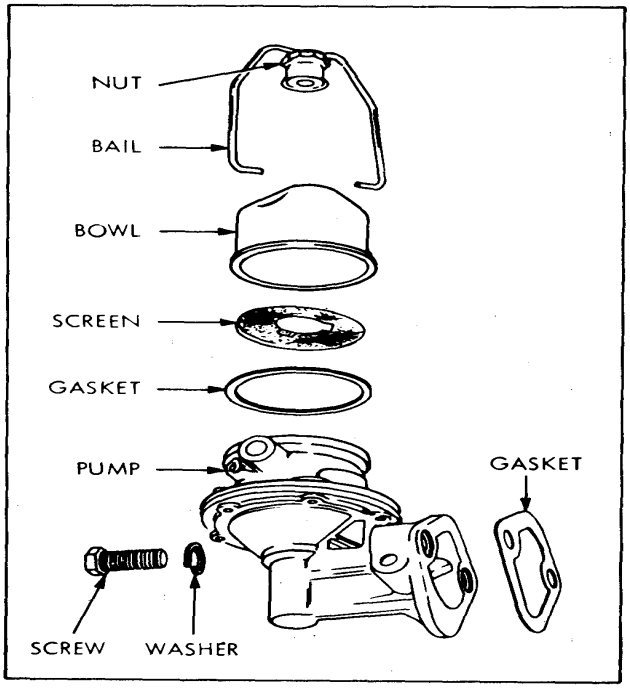


Figure 6-25. Fuel Pump, Exploded View

6-71. FUEL TANK

a. Removal.

(1) Remove drain plug (Figure 6-26) and drain all fuel into a container. Observe safety precautions for handling gasoline.

(2) Unscrew cap completely from tank fill neck.

(3) Disconnect pipe nipple from elbow.

(4) Hoist truck to obtain access, remove four nuts, eight washers and four screws, and remove tank from below.

b. Cleaning.

(1) Remove tank (a. above).

(2) Put one gallon SD in tank and slosh it around. Pour out SD quickly through fill pipe, to carry out sediment.

(3) Air dry tank interior.

c. Repair.

(1) Replace all defective detachable parts.

(2) If damaged threads are repairable, clean threads with tap.

(3) After purging tank of all gasoline fumes by water flush and carbon dioxide discharge, weld all cracks and leaks so tank does not leak air at 5 psi internal pressure.

CAUTION

Do not exceed 5 psi during test.

(4) Rinse interior with alcohol (or approved equivalent), drain, and air dry.

(5) Paint exterior with zinc chromate primer.

(6) If tank is to be returned to stock for later issue, fog interior with preservative oil and seal all openings with tape.

Otherwise, install fuel tank.

d. Installation. Reverse procedure in a. above.

6-72. GOVERNOR AND CONTROLS.

a. Adjustment.

(1) Connect a tachometer to the engine to read engine rpm.

(2) Start and warm up engine to operating temperature

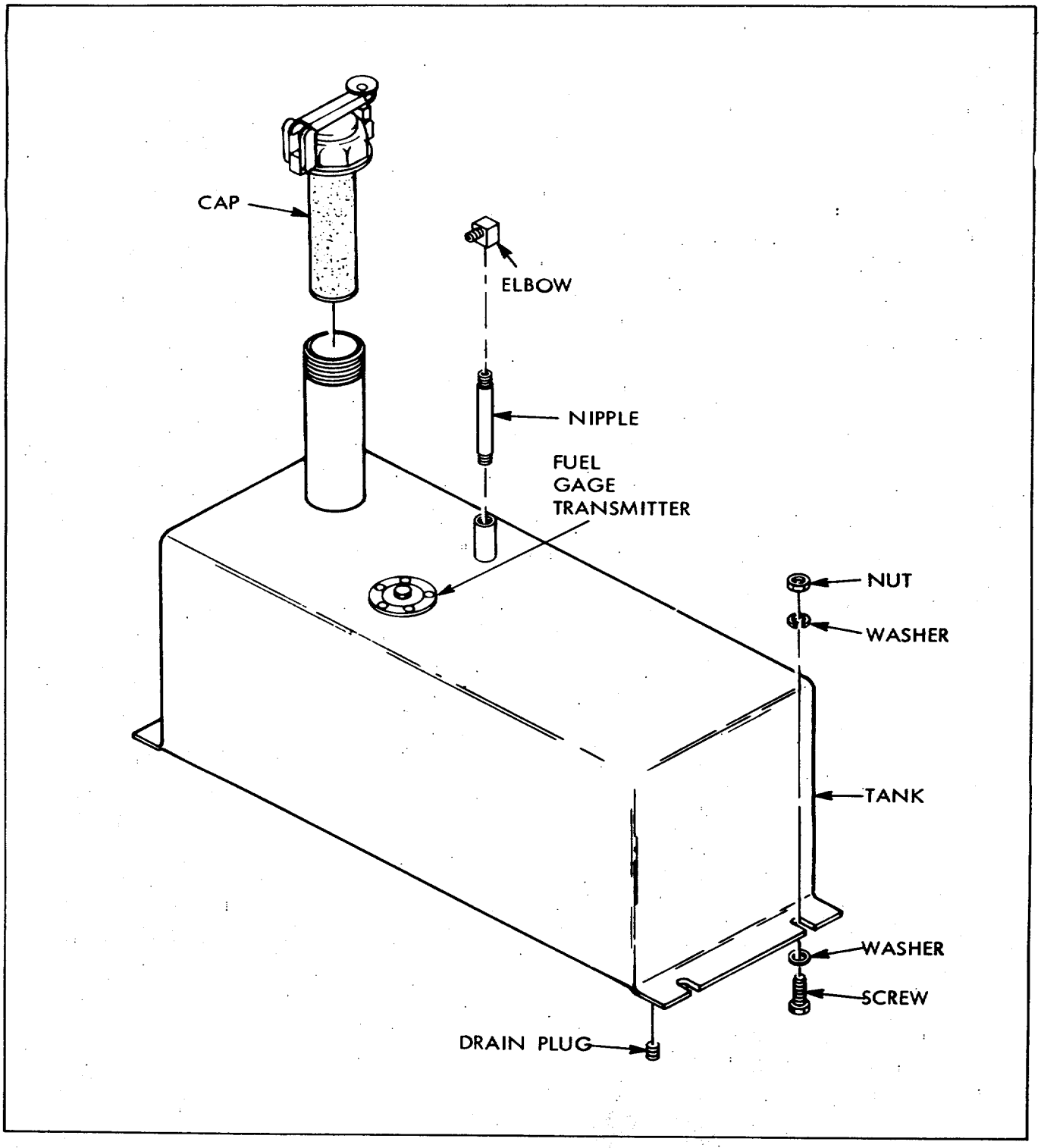


Figure 6-26. Fuel Tank Removal

(3) Loosen locknut on speed adjust screw and adjust screw down to increase governed speed, and up to decrease speed.

(4) Tighten locknut to retain governor setting. If engine speed surges at governed speed, loosen locknut on surge adjust screw and turn screw in until surging ceases.

b. Removal.

(1) Remove radiator.

(2) Remove nuts and lockwashers from both ends of rod to governor and remove linkage.

(3) Remove capscrews from top and bottom of governor mounting flange, and remove governor.

c. Installation. Reverse procedures in b. above.

6-73. THROTTLE AND CHOKE CONTROLS.

a. Throttle linkage removal.

(1) Pull toe end of pedal (Figure 6-27) up until free of pedal rod ball. Unhook return spring at both ends. Remove cotter pins at each end of cross shaft, outer two washers, cotter pin and clevis pin at front of throttle rod, and remove cross shaft and pedal rod.

(2) Remove clip at carburetor end of throttle rod and remove throttle rod.

b. Throttle linkage installation. Reverse a. above.

c. Adjustment.

(1) With linkage installed, depress pedal by hand until carburetor throttle is fully open. Adjust pedal down stop to contact under surface of pedal at this point.

(2) With carburetor idle speed and mixture adjusted (paragraph 6-68a.) and spring holding pedal and linkage at idle position, adjust pedal up stop to contact arm of cross shaft.

d. Choke linkage removal.

(1) Loosen screw holding choke wire to carburetor, and screw clamping choke cable.

(2) Remove nut and washer from underside of choke knob mounting and withdraw choke cable and knob from truck.

e. Choke linkage installation. Reverse d. above.

f. Adjustment. Loosen choke wire screw at carburetor, open choke valve fully by hand, press choke knob fully down, and tighten choke wire screw.

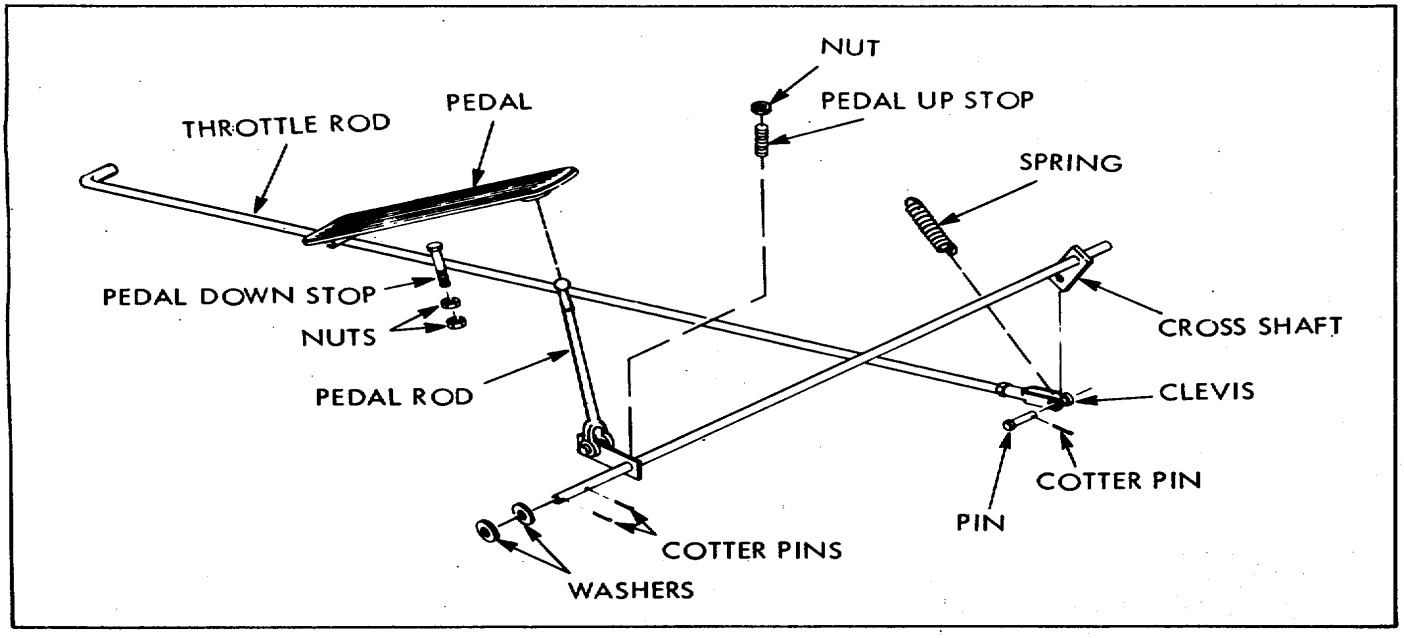


Figure 6-27. Carburetor Linkages

6-74. ENGINE.

a. General. The engine is a six-cylinder, L-head, water cooled unit of generally conventional design. Overhaul can be accomplished with tools and equipment ordinarily available at the overhaul facility. Detailed instruction for complete overhaul is given; however, if preliminary diagnosis has shown a specific defect to -be corrected, do not disassemble the engine further than necessary to restore the engine to normal operating condition. The instructions in this manual emphasize that which is unique or special in repairing this particular engine. In all cases follow good general shop practice in performance of these instructions. Certain specialized shop equipment will be required to perform a complete overhaul, such as a crankshaft grinder and a boring bar. Detailed instructions for operation of such equipment is not within the scope of this manual. Refer to the publication covering the equipment being used for this information.

b. Engine test.

(1) Test compression as follows:

(a) With engine warmed up, remove plug cables from spark plugs, loosen plugs 1/2 to one turn, reinstall cables and start and run engine for at least thirty seconds, to get rid of carbon loosened by plug loosening.

(b) Turn ignition switch OFF (or ground coil high tension lead) and remove all spark plugs. Put transmission in NEUTRAL.

(c) Insert compression tester in spark plug hole (using adapter if necessary) (figure 6-28) and crank engine for at least four compression strokes. Note reading on first full stroke as well as on final stroke. (See test indications (2) below.)

NOTE

All cylinders must be tested the same number of compression strokes to assure accurate readings. Slightly higher compression readings will be obtained if throttle and choke are opened during test.

(d) Refer to manufacturer's specifications for proper cranking compression pressure.

(e) If readings are below normal or uneven, place a small quantity of OE 30 oil on top of each piston through spark plug hole and retest compression.

(2) Test indications.

(a) Normal. Compression builds up quickly and evenly to specified compression on each cylinder, varies less than 10 pounds between highest and lowest reading cylinders.

(b) Ring trouble. Compression low on first stroke, tends to build up on following strokes but does not reach normal. Improves considerably with addition of oil.

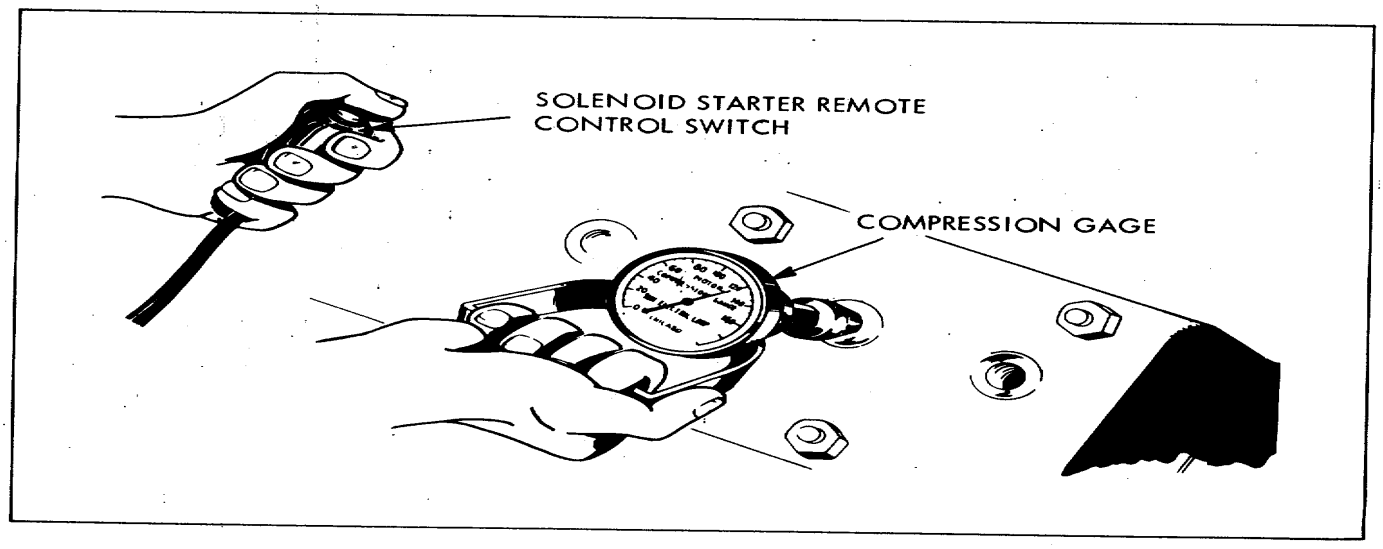


Figure 6-28. Compression Test

(c) Valve trouble. Low on first stroke, does not tend to build up on following strokes; does not improve much with addition of oil.

(d) Leaking head gasket. Same reaction as valve trouble on two adjacent cylinders, usually accompanied by indications of water in cylinders and/or oil.

(e) Carbon deposits. Compression pressure considerably higher than specified.

(3) Engine ignition timing check.

(a) Remove cable from number one or number six spark plug and install adapter (Figure 6-29) to connect timing light.

CAUTION

Use adapter. Do not puncture insulation to make connection.

(b) Connect timing light spark plug lead as shown, and power leads to battery terminals.

NOTE

If available equipment requires different power connection procedures, such as connection to a 115 volt source, use appropriate procedures.

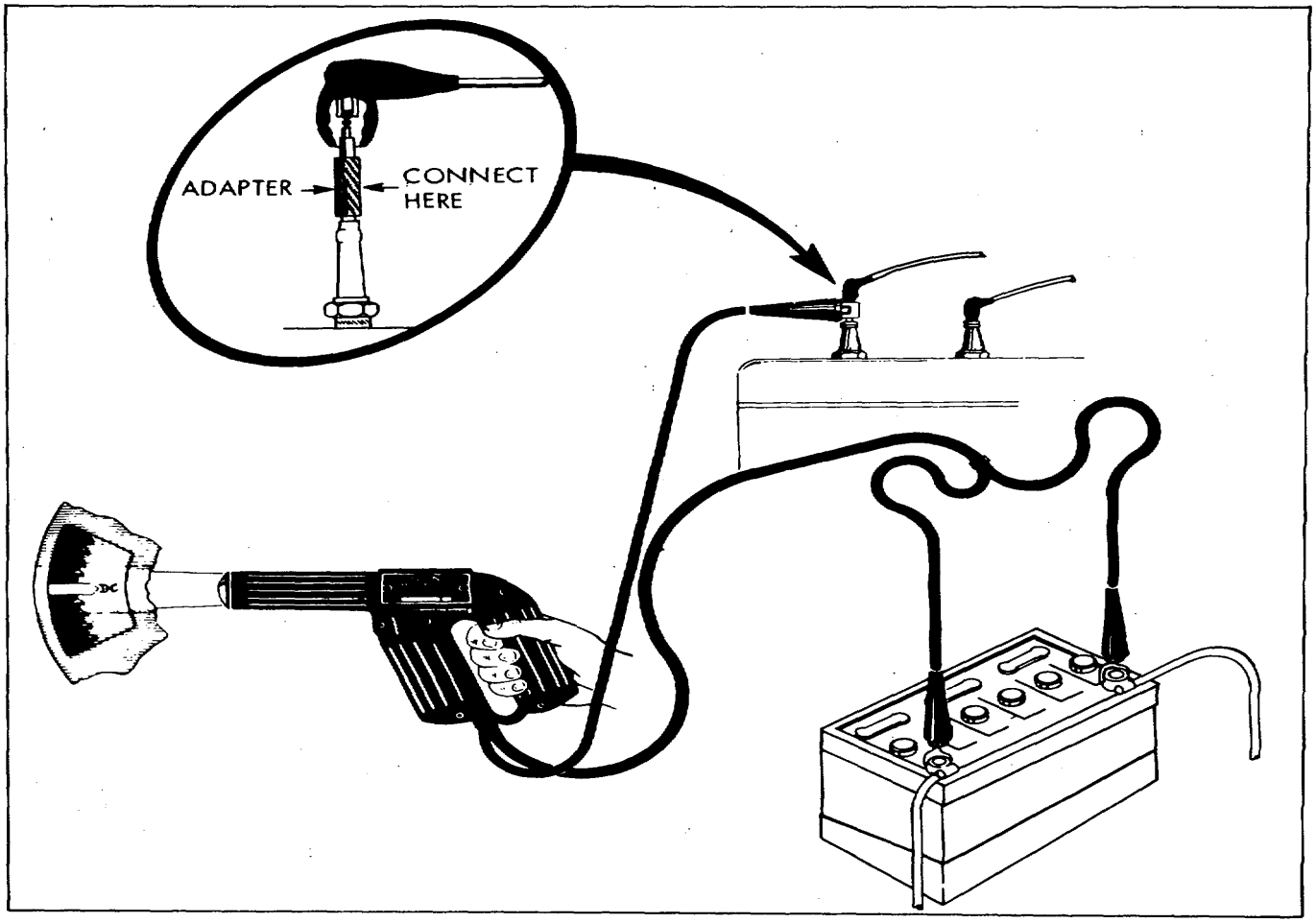


Figure 6-29. Ignition Timing

(c) Start engine and, at 450 rpm idle speed, direct flashing beam of timing light through hole in flywheel housing at distributor side of engine. If ignition timing is correct, light flash will show D-C on flywheel aligned with mark on flywheel housing as plug fires.

(4) Vacuum test.

(a) Remove slotted plug from check valve adapter Tee-fitting to intake manifold and install an adapter to receive vacuum gauge hose. Connect vacuum gauge to adapter.

(b) With engine warm, and idling at 450 to 500 rpm, vacuum gauge reading should be between 17 and 21 inches of mercury, and steady. General indications are as follows:

(c) As in (b) above: no trouble indicated.

(d) Slow oscillation of gauge reading, usually with drifting engine idle speed: carburetor idle mixture adjustment wrong.

(e) Low, steady reading: power loss affecting all cylinders equally. Possibly late timing, leaking induction system or rings, or mechanical drag on engine, such as tight bearings.

(f) Steady pulsing of gage: partial or complete loss of power in one (or more) cylinders. Burned or stuck valve or leaky head gasket gives major pulsations. Fouled spark plug gives lesser fluctuations. Cross check indications with compression test.

c. Engine removal.

(1) Drain cooling system and crankcase.

(2) Remove the radiator, upper and lower hoses, and exhaust piping.

(3) Disconnect the following items, at the points shown in Figure 6-30:

(a) Throttle and choke linkage.

(b) Battery cable, starter and ammeter leads.

(c) Ignition switch to coil lead.

(d) Oil filter lines. .

(e) Engine temperature transmitter lead.

(f) Carburetor air duct, and crankcase breather hose.

(4) Drain hydraulic tank and disconnect hydraulic hoses at hydraulic pump. Disconnect fuel line at fuel pump, remove clamp on 'top of flywheel housing, and tie this line out of way with light string. Seal off open ends of disconnected lines and ports from which they were removed, to keep dirt out of systems.

(5) Attach the hook of a chain hoist to the lifting eye of engine. Lift engine enough to relieve weight on engine supporting parts yet to be removed.

(6) Remove screws and washers shown, and remove rear engine mount. Remove nut, bolt, washers, and rubber sandwich mounting at each front mounting bracket.

Remove twelve screws and washers which attach transmission to engine.

(7) Swing engine toward rear of truck until torque converter on flywheel is free of transmission shaft. Lift engine free of truck.

d. Engine external parts removal. Remove parts for which instructions are given in this paragraph, only to the extent necessary to perform the intended task. Complete disassembly is necessary only when complete overhaul of the engine is planned.

(1) Remove the following components:

(a) Thermostat and housing, and cylinder head.

(b) Generator, water pump and fan belt.

(c) Fuel pump, carburetor, and governor and linkage.

(d) Starter, distributor, coil, spark plugs and capacitor.

(e) Manifold, crankcase ventilator check valve, l;1 level gauge, valve covers.

(2) Remove nut and washer at top and bottom of hydraulic pump mounting flange, remove pump, and remove elbows and fittings from pump.

(3) Remove twelve screws and washers and remove oil pan and pan gasket.

(4) Remove screws and washers and remove torque converter from flywheel.

(5) Remove four cotter pins, nuts and washers and remove flywheel, using pry bar inserted through center of flywheel.

(6) Remove screws and washers at left side, securing flywheel housing to engine block and oil pan. Remove corresponding screws at other side of housing, and two screws and washers accessible from inside housing, and remove housing. It may be necessary to tap housing with a soft hammer or mallet to loosen from saddle or gasket sticking to block.

(7) Remove oil fill pipe and generator bracket by removing attaching screws and washers. Remove retaining

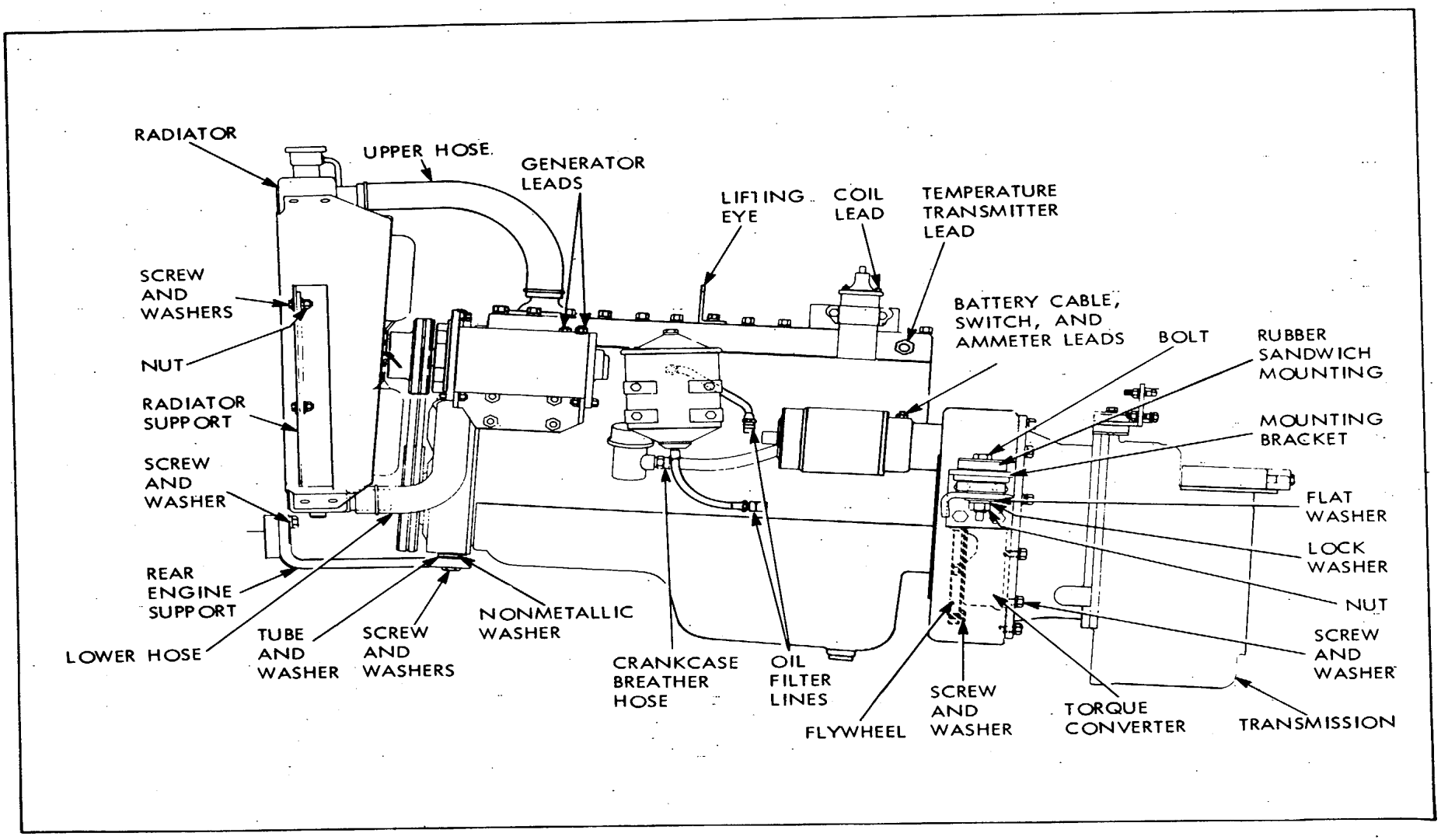


Figure 6-30. Engine Removal Check Points (Sheet 1 of 2)

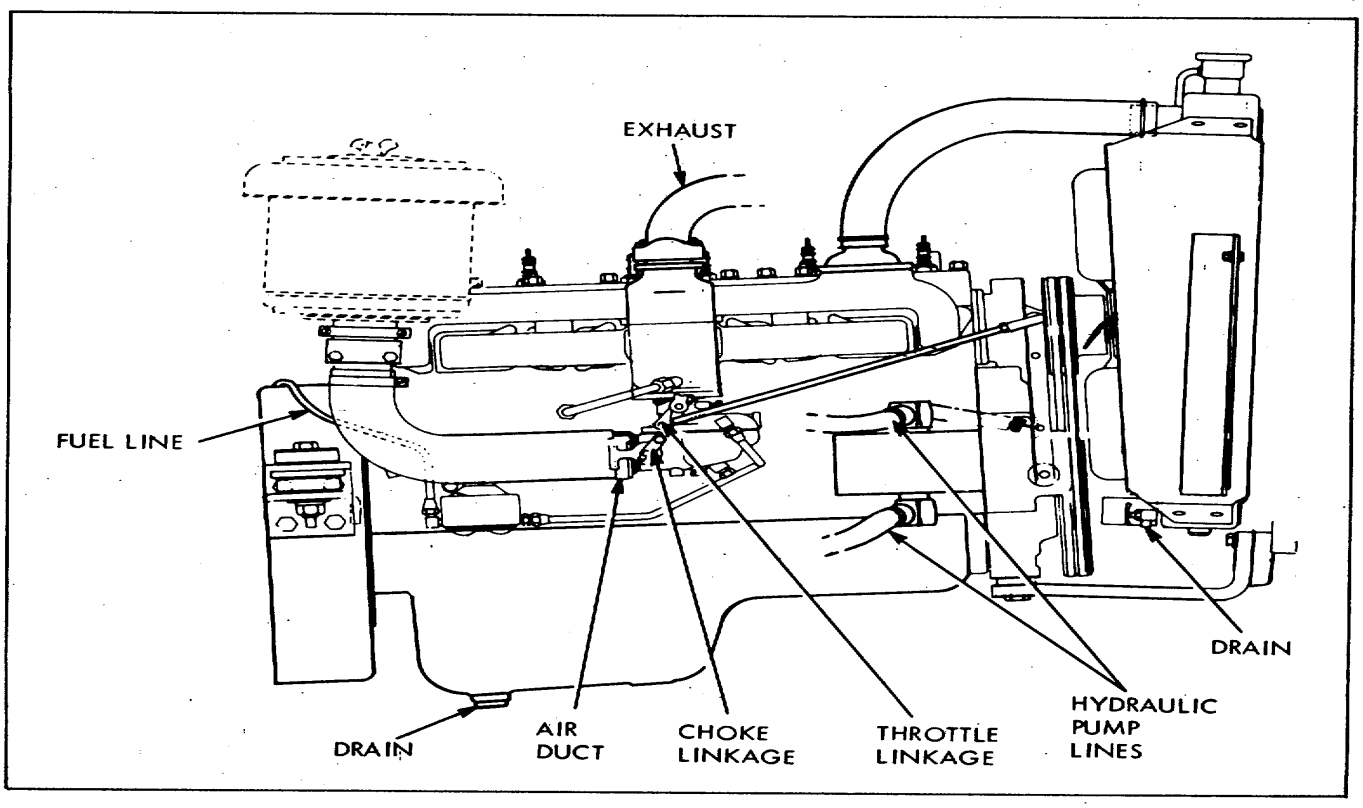


Figure 6-30. Engine Removal Check Points (Sheet 2 of 2)

nut and washer and pull off crankshaft pulley. Remove timing gear cover screws, and remove cover with crankshaft oil seal, and cover gasket.

e. Engine external parts, cleaning.

(1) Nonelectrical parts. Except as noted below, clean all nonelectrical parts with SD, and brush or wipe clean.

(2) Crankcase ventilator check valve. Disassemble and clean interior with SD. Wipe thoroughly clean and reassemble.

(3) Electrical parts. Wipe exterior clean with cloth wetted with SD. Do not submerge in cleaning fluid, nor wet interior.

6-75. CYLINDER HEAD.

a. Removal.

(1) Open petcock at bottom of radiator and drain coolant. If coolant is clean, save it for reuse after assembly.

(2) Remove bypass tube, hose clamps and upper hose, and thermostat housing and gasket.

(3) Remove lead to temperature transmitter, and remove transmitter. Remove spark plugs, and plug cables from cylinder head.

(4) Remove all head bolts, washers and capscrews. Lift off cylinder head. Tap head softly with a soft hammer if

required. Do not pry on contact surfaces. Remove and discard head gasket.

b. Cleaning.

(1) Soak cylinder head in SD. Dry with compressed air and clean rags.

(2) Scrape carbon from inside of combustion chamber area with carbon scraper, or use a wire brush. Do not scratch surface when scraping.

(3) Scrape or brush gasketed surface to remove gasket paste residue.

c. Installation. Reverse a. above, using new gaskets.

Tighten head bolts to 100 foot pounds torque.

6-76. VALVE COVER. The engine has two valve covers. These covers are removed for valve service, or replacement of the gaskets.

a. Removal.

(1) Remove tube from rear valve cover to crankcase ventilating check valve.

(2) Remove two screws holding each cover in place and lift off valve covers with cover gaskets. Discard gaskets.

b. Installation. Reverse procedure in above, using new gaskets.

6-77. VALVE ADJUSTMENT.

a. Remove valve covers (paragraph 6-76).

b. To the extent necessary to provide working room during valve adjustment, disconnect the following items: (1) Air duct (at carburetor).

(2) Throttle, choke, and governor linkages (at carburetor).

(3) Fuel line (at fuel pump intake), and fuel line from fuel pump to carburetor (remove completely).

(4) Fuel pump (remove two capscrews and washers, and remove pump).

c. Crank engine by hand until D-C mark appears at hole in flywheel housing. At this time both valves will be open (tappets cannot be turned with fingers) at No. 1 cylinder, and both closed at No. 6 cylinder or vice versa, depending on whether No. 1 or No. 6 piston is in firing position. If No. I valves are open, adjust valve clearance on cylinders 3, 2 and 6, then turn the engine one full revolution and adjust valves for cylinders 1, 5 and 4, as follows:

(1) Insert feeler gauge (0.007 inch on intake valves and 0.010 inch on exhaust valves) between tappet adjusting screw and valve stem cap.

(2) Hold tappet with 9/16 inch end of one tappet wrench, and turn adjusting screw with 1/2 inch end of second wrench until feeler gauge fits with slight drag. Repeat for all valves.

d. Restore engine to operating condition by reversing b. and a. above.

6-78. GEAR COVER.

a. Removal.

(1) Remove radiator, disconnect governor to carburetor control rod hooked to governor lever.

(2) Remove governor attaching screws and lift governor away from gear cover.

(3) Remove hydraulic pump (paragraph 6-29).

(4) Remove starting crank grab and fan drive pulley.

(5) If engine is in vehicle, remove front motor support screws. If necessary to raise front of motor to release the front support, use a large block of wood under front of oil pan so jack will not damage it. The front support may be removed from the gear cover, if necessary.

(6) Remove gear cover attaching screws (Figure 6-31) and pull gear cover forward away from the engine. The crankshaft oil seal will pull off the shaft with the gear cover. If no gasket or seals are available, use care when removing these parts.

b. Installation.

(1) Wash and clean the gear cover and fasten a new gasket to the gear cover with gasket cement. Loosen thrust screw lock nuts and back screws out two or three turns.

(2) Carefully install the oil seal on the crankshaft and slide the seal about one inch back on the shaft. If available, use new seal and ring.

(3) Assemble the gear cover on the seal. Use care that the seal properly seats in the groove provided for it in the gear cover.

(4) In order to avoid any difficulty with the oil seal sleeve when pushing the gear cover back in place, loosen the oil pan and allow the front end of the oil pan to drop 1/8 inch to 1/4 inch. Then push the gear cover back into place.

(5) Check to see that oil seal sleeve is properly located in the oil pan.

(6) Start the gear cover attaching screws and, with some tension on the lock washers of the gear cover to cylinder block screws, tighten the oil pan screws, also the oil pan to gear cover screws. After these are tight, draw up the gear cover screws. Keep seal concentric with crankshaft.

(7) Assemble front motor support, if removed.

(8) Assemble fan drive pulley and starting crank grab.

(9) Assemble governor to gear cover and fasten in place with cap screws.

(10) Connect governor to carburetor control rod.

(11) Assemble hydraulic pump to gear cover.

(12) Adjust camshaft, idler shaft and water pump thrust screws. To adjust these screws, loosen the lock nut and turn the screw until it contacts the thrust plugs in their respective shafts; then turn the screw out approximately 1/8th turn and tighten the lock nut.

6-79. CAMSHAFT, GEAR AND BEARINGS.

a. Removal and disassembly.

(1) Remove engine and external parts as required.

(2) Remove valve tappet covers and, with a valve spring compressor, lift valves so that all of the valve tappets may be blocked up. A nail, if cut off to 15/16 inch may be used for this purpose. Lower spring compressor -carefully so nail does not snap out and pinch fingers.

NOTE.

If valves are removed, tappets must still be raised to remove camshaft. Remove oil pump.

(3) Pull the camshaft forward out of the - engine. It may be necessary to turn the crankshaft slightly to permit the camshaft bearing journals to pass the crank throws.

(4) The camshaft gear is pressed off to the rear of the camshaft. Place suitable support under rear of the front bearing journal and press gear back off of gear seat. The gear can then be easily removed from the camshaft.

(5) Although it is seldom necessary to remove the thrust plunger from the camshaft, it may be removed in the following manner: With a torch, quickly heat the plunger to anneal it. Allow the plunger to cool, then drill through the

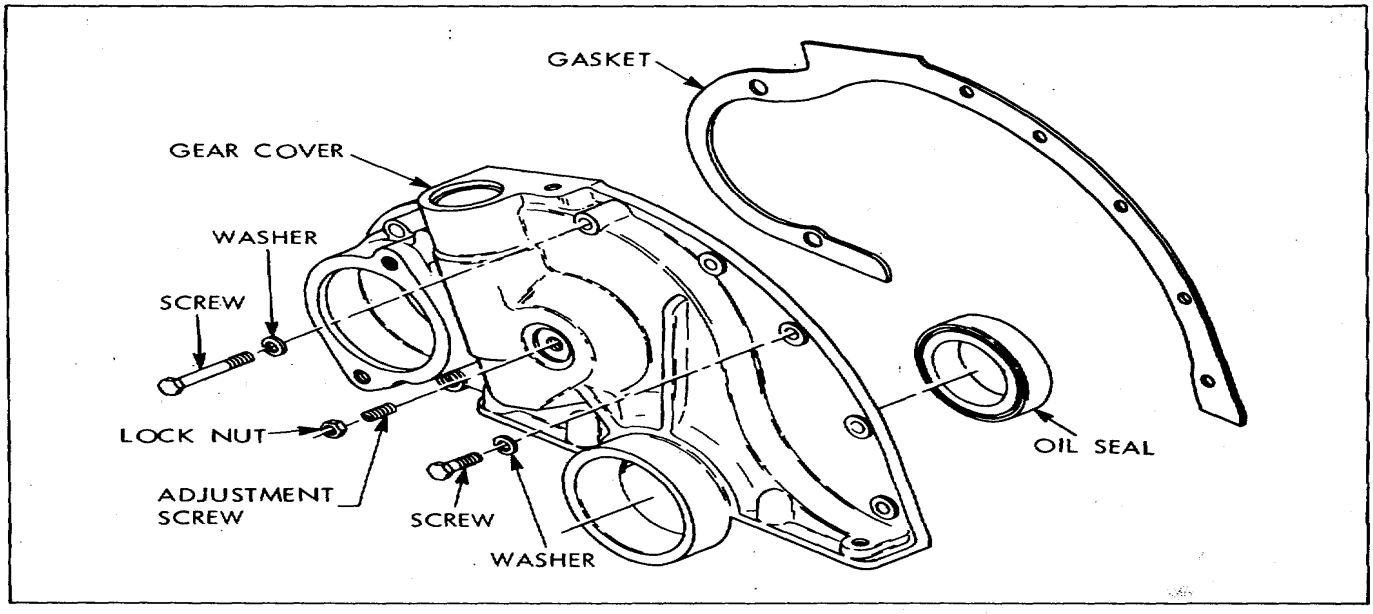


Figure 6-31. Gear Cover Assembly

plunger with a 5/16 inch diameter drill and tap the hole with a 3/8 inch - 16 tap. Using a 3/8 inch screw of suitable length, the plunger may be pulled from the shaft.

(6) If new camshaft bearings are needed, drive out old bearings with a suitable driver. The driver may be used to drive in the new bearings: b. Inspection. With shaft installed, use narrow leaf feeler gauge to check for 0.0025 maximum clearance at camshaft bearings.

c. Assembly and installation.

(1) Insert Woodruff key in shaft.

(2) Press camshaft into gear.

(3) Place a small amount of grease or heavy oil on the thrust washer and place thrust washer on gear.

(4) If thrust plug has been removed, press in new plug.

Do not damage thrust washer.

(5) Drive new bearings into place with driver. These bearings are cut to allow for the press fit when the bearings are pressed into the case; therefore, no reaming should be necessary. Be certain to align hole in each bearing with oil passage in block.

(6) Use care when installing the camshaft that the cams do not damage the bearings, as this usually causes tight bearings. Be certain to align punch mark on camshaft gear with punch mark on crankshaft gear to time valves to' crankshaft.

(7) Complete installation by installing gear cover, gasket and oil seal.

(8) Install any removed external parts and install engine in vehicle.

6-80. PISTONS, CONNECTING RODS AND BEARINGS.

a. Description. Each piston has two compression rings and two oil rings. The full floating piston pins are held in place by retaining rings. The connecting rods use copper-lead lined sleeve bearing pairs. The connecting rods and the connecting rod bearing caps are matched and numbered. Numbered sides must face the camshaft when reinstalled.

CAUTION

Keep each bearing cap with rod from which it was removed. Caps are not interchangeable.

b. Removal.

(1) Remove the oil pan.

(2) Remove the cylinder head from the engine block.

(3) Using a ridge reamer (Figure 6-32), remove the ridge from the top of the cylinder bore.

NOTE

Ridge must be completely removed to avoid breaking rings, and piston lands between ring grooves. Do not cut into ring travel area of cylinder wall.

(4) Turn crankshaft throws to lowest points, and remove cotter pins and nuts from the connecting rod bolts and remove the lower bearing caps and bearing halves from the connecting rods. Tap rod with a soft hammer, if required, to remove caps.

(5) Push the connecting rods and pistons (Figure 6-33) out of the top of the bore using a suitable piece of wood.

Use care that the connecting rod does not scratch the cylinder wall. To insure against scratching, wrap lower part of rod with a wiping cloth.

(6) Temporarily install the connecting rod bearing caps on the connecting rods from which they were removed.

(7) Using a ring spreader, remove the piston rings from the pistons, or simply break rings off, if they will not be reused.

(8) Remove the piston pin retainers and remove the pins from the pistons, separating the connecting rods from the pistons. Press the sleeve bearings from the connecting rods, using new bearings (Figure 6-34) which will result in installing new bearings in one operation.

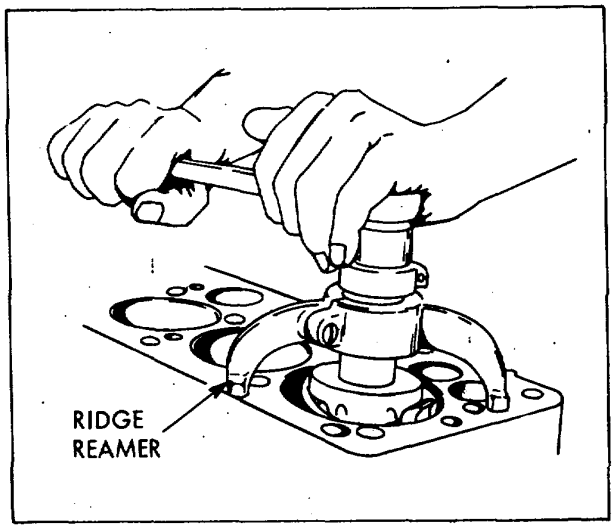


Figure 6-32. Using Ridge Reamer

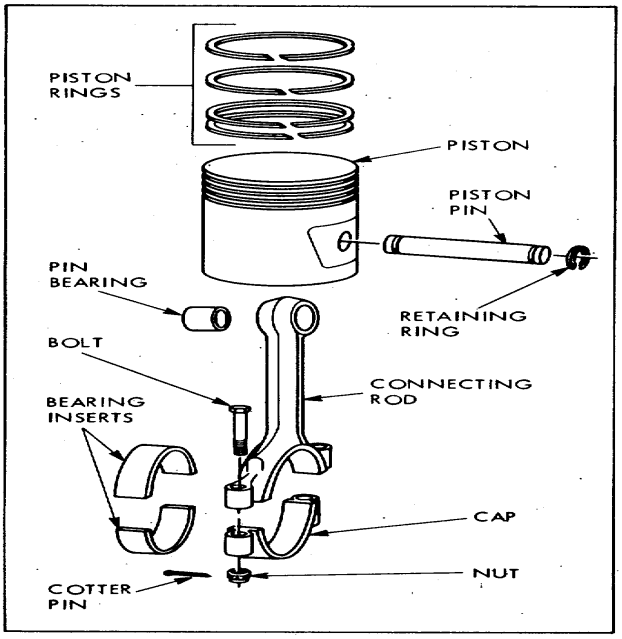


Figure 6-33. Piston and Rod Assembly

c. Cleaning.

(1) Soak pistons in SD and remove carbon from the tops and from ring grooves of the pistons.

(2) Using a drill or probe of the proper size, clean carbon from the oil return holes in the ring grooves.

(3) Clean the oil groove passages in the connecting rods and caps.

d. Piston fit. Fit the pistons clean and dry. To fit the pistons to the cylinder bore properly, use a spring scale and a feeler ribbon 1/2 inch wide, 10 inches long, and 0.003 inch thick (Figure 6-35). Insert the feeler ribbon full length into the cylinder bore, about halfway down. Hook the

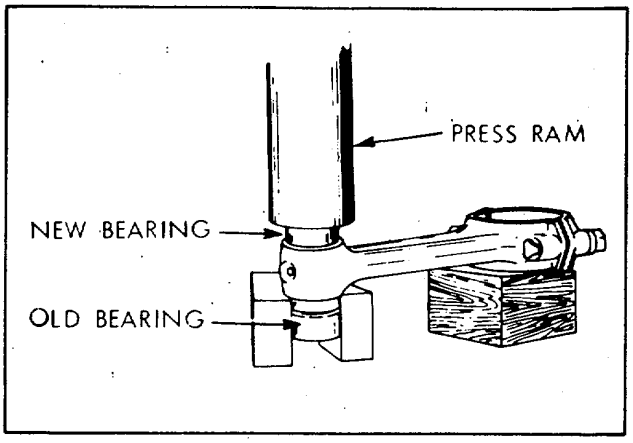


Figure 6-34. Pressing in New Piston Pin Bearings

spring scale into the end of the feeler ribbon and pull the feeler ribbon from the cylinder. If the fit is correct, the scale should register 5 to 10 pounds pull.

e. Piston pin fit. Check the fit of the piston pin in the

piston and the connecting rod. The piston pin should be a thumb push fit ii the piston pin bearing and a palm push fit in the piston bosses. If the piston pins or bearings are worn, they must be replaced with standard size pins and bearings. If the piston bosses are worn, the piston must be replaced.

f. Piston ring installation.

(1) Always install new piston rings during an overhaul of the engine. Replacement rings are available in standard size, in 0.020 inch oversize, and in 0.040 inch oversize.

(2) To determine whether the ring has the proper end gap, place it in the cylinder, pushing it about halfway down in the cylinder bore. With the ring square with the cylinder

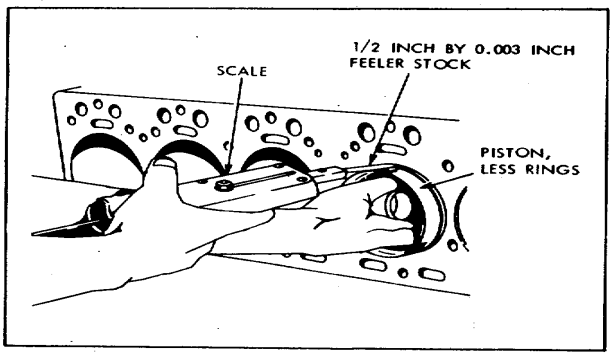


Figure 6-35. Measuring Piston Fit in Cylinder

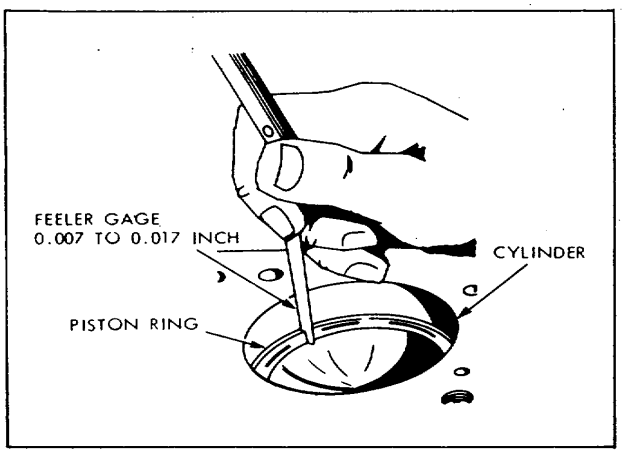


Figure 6-36. Measuring Ring End Gap

bore (use a piston to straighten the ring in the cylinder) measure the gap between the ring ends with a feeler gauge (Figure 6-36). The ring gap for all rings is 0.015 to 0.020 inch. If the gap is less than specified, remove the ring and dress end with a fine-cut mill file until correct clearance is obtained.

(3) Measure side clearance of piston rings in the grooves with feeler gauge. Gap should be 0.0035 to 0.005 inch for top compression ring. Scraper and oil ring gap is 0.0015 to 0.003 inch. If clearance is less than specifications, remove ring from piston and rub the ring lightly on piece of fine emery cloth (all on flat surface) until proper clearance is obtained.

g. Connecting rod alignment.

(1) Install piston pin in connecting rod and place connecting rod, with sleeve bearings, on aligning fixture. Install connecting rod bearing cap on connecting rod.

(2) Pin should touch measuring bar on aligning fixture at both ends. Straighten bent or twisted connecting rods. Maximum bend or twist may not exceed 0.inch over 4 inch spread of length of the connecting rod.

h. Connecting rod bearing installation.

(1) Connecting rod bearings that are scored, burned, or damaged must be replaced by new ones. Replacement bearings require no reaming or fitting.

(2) Install the piston with connecting rod and with upper half of connecting rod bearing installed, but without piston rings, in the cylinder bore. Coat a piece of 0.002 inch feeler stock, approximately 1/2 inch wide and 1 inch rod bearing calf and crankshaft journal (Figure 6-37). Install connecting rod bearing cap and tighten nuts to 39 foot pounds torque. Try to rotate crankshaft one full turn by hand. If drag is felt, the clearance is correct. If the (crankshaft turns freely, it will be necessary to measure crankshaft journal for taper or out of round. If taper or out of round exceeds 0.0015 inch, replace crankshaft.

i. Installation.

(1) It is important to remove glaze on cylinder bore to assure quick seating of piston rings.

(a) Cover crankshaft journals with clean cloth to prevent dirt and abrasives, from getting on crankshaft.

(b) Surface hone cylinder bores with glaze breaker to break glaze and produce dull finish in bore. Clean glaze breaker between use in each cylinder bore to reduce amount of loose abrasives released in bore.

(c) Clean cylinder bores thoroughly with clean oiled rag, to pick up any abrasive that might be left in bore. Follow this with clean cloth to assure that walls are clean.

(2) Install oil rings and compression rings on piston with ring expander tool Start with the lowest ring first. Make sure that tapered side of compression ring is up. Make sure that the ring gaps are equally spaced about circumference of the piston, not in vertical alignment.

(3) Oil cylinder wall and generously coat piston and rings with OE (lubricating oil, internal combustion engine).

(4) Install ring compressor on piston and compress rings into grooves. Tap compressor lightly around circumference of piston to allow rings to seat evenly in grooves.

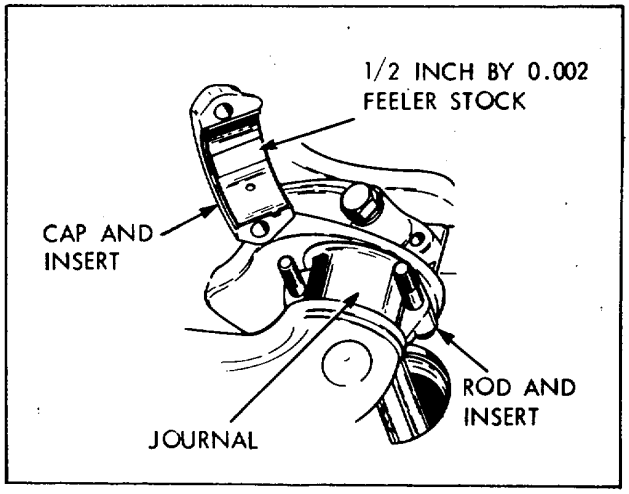


Figure 6-37. Measuring Rod Bearing Clearance

(5) Put a light coat of oil in the crankshaft end of the connecting rod and install upper half of connecting rod bearing, making certain that the bearing lock fits in the machined groove in the rod. Apply a light coat of oil to the bearing half, and install the piston and connecting rod in the cylinder bore.

(6) Connecting rods are numbered according to cylinder bore in which they must be installed. Oil squirt hole in rod should be installed toward camshaft side of engine.

Crankshaft journal should be at bottom dead center of bore in which piston and rod is being installed. Use a hammer handle to force piston through compressor into cylinder bore. While forcing piston into bore, ring compressor must be kept tight against cylinder block to prevent damage to piston rings as they are forced into bore.

(7) Apply a light coat of oil to connecting rod bearing cap and install lower half of the connecting rod bearing in cap, making certain that bearing lock fits in machined notch of rod. Apply a light coat of oil to bearing and install bearing cap and bearing on connecting rod. Tighten nuts to 39 foot pounds torque. Install cotter pins in nuts.

(8) Complete installation of pistons. Before replacing the engine head, squirt a few drops of oil around edges of pistons to help lubricate rings when starting engine.

(9) Complete installation by reversing removal procedure.

6-81. CRANKSHAFT AND BEARINGS.

a. Replacement of crankshaft bearings.

(1) Remove the oil pan.

(2) Mark the main bearing caps for correct installation.

NOTE

To keep crankshaft supported, one pair of bearings should be replaced at a time, leaving bearing capscrews snug, but not tight when installing, until all bearings are replaced.

(3) Remove main bearing capscrews and remove bearing caps from engine block.

(4) Remove bearing insert halves (Figure 6-38) from caps.

(5) Insert bearing removing tool or flat head rivet, with head thickness less than that of bearing shell, into oil hole in the crankshaft journal. Rotate crankshaft so that tool or rivet forces upper bearing half out of engine block. Make certain to rotate crankshaft in proper direction so that bearing lock is pushed out of notch in engine block.

(6) Coat new bearing half with OE and insert in same manner as old bearing half was removed.

(7) Coat lower bearing half with OE and insert in bearing cap.

(8) Install bearing cap following procedures in b. below to check clearances. After clearance is checked, leave capscrews loose so other bearings may be accurately checked.

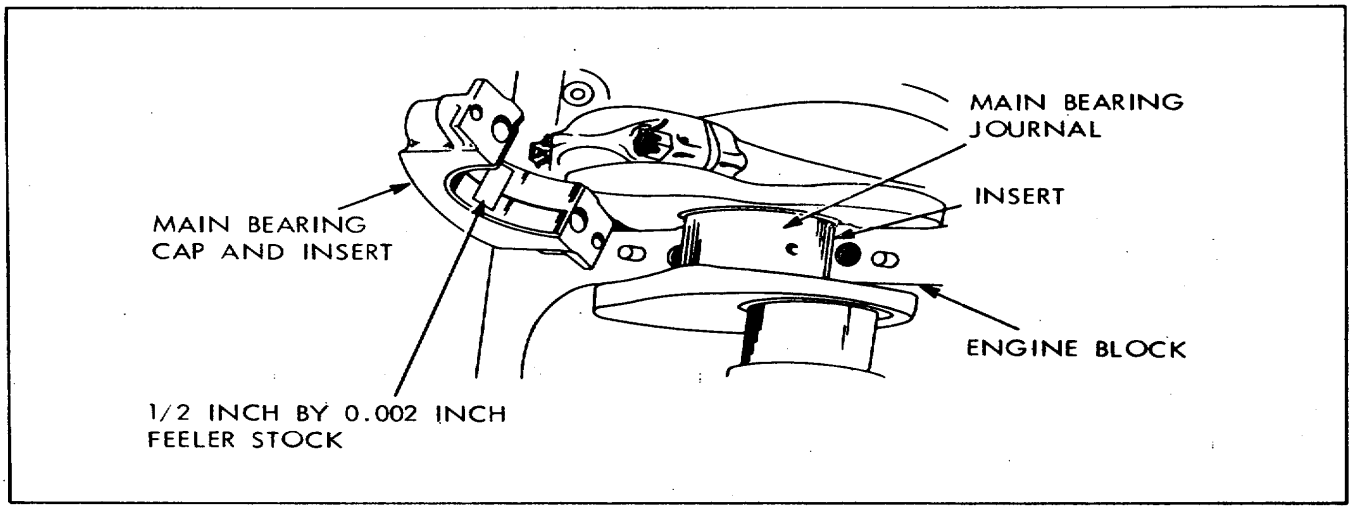


Figure 6-38. Measuring Main Bearing Clearance

(9) Replace remaining bearings in same manner.

NOTE

Be sure thrust side of front main bearing lower half is flush with thrust side of upper half, then check crankshaft endplay. Endplay should be 0.002 to 0.004 inch.

(10) Torque numbers I and 4 main bearing capscrews to 70 foot pounds, and all others to 60 foot pounds.

(11) Install oil pan.

b. Clearance. The crankshaft bearing clearance should be checked as follows after new bearing halves have been installed or when engine performance (crankshaft knock) indicates need for such a check.

(1) Remove bearing cap and place a piece of 0.002 by 1/2 by I inch shim stock in bearing cap (Figure 6-38).

(2) Install bearing. cap and tighten as given in a.(10) above. If crankshaft rotates with noticeable drag, clearance is correct. Remove shim stock and reassemble bearings to engine.

(3) Clearance may be checked by plastiqauge method-if plastigauge and special measuring scale are available. If this method is used, do not rotate crankshaft with plastigauge in place. Maximum allowable crankshaft bearing clearance, if bearing shells are being reused, is 0.0029 inch.

NOTE

Be sure front main thrust bearing lower half is flush with upper half on thrust side, then check crankshaft endplay. Endplay should be 0.002 to 0.004 inch.

c. Removal of crankshaft.

(1) Remove the engine (paragraph 6-74c.).

(2) Remove engine flywheel and bell housing (paragraph 6-74d. (5) and (6)) and oil pump.

(3) Remove timing gear cover, cover plate, and crankshaft pulley (paragraph 6-74d.(7)).

(4) Remove the pistons from the engine block (paragraph 6-80b.).

(5) Mark and remove crankshaft bearing caps, procedure a. above, and remove bearings from caps.

(6) Remove crankshaft and remove upper bearing halves.

d. Cleaning. Clean all parts with SD and dry them thoroughly. Use a soft wire probe or stiff bristle brush to clean all oil passages.

e. Inspection and repair of crankshaft.

(1) Inspect crankshaft journals and bearings for excessive wear, scoring, taper, out of round, and other damages. See tabulated data for minimum allowances for bearings and journals.

(2) Inspect crankshaft gear for cracks or tooth damage.

Replace gear if defective.

(3) When installing new crankshaft, also install new main and connecting rod bearings.

f. Installation of crankshaft. Reverse procedure in c. above, observing the following:

(1) Time gears.

(2) Torque bearing capscrews .(paragraph 6-81a.(10)) and check bearing clearance.

(3) Be sure front main bearing lower half is flush with upper half on thrust side, then check endplay.

6-82. CYLINDER BLOCK.

a. Removal. Remove engine from the truck (paragraph 6-74c.). Strip engine down to bare block by removing remaining accessories (paragraph 6-74d.), crankshaft (paragraph 6-81) and camshaft (paragraph 6-79).

b. Cleaning, inspection, and repair.

(1) Remove gasket residue from cylinder block.

(2) Remove dirt, carbon, and sludge.

(3) Clean oil and water passages.

(4) Clean block with SD and dry with compressed air.

(5) Inspect block for cracks or damage.

(6) Inspect expansion plug for good condition and tight seal, and replace plug if necessary.

(7) Examine machined surfaces for scratches, nicks, burrs, or similar damage.

(8) Examine all threaded holes and retap any that are stripped or damaged.

(9) Inspect cylinder bores while holding a light at the bottom of each bore. If rust pits are evident, or if bores are deeply scratched or scored, rebore block.

(10) Rotate dial indicator in cylinder or measure bore with inside micrometer, and observe and record largest and smallest indications (Figure 6-39). The difference between the indications is the amount of out of round. Move dial

indicator up and down in cylinder and note largest and smallest indications. The difference between indications is the amount of taper of the cylinder. If out of round or taper exceeds 0.004 inch or if overall wear exceeds 0.008 inch, rebore cylinder walls and install oversize pistons and rings.

(11) Compare' cylinder bore measurements with diameter when new and determine whether to rebore to 0.020 or 0.040 inch oversize.

(12) Rebore all cylinders with cylinder boring equipment to same predetermined oversize.

NOTE

Engine will now need pistons and rings in oversize corresponding to new cylinder bore diameter.

(13) When cylinder bores have been finished to size, coat walls with OE to: prevent rusting.

6-83. VALVES.

a. Description. The engine valves are equipped with valve rotators, which consist of a special seat retainer (Figure 6-40), a cap, a pair of flat half-round keys, and a special shaped valve stem. The lift cycle of the valve is as follows:

(1) Tappet travels through normal valve clearance to contact cap.

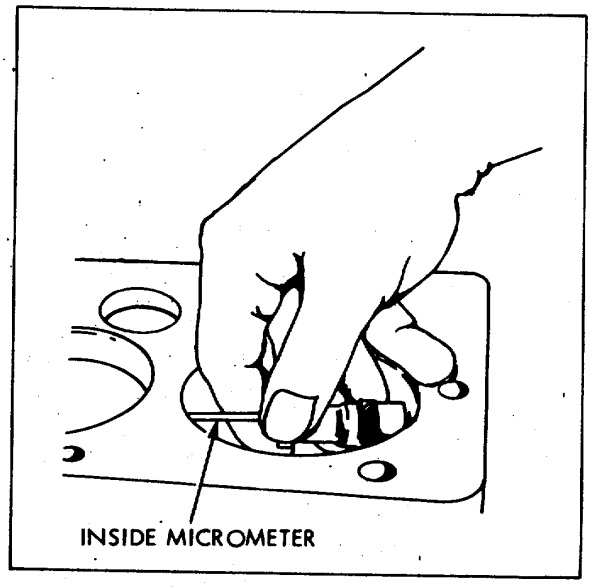


Figure 6-39. Measuring Cylinder Bore

(2) Tappet travels 0.002 to 0.006 inch, through rotator clearance, lifting keys from valve stem contact, but not yet lifting valve. Valve can turn now, as keys no longer grip it at stem.

(3) Continued lift of tappet raises valve through push on cap. Valve will rotate slightly each time it opens, due to various forces acting on it.

b. Removal.

(1) Remove cylinder head, manifold, and valve covers.

Plug oil return holes in block with rags, to prevent dropping parts into oil pan.

(2) With conventional valve spring compressor, raise spring retainer and valve spring enough to remove cap and two keys. With these parts removed, lift valve from engine block, and place in numbered valve rack so each valve can be identified, and returned to the same port from which it came. Keep components from each valve together to reduce the amount of adjusting at reinstallation.

c. Inspection.

(1) Inspect valve for burning at the neck, below head of valve, carbon formation on head or stem, or pitting of stem or face of valve.

(2) Inspect valve seat in block for burning or uneven seating of valve. Inspect valve guide for wear or gumming from carbon deposits.

d. Repair.

(1) Original valves in this engine are not to be serviced for any reason. If they are found to be unserviceable, replace. with new valves.

(2) Service replacement: valves with conventional valve grinding techniques. Grind replacement valve faces to 45 deg. angle, with 1/16 inch margin, on standard shop valve grinder, and reface valve seats to same angle.

(3) Replace exhaust valve seat inserts which are beyond practical repair, using standard procedure of pulling old insert and driving in a new insert which has been chilled in dry ice for twenty minutes.

(4) Replace valve guides worn beyond 0.0025 clearance as follows: (a) Run tappet adjusting screws all the way down and turn engine so tappet is off cam lobe.

(b) Drive out guides with 1/2 inch diameter drift, with 5/16 inch diameter pilot. Drive in new guides with same pilot to same depth as old guides.

(c) After installation, ream bore of new guides to 0.002 inch larger than stem of valve to be installed.

e. Installation. Reverse b (2) above, perform f below, then reverse b(l) above.

f. Check and adjustment, rotator cap clearance.

(1) Set up a dial indicator (Figure 6-41) to contact top of installed valve, and turn engine until valve opens. Valve is now free to turn, and can be moved vertically through rotator clearance, if any exists.

(2) Raise and lower valve with fingers, noting indicator reading total. If not between 0.002 and 0.006 inch, adjust as required as shown in figure 6-41.

g. Valve adjustment. Refer to paragraph 6-77.

6-84. ENGINE ASSEMBLY.

a. Install crankshaft Paragraph 6-81f) and bearings.

b. Install camshaft (Paragraph 6-79c), gear cover (Paragraph 6-78b), and valves (Paragraph 6-83e).

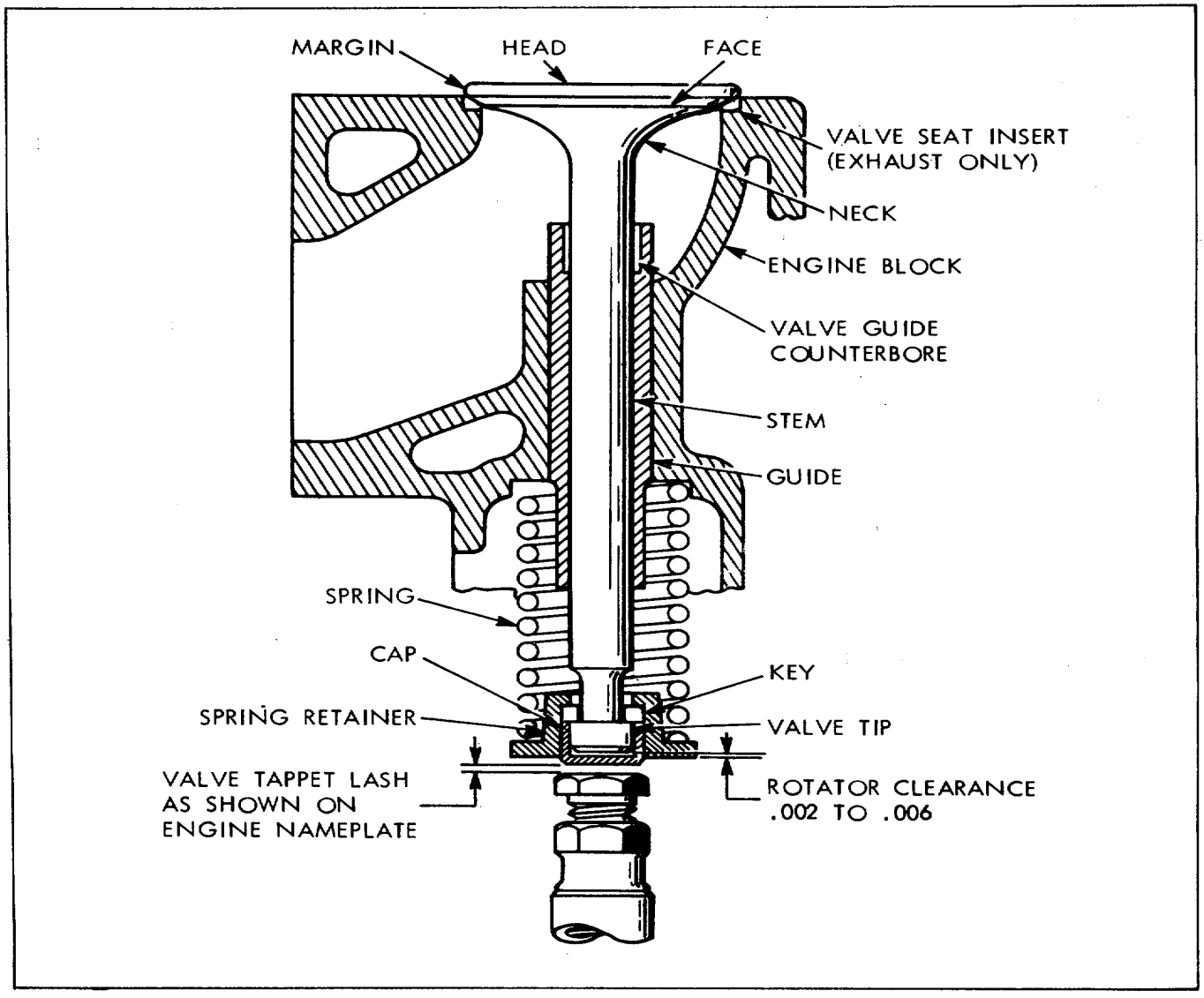


Figure 6-40. Valve Installation

c. Install oil pump (Paragraph 14b).

d. Install pistons, rings, connecting rods, and bearings (Paragraph 6-80).

e. Install oil pan and gasket.

f. Install bell housing and gasket as follows:

(1) Cement new gasket to bell housing. Let dry so gasket will not skid.

(2) Assemble bell housing to engine and oil pan and check the following measurements:

(a) Bell housing bore concentricity. Install dial indicator on crankshaft flange to contact bore of bell housing. Turn shaft one revolution. Concentricity must be within 0.010 inch. If necessary to correct, loosen mounting screws and shift bell housing as required on screws, then tighten screws.

(b) Bell housing to crankshaft chamfer clearance. Check with a leaf feeler gage that 0. to 0.025 inch clearance shown is maintained completely around the chamfer.

(3) Install oil seal and coat seal lightly with oil soap for lubrication during initial run-in.

g. Locate flywheel on crankshaft flange so timing dowel on crankshaft enters dowel hole in flywheel, and attach by drawing flywheel gradually in place by alternately tightening nuts. Do not draw any one nut tight until all have been progressively snugged down. Install new cotter pins to retain nuts.

h. Install external parts by reversing removal procedures in paragraph 6-74d.

6-85. ENGINE INSTALLATION. Reverse procedures given in paragraph 6-74c.).

6-86. TEST AFTER INSTALLATION. Test operation of engine (compression, vacuum, ignition timing) and make any necessary final adjustments as indicated in paragraph 6-74b.

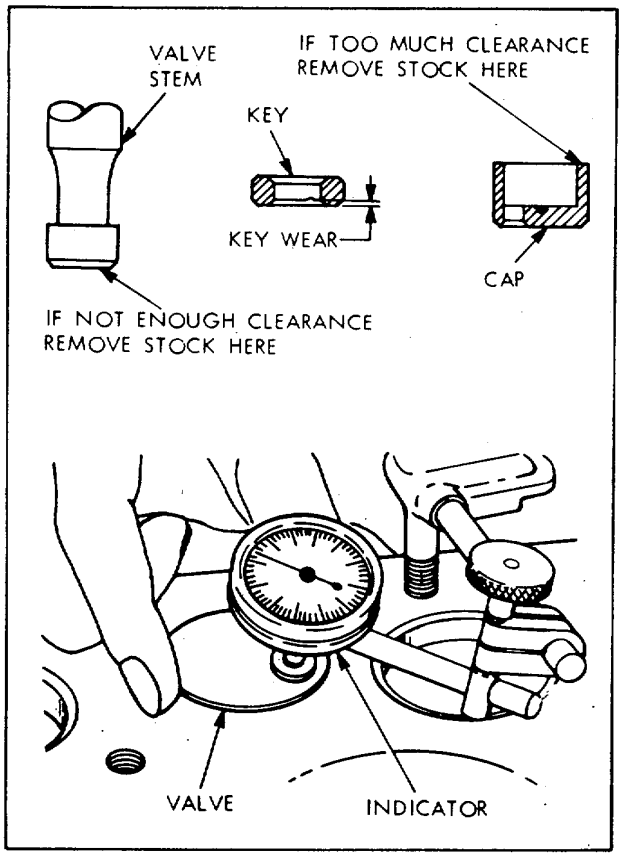


Figure 6-41. Checking Rotator Cap Clearance

APPENDIX A

REFERENCES

A-1.	FIRE PROTECTION	
	TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users.
A-2.	LUBRICATION	
	C9100IL	Fuels, Lubricants, Oils, and Waxes.
	LO 10-3930-622-12	Lubrication Order for Truck, Fork, Lift, Gasoline Engine Driven, Pneumatic Tires, 6000-LB Capacity, 173-In. Lift (Baker Model FJF-060), Army Model MHE-210) w/Engine HERCULES Model QXDL3ER.
A-3.	CLEANING	
	SB 725-7930-1	Issue of Supplies and Equipment: Engineering Practices Study of CONUS and Overseas Installation Requirements for Hard and Soft Water Cleaning Compounds.
A-4.	MAINTENANCE	
	TM 5-331B	Utilization of Engineer Construction Equipment: Volume B--Lifting, Loading, and Hauling Equipment.
	TM 38-750	The Army Maintenance Management System (TAMMS).
	TM 10-3930-622-20P	Organizational Maintenance Repair Parts, and Special Tools Lists: Truck, Fork Lift, Gasoline Engine Driven, Pneumatic Tires, 6000-Lb Capacity, 173-In. Lift (Baker Model FJF-060, Army Model MHE-210) FSN 3930-235-4674.
	TM 10-3930-622-35P	Direct Support, General Support, and Depot Maintenance Repair Parts and Special Tools Lists: Truck, Fork Lift, Gasoline Engine Driven, Pneumatic Tires, 6000-Lb Capacity, 173-In. Lift (Baker Model FJF-060, Army Model MHE-210) FSN 3930-235-4674.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section 1. 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 is Not Applicable.

d. Section IV is 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. Assembly 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 category authorized to perform these functions. 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

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.

B - TEST. To verify serviceability and to 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. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

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 category of maintenance.

J - OVERHAUL. Normally, the highest degree of maintenance performed by the Army In order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an Item to completely serviceable condition as prescribed by maintenance standards in technical publications for each Item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K - REBUILD. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Tools and Equipment. Column 4. This column is Not Applicable.

e. Remarks. Column 5. This column is Not Applicable.

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
01	ENGINE													
	Engine Assembly	O	O	C	O				F	O	H			
	Cylinder Head								O	F				
	Crankshaft	H							H					
	Flywheel Assembly								F	H				
	Valve, Engine				0				F	F				
	Gears, Timing	F							F					
	Breather			0					0					
	Filter, Oil			0					0					
	Pump, Oil	F							F					
	Manifold, Intake & Exhaust	0							0					

SECTION II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)	(4)	(5)

GROUP NUMBER	FUNCTIONAL GROUP	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
02	FUEL SYSTEM													
	Carburetor				O				O	F				
	Fuel Pump		O	O					O					
	Air Cleaner			C					O					
	Tank, Fuel			C					O	H				
	Governor				O				F	F				
	Pedal & Linkage, Accelerator				O				O					
03	EXHAUST SYSTEM													
	Muffler & Pipes	O							O					

SECTION II. MAINTENANCE ALLOCATION CHART (Cont'd)

(1) GROUP NUMBER	(2) ASSEMBLY 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		
04	COOLING SYSTEM													
	Radiator		O	C					O	H				
	Thermostat		O						O					
	Water Pump	O							O					
	Belt, Fan				O				O					
05	ELECTRICAL SYSTEM													
	Generator		O						O	F				
	Regulator Voltage		O		O				O					
	Starting Motor		O						O	F				
	Distributor				O				O	O				
	Spark Plugs		O	O	O				O					
	Ignition Coil		O						O					

SECTION II. MAINTENANCE ALLOCATION CHART (Cont'd)

(1) GROUP NUMBER	(2) ASSEMBLY 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		
05	ELECTRICAL SYSTEM (Cont'd)													
	Battery		O	C					O					
	Cables Battery			O					O					
06	TRANSMISSION													
	Filter, Oil			O					O					
	Torque Converter			O					F					
	Transmission Assembly		F	C					F	F	H			
	Control Valve		F						F	F				
	Inching Control				F					F				
07	PROPELLER & PROPELLER SHAFTS													
	Propeller Shaft				O				O	F				

SECTION II. MAINTENANCE ALLOCATION CHART (Cont'd)

(1) GROUP NUMBER	(2) ASSEMBLY 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		
08	FRONT AXLE													
	Front Axle Assy (Drive)			O					F	F				
	Differential				F				F	H				
09	REAR AXLE													
	Rear Axle Assy (Steering)			O	F				F	F				
10	BRAKES													
	Brake Shoes, Hand Brake				O				F	F				
	Lever, Hand Brake				O				O					
	Cable, Hand Brake				O				O					
	Brake Shoes, Service Brake				O				O	F				
	Master Cylinder			O					O	F				
	Wheel Cylinder								O	F				
	Pedal				O				F					

SECTION II. MAINTENANCE ALLOCATION CHART (Cont'd)

(1) GROUP NUMBER	(2) ASSEMBLY 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		
11	WHEELS													
	Rims								O					
	Hubs & Drums								F	F				
	Bearings & Seals			O	O				F					
	Tires, Tubes	O							O	O				
12	STEERING													
	Drag Link				O				O	O				
	Tie Rod				O				O	O				
	Gear Assembly Steering			O	F				F	H				
	Hydraulic Cylinder				O				O	F				
13	BODY													
	Upholstery Seats								O	H				

SECTION II. MAINTENANCE ALLOCATION CHART (Cont'd)

(1) GROUP NUMBER	(2) ASSEMBLY 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		
14	HYDRAULIC LIFT COMPONENTS,													
	Hydraulic Pump		F						F	F				
	Control Valve		F		F				F	F				
	Control Levers & Linkage				O				F					
	Tilt Cylinder				O				O	F				
	Lift Cylinder								F	F				
	Mast Assembly								F	F				
	Carriage Assembly								F	F				
	Chain Hydraulic Lift				O				O	O				
	Lines & Fittings	O							O					
	Tank, Oil			O					F					
	Breather, Oil Tank			O					O					
	Filter, Oil			O					O					

APPENDIX C

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists Items which accompany the Fork Lift Truck or are required for installation, operation, or operator's maintenance.

C-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items - Section II. A list of items which accompany the Fork Lift Truck and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies - Section III. A listing of maintenance and operating supplies required for initial operation.

C-3. Explanation of Columns

The following provides an explanation of columns In the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR).

(1) Source code indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts, Special Tools and Test Equipment supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair Parts, Special Tools and Test Equipment which are procured and stocked for Insurance purposes because the combat or military essentiality of the end item dictated that a minimum quantity be available In the supply system.
M	Repair Parts, Special Tools and Test Equipment which are not procured or stocked, as such, in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry Individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at Indicated maintenance categories.

Code	Explanation
X	Parts and assemblies that are not procured or stocked because the failure rate Is normally below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end Item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by the next higher assembly or component.
X2	Repair Parts, Special Tools and Test Equipment which are not stocked and have no foreseen mortality. The Indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, the item may be requisitioned with exception data, from the end Item manager, for Immediate use.
G	Major assemblies that are procured with PEMA funds for Initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above the DS and GS level or returned to depot supply level.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code indicates whether unserviceable Items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Repair parts (assemblies and components) which are considered economically reparable at direct and general support maintenance levels. When the maintenance capability to repair these Items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When Items are determined by a GSU to be uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.

Code	Explanation
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes..

c. Description. This column indicates the Federal item name and any additional description of the Item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation Indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated In Unit. This column Indicates the quantity of the Item used In the assembly group.

f. Quantity Furnished With Equipment. This column indicates the quantity of an Item furnished with the equipment.

g. Illustration. This column is Not Applicable.

C-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies - Section III.

a. Component Application. This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number. This column Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the item name and brief description.

d. Quantity Required for Initial Operation, This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes. This column Indicates Informative notes keyed to data appearing in a preceding column.

SECTION II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal Stock Number	(3) Description Ref no. & mfr Code / Usable on code	(4) Unit of Meas	(5) Qty inc in Unit	(6) Qty furn with equip	(7) Illustration (A) Fig no.	(7) Illustration (B) Item No.
	7510-889-3494	Binder, Loose Leaf	EA	1	1		
	7520-559-9618	Case, Maintenance and Operation Manuals	EA	1	1		
	4210-889-2221	Extinguisher, Fire	EA	1	1		
		2½ lb., Fed. Spec O-E95 Department of the Army Technical Manual TM 10-3930-622-14	EA		1		
		Department of the Army Lubrication Order LO 10-3930-622-12	EA		1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
Air Cleaner		Oil Lubricating: 5 gallon drum as follows:			(1) Includes quantity of oil to fill engine oil system as follows:
	9150-265-9435(2)	OE30	1/2 qt	(3)	5 qt - crankcase
	9150-265-9428(2)	OE10	1/2 qt	(3)	1 qt - oil filter
	9150-242-7603(2)	OES	1/2 qt	(3)	
Crankcase		Oil Lubricating (1)			(2) See C9100-IL for additional data and requisitioning procedures
		OE30	6 qt	(1)	
		OE10	6 qt	(1)	(3) See current LO for grade application and replenishment intervals
		OES	6 qt	(1)	
Hydraulic Brake Cylinder		Brake Fluid: Automotive 1 gallon can as follows:			
	9150-252-6375(2)	HBA	1/2 pt	(3)	(4) Fuel tank capacity
Hydraulic Reservoir		Oil Lubricating: 55 gallon drum as follows:			(5) Cooling System capacity
	9150-265-9430(2)	OE10	94 gal	(3)	
	9150-242-7605(2)	OES	94 gal	(3)	
Radiator		Water Antifreeze 5 gallon can as follows:			
	6850-224-8730	Ethylene Glycol type 1	13 qt	(5)	
		Antifreeze: 5 gallon drum as follows:			
	6850-174-1806	Artic grade	13 qt	(5)	

SECTION III. MAINTENANCE AND OPERATING SUPPLIES (Cont'd)

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
Fuel Tank		Fuel, Gasoline: bulk as follows:			
	9130-160-1818(2)	Automotive Combat 91A	104 gal	(4)	
	9130-160-1830(2)	Automotive Combat 91C	104 gal	(4)	
Transmission		Oil Lubricating: 55 gallon drum as follows:			
	9150-265-9430(2)	OE10	10 qt	(3)	
	9150-242-7605(2)	OES	10 qt	(3)	
Grease Points		Grease, Automotive and Artillary: 5 lb can as follows:			
	9150-190-0905(2)	GAA			
Drive Axle		Oil Lubricating Gear: 5 gallon drum as follows:	11 pts		
	9150-577-5847(2)	GO 140		(3)	
	9150-577-5844(2)	GO 90		(3)	
	9150-257-5440(2)	GOS		(3)	

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To be distributed in accordance with DA Form 12-25, Section I (qty rqr block no. 193) Operator Maintenance requirements for Trucks, Forklift: Gasoline.

* U.S. GOVERNMENT PRINTING OFFICE: 1970-431097/5051

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