

DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

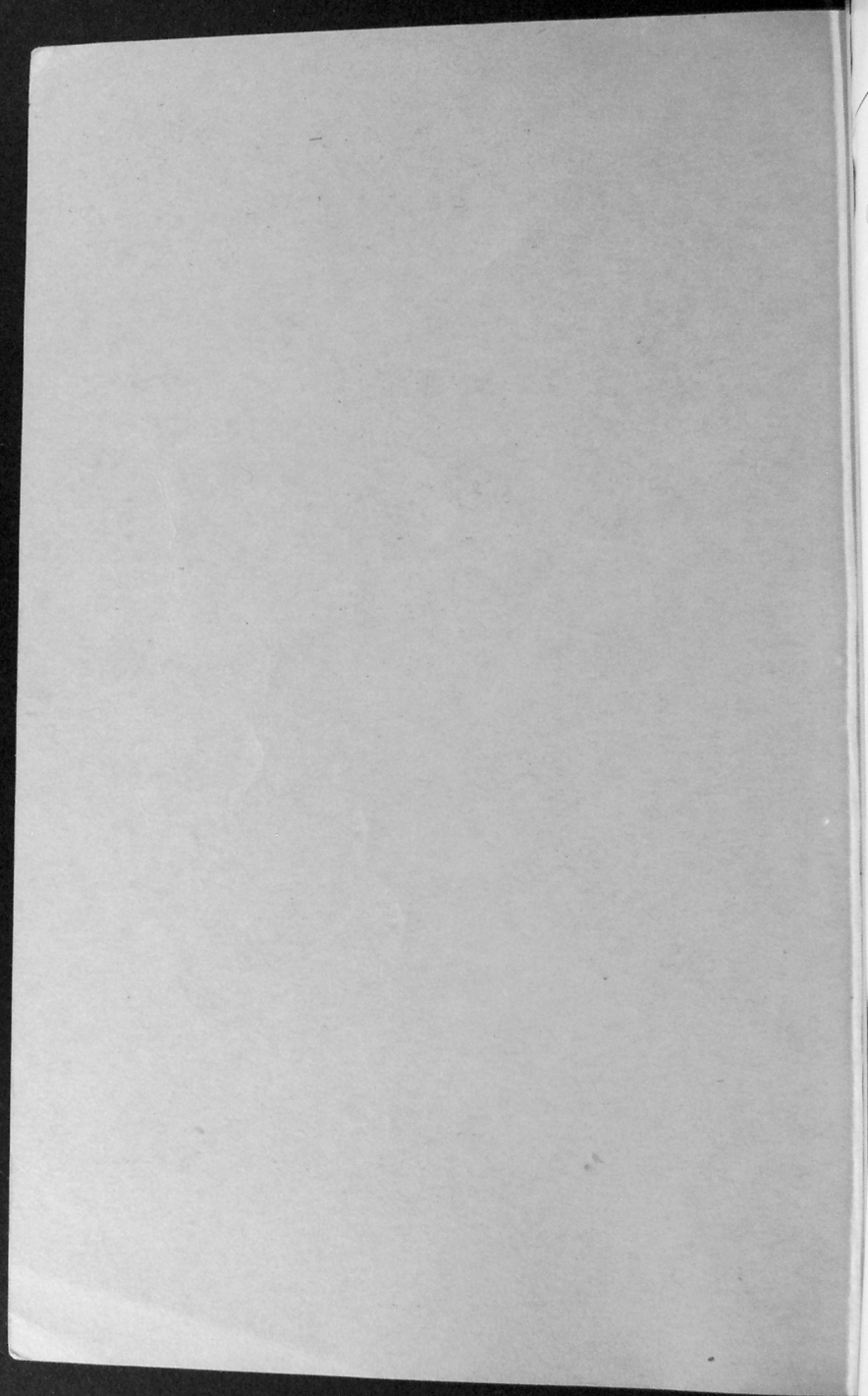
DEPARTMENT OF THE AIR
FORCE TECHNICAL ORDER

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TM 9-1819AC
TO 19-75CAJ-4

ORDNANCE
MAINTENANCE:
2½-TON 6x6
CARGO TRUCKS
M135 AND M211
DUMP TRUCK M215
GASOLINE
TANK TRUCK M217
TRACTOR TRUCK M221
AND WATER TANK
TRUCK M222:
POWER TRAIN

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
DECEMBER 1952

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ORDNANCE MAINTENANCE:

2½-TON 6x6

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TANK TRUCK M217

TRACTOR TRUCK

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AND WATER TANK

TRUCK M222:

POWER TRAIN



DEPARTMENTS OF THE ARMY
AND THE AIR FORCE

WASHINGTON 25, D. C., 5 December 1952

TM 9-1819AC/TO 19-75CAJ-4 is published for the information
and guidance of all concerned.

[AG 461 (4 Nov 52)]

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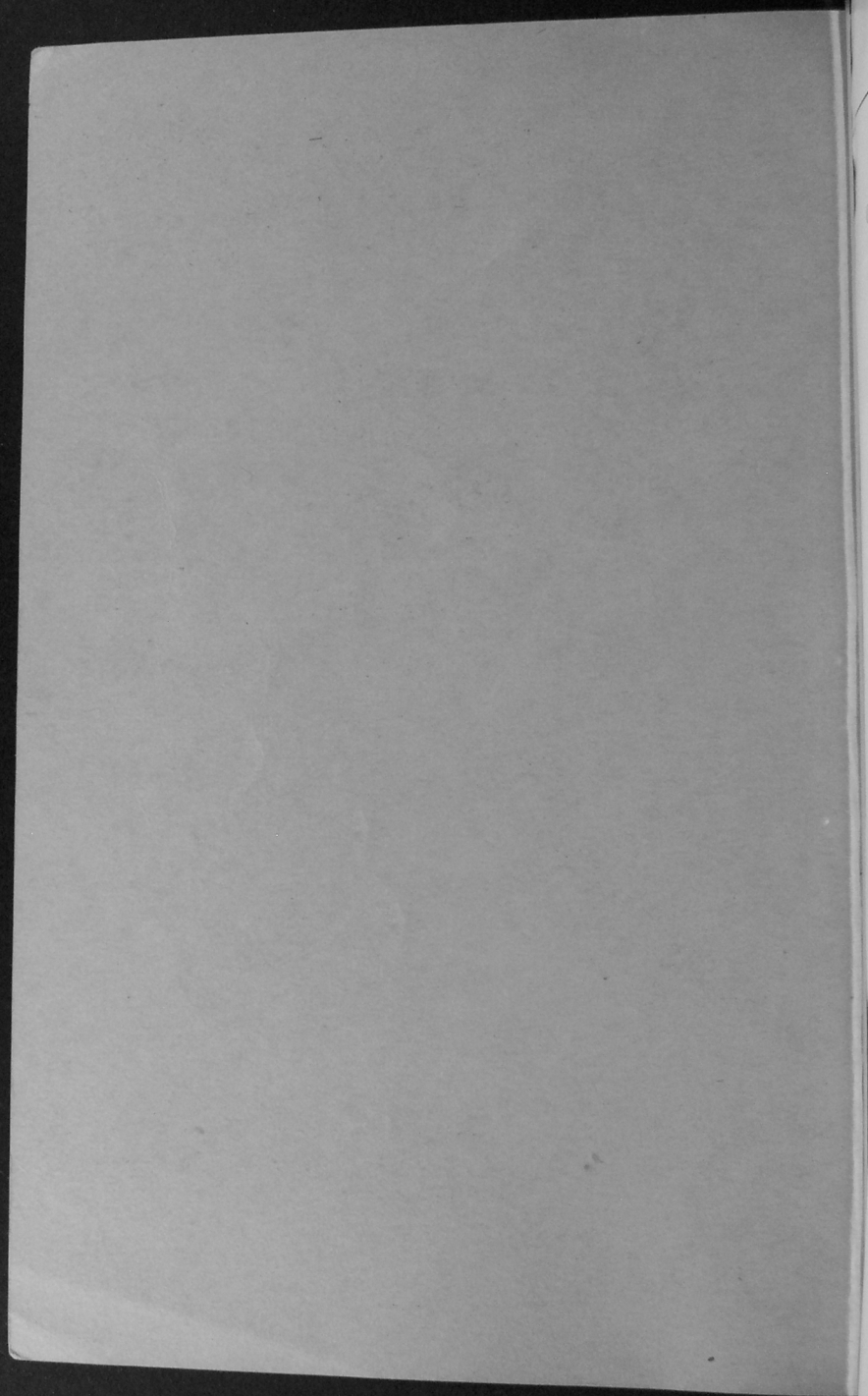
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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. (1) These instructions are published for the information and guidance of personnel responsible for field and depot maintenance of this matériel. These instructions contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. This manual does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operators technical manual or field manual.

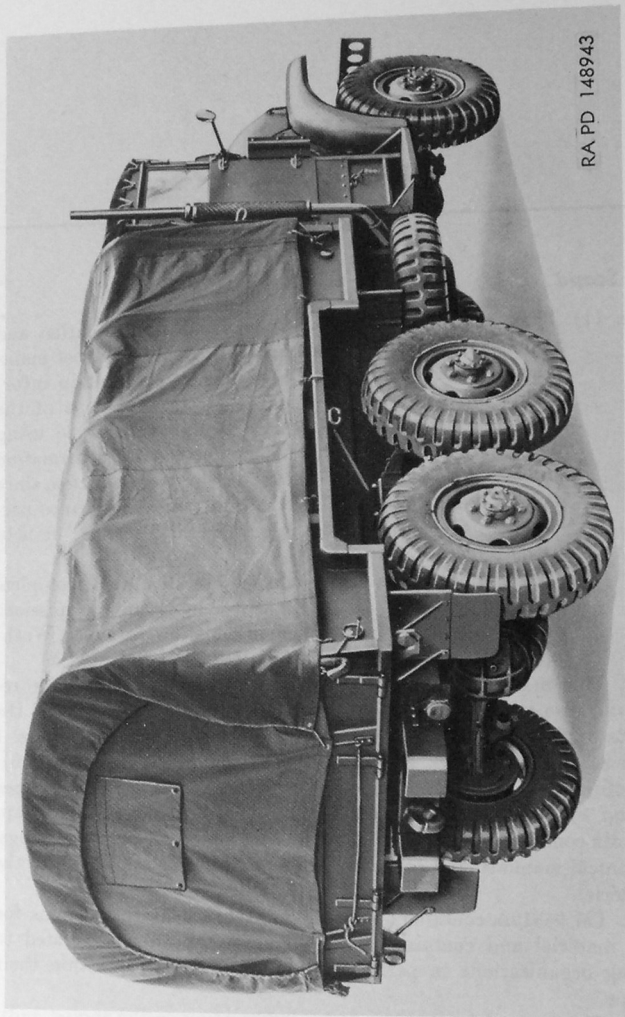
(2) This first edition is being published in advance of complete technical review of all concerned. Any errors or omissions will be brought to the attention of Chief of Ordnance, Washington 25, D. C., ATTENTION: ORDFM-Pub.

b. This manual contains a description of and procedures for removal, disassembly, inspection, repair, rebuild, and assembly of the units of the power train for 2½-ton 6x6 cargo truck M135 (figs. 1 and 2) and M211 (figs. 3 and 4), dump truck M215 (figs. 5 and 6), gasoline tank truck M217 (figs. 7 and 8), tractor truck M221 (figs. 9 and 10), and water tank truck M222 (figs. 11 and 12). The appendix contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the matériel.

c. TM 9-819A contains operating and lubricating instructions for the matériel and contains all maintenance operations allocated to using organizations in performing maintenance work within their scope.

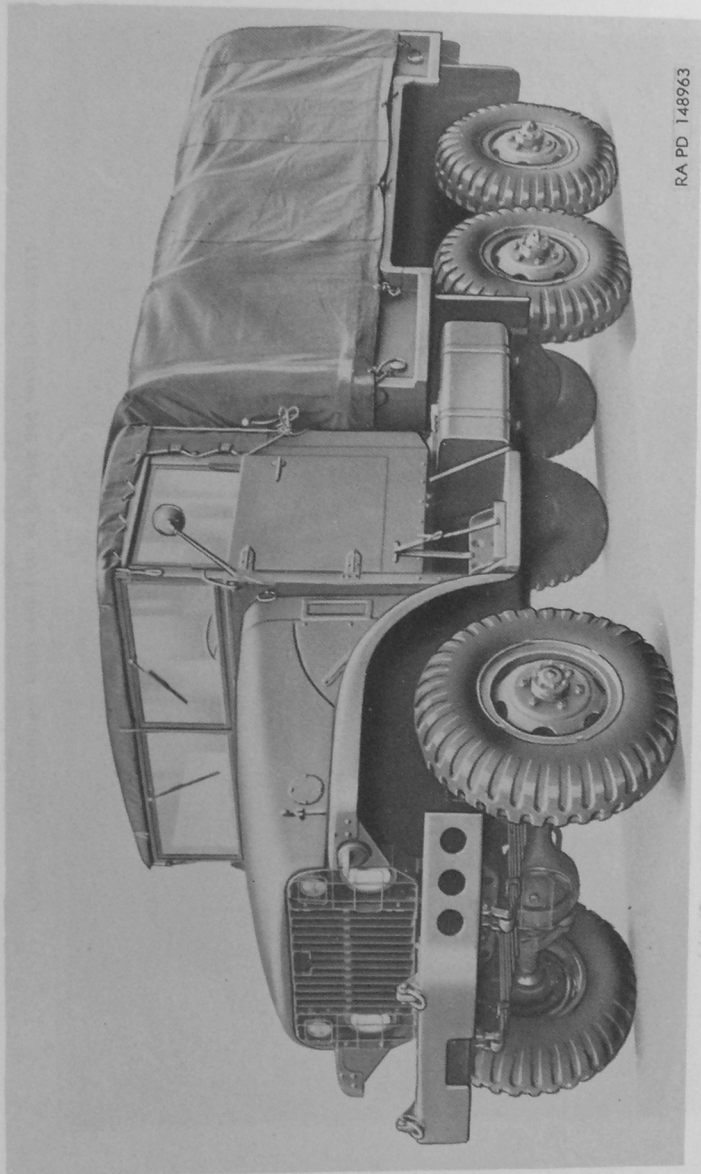
d. TM 9-1819AA contains service information on the engine, radiator, and air compressor.

e. TM 9-1819AB contains service information on the Hydra-Matic transmission (GMC Model 302M).



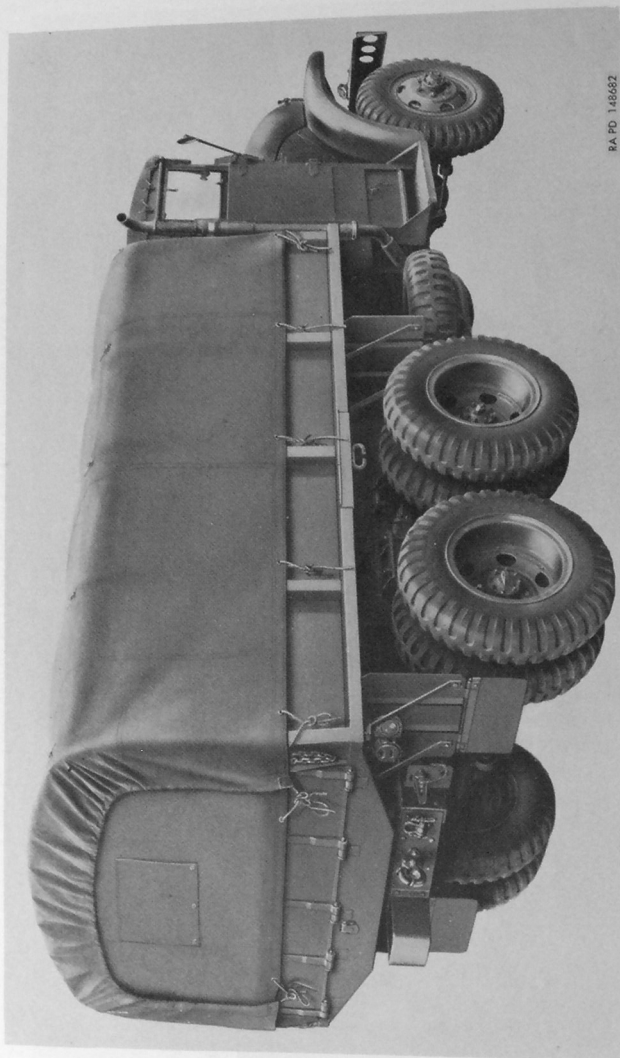
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Figure 1. Three-quarter right rear view of 2½-ton 6x6 cargo truck M135.



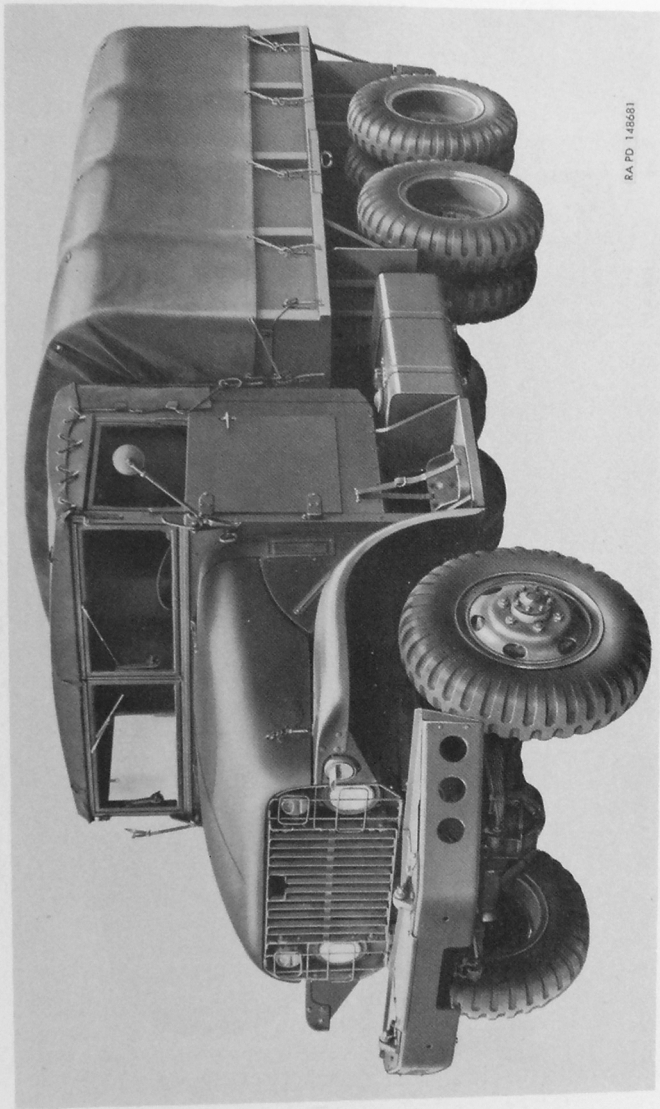
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Figure 2. Three-quarter left front view of 2½-ton 6x6 cargo truck M135.



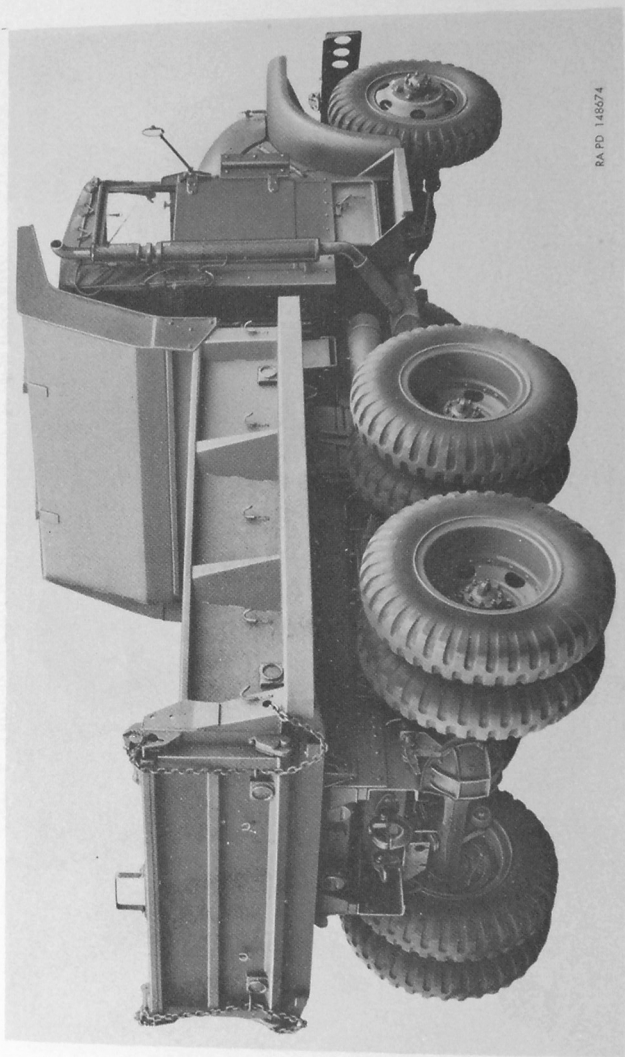
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Figure 3. Three-quarter right rear view of 2½-ton 6x6 cargo truck M211.



RA PD 146681

Figure 4. Three-quarter left front view of 2½-ton 656 cargo truck M211.



BA PD 148574

Figure 5. Three-quarter rear view of 2½-ton 6x6 dump truck M21b.

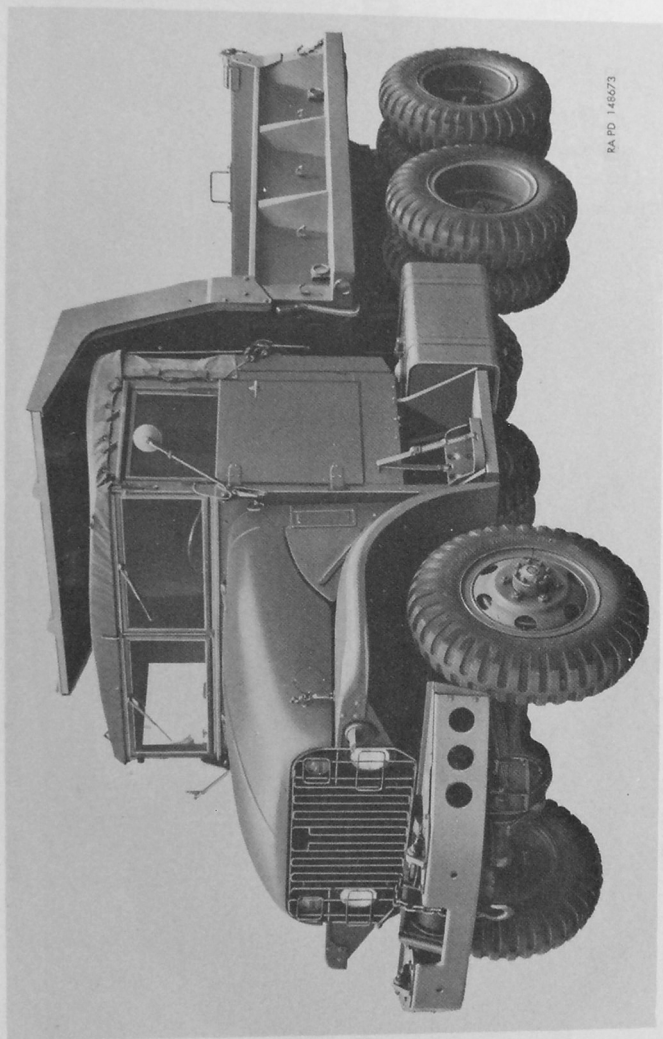
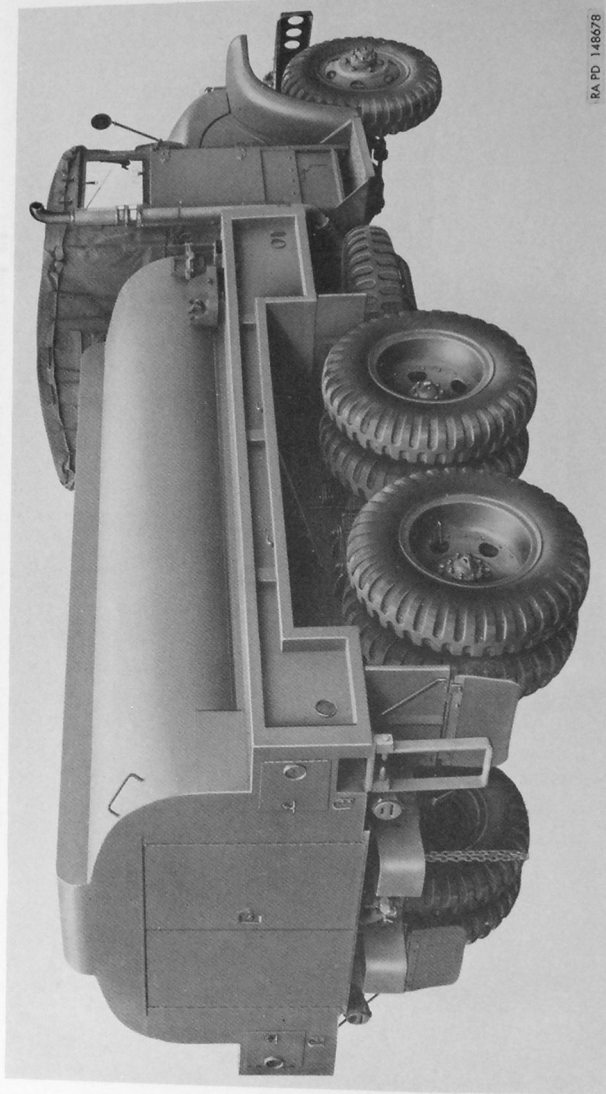
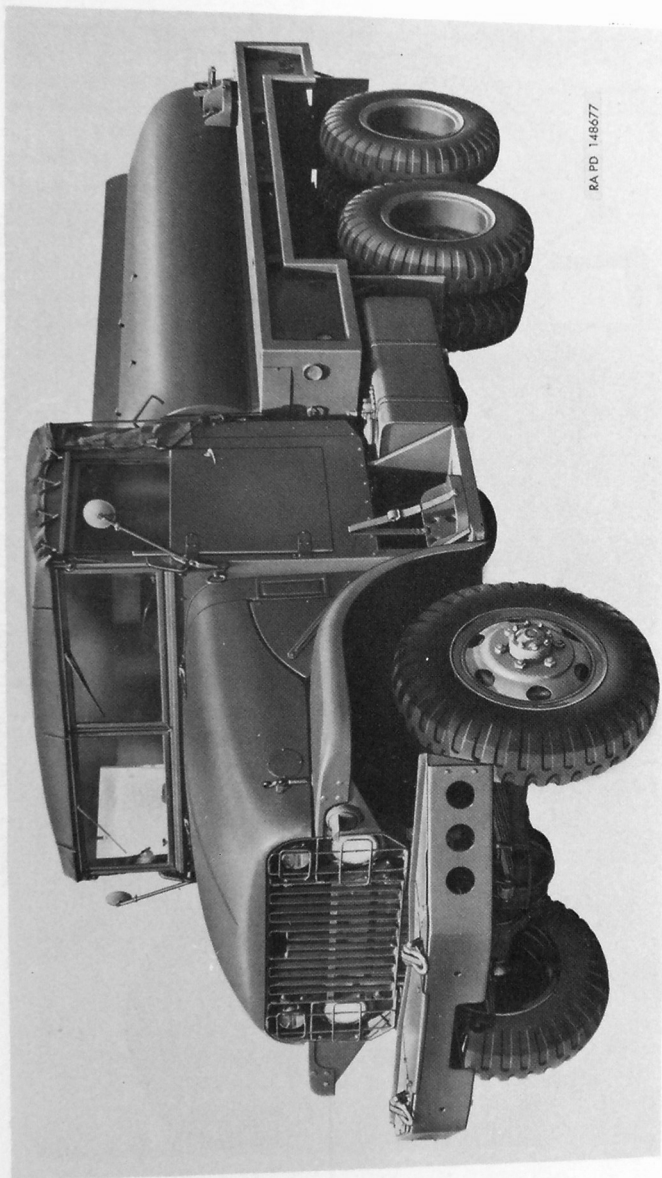


Figure 6. Three-quarter left front view of 2½-ton 6x6 dump truck M215.



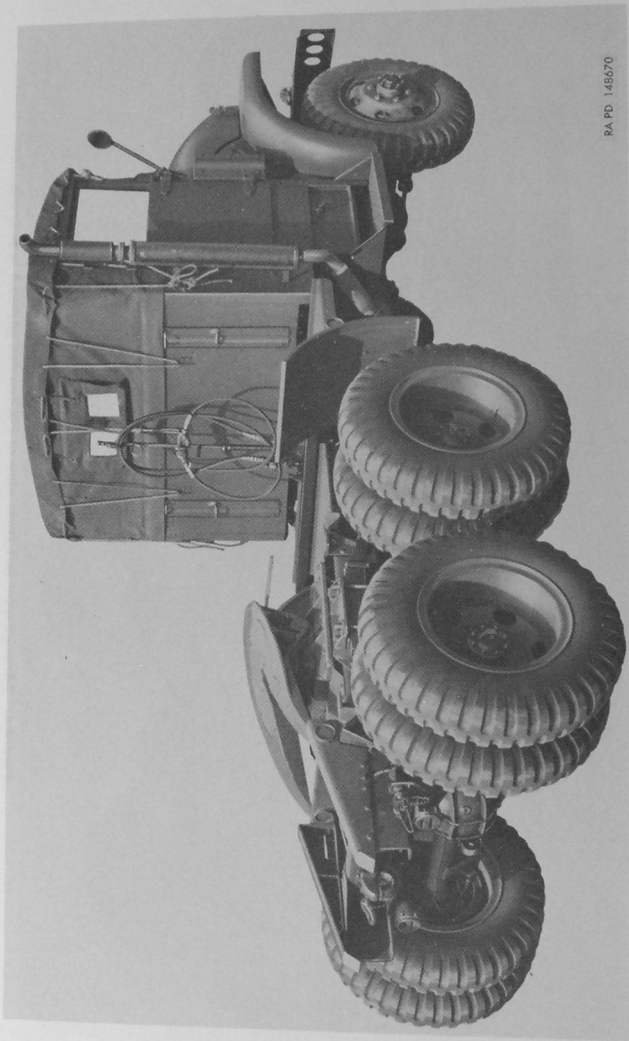
BA PD 148678

Figure 7. Three-quarter right rear view of 2½-ton 6x6 gasoline tank truck M217.



RA PD 148677

Figure 8. Three-quarter left front view of 2½-ton 6x6 gasoline tank truck M217.



RA PD 148570

Figure 9. Three-quarter right rear view of 2½-ton 6x6 tractor truck M221.

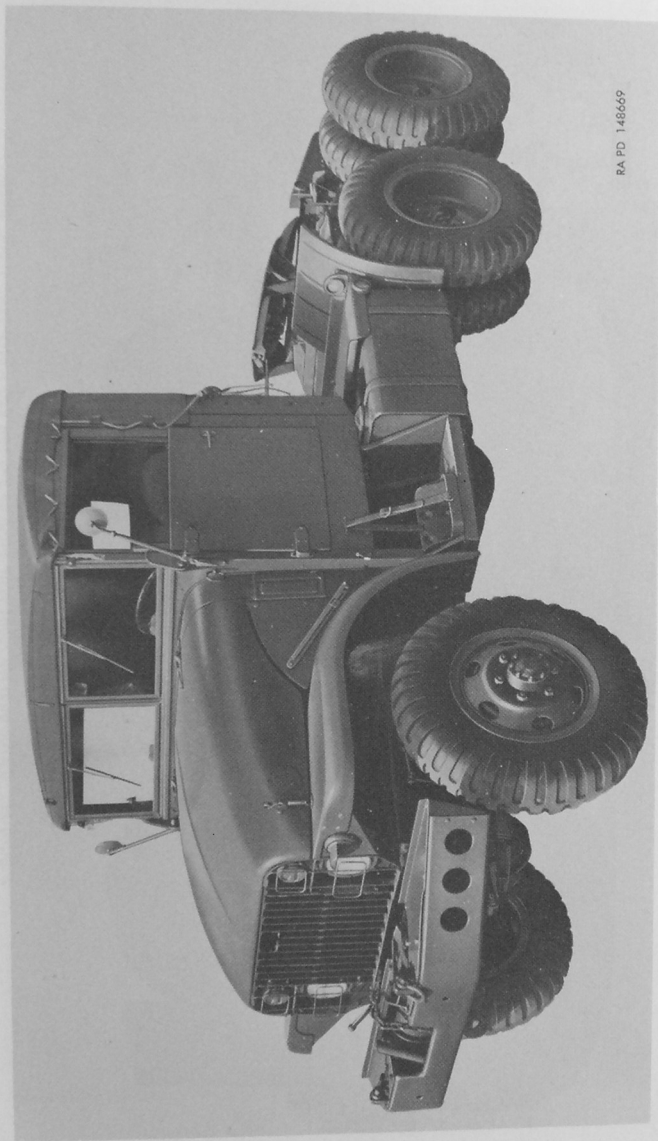
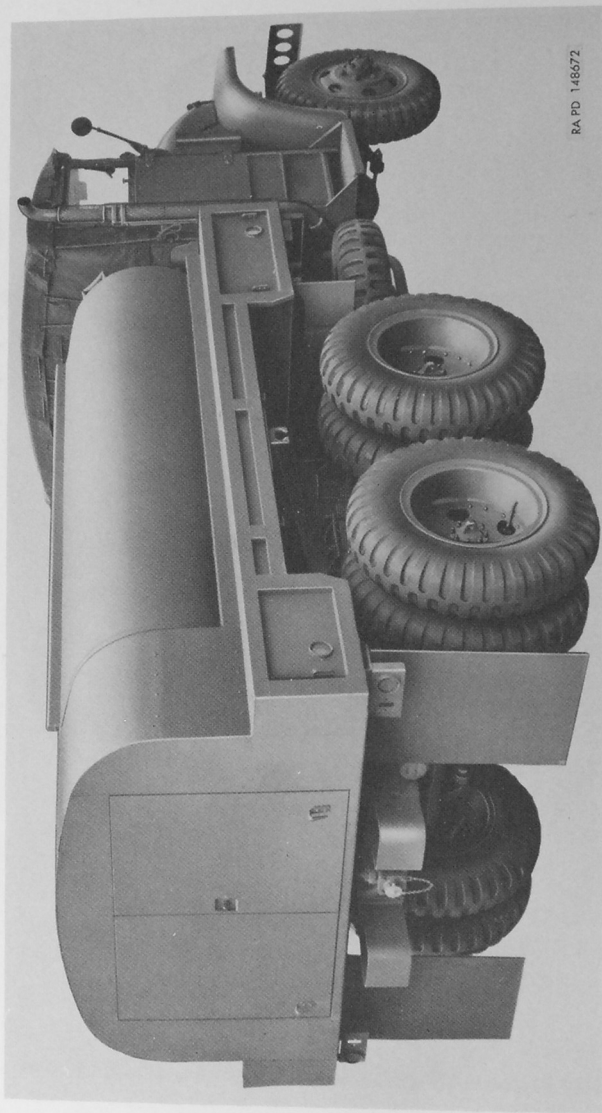
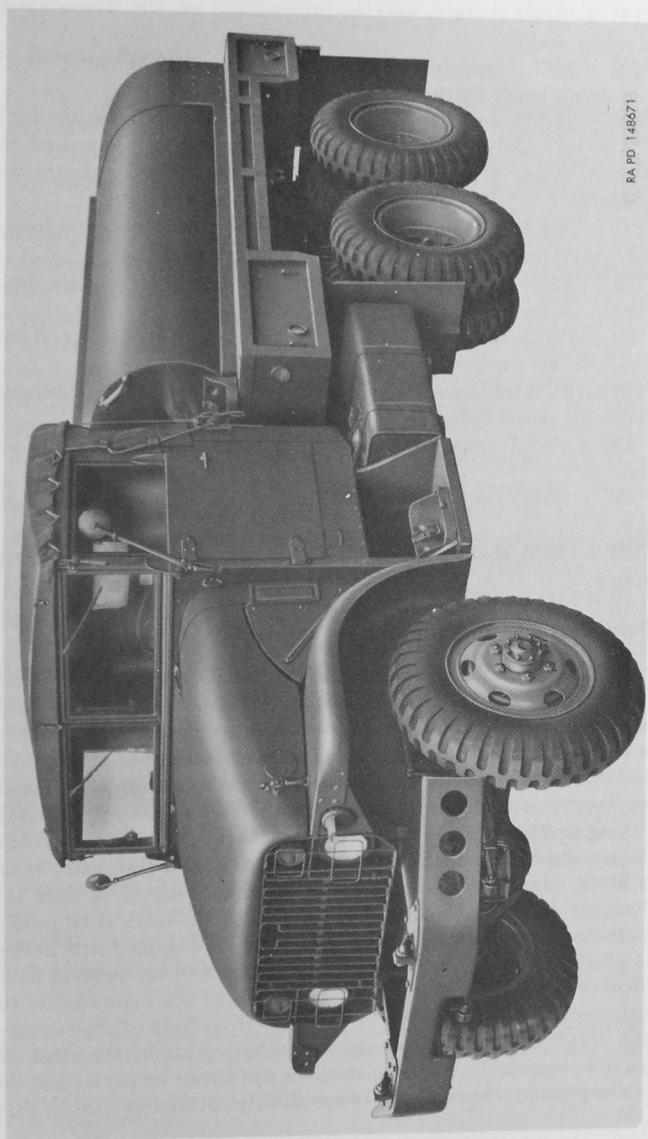


Figure 10. Three-quarter left front view of 2 1/2-ton 6x6 tractor truck M221.



RA PD 146572

Figure 11. Three-quarter right rear view of 2 1/2-ton 6x6 water tank truck M222.



RA PD 148671

Figure 12. Three-quarter left front view of 2½-ton 6x6 water tank truck M222.

- f.* TM 9-1819B contains service information on the Trico windshield wiper motor.
- g.* TM 9-1819C contains service information on the dump body used on dump truck M215.
- h.* TM 9-1819D contains service information on the gasoline tank body used on gasoline tank truck M217, water tank body used on water tank truck M222, and trailer attachments used on tractor truck M221.
- i.* TM 9-1825A contains service information on the Delco-Remy starter, generator, generator-regulator, and ignition unit.
- j.* TM 9-1825E contains service information on the Scintilla multiple cable connectors and light switch.
- k.* TM 9-1827A contains service information on the Bendix-Westinghouse low air pressure switch.
- l.* TM 9-1827B contains service information on the Bendix Products air-hydraulic power cylinder.
- m.* TM 9-1829A contains service information on the AC speedometer.
- n.* TM 9-1826D contains service information on the Holley carburetor.
- o.* TM 9-1828A contains service information on the Carter electric fuel pump.

2. Field and Depot Maintenance Allocation

The publication of instructions for complete disassembly and rebuild is not to be construed as authority for the performance by field maintenance units of those functions which are restricted to depot shops and arsenals. In general, the prescribed maintenance responsibilities will be reflected in the allocation of maintenance parts listed in the appropriate columns of the current ORD 8 supply catalog pertaining to 2½-ton 6x6 cargo truck M135 and M211, dump truck M215, gasoline tank truck M217, tractor truck M221, and water tank truck M222. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair functions imperative. Supply of parts listed in the depot guide column of ORD 8 supply catalogs will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization and upon express authorization by the chief of the service concerned. Those operations which can be performed as "emergency field maintenance" are specifically covered as such in this manual.

3. Forms, Records, and Reports

a. General.—Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the quantity, and condition of matériel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of matériel in the hands of troops and for delivery of matériel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the matériel upon completion of its repair.

b. Authorized Forms.—The forms generally applicable to units maintaining this equipment are listed in the appendix. No forms other than those approved for the Department of the Army will be used. For current and complete listing of all forms, refer to current SR 310-20-6. Additional forms applicable to the using personnel are listed in the operators manual. For instructions on use of these forms, refer to FM 9-10.

c. Field Reports of Accidents.—The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in the SR 385-10-40 series of special regulations. These reports are required whenever accidents involving injury to personnel or damage to matériel occur.

d. Report of Unsatisfactory Equipment or Materials.—Any suggestions for improvement in design and maintenance of equipment, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants, and/or preserving materials, will be reported through technical channels as prescribed in SR 700-45-5 to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM, using DA Form 468, Unsatisfactory Equipment Report. Such suggestions are encouraged in order that other organizations may benefit.

Note. Do not report all failures that occur. Report only REPEATED or RECURRENT failures or malfunctions which indicate unsatisfactory design or material. However, reports will always be made in the event that exceptionally costly equipment is involved. See also SR 700-45-5 and the printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. General.—The power train units and systems covered in this manual include the transfer and propeller shafts, front and rear axles, spring suspension and frame, steering system, brake system, cab, and bodies on models itemized in paragraph 1*b*. Differences in the models are briefly described in paragraph 5.

b. Transfer Assembly.—The transfer assembly (fig. 47) is a two-speed unit which transfers power to front and rear axles. Complete description and tabular data on this component are described in chapter 5. Adjustment and replacement procedures of control linkage are contained in TM 9-819A.

c. Power Take-Off Assembly (figs. 85, 86, and 87).—The power take-off is single-speed and is mounted to the left side of transfer. Power take-off is used to drive winch, and to drive operating units of the dump, gasoline tank, and water tank body models. Control linkage adjustment and replacement procedures are contained in TM 9-819A. Complete description and tabular data on this component are included in chapter 6.

d. Front Axle Assembly (fig. 105).—The front axle is hypoid, single-reduction type using conventional differential and carrier assembly to transmit drive through constant-velocity universal joints. Power to front axle is automatically transmitted from transfer through conventional propeller shaft. Complete description and tabular data are included in chapter 7.

e. Rear Axles (fig. 131).—Rear axles are hypoid, single-reduction type using conventional differential and carrier assembly to transmit drive to rear wheels through full-floating axle shafts. Power is transmitted to both rear axles from transfer through conventional propeller shafts. Complete description and tabular data are included in chapter 8.

f. Propeller Shafts and Universal Joints.—Each axle propeller shaft (fig. 150) is tubular type, equipped with fixed yoke universal joint assembly at one end and slip yoke universal joint assembly at opposite end. Transmission-to-transfer propeller shaft consists of two universal joint assemblies bolted together. All universal joint assemblies are needle roller bearing type. The pillow block assembly (fig. 155), mounted on forward rear axle, connects and supports the two propeller shafts required to transmit power from transfer to rear axle. Rebuild procedures are included in chapter 9.

g. Service Brake System.

- (1) The service brake system is air-hydraulic type consisting primarily of a pedal, interconnected to a hydraulic master cylinder; an air-hydraulic power cylinder; wheel cylinders

to transmit hydraulic pressure to the brake assemblies at each wheel; air compressor which maintains a supply of compressed air to operate the power cylinder; and interconnecting lines, fittings, and linkage.

- (2) Replacement procedures on interconnecting lines, fittings, and linkage are contained in TM 9-819A. Service information on the air compressor is contained in TM 9-1819AA. Service information on the air-hydraulic power cylinder is contained in TM 9-1827B. Rebuild of brake assemblies, brake drum, hydraulic master cylinder, and wheel cylinders is contained in chapter 10.

h. Parking Brake System.

- (1) Mechanical parking brake system includes an external-contracting one-piece band type brake, located at rear of transfer assembly. Parking brake hand lever, located at right of driver in cab, operates brake band through a relay lever and interconnecting rods. Description, tabular data, and service information are contained in chapter 11.
- (2) In addition to the mechanical parking brake system, a temporary (electric) parking brake system is used only in the event of failure of mechanical parking brake system. This system includes a braking switch electrically connected to a solenoid valve connected into hydraulic master cylinder outlet hydraulic line. Service information on the parking brake valve is contained in chapter 11.

i. Wheels and Hubs. Service information on wheels, hubs, and bearings for both single and dual wheels is contained in chapter 12.

j. Steering Gear and Drag Link.—The steering gear assembly (fig. 186) is recirculating-ball type, flange-mounted on left frame side rail. The Pitman arm of the gear assembly is interconnected with left steering knuckle of front axle by a drag link. The drag link (fig. 204) is tubular type equipped with ball studs at both ends. Ball studs are mounted in bearings which require no lubrication. Service information and necessary tabular data are contained in chapter 13.

k. Front Spring Suspension (fig. 205).—Front springs are semi-elliptic, mounted with the arch down, shackled at both ends. Springs are mounted on front axle housing and held in place with "U" bolts and spring bumper blocks. Three torque rods, two lower and one upper, transmit driving and braking forces to frame. A double-acting shock absorber is mounted to frame side rail on each side. Absorber arms are connected to axle with links which attach to bumper blocks. Service information on front spring suspension is contained in chapter 14.

l. Rear Spring Suspension (fig. 214).—Rear spring suspension consists of an articulated main spring assembly and a fixed secondary spring assembly on each side. Both spring assemblies are semi-elliptic with slipper-type ends and mounted with the arch up. The main spring is mounted on a spring seat (fig. 39) which in turn is mounted on a shaft with tapered roller bearing. The secondary spring is mounted rigidly to frame side rail. Slipper ends of main springs are inserted in axle housing brackets, while secondary spring ends contact top of brackets under heavy loaded conditions. Three torque rods are used at each axle, two upper and one lower. Service information on rear spring suspension is contained in chapter 15.

m. Frame.—Service information on frame and associated parts is contained in chapter 16.

n. Cab.—Cab consists of an open-top structure enclosing driver's compartment. The all-steel cab structure includes several subassemblies bolted together into a unit assembly. The cab is equipped with an adjustable windshield, canvas top deck and rear curtains, and metal doors with regulated glass windows. Service information on the cab and associated parts is contained in chapter 19.

o. Cargo Body.—The cargo body, of all-steel construction, is mounted on frame side rails, attached by means of bolts to brackets on frame side rails. Removable wood side racks incorporate folding troop seats. Canvas top paulin, front end curtain, and rear end curtain are supported by five removable wood bows. The cargo bodies on the cargo truck M135 and M211 are the same except that body on cargo truck M211 (fig. 240) has a flat floor, while body on cargo truck M135 (fig. 239) has wheel housings built into each side of body. Service information on cargo bodies is contained in chapter 20.

p. Winch (fig. 222).—Winch is a worm-gear, jaw-clutch, drum type mounted at front of truck. The winch is operated through propeller shafts by power take-off mounted on left side of transfer. Service information on winch assembly and drive line is contained in chapter 18. Replacement procedures on power take-off control linkage are contained in TM 9-819A.

5. Differences Between Models

a. Cargo Truck M135 (figs. 1 and 2).—The cargo truck M135 is a 2½-ton 6 x 6 truck equipped with a metal cargo type body mounted on frame independent of cab. Complete descriptions of chassis, body, and cab items are contained in TM 9-819A. This truck is furnished with or without winch.

b. Cargo Truck M211 (figs. 3 and 4).—The cargo truck M211 is similar to the cargo truck M135 (*a* above) except it is equipped with flat-floor steel cargo body and dual rear wheels. This truck is furnished with or without winch.

c. Dump Truck M215 (figs. 5 and 6).—The dump truck M215 is similar to the cargo truck M135 (*a* above) except it is equipped with a metal dump body and dual rear wheels. The power take-off is equipped with an accessory drive which actuates the body hoist equipment when controls are properly positioned by the driver. An auxiliary governor is also used in conjunction with the engine governor to properly limit engine speed when operating dump hoist mechanism. The dump body can also be fitted with side stake racks and folding troop seats. Paulin and bows for body protection may be installed in same manner as on the cargo truck M135. This truck is furnished with or without winch.

d. Gasoline Tank Truck M217 (figs. 7 and 8).—The gasoline tank truck M217 is similar to the cargo truck M135 (*a* above) except it is equipped with a 1,200-gallon gasoline tank body and dual rear wheels. An accessory drive on power take-off actuates the pumping equipment when controls are properly positioned by driver. An auxiliary governor is used in conjunction with the engine governor to properly limit engine speed when operating the pump equipment. The body may be fitted with bows and top paulin for camouflage purposes. This truck is furnished without winch only.

e. Water Tank Truck M222 (figs. 11 and 12).—The water tank truck M222 is identical to the gasoline tank truck M217 (*d* above) except it is equipped with a 1,000-gallon water tank body. The power take-off accessory drive and the auxiliary governor are similar to gasoline tank truck M217. This truck is furnished without winch only.

f. Tractor Truck M221 (figs. 9 and 10).—The tractor truck M221 is a tractor type truck with chassis and power plant construction similar to cargo truck M135 (*a* above), except vehicle is a shorter wheelbase with dual rear wheels, and is equipped with a conventional type fifth wheel and ramp. The spare tire is mounted on frame at rear of cab. This truck is furnished with or without winch.

6. Data

a. Reference should be made to TM 9-819A for tabular data pertaining to the general characteristics and performance of the models described in paragraph 5.

b. Pertinent tabular data on the various components or systems included in the power train will be found in the applicable chapters of this manual.

CHAPTER 2

PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

7. General

Tools and equipment and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units and depot shops for maintaining, repairing, and/or rebuilding the matériel.

8. Parts

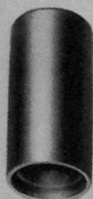
Maintenance parts are listed in Department of the Army Supply Catalog ORD 8 SNL G-749 which is the authority for requisitioning replacements. Parts not listed in the ORD 8 catalog, but required by depot shops in rebuild operations may be requisitioned from the listing in the corresponding ORD 9 catalog and will be supplied if available. Requisitions for ORD 9 parts will contain a complete justification of requirements.

9. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this matériel are listed in ORD 6 SNL J-8, Sections 7, 12, 13, and 18; ORD 6 SNL J-9, Sections 1, 2, 3, 8, and 10; ORD 6 SNL J-10, Sections 4, 7, 8, 11, 12, and 15; and are authorized for issue by T/A and T/O & E.

10. Special Tools and Equipment

The special tools (figs. 13, 14, and 15) and equipment tabulated in table I will be listed in the Department of the Army Supply Catalog ORD 6 SNL J-16, Section 42. This tabulation contains only those special tools and equipment, with the exception of those special tools listed in TM 9-819A, necessary to perform the operations described in this manual. It is included for information only, and is not to be used as a basis for requisitions.



REPLACER—
41-R-2395-518



REMOVER—
41-R-2369-725



REPLACER—
41-R-2388-250



REPLACER—
41-R-2390-415



REMOVER—
41-R-2370



REPLACER—
41-R-2388-730



REPLACER—
41-R-2394-115



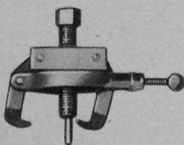
ADAPTER—
41-A-27-430



SCALE—
41-S-503



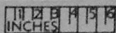
ADAPTER—
41-A-18-293



REMOVER—
41-R-2367-950



REPLACER—
41-R-2395-535



RA PD 148825

Figure 13. Special tools.

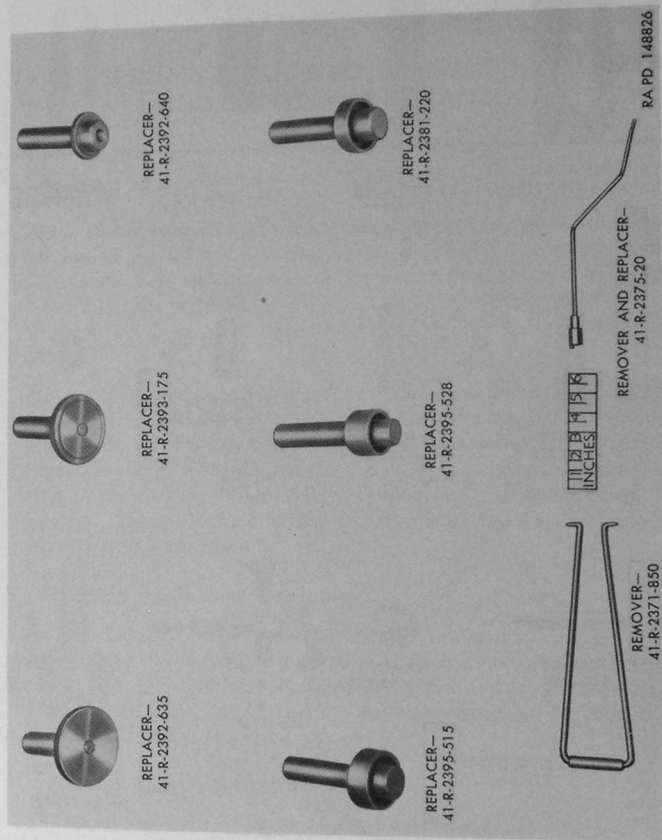
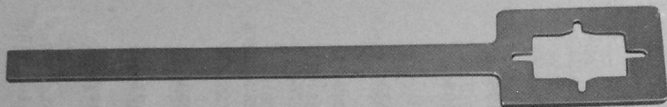


Figure 14. Special tools.



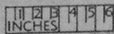
WRENCH—41-W-3634



TOOL—41-T-3215-910



WRENCH—41-W-3838-75



WRENCH—
41-W-545-5



WRENCH—
41-W-3825-66



WRENCH—7950690
RA PD 148827

Figure 15. Special tools.

Table I. Special Tools and Equipment for Field and Depot Maintenance

Item	Identifying number	References		Use
		Fig.	Par.	
ADAPTER, puller, 1 1/4 in. diam, 1 1/2 in. long.	41-A-27-430	13, 187	21, 259c(3)	Use with PULLER 41-P-2954 to pull steering wheel.
ADAPTER, remover, drive pinion flange and differential side bearing.	41-A-18-293	13, 134	198c, d	Use with REMOVER 41-R-2367-950 to remove differential side bearing.
REMOVER, bearing and drive pinion flange, differential side.	41-R-2367-950	13, 134, 135	198c, d	For removing drive pinion flange and differential side bearing using ADAPTER 41-A-18-293.
REMOVER, bushing, 1 13/16 in. OD, 1 1/2 in. ID, 10 in. long.	41-R-2369-725	13, 117	173a	For removing steering knuckle bushing type bearing.
REMOVER, bushing and oil seal retainer, 1 1/2 in. diam, 6 in. long.	41-R-2370	13, 192	262a(2)	For removing steering gear Pitman shaft bushing and oil seal retainer.
REMOVER, oil seal-----	41-R-2371-850	14, 122	175d	For removing axle shaft oil seal in front axle housing.
REMOVER AND REPLACER, springs, 2 1/2 in. diam, 1 1/4 in. long, w/handle.	41-R-2375-20	14, 162, 167	233h, 230b	For removing and replacing brake shoe springs.
REPLACER, bearing, 2 1/2 in. diam, 7 1/4 in. long.	41-R-2381-220	14, 143	202e(3)	For installing differential side bearings.
REPLACER, bushing, 2 in. diam, 5 in. long.	41-R-2388-250	13, 117	173a(2)	For installing steering knuckle bushing type bearing.
REPLACER, bushing and oil seal retainer 1 1/4 in. diam, 5 in. long.	41-R-2388-730	13, 193	262a(2)	For installing steering gear Pitman shaft bushing and oil seal retainer.
REPLACER, gear and bearing, 2 3/8 in. OD, 2 1/16 ID, 7 in. long.	41-R-2390-415	13, 66, 82	97a, 114c, 116c, 116d	For installing transfer ball type bearings and speedometer drive gear.

REPLACER, oil seal, 4 13/16 in. diam, 5/8 in. wide, w/hdl.	41-R-2392-635	14, 183, 184	256d(4), 256e(2)	For installing oil seal in front and rear wheel hubs.
REPLACER, oil seal, 2 in. diam, 1 1/2 in. wide, w/hdl.	41-R-2392-640	14, 123	179a	For installing axle shaft oil seal in front axle housing.
REPLACER, oil seal, 4 in. diam, 5/8 in. wide, w/hdl.	41-R-2393-175	14, 139	201a	For installing oil seal in drive pinion outer bearing retainer.
REPLACER, oil seal, 1 in. diam, 2 1/2 in. long	41-R-2394-115	13, 84	118e	For installing transfer shifter shaft oil seal.
REPLACER, oil seal sleeve, 3/4 in. OD, 3.280 in. ID, 8 3/4 in. long.	41-R-2395-518	13, 120	173c(2)	For installing front and rear wheel hub inner oil seal sleeves.
REPLACER, oil seal sleeve, 3/8 in. diam, 7 1/2 in. long.	41-R-2395-515	14, 140	201b	For installing oil seal sleeve on front and rear axle propeller shaft flanges.
REPLACER, oil seal sleeve, 2 1/2 in. diam, 7 1/2 in. long.	41-R-2395-528	14, 156	224b	For installing oil seal sleeve on transfer output and pillow block propeller shaft flanges.
REPLACER, oil seal sleeve, 3 in. diam, 8 1/4 in. long.	41-R-2395-535	13, 61, 153	220b, 93c(2)	For installing oil seal sleeve on transmission output and transfer input propeller shaft flanges.
SCALE, steering gear checking.	41-S-503	13, 201	264c(2)	For checking steering gear adjustment.
STAND, shock absorber rebuilding, complete.	41-S-4977-5	209, 212	275, 277	For holding shock absorber during rebuilding operations.
TOOL, holding, 3/8 in. thk, 6 1/2 in. wide, 38 in. long.	41-T-3215-910	15, 51	84b, 90a, 114f, 116d, 198d, 202d, 223b	For holding propeller shaft flange while removing or installing retaining nut.
WRENCH, adjusting	7950690	15	256f(1)	For adjusting rear wheel bearings.
WRENCH, bearing adj nut, socket (detachable) oct, 3 1/16 in. opng, 3/4 in. sq-drive, 1 1/2 in. lg.	41-W-545-5	15, 40	49b(5), 256f(1)	For adjusting rear spring seat bearings.

Table 1. Special Tools and Equipment for Field and Depot Maintenance—Continued

Item	Identifying number	References		Use
		Fig.	Par.	
WRENCH, torque indicating, $\frac{3}{4}$ in. sq-drive, 300 ft.-lb, cap.	41-W-3634	15, 40	49b(5), 256f(1)	For adjusting wheel and spring seat bearings. For removing or installing wheel stud nuts. For adjusting front wheel bearings.
WRENCH, wheel stud nut, dble-hd socket, $1\frac{3}{8}$ in. hex opng, 0.817 in. sq opng, $22\frac{1}{2}$ in. long.	41-W-3838-75	15	34a, 60b	
WRENCH, wheel bearing nut, tubular, oct, $3\frac{1}{16}$ in. opng, $\frac{3}{4}$ in. female sq-drive, with 2.072 in. diam tubular pilot, 5 in. long.	41-W-3825-66	15	256f(1)	

CHAPTER 3

TROUBLE SHOOTING

11. Purpose

Note. Information in this chapter is for use of ordnance maintenance personnel in conjunction with and as a supplement to the trouble shooting section in the pertinent operators manual (TM 9-819A). It provides the continuation of instructions where a remedy in the operators manual refers to ordnance maintenance personnel for corrective action.

Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and trouble shooting, such damage and injury can be avoided and, in addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

12. Excessive Front Axle Caster

If excessive front axle caster is indicated by hard steering, refer to paragraph 155*b* for method of checking and causes of excessive axle caster.

13. Incorrect Front Wheel Alinement

If incorrect front wheel alinement is indicated by front wheel shimmy, refer to paragraphs 155 and 156 for front end alinement information.

14. Bent Brake Backing Plate

When a bent brake backing plate is indicated by noisy brakes, replacement of backing plate is necessary. Refer to paragraphs 228 through 235 for removal, disassembly, inspection, assembly, and installation of brake assembly.

CHAPTER 4

REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

Section I. DISASSEMBLY OF VEHICLE INTO MAJOR COMPONENTS

15. General

This section contains information for the guidance of personnel performing major rebuild work on the 2½-ton 6x6 cargo trucks M135 and M211, dump truck M215, gasoline tank truck M217, tractor truck M221, and water tank truck M222. It provides an assembly line procedure for the disassembly of the vehicle into its major components. It designates what constitutes a major component, illustrates the points of connection between major components, and states briefly what must be done. The illustrations shown in this section are keyed with reference letters which indicate disconnect points. These key letters are referred to as such in the various procedures.

Note. Procedures covering removal of cargo body (par. 16) apply only to cargo trucks M135 and M211; all other procedures generally apply to all of the vehicles after their respective bodies have been removed.

16. Removal of Cargo Body

Note. Key letters in following text indicate disconnect points and refer to figure 46.

a. General.

- (1) The cargo body, which includes racks, roof bows, top paulin, rear curtain, tail lights, marker lights, reflectors, and splash shields, is removed from chassis as an assembly.
- (2) A suitable chain fall with chain hooks must be provided to lift body high enough to clear chassis. The sequence of procedures for removing cargo body from chassis are listed in logical sequence, permitting the use of more than one mechanic. However, the sequence of procedures can be changed to meet existing conditions or facilities.

b. Removal Procedures.

- (1) Remove six cap screws (C) and nuts (D), three on each side, which attach cargo body to brackets on chassis side members.
- (2) Remove four bolts (A), nuts (B), plain washers (E), and four inner and four outer compression springs (F and G) which retain cargo body to brackets on chassis side members.
- (3) Disconnect both tail light and marker light wiring cables from harness at bayonet type connectors. Body is now prepared for removal.
- (4) Fasten chain fall hooks under each corner of body, then raise body to elevation required to allow removal of either chassis or body.
- (5) Remove two wooden body support sills from chassis.
- (6) Rebuild procedures for cargo body are contained in chapter 20.

17. Removal of Front Bumper Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 16.

a. General.—The front bumper assembly, which includes gussets, is removed as an assembly.

b. Removal Procedures.

- (1) Remove pin (B) retaining each tow hook (C) to bumper; then remove tow hooks.
- (2) Remove two cap screws and nuts, one each side, under bumper attaching bumper to frame side members.
- (3) Remove six cap screws (D) and nuts, three each side, which attach gusset and bumper to side members.
- (4) Pull bumper and gussets forward and remove bumper.

18. Removal of Winch Assembly (When Used)

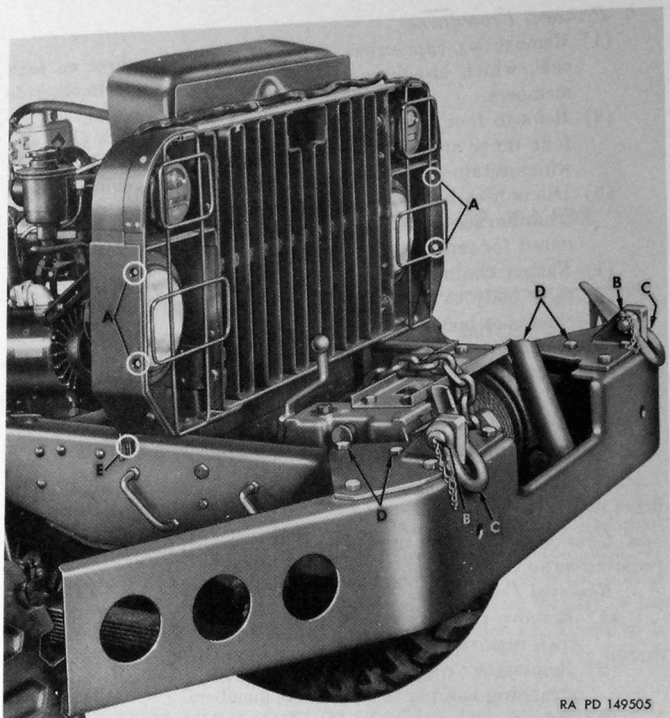
Note. Key letters in following text indicate disconnect points and refer to figure 17.

a. General.—The winch assembly, which includes support brackets and drive shaft universal joint, is removed as an assembly.

b. Removal Procedures.

- (1) Support winch with hoist.
- (2) Remove two nuts (D) from inside of frame attaching each front tie-down "U" bolt (E) to frame.
- (3) Remove four cap screws (A, B, C, and F) and nuts which attach each winch support bracket to frame side member.

Note. It is not necessary to remove winch spacers from frame.



RA PD 149505

Figure 16. Front bumper and fender disconnect points.

- (4) While supporting winch with hoist, pull winch, with support brackets attached, toward front and out of frame side members.
- (5) Remove winch drive shaft universal joint from winch shaft by removing shear pin.
- (6) Refer to chapter 18 for rebuild of winch assembly.

19. Removal of Hood Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 18.

a. General.—The hood assembly, which includes horn and horn air supply line, is removed as an assembly.

b. Preliminary Procedure. Open drain cock at one air reservoir to exhaust air from system.

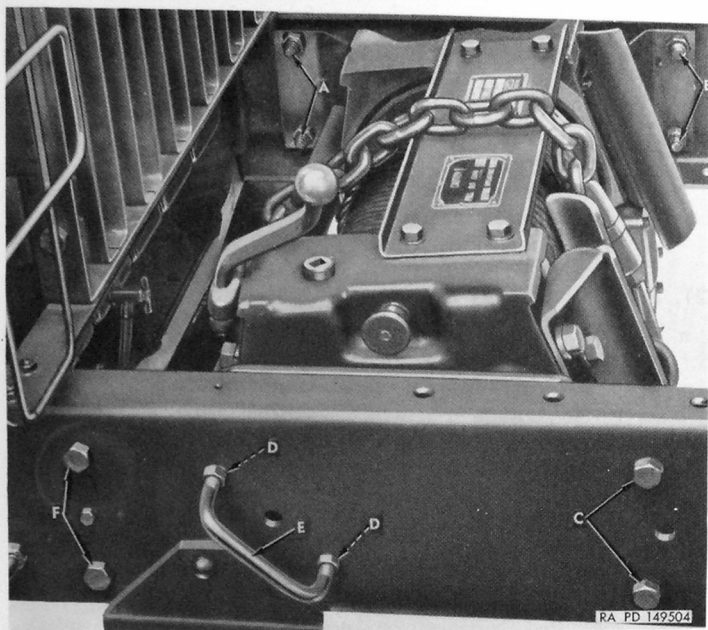


Figure 17. Winch disconnect points.

c. Removal Procedures.

- (1) Disengage hood catches; then raise hood to vertical position.
- (2) Disconnect horn air supply line at air line fitting (E) on cowl.
- (3) Disconnect horn wiring cables at bayonet type connectors (J).
- (4) While supporting hood, remove two cap screws and nuts which attach each hood prop to hood support bracket (A).
- (5) Lower hood to horizontal position; then remove hinge cap screw and nut from each hinge. Remove hood.

20. Removal of Fender and Skirt Assemblies

a. General.—Each fender and skirt assembly, which includes hood catch, fender support, fender brace, and blackout head light on left fender only, is removed as an assembly.

b. Removal Procedures.

- (1) At left fender, disconnect blackout head light wiring connectors.

- (2) Remove two cap screws which attach each fender support to brush guard and radiator side baffles ((A), fig. 16).
- (3) Remove two cap screws which hold radiator side baffles ((E), fig. 16) to fender skirts.
- (4) Remove cap screw and washer which attach each fender brace to bracket ((L), fig. 18) on cab cowl.
- (5) Remove two cap screws, two nuts, and one rubber spacer which attach each fender to running board ((P), fig. 18). Remove fender assembly.

21. Removal of Cab Assembly

a. General.

- (1) The cab assembly, which includes instruments, accelerator pedal, engine air cleaner, generator regulator, wiring cables, batteries, air and vent lines, parking brake lever, transfer lever, power take-off lever, muffler tail pipes, hood extension panels, hood props, running boards, tool box, fluid container bracket, gun mount bracket and gun mounting rear "U" bolts, is removed from chassis as an assembly.
- (2) A suitable chain fall must be provided to lift cab high enough to clear steering column on chassis.
- (3) The sequence of procedures for removing cab from chassis are listed in logical sequence, permitting the use of more than one mechanic; however, the sequence can be changed to meet existing conditions or facilities.

b. Procedures at Front of Cab.

- (1) *Remove brake pedal cap screw.* Remove clamp cap screw and nut attaching upper brake pedal to lower brake pedal.
- (2) *Disconnect choke and throttle controls.*
 - (a) Disconnect choke control ((F), fig. 18) at carburetor.
 - (b) Disconnect throttle rod ((H), fig. 21) linking accelerator lever ((GG), fig. 18) on cowl to accelerator lever on intake manifold.
- (3) *Disconnect hoses and lines.*
 - (a) Disconnect air cleaner hose ((G), fig. 18) at carburetor elbow ((B), fig. 19).
 - (b) Disconnect vent line ((EE), fig. 18) connecting nipple ((D), fig. 19) on engine to cowl vent line.
 - (c) Disconnect air hose ((Z), fig. 18) connecting air compressor governor to cowl air line fitting ((A), fig. 19) on governor.
- (4) *Disconnect wiring harness and cables.*
 - (a) From right side of engine, disconnect engine wiring harness at three bayonet type connectors ((H), fig. 19 and (DD), fig. 18).

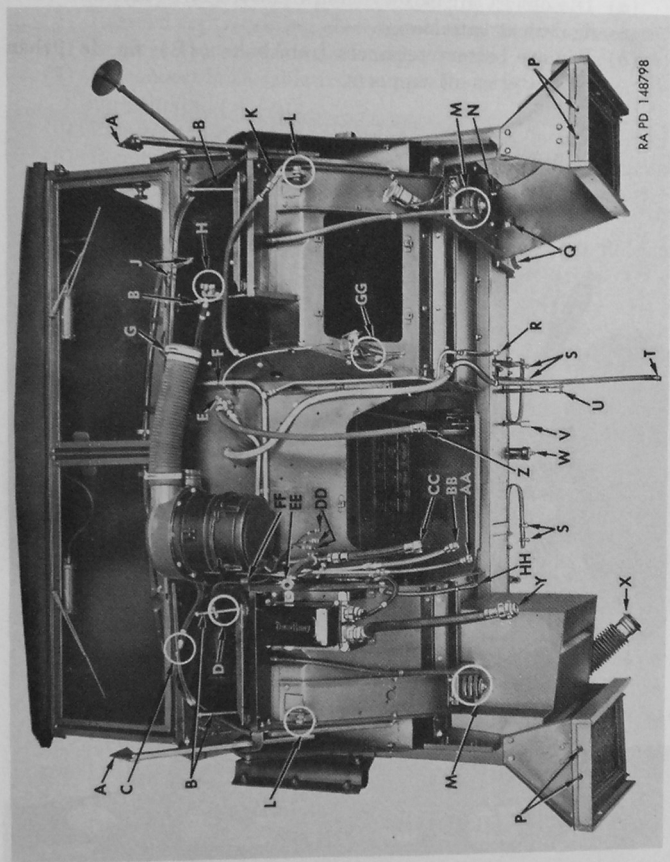


Figure 18. Disconnect points at front and bottom of cab.

- (b) Disconnect generator wiring cable ((Y), fig. 18) at generator ((C), fig. 19) using wrench 41-W-3249-900.
 - (c) Disengage battery-to-starter cable ((K), fig. 19) from clips ((FF), fig. 18) on cowl.
- (5) *Remove batteries.*
- (a) Disconnect all battery cables ((C), (D), (H), and (K), fig. 18) at batteries.
 - (b) Remove battery retainers from bolts ((B), fig. 18), then lift batteries off supports.

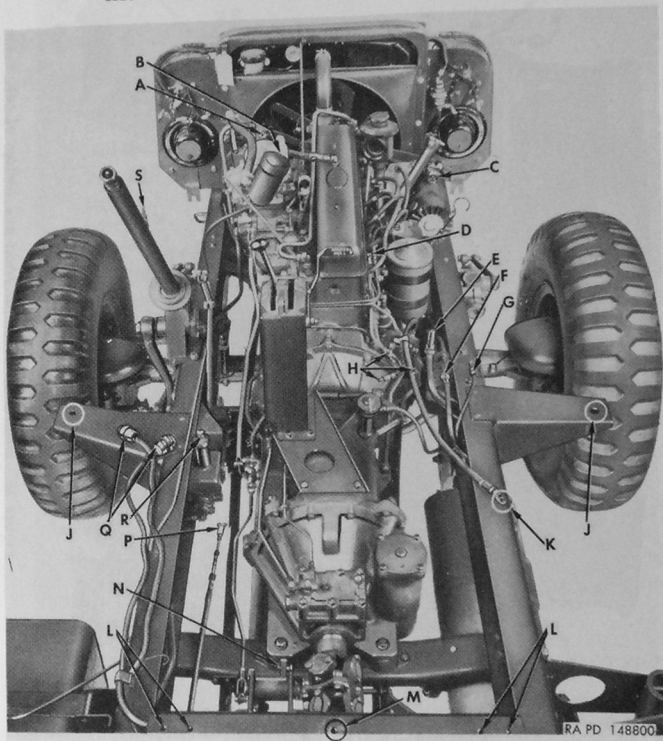


Figure 19. Cab disconnect points on chassis.

c. Procedures Inside of Cab.

- (1) Fold companion seat bottom up and retain with latch to obtain maximum accessibility to interior of cab.

- (2) Remove horn button from steering wheel by removing four screws attaching horn button retaining ring to steering wheel.
- (3) Remove nut attaching steering wheel to steering shaft.
- (4) Remove steering wheel from steering shaft, using wheel puller 41-P-2954 and puller adapter 41-A-27-430.
- (5) Remove cap retaining steering column to dash bracket.
- (6) Remove grommet from steering column.
- (7) Disconnect horn cable from connector ((S), fig. 19) on steering column.
- (8) Remove cab mounting bolt hole covers from floor pan.
- (9) Remove brake pedal upper half from brake pedal lower half.
- (10) Remove upper and lower brake pedal plates from cowl.
- (11) Lift rubber seal from shift control tower.
- (12) Remove 14 cap screws attaching front floor pan to floor pan, then lift front floor pan from around shift control tower and remove from cab.
- (13) Through cab floor opening at right side of transmission, disconnect three rubber lines ((CC), fig. 18 and (E), fig. 19—vent line), ((AA), fig. 18 and (G), fig. 19—air exhaust line), and ((BB), fig. 18 and (F), fig. 19—air line).
- (14) Under driver's seat, disconnect power take-off control cable at hand control lever by removing yoke pin ((P), fig. 19).
- (15) Remove power take-off control cable grommet at floor pan, using screw driver.

d. Procedures Underneath Cab.

- (1) Disconnect speedometer shaft at transfer case ((T), fig. 18).
- (2) Disconnect parking brake lever rod ((V), fig. 18) at relay lever ((N), fig. 19 or (G), fig. 36) on frame cross member.
- (3) Disconnect transfer control lever rod ((U), fig. 18) at cross shaft ((F), fig. 36) on cross member.
- (4) Remove clamp bolt which retains power take-off control cable to support bracket underneath cab floor.
- (5) Disconnect rubber vent line ((R), fig. 18) at brake master cylinder ((R), fig. 19).
- (6) Disconnect starter ground cable ((HH), fig. 18) from starter ((F), fig. 22).
- (7) Remove cab front mounting bolts, nuts, washers, and one upper and two lower cushions ((M), fig. 18) which attach cab to support brackets ((J), fig. 19) on frame.

e. Procedures at Rear of Cab.

- (1) Remove cab rear center mounting cap screw nut, steel washer, and lower cushion ((W), fig. 18) which mount cab to frame ((M), fig. 19).

- (2) Remove two cap screws, nuts, and washers ((S), fig. 18) which attach cab rear mounting spring to frame cross member ((L), fig. 19).

f. Procedures at Sides of Cab.

- (1) At left side of cab, disconnect two wiring harnesses ((Q), fig. 19) at multiple plug and receptacle connectors ((N), fig. 18) located under cab floor directly above running board, using wrench 41-W-3249-900; then disengage harnesses from clips ((Q), fig. 18) on running board rear support.
- (2) Disconnect tail pipe ((X), fig. 18) from muffler by opening clamp.

g. Removal of Cab from Chassis.

- (1) Attach hoist to four lifting ring nuts on cab.



Figure 20. Cab assembly removed.

- (2) Inspection should be made to see if all disconnect operations have been completed before cab is raised off mountings.
- (3) Raise cab slowly, using several short lifts until free from mountings and past steering column; then remove cab.
- (4) Remove cab mounting cushions and rear center cap screw spacer from chassis.
- (5) Refer to chapter 19 for rebuild of cab.

22. Removal of Power Plant Assembly

a. General.—The power plant assembly, which includes engine and accessories, radiator, radiator baffles, brush guards, head lights, engine front exhaust pipe, transmission, universal joint, and transmission shift control tower is removed as an assembly.

Note. It is not necessary to drain cooling system, engine crankcase, or transmission when removing power plant assembly.

b. Equipment.—A chain fall and one special tool is required to accomplish power plant removal. Engine sling 41-S-3831-600 ((D), fig. 21) must be used to lift power plant out of vehicle.

c. Removal Procedures.

- (1) *Operations at front of vehicle.*—Remove two bolts, washers, nuts, and springs attaching radiator to front cross member ((M), fig. 23).
- (2) *Operations at left side of engine.*
 - (a) Disconnect air compressor discharge line ((K), fig. 23) from elbow ((B), fig. 21) on air compressor; then detach line from clip ((J), fig. 21) at base of air compressor.
 - (b) Remove one bolt and washer attaching power plant to rear mounting ((E), fig. 21 and (E), fig. 23).
 - (c) Remove nut, washer, and rubber cushions attaching power plant at front mounting ((K), fig. 21 and (L), fig. 23).
 - (d) Disconnect rod ((G), fig. 23) linking transmission lever and transfer reverse cross shaft lever at transmission lever ((F), fig. 21) by removing yoke pin.
 - (e) Disconnect flexible fuel line ((H), fig. 23) at carburetor connector ((C), fig. 21).
 - (f) Remove clamp ((J), fig. 23) retaining engine front exhaust pipe to engine rear exhaust pipe.
 - (g) Remove radiator brace rod ((A), fig. 21) from clip on radiator, then swing rod into position at special cylinder head bolt. Install nut to hold lower end of rod at cylinder head.
- (3) *Operations at right side of engine.*
 - (a) Using wrench 41-W-3249-900, disconnect wiring harness ((N), fig. 23) at head light wiring connector ((B), fig. 22) at right side of radiator.

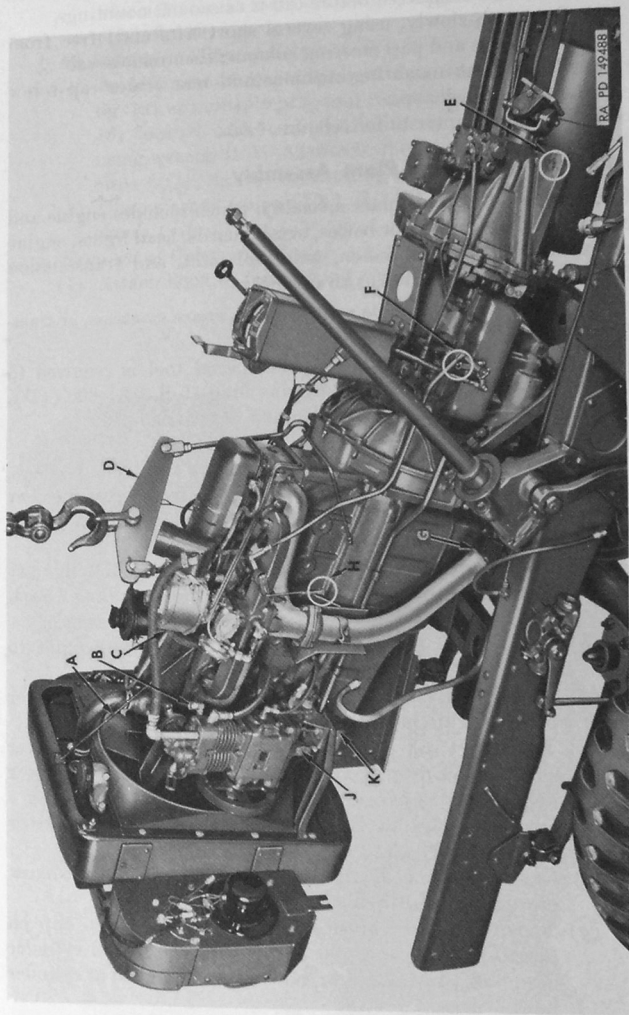


Figure 21. Power plant disconnect points on left side.

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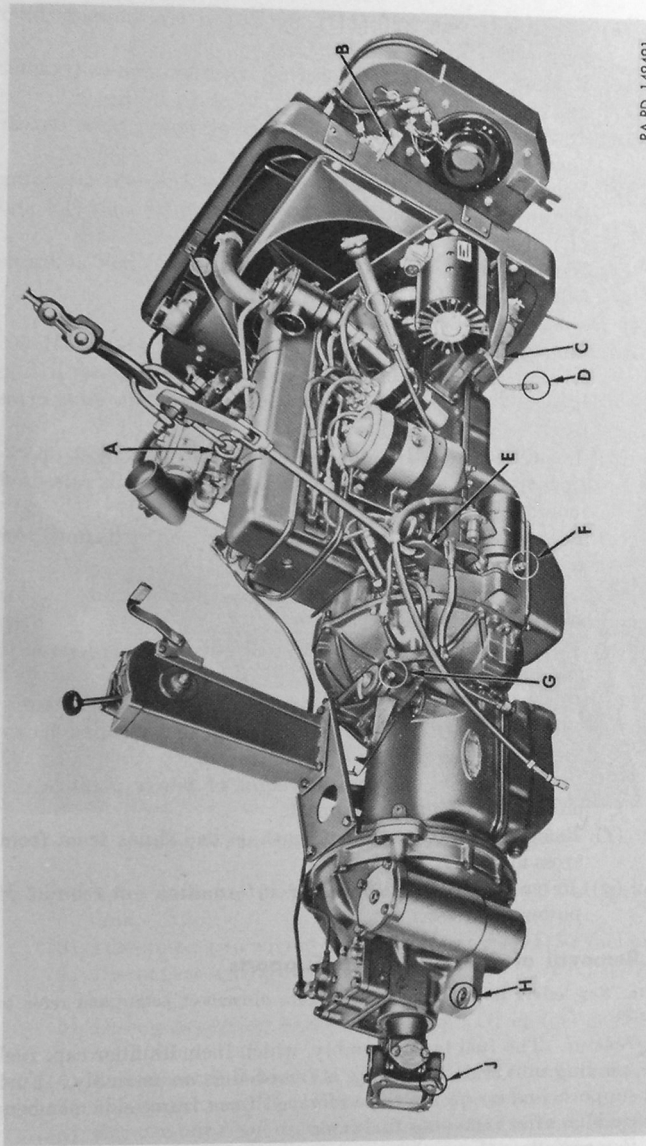


Figure 22. Power plant removed showing disconnect points on right side.

- (b) Disconnect vent line ((D), fig. 23) at transmission filler neck ((G), fig. 22).
 - (c) Remove four bolts connecting transmission-to-transfer universal joint flanges ((F), fig. 23 and (J), fig. 22).
 - (d) Remove one bolt and washer attaching power plant to rear mounting ((H), fig. 22 and (E), fig. 23).
 - (e) Remove bolt, nut, washers, and rubber cushions attaching power plant at front mounting ((C), fig. 22, and (P) and (L), fig. 23).
 - (f) Remove engine ground strap ((D), fig. 22) bolt at frame side member ((Q), fig. 23).
- (4) *Removal of power plant from vehicle.*
- (a) Engage short hook of engine lifting sling 41-S-3831-600 with eye nut ((A), fig. 22) and long hook with lower lifting bracket ((E), fig. 22). Attach chain to engine sling cross bar.
 - (b) Inspection should be made to see if all disconnect operations have been completed before power plant is raised off mountings.
 - (c) Raise power plant slowly, using several short lifts until free from mountings.

Note. As power plant is raised, be sure radiator lifting arms engage brackets on radiator support.

- (d) Pull power plant slowly forward, raising as necessary to clear front cross member.
 - (e) When power plant is out of vehicle, support in manner which will permit access to drain plugs in transmission case and drain plug in engine oil pan cover.
- Caution.** Do not permit weight of power plant to rest on oil pan or radiator support.
- (f) Remove radiator mounting cushion and shims from front cross member.
 - (g) Refer to TM 9-1819AA for information on rebuild of power plant assembly.

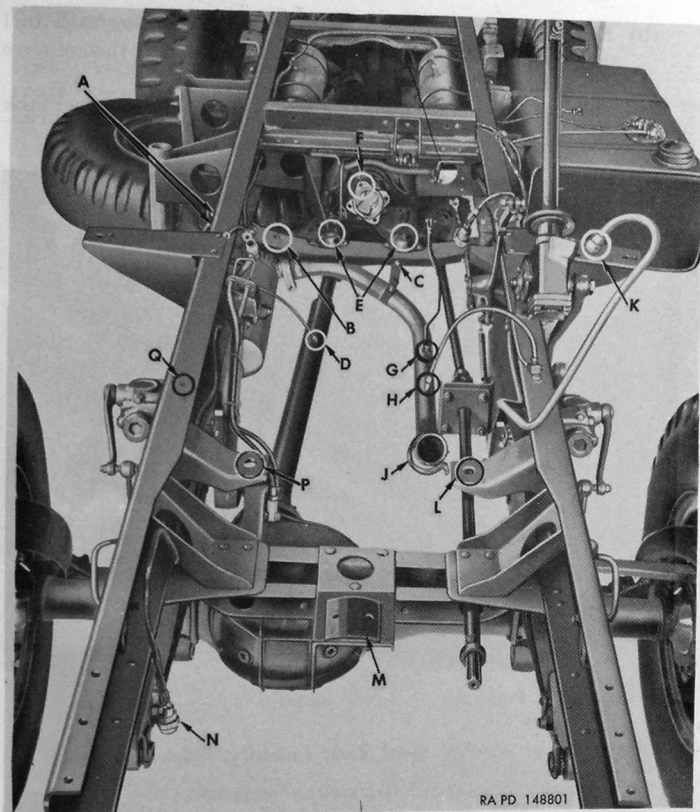
23. Removal of Fuel Tank and Supports

Note. Key letters in following text indicate disconnect points and refer to figure 24.

a. General. The fuel tank assembly, which includes filler cap, fuel gage, sending unit and fuel pump, is removed as an assembly. Fuel tank supports and straps are to be removed from frame side members as assemblies after removing fuel tank.

b. Removal Procedures.

- (1) Remove drain plug and gasket from bottom of fuel tank and drain fuel.



RA PD 148801

Figure 23. Power plant disconnect points on chassis.

- (2) After draining fuel from tank, install plug and gasket in tank.
- (3) Disconnect two wiring harness connectors (H) at fuel pump.
- (4) Disconnect wiring harness connector (G) at fuel gage sending unit.
- (5) Disengage wiring harness from clip (D) at fuel gage sending unit.
- (6) Disconnect fuel line (C) at shut-off cock (J) on tank.
- (7) Disconnect vent line (E) at elbow (F) on tank.
- (8) Remove nut from each strap holding fuel tank to support at (K). Raise straps and remove fuel tank assembly.

- (9) Remove four cap screws (B) and nuts attaching each fuel tank support and strap assembly to side member; then remove support assemblies.
- (10) Remove chassis wiring harness and clip (A) from fuel tank front support.

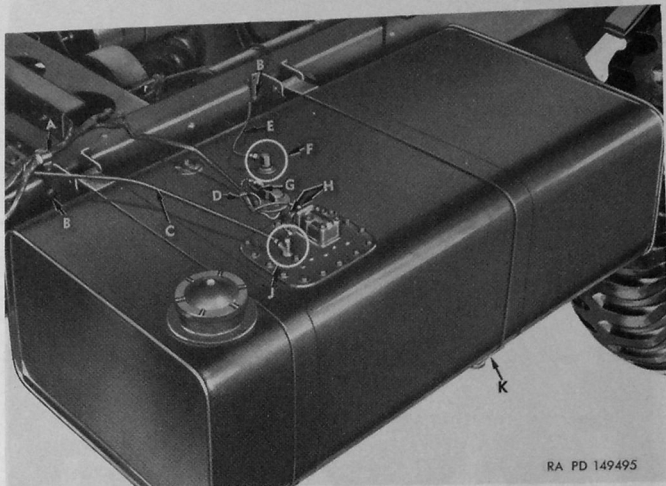


Figure 24. Fuel tank disconnect points.

24. Removal of Muffler and Rear Exhaust Pipe Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 23.

a. General.—The muffler and rear exhaust pipe assembly, which includes muffler support bracket, muffler support, and rear exhaust pipe to transmission support hanger strap, is removed as an assembly.

b. Removal Procedures.

- (1) Remove bolt (C), nut, washer, insulators, and spacer attaching rear exhaust pipe support strap to transmission rear support.
- (2) Remove bolt (B) and nut attaching muffler supporting strap to transmission rear support.
- (3) Remove four cap screws (A), washers, spacers, and eight insulators attaching muffler supporting bracket to side members; then remove muffler and rear exhaust pipe assembly from vehicle.
- (4) Disconnect rear exhaust pipe and muffler bracket from muffler.

25. Removal of Spare Wheel and Carrier

a. *General.*—The spare wheel and tire is to be removed first from spare wheel carrier; then the spare wheel carrier, which includes swivel bracket and support bracket, is to be removed as an assembly.

b. *Removal Procedures.*

- (1) Remove two nuts attaching spare wheel swivel bracket to lock bracket on frame. Swing carrier and wheel out and away from frame and tip wheel and tire to upright position.
- (2) Remove four nuts attaching wheel to swivel bracket; then remove wheel and tire from bracket.
- (3) Remove four bolts and nuts attaching spare wheel carrier and support bracket to frame side member.

26. Removal of Steering Gear Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 25.

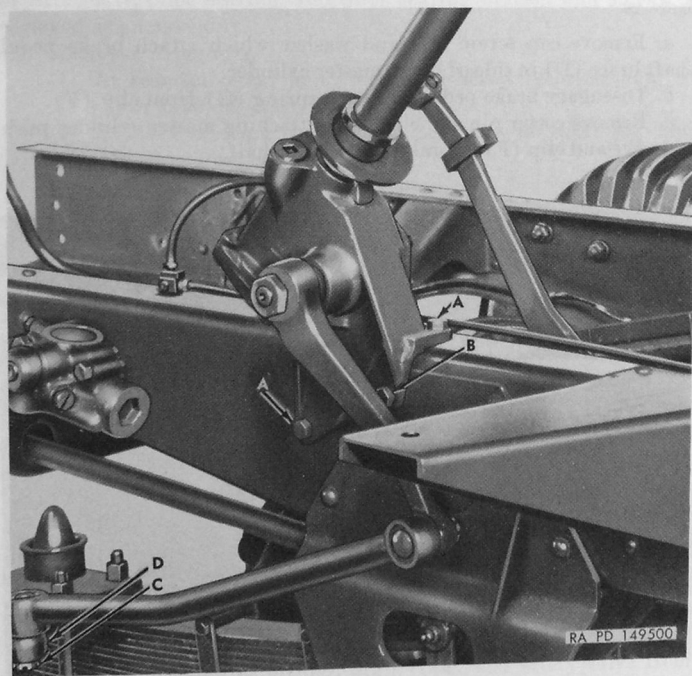


Figure 25. Steering gear disconnect points.

a. General.—The steering gear assembly, which includes Pitman arm and steering drag link, is removed as an assembly.

b. Removal Procedures.

- (1) Disconnect drag link at front axle steering arm (D) by removing ball stud nut (C) and driving ball stud out of steering arm.
- (2) Remove four cap screws (A and B) and nuts which mount steering gear to frame side member; then remove steering gear and drag link from vehicle.
- (3) Disconnect drag link from steering gear Pitman arm by removing nut and driving out drag link ball stud.
- (4) Remove nut and washer which retain Pitman arm to Pitman shaft. With puller 41-P-2952, remove arm from shaft.
- (5) Refer to chapter 13 for rebuild of steering gear and drag link.

27. Removal of Brake Pedal Lower Half and Pedal Brace

Note. Key letters in following text indicate disconnect points and refer to figure 26.

a. Remove cap screw (B) and washer which attach brake pedal shaft brace (D) to side of brake master cylinder.

b. Disengage brake pedal pull back spring (G) from clip (F).

c. Remove cotter pin and clevis pin attaching master cylinder push rod yoke and clip (F) to brake pedal lower half.

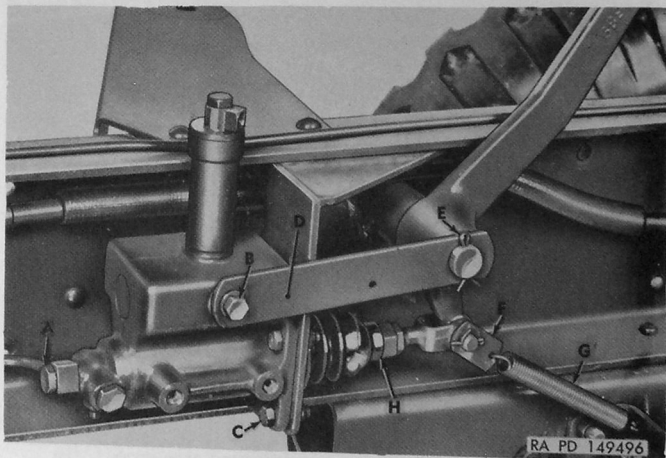


Figure 26. Master cylinder and brake pedal disconnect points.

d. Remove cotter pin (E) retaining brake pedal lower half and pedal brace on pedal shaft, then remove pedal brace and pedal from chassis.

28. Removal of Brake Master Cylinder

Note. Key letters in following text indicate disconnect points and refer to figure 26.

a. Disconnect brake hydraulic line at rear of master cylinder by removing bolt (A) and washers from line connector.

b. Remove four cap screws (C) and nuts attaching brake master cylinder to frame bracket, then remove master cylinder.

c. Refer to paragraphs 236 through 238 for rebuild of brake master cylinder.

29. Removal of Winch Drive Line Assembly

a. *General.*—The winch drive line assembly, which includes both front and rear drive shafts, rear universal joint at power take-off end of rear shaft, pilot bearing, and pilot bearing bracket and shield, is removed as an assembly.

b. *Removal Procedures.*

- (1) At rear universal joint, loosen set screw securing joint to power take-off shaft.
- (2) At front of front shaft, loosen set screw on shaft stop and slide stop from end of shaft.
- (3) Remove two cap screws attaching pilot bearing bracket to front spring and torque rod bracket.
- (4) Pull complete drive line assembly toward front until rear universal joint yoke clears power take-off shaft; then pull drive line assembly to rear until end of front shaft clears hole in front cross member. Lower drive line assembly and remove from under vehicle.
- (5) Refer to paragraphs 316 through 319 for rebuild of winch drive line.

30. Removal of Air Reservoir Assemblies

a. *General.*—The air reservoir assemblies, which includes safety valve (on left reservoir only), air line fittings, mounting supports, and "U" bolts, are removed as assemblies.

b. *Removal Procedures.*

- (1) Disconnect all air lines at each air reservoir.
- (2) Remove two nuts from each "U" bolt retaining air reservoirs to frame side members. Remove air reservoirs.
- (3) Remove air line fittings, drain cocks, and safety valve from reservoirs.

31. Removal of Air-Hydraulic Cylinder Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 27.

a. General.—The air-hydraulic cylinder assembly, which includes rear mounting bracket, is removed as an assembly.

b. Removal Procedures.

- (1) Disconnect three top air lines (A, B, and C) and two lower hydraulic fluid lines (D and E) from cylinder.
- (2) Remove two bolts (F) and nuts attaching cylinder rear bracket (G) to frame side member.
- (3) Remove nuts from two bolts attaching cylinder to front mounting bracket.
- (4) Remove air-hydraulic cylinder assembly from vehicle.

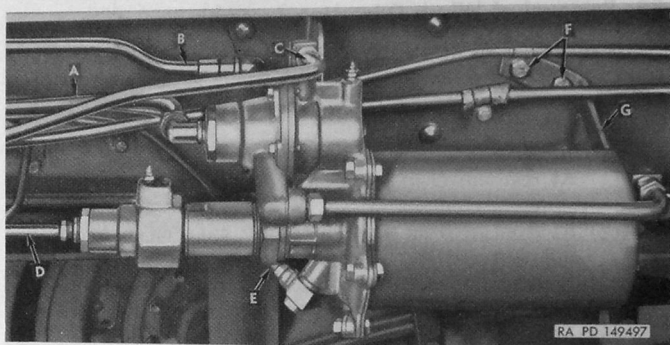


Figure 27. Air-hydraulic cylinder disconnect points.

32. Removal of Propeller Shaft Assemblies

a. General.—The propeller shaft assemblies, which includes universal joints and flange yokes, are removed as assemblies.

b. Removal Procedure.

- (1) Remove four bolts from each propeller shaft universal joint flange. Lower propeller shaft assembly and remove from under vehicle.
- (2) Refer to chapter 9 for rebuild of propeller shafts.

33. Removal of Transfer Assembly

Note. Key letters in following text indicate disconnect points and refer to figure 28.

a. General.—The transfer assembly, which includes parking brake, power take-off, and power take-off control cable, is removed as an

assembly. A suitable jack or a chain fall is required to remove transfer assembly.

b. Removal Procedures.

- (1) Disconnect rod (G) linking transfer reverse cross shaft (F) and transfer lower shifter shaft (H) by removing yoke pin (E) at transfer end of rod.
- (2) Disconnect transfer upper shifter shaft (J) from transfer control cross shaft (C) by removing yoke pin (D) and flat washers.
- (3) Disconnect transfer vent line at vent line tee on frame No. 2 cross member.
- (4) Disconnect parking brake pull rod at parking brake cam levers by removing pin.
- (5) Bend back transfer mounting bolt locks (B). With jack or hoist, raise transfer just enough to remove weight of transfer from mounting bolts. Remove mounting bolts (A) from each side of transfer; then lower transfer assembly and remove from under vehicle.
- (6) Disconnect vent line from transfer.
- (7) Refer to TM 9-819A for removal of parking brake components, power take-off, and power take-off control cable from transfer.

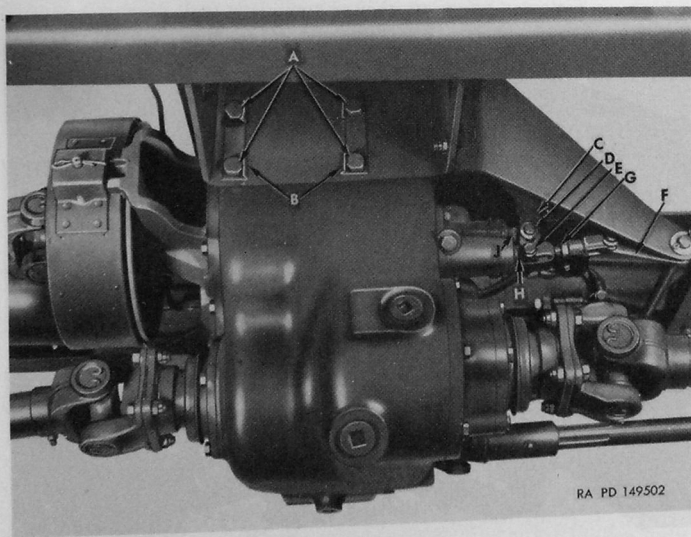


Figure 28. Transfer disconnect points.

- (8) Refer to chapter 5 for rebuild of transfer, chapter 6 for rebuild of power take-off, and paragraphs 244 through 246 for rebuild of parking brake components.

34. Removal of Wheels

- a. Loosen wheel stud nuts, using wheel stud nut wrench 41-W-3838-75 with handle 41-H-1541-10.
- b. Raise complete chassis until tires are clear of floor or ground and place suitable supports under frame.
- c. Remove wheel stud nuts; then remove wheels.

35. Removal of Shock Absorber Assemblies

Note. Key letters in following text indicate disconnect points and refer to figure 29.

a. *General.*—Each shock absorber assembly, which includes link, is removed as an assembly.

b. *Removal Procedures.*

- (1) Remove nut (F) and disconnect shock absorber link from spring bumper block (E).
- (2) Remove two cap-screws (A) and nuts attaching each shock absorber to frame side member. Remove shock absorber assembly.

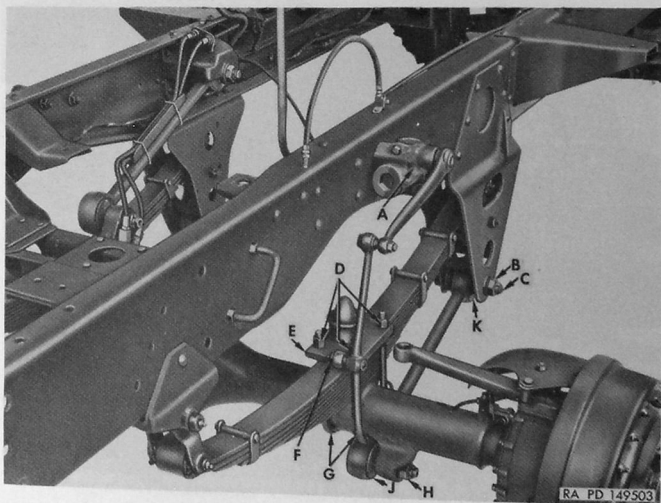


Figure 29. Shock absorber and front axle disconnect points.

- (3) Remove nut attaching link pin to shock absorber arm; then drive out link pin and remove link.
- (4) Refer to paragraphs 273 through 277 for rebuild of shock absorber assembly.

36. Removal of Front Axle Assembly

a. General.—The front axle assembly, which includes hubs, torque rods, brake lines, and steering tie rod, is removed as an assembly. A suitable jack or chain fall is required to remove front axle.

b. Removal Procedures.

- (1) At axle, disconnect flexible hydraulic brake and axle vent lines by removing bolts ((A) and (B), fig. 30) and washers attaching each line connector ((C), fig. 30) to axle.
- (2) Remove two clips ((D), fig. 30) retaining brake and vent lines in shield on upper torque rod.
- (3) At frame end of each torque rod, remove nut ((B), fig. 29 and (F), fig. 30), and drive torque rod ((C), fig. 29 and (G), fig. 30) from frame brackets with soft metal hammer.
- (4) Using jack or chain fall, raise front axle just enough to permit removal of "U" bolt nuts ((D), fig. 29), spring bumper block ((E), fig. 29), and spring "U" bolts ((G), fig. 29).
- (5) Lower jack or chain fall until axle clears under side of chassis; then withdraw axle from under vehicle.
- (6) Remove nut ((H), fig. 29) and washer from torque rod tapered pins. With soft metal hammer, drive pins out of axle bracket to remove torque rods from axle.
- (7) Refer to chapter 7 for rebuild of front axle assembly.

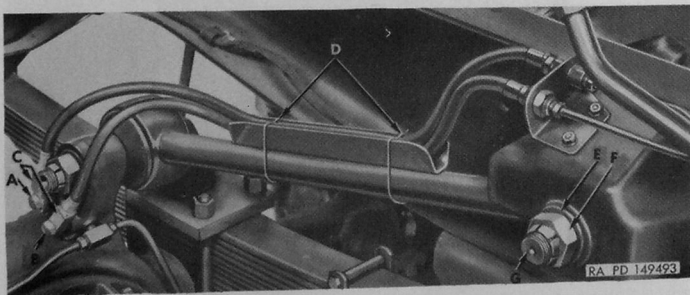


Figure 30. Front axle upper torque rod and lines disconnect points.

37. Removal of Rear Axle Assemblies

a. General.—Each rear axle assembly, which includes brakes, hubs, metal brake lines, and propeller shaft pillow block on forward rear

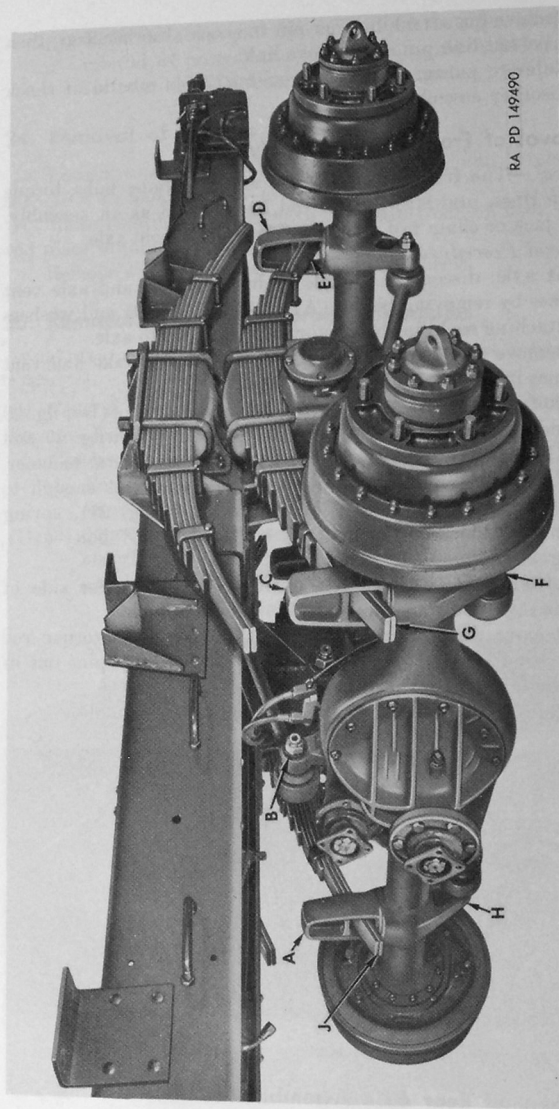


Figure 31. Rear axles installed showing disconnect points.

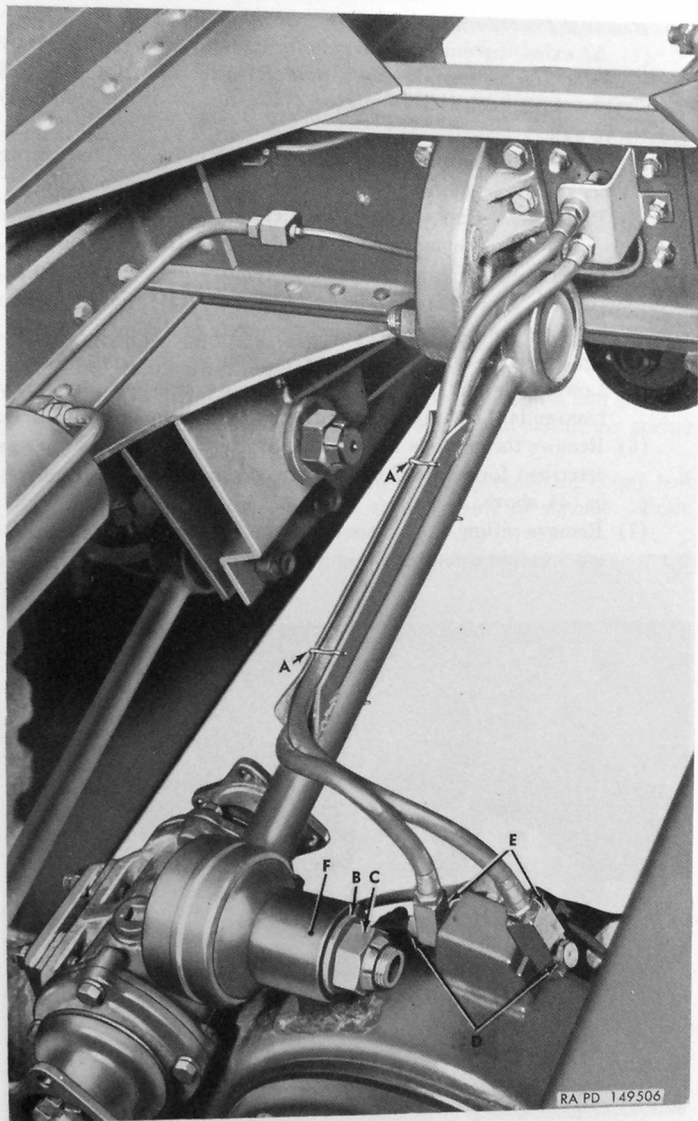


Figure 32. Forward rear axle upper torque rod and lines disconnect points.

axle only, is removed as an assembly. A suitable dolly type jack or a chain fall is required to remove rear axle assemblies from vehicle.

b. Removal Procedures.

- (1) At axles, disconnect hydraulic brake and axle vent lines by removing bolt ((D), fig. 32 or (G), fig. 33) and washers attaching each line connector ((E), fig. 32 or (H), fig. 33) to axle.
- (2) Remove tow clips ((A), fig. 32 or (F), fig. 33) retaining brake and vent lines in shield on each upper torque rod.
- (3) Place jack under axle or attach chain fall to axle and raise assembly just enough to remove tension from torque rods.
- (4) At axle end of each torque rod, remove nuts ((B), fig. 31, (C), fig. 32, or (D), fig. 33) and washer ((B), fig. 32); then drive torque rod pins from axle brackets ((F), fig. 32 or (J), fig. 33) with soft metal hammer.
- (5) Lower axle and at the same time move axle out and away from ends of springs; then withdraw axle from under vehicle.
- (6) Remove torque rods from frame brackets in same manner as described for removal of torque rod pins from axle brackets in (4) above.
- (7) Remove pillow block assembly from forward rear axle by removing four mounting stud nuts and dowels attaching pillow

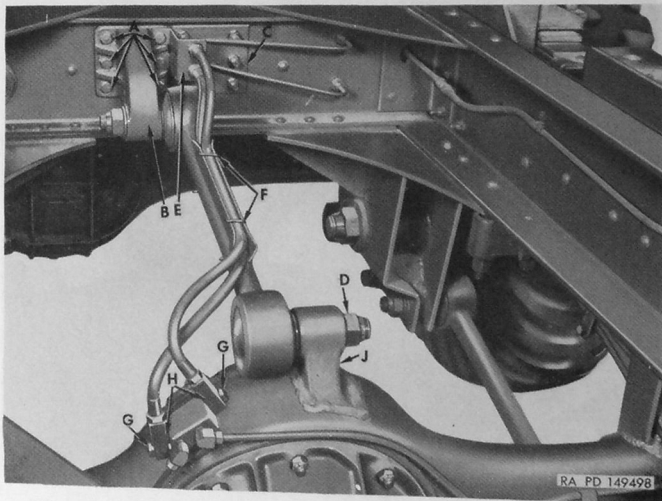


Figure 33. Rear rear axle upper torque rod and lines disconnect points.

block to axle bracket. Refer to paragraphs 222 through 225 for rebuild of pillow block assembly.

(8) Refer to chapter 8 for rebuild of rear axle assemblies.

38. Removal of Front Spring Assemblies

Note. Key letters in following text indicate disconnect points and refer to figure 34.

a. General.—Each front spring assembly, which includes spring shackles, is removed as an assembly.

b. Removal Procedures.

- (1) Remove lubrication fittings (B) from shackle pins and bolts.
- (2) Support spring assembly adequately before removing shackle bolts.
- (3) Remove nut from bolt (A) attaching each spring shackle (D) to spring bracket (C and E) on frame.
- (4) Drive spring shackle bolts from spring brackets and shackles with soft metal hammer; then lower and withdraw spring from under chassis.
- (5) Remove spring shackles from spring by removing clamp bolt which secures shackle pin at inner side of shackle. From

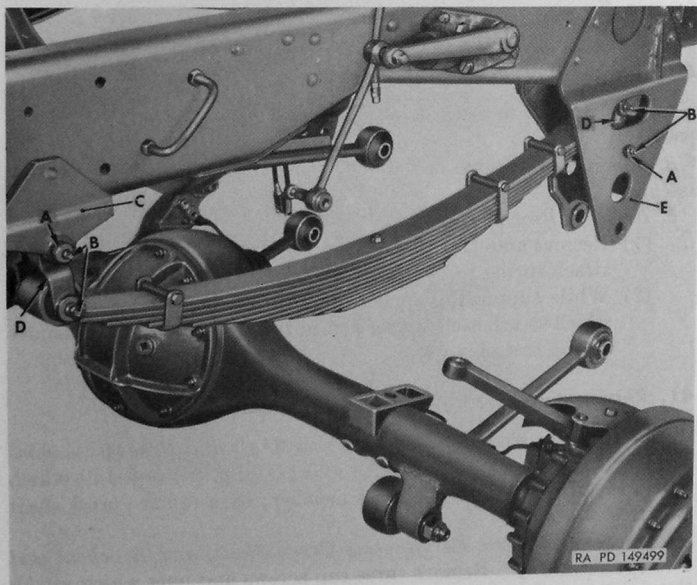


Figure 34. Front spring disconnect points.

inner side of spring, drive pin out of shackle and spring eye at each end of spring.

- (6) Refer to paragraphs 269 through 272 for rebuild of front spring suspension components.

39. Removal of Rear Main Spring Assemblies

a. General.—Each rear main spring assembly, which includes spring seat, spring seat bearing cups, spring “U” bolts, and “U” bolt spacers, is removed as an assembly.

b. Removal Procedures.

- (1) Remove four cap screws and washers ((G), fig. 35) which attach each spring seat dust cap ((F), fig. 35) to seat. Remove cap.
- (2) Bend tangs of nut lock away from lock nut retaining spring seat to spring seat shaft.
- (3) Remove lock nut, nut lock, adjusting nut, washer, and outer bearing cone from spring seat shaft.
- (4) Slide spring assembly off spring seat shaft and remove from vehicle.
- (5) Remove oil seal flange and inner bearing from spring seat.
- (6) Remove spring seat bearing seal from spring seat shaft.
- (7) Refer to chapter 15 for rebuild of rear spring suspension components.

40. Removal of Rear Secondary Spring Assemblies

Note. Key letters in following text indicate disconnect points and refer to figure 35.

a. General.—Each rear secondary spring assembly is removed as an assembly.

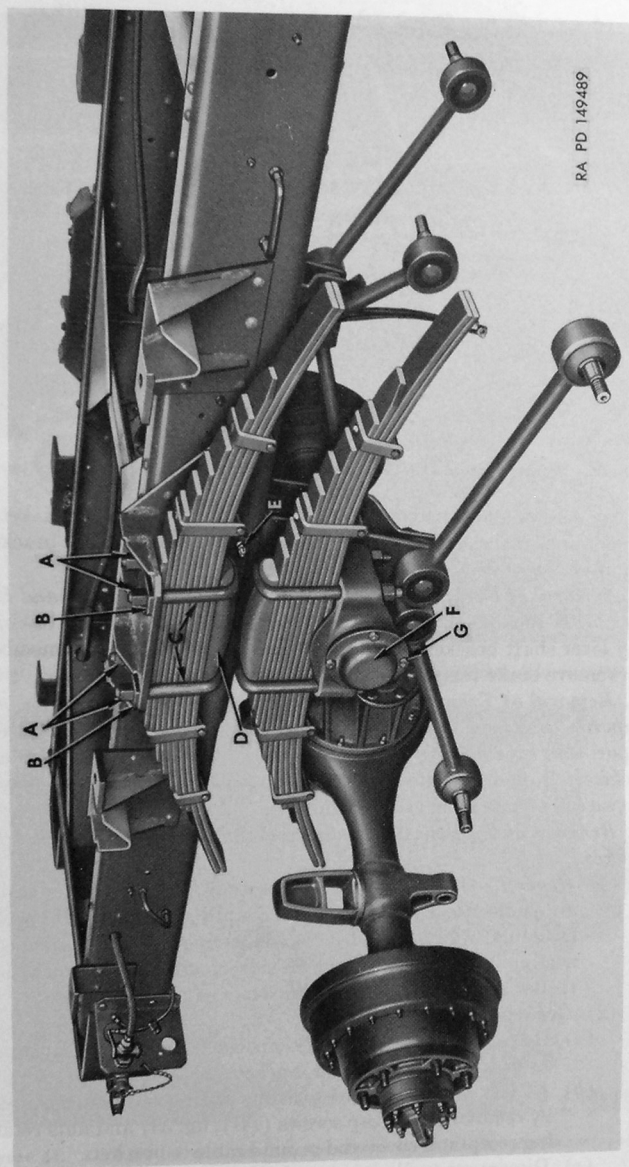
b. Removal Procedures.

- (1) Remove nuts (A) and spacers (B) from “U” bolts (C) which attach spring to spring seat (D) and frame bracket.
- (2) While supporting spring, remove four bolts (E) and nuts which attach each spring seat to frame brackets; then remove spring assembly.

41. Removal of Control Shafts and Brackets

a. Removal of Transfer Control Cross Shaft and Brackets Assembly.—Remove two cap screws ((A) and (D), fig. 36) and nuts which attach each bracket to No. 2 cross member; then remove cross shaft and bracket assembly.

b. Removal of Transfer Reverse Cross Shaft, and Brackets and Linkage Assembly.—Remove three cap screws and nuts which attach the right cross shaft bracket to frame No. 2 cross member, and remove



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Figure 35. Rear spring disconnect points.

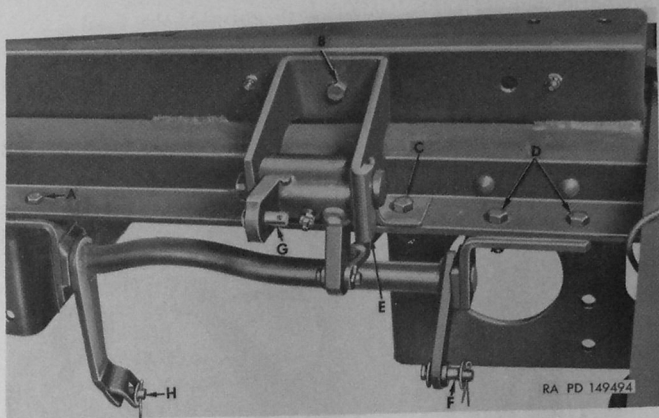


Figure 36. Transfer cross shaft and parking brake relay lever disconnect points.

two cap screws and nuts which attach the left cross shaft bracket to transmission rear support; then remove cross shaft and brackets assembly.

c. Removal of Parking Brake Relay Lever Shaft, Bracket, and Rod Assembly.—Remove three cap screws ((B) and (C), fig. 36) attaching relay lever shaft bracket ((E), fig. 36) to frame No. 2 cross member; then remove brake relay lever shaft, bracket, and rod assembly.

d. Removal of Transmission Rear Support, Support Brackets, and Support Cushions Assembly.—Remove four cap screws which attach support and bracket to each side member; then remove support and brackets. Support cushions can be removed from support by removing two cap screws from each cushion.

e. Removal of Trailer Air Connection and Tail Light Bracket Assemblies.

- (1) *General.*—The right bracket assembly, which includes trailer air connection cut-out cock and coupling, and the left bracket assembly, which includes chassis wiring harness trailer connection receptacle, receptacle cover, air cut-out cock, and trailer air coupling, are to be removed as assemblies.
- (2) *Removal Procedures.*
 - (a) Disengage chassis wiring harness from clip ((C), fig. 37 and (E), fig. 38) on each bracket.
 - (b) At left bracket, remove chassis wiring harness receptacle by removing four cap screws ((B), fig. 38) and nuts retaining receptacle cover and ground cable to bracket.
 - (c) Disconnect trailer air supply line from cut-out cock ((D), fig. 37 and (D), fig. 38) on each bracket.

(d) Remove two cap screws ((B), fig. 37 and (A), fig. 38) and nuts which attach each trailer connection and tail light bracket to frame side member; then remove brackets.

f. *Removal of Rear Upper Torque Rod Brackets.* Remove six cap screws ((A), fig. 33) which attach each upper torque rod bracket (B), bracket reinforcement (C), and brake and vent line support (E) to cross member and remove brackets, reinforcements, and line supports.

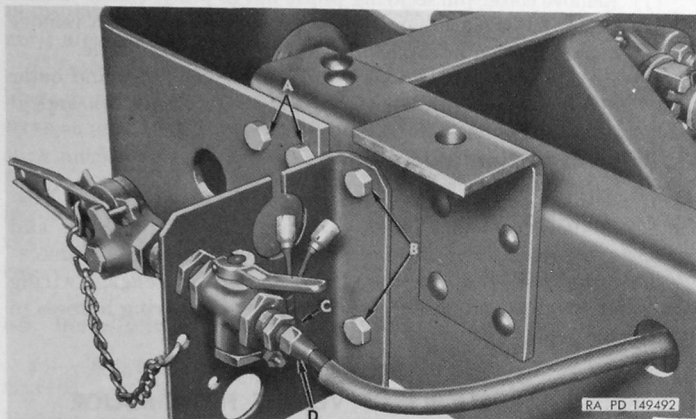


Figure 37. Right trailer air connection and tail light bracket disconnect points.

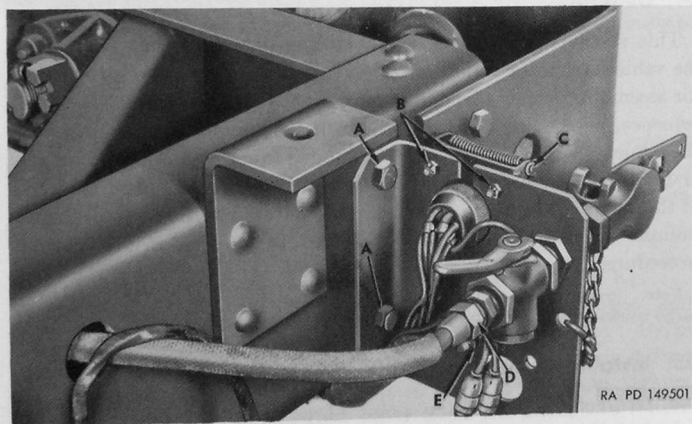


Figure 38. Left trailer air connection and tail light bracket disconnect points.

42. Removal of Rear Bumpers, Tow Hooks, and Pintle

a. *Removal of Rear Bumpers.*—Remove six cap screws ((A), fig. 37) and nuts attaching each bumper to frame side member and rear cross member; then remove bumpers.

b. *Removal of Rear Tow Hooks.*—Remove cotter pin holding shackle pin to bracket; then remove shackle pin and shackle.

c. *Removal of Pintle and Pintle Brackets.*

(1) Remove cotter pin securing pintle nut to pintle shaft. Insert bar through pintle jaw to prevent its turning; then remove nut and washer at end of pintle shaft. Remove pintle.

(2) Remove two cap screws and nuts retaining inner and outer pintle brackets to rear cross member and remove brackets.

43. Removal of Lines and Wiring

a. *Removal of Air, Hydraulic, and Vent Lines From Frame.*—Disconnect all lines from each other. Disengage lines from clips and grommets that retain lines to frame; then remove lines from frame.

b. *Removal of Wiring Harnesses From Frame.*—Disengage wiring harnesses from clips and grommets that retain each wiring harness to frame; then remove harnesses from frame.

Section II. ASSEMBLY OF VEHICLE FROM MAJOR COMPONENTS

44. General

This section provides an assembly line procedure for assembling the vehicle from its major components. The sequence of procedures for assembling vehicle from its major components are listed in logical sequence, permitting the use of more than one mechanic. However, the sequence of procedures can be changed to meet existing conditions or facilities. The illustrations shown in this section and in section I of this chapter are keyed with reference letters which indicate connect points. These key letters are referred to as such in the various procedures.

Note. Procedures covering installation of cargo body (par. 79) apply only to cargo trucks M135 and M211; all other procedures generally apply to all vehicles.

45. Installation of Lines and Harnesses on Frame

a. *General.*—The starting point of assembly procedures on this vehicle is with the frame assembly. The frame assembly consists of all brackets and reinforcements which are welded or riveted to frame side members and cross members. Support and position frame as-

sembly in suitable manner. If an overhead hoist with a stationary type track is used, place frame assembly directly under track.

b. Installation of Air Vent Lines on Frame.—Install air vent lines on frame, using required clips and short pieces of loom which serve as insulation between lines and clips. Do not tighten attaching clips until vent lines are connected to their respective units.

c. Installation of Air Lines on Frame.—Install air lines on frame, using required clips, clip spacers, and short pieces of loom which serve as insulation between lines and clips. Do not tighten attaching clips until air lines are connected to their respective units.

d. Installation of Hydraulic Lines on Frame.—Install hydraulic lines on frame, using required clips and short pieces of loom which serve as insulation between lines and clips. Do not tighten attaching clips until hydraulic lines are connected to their respective units.

e. Installation of Wiring Harnesses on Frame.—Install wiring harnesses on frame, using required rubber coated type clips. Do not tighten attaching clips until wiring harnesses are connected to their respective units.

46. Installation of Rear Upper Torque Rod Brackets

Note. Key letters in following text indicate connect points and refer to figure 33.

Position each torque rod bracket (B) to cross member and install six $\frac{7}{16}$ -20 x 2 cap screws (A). On opposite side of cross member install torque rod reinforcement (C) (metal plate with six screw holes) over bracket cap screws, then install six $\frac{7}{16}$ -20 nuts. Tighten nuts to torque of 33 to 43 pound-feet.

47. Installation of Front Spring Assemblies

Note. Key letters in following text indicate connect points and refer to figure 34.

a. General.—Each front spring assembly, which includes shackles, can be installed as an assembly.

b. Installation Procedures.

- (1) Position spring assembly at spring brackets (C and E).
- (2) Install shackle bolt (A) through spring bracket and shackle. Shank of bolt at outer end is serrated. Drive shackle bolt in from outer side, seating bolt firmly in spring bracket. Install nut on bolt at each shackle and tighten until shackle binds; then loosen nuts just enough to relieve binding.
- (3) Install lubrication fittings (B) in shackle bolts and pins; then lubricate shackles.

48. Installation of Rear Secondary Spring Assemblies

Note. Key letters in following text indicate connect points and refer to figure 35.

a. Position spring under upper ledge of frame mounting bracket, with spring center bolt engaging hole in frame bracket. Install spring seat (D) under spring with center bolt properly located in seat; then attach seat to frame bracket with two $\frac{7}{16}$ -20 x $1\frac{3}{4}$ and two $\frac{7}{16}$ -20 x 2 cap screws (E) and four $\frac{7}{16}$ -20 nuts. Tighten nuts to torque of 33 to 43 pound-feet.

b. Install "U" bolts (C), spacers (B), and nuts (A). Push spring against frame bracket and parallel to frame. Tighten nuts on "U" bolts to torque of 375 to 400 pound-feet.

49. Installation of Rear Main Spring Assemblies

Note. Key letters in following text indicate connect points and refer to figure 39.

a. General. Each rear main spring assembly, which includes spring seat, bearing cups, "U" bolts, and "U" bolt spacers, can be installed as an assembly.

b. Installation Procedures.

- (1) Coat inner diameter of oil seal assembly (J) with plastic type gasket cement. Press seal over sleeve (F) with lip of seal toward frame bracket. Press on sleeve until inner edge of seal is $\frac{1}{4}$ -inch from inner edge of sleeve.
- (2) Lubricate tapered roller bearing cones thoroughly. Install tapered roller bearing cone (E) in main spring seat assembly (D).
- (3) Press oil seal flange (H) into spring seat.
- (4) Slide spring and seat assembly over main spring seat shaft (G), with oil seal flange over oil seal lip; then insert tapered roller bearing cone (C).
- (5) Install adjusting nut washer (M) over spring seat shaft threads. Install adjusting nut (N) and tighten to torque of 60 to 75 pound-feet, using wrench 41-W-545-5 with torque wrench 41-W-3634 (fig. 40), while oscillating spring and seat to make sure bearings are properly seated; then back off adjusting nut one-quarter turn.
- (6) Install adjusting nut lock (P) and second adjusting nut (Q), which serves as a lock nut. Tighten lock nut to torque of 100 to 150 pound-feet, using wrench 41-W-545-5 with torque wrench 41-W-3634; then bend tangs of nut lock over flats on adjusting nuts.

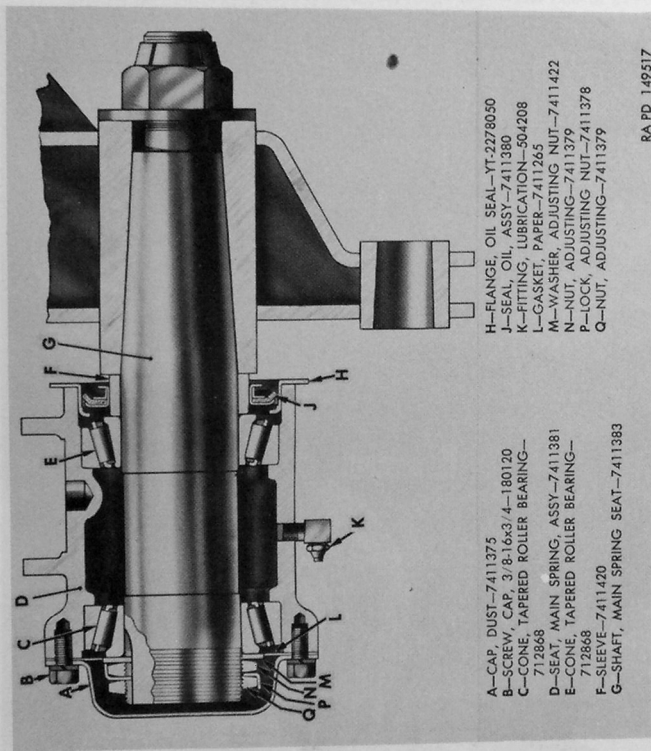


Figure 39. Sectional view of rear main spring seat installed.

- (7) Install dust cap (A), using new paper gasket (L), and attach with four $\frac{3}{8}$ -16 x $\frac{3}{4}$ cap screws (B). Tighten cap screws firmly.
- (8) Fill spring seat with lubricant through lubrication fitting (K) until lubricant appears at seal on inner side of seat. Refer to TM 9-819A or to lubrication order for type of lubricant.

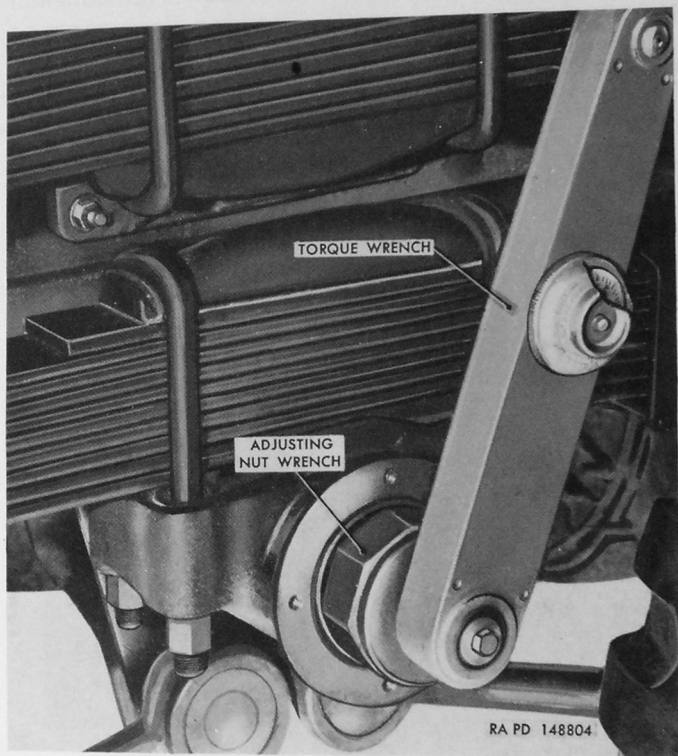


Figure 40. Using wrench 7950946 with torque wrench 41-W-3634 to tighten spring seat adjusting nuts.

50. Installation of Front Axle Assembly

a. General.—The front axle assembly, which includes hubs, brakes, brake lines, and steering tie rod, can be installed as an assembly. A suitable dolly type jack or a chain fall is required to install front axle assembly.

b. Preliminary Procedures.—If metal hydraulic brake lines are not on axle, install brake lines as directed in paragraph 179*d*.

c. Installation Procedures.

- (1) Place axle assembly into position under vehicle, using jack or chain fall.
- (2) Lift axle until spring center bolts are located in holes of spring seats on top of axle. Install “U” bolts ((G), fig. 29) and spring bumper block ((E), fig. 29) with shock absorber link eye at front. Install “U” bolt nuts ((D), fig. 29) and tighten nuts to torque of 170 to 200 pound-feet.
- (3) Install front torque rods (par. 51).
- (4) Connect hydraulic brake and axle vent rubber lines at junction on top of axle housing with bolts ((A) and (B), fig. 30) and four plain copper washers.

Note. On each line, install one washer under bolt head and one washer between line connector ((C), fig. 30) and line junction on axle.

- (5) On upper torque rod only, position brake and vent rubber lines in shield on top of torque rod. Secure lines in shield with two clips ((D), fig. 30).

51. Installation of Front Torque Rods

Note. Following procedures apply to the upper and both lower torque rods.

a. Place dust seal ((K), fig. 29) on both ends of torque rod bearing at frame bracket end. Position dust seal ((J), fig. 29) over end pin at axle end of rod.

b. Position torque rod tapered pin in axle bracket, being careful not to dislodge dust seal from bearing.

c. Position torque rod end with seals in frame bracket; then insert torque rod bolt ((C), fig. 29 or (G), fig. 30) in frame bracket, making sure torque rod bearing is alined with bolt hole. Drive bolt through bracket and bearing, using a soft metal hammer.

Note. Plain washer must be installed under bolt head at frame bracket on upper torque rod only. Upper torque rod bolt is installed from outer side and both lower bolts are installed from inner side. It may be necessary to turn bolts slightly when driving into place to aline serrations on bolt with serrations in bearing.

d. Install flat washer ((E), fig. 30) and nut ((B), fig. 29 or (F), fig. 30) on frame bracket bolt and tighten nut to torque of 190 to 250 pound-feet.

e. Install plain washer and nut ((H), fig. 29) on torque rod tapered pin at axle end; then tighten nut to torque of 350 to 400 pound-feet.

52. Installation of Shock Absorber Assemblies

Note. Key letters in following text indicate connect points and refer to figure 29.

a. General.—Each shock absorber assembly, which includes link, is installed as an assembly. Connect shock absorber link to shock absorber arm by inserting link pin in arm. Install $\frac{1}{2}$ -20 nut on link pin and tighten nut to torque of 48 to 64 pound-feet.

b. Installation Procedures.

- (1) Position absorber assembly at frame; then insert two $\frac{9}{16}$ -18 x 4 cap screws (A) through shock absorber and frame side member.
- (2) Place a reinforcing spacer at inner side of frame side member over cap screws. Install a $\frac{9}{16}$ -18 nut on each cap screw and tighten to torque of 63 to 84 pound-feet.
- (3) Insert shock absorber link pin through eye on spring bumper block (E), install $\frac{1}{2}$ -20 nut (F) on link pin, and tighten to torque of 48 to 64 pound-feet.

53. Installation of Rear Axles

a. General.—The rear axle assemblies, which include hubs, brakes, brake lines, propeller shaft universal joint flanges, and pillow block on forward rear axle only, can be installed as assemblies. A suitable dolly type jack or a chain fall is required to install rear axles.

b. Preliminary Procedures.

- (1) If metal brake lines are not on axle, install brake lines as directed in paragraph 208.
- (2) Install propeller shaft pillow block on forward rear axle by positioning pillow block on inside (differential side) of mounting bracket with drain plug toward front. Install four tapered dowel wedges and four $\frac{1}{2}$ -20 nuts on mounting studs and tighten to torque of 48 to 64 pound-feet.
- (3) Attach all torque rods to frame and spring seat shaft brackets by inserting tapered torque rod end pins through brackets, install plain washer and nut on each pin, and tighten to torque of 350 to 400 pound-feet.

c. Installation Procedures.

- (1) Move each axle into position under chassis and engage main spring ends ((E), (G), and (J), fig. 31) with openings in brackets ((A), (C), and (D), fig. 31) at each end of axle housing.
- (2) At each axle, attach three torque rods to axle brackets ((B), (F), and (H), fig. 31) by installing tapered pins in axle brackets. Install plain washer and nut on each pin and tighten nut to torque of 350 to 400 pound-feet.
- (3) Connect hydraulic brake and axle vent rubber lines at junction on top of axle housing with two bolts ((G), fig. 33) and four plain copper washers.

Note. At each line connection, install one washer under bolt head and one washer between line connector and line junction on axle.

- (4) On upper torque rod only, position brake and vent lines in shield on top of torque rod. Secure lines in shield with two clips ((A), fig. 32 and (F), fig. 33).

54. Installation of Transfer Assembly

Note. Key letters in following text indicate connect points and refer to figure 28.

a. General.—The transfer assembly, which includes parking brake, power take-off, and power take-off control cable, can be installed as an assembly. A suitable jack or a chain fall is required to install transfer assembly.

b. Preliminary Procedures.—Install power take-off, power take-off control cable, and parking brake on transfer. Refer to TM 9-819A for installation procedures and adjustments.

c. Installation Procedures.

- (1) Using jack or chain fall, position transfer assembly under chassis.
- (2) Install locks (B) on eight $\frac{1}{2}$ -13 x $1\frac{3}{16}$ transfer mounting bolts (A) and install bolts attaching transfer to frame No. 2 cross member (four on each side of transfer). Tighten bolts to torque of 60 to 85 pound-feet. Bend bolt locks against bolt heads.
- (3) Connect transfer vent line to tee on cross member and to transfer. Tighten line nuts firmly.

55. Installation of Transmission Rear Support, Support Brackets, and Cushions

a. Attach transmission support and brackets to underside of frame side member with four $\frac{1}{2}$ -20 x $2\frac{1}{4}$ cap screws and $\frac{1}{2}$ -20 nuts. Tighten nuts to torque of 48 to 64 pound-feet.

b. Attach each support bracket to side of frame side member with two $\frac{1}{2}$ -20 x $1\frac{1}{4}$ cap screws and $\frac{1}{2}$ -20 nuts. Tighten nuts to torque of 48 to 64 pound-feet.

56. Installation of Transfer Reverse Cross Shaft, Brackets, and Linkage Assembly

a. Position cross shaft assembly at frame No. 2 cross member and at transmission rear support.

b. Attach cross shaft right bracket to frame No. 2 cross member with two $\frac{3}{8}$ -24 x 1 cap screws and $\frac{3}{8}$ -24 nuts. Tighten nuts to torque of 20 to 27 pound-feet.

c. Attach cross shaft left bracket to transmission rear support with two $\frac{5}{16}$ -24 x $\frac{7}{8}$ cap screws and $\frac{5}{16}$ -24 nuts. Tighten nuts to torque of $9\frac{1}{2}$ to 13 pound-feet.

d. Connect transfer reverse cross shaft lever rod yoke to transfer lower shifter shaft by installing yoke pin. Secure yoke pin with

cotter pin. Refer to TM 9-819A for adjustment procedures on transfer control linkage.

57. Installation of Transfer Control Cross Shaft and Brackets Assembly

- a. Position cross shaft assembly to frame No. 2 cross member.
- b. Attach each cross shaft bracket with two $\frac{3}{8}$ -24 x 1 cap screws ((A) and (D), fig. 36) and $\frac{3}{8}$ -24 nuts. Tighten nuts to torque of 20 to 27 pound-feet.
- c. Install yoke pin ((D), fig. 28 or (H), fig. 36) and two plain washers connecting cross shaft lever ((C), fig. 28) to transfer upper shifter shaft ((J), fig. 28).

58. Installation of Parking Brake Relay Lever Shaft, Bracket, and Rod Assembly

- a. Position shaft assembly on frame No. 2 cross member with parking brake rod placed at cam levers at brake.
- b. Install three $\frac{3}{8}$ -24 x 1 cap screws ((B) and (C), fig. 36) and $\frac{3}{8}$ -24 nuts attaching bracket ((E), fig. 36) to frame No. 2 cross member. Tighten nuts to torque of 20 to 27 pound-feet.
- c. Install parking brake rod between cam levers; then insert $\frac{3}{8}$ x $\frac{15}{16}$ clevis pin through cam levers and rod. Secure clevis pin with cotter pin.

59. Installation of Propeller Shaft Assemblies

Position propeller shaft between flanges of connecting units with lubrication fittings in same plane as other shafts; then install four bolts and nuts at each end.

Note. Propeller shafts must be installed with slip joints positioned as shown in figure 149.

60. Installation of Wheels

- a. Position wheels on hub studs.
- b. Install wheel stud nuts. Tighten nuts to torque of 300 to 350 pound-feet, using wheel stud nut wrench 41-W-3888-75 adapted to a torque wrench.

61. Installation of Winch Drive Line Assembly

- a. *General.*—The winch drive line assembly, which includes front and rear drive shafts, rear shaft universal joint at power take-off, drive shaft pilot bearing, and pilot bearing bracket, can be installed as an assembly.

b. Installation Procedures.

- (1) Guide front end of front shaft through hole in frame front cross member; then position stop on shaft. Do not tighten stop set screw until after winch has been installed.
- (2) Push entire shaft assembly toward front until rear universal joint can be installed on power take-off shaft, alining key in shaft with keyway in universal joint yoke. Tighten set screw which secures joint yoke to power take-off shaft.
- (3) Position pilot bearing bracket against front spring and torque rod bracket; then install two $\frac{1}{2}$ -20 x $1\frac{1}{4}$ cap screws and $\frac{1}{2}$ -20 nuts. Tighten nuts to torque of 48 to 64 pound-feet.

62. Installation of Brake Master Cylinder

Note. Key letters in following text indicate connect points and refer to figure 26.

a. Position master cylinder to bracket on frame. Install four $\frac{3}{8}$ -24 x $1\frac{1}{4}$ cap screws (C) and $\frac{3}{8}$ -24 nuts which attach master cylinder to bracket. Tighten nuts to torque of 20 to 27 pound-feet.

b. Insert hydraulic brake line connector bolt (A) through connector, with washer on both sides of connector, and thread bolt into rear end of master cylinder. Tighten bolt to torque of 20 to 30 pound-feet.

63. Installation of Brake Pedal Lower Half and Pedal Brace

Note. Key letters in following text indicate connect points and refer to figure 26.

a. Place brake pedal lower half on pedal shaft.

b. Position brace (D) on pedal shaft and secure with cotter pin (E).

c. At master cylinder end of brace, install one $\frac{7}{16}$ -20 x $\frac{7}{8}$ cap screw (B) and $\frac{7}{16}$ -inch lock washer which attach brace to master cylinder.

d. Position master cylinder push rod yoke and clip (F) to brake pedal lower half and secure with clevis pin and cotter pin.

e. Install brake pedal return spring (G) between clip (F) and winch drive shaft pilot bearing bracket.

64. Installation of Air-Hydraulic Cylinder Assembly

Note. Key letters in following text indicate connect points and refer to figure 27.

a. General.—The air-hydraulic cylinder assembly, which includes rear mounting bracket, can be installed as an assembly.

b. Installation Procedures.

- (1) Install rear mounting bracket (G) on stud at rear of air-hydraulic cylinder and secure with plain washer and $\frac{5}{16}$ -24 nut. Do not tighten nut.

- (2) Position air-hydraulic cylinder at frame side member, with two end plate bolts inserted through front mounting bracket. Install $\frac{5}{16}$ -24 nut on each bolt. Tighten nuts to torque of $9\frac{1}{2}$ to 13 pound-feet.
- (3) Position rear bracket (G) at frame side member and secure with two $\frac{3}{8}$ -24 x 1 cap screws (F) and $\frac{3}{8}$ -24 nuts, attaching hydraulic brake line clip under front cap screw head. Tighten nuts attaching bracket to frame to torque of 20 to 27 pound-feet; then tighten nut attaching bracket to rear end of air-hydraulic cylinder to torque of $9\frac{1}{2}$ to 13 pound-feet.
- (4) Connect hydraulic line (D) to slave cylinder end fitting and hydraulic line (E) to bottom of control valve.
- (5) Connect air line (A) to control valve inlet port, and connect air vent line (C) to exhaust port. Connect air line (B) to control valve trailer air outlet port. Tighten all line connections firmly.

65. Installation of Steering Gear Assembly

Note. Key letters in following text indicate connect points and refer to figure 25.

a. General.—The steering gear assembly, which includes Pitman arm and steering drag link, can be installed as an assembly.

b. Preliminary Procedures.

- (1) Install Pitman arm on Pitman arm shaft, matching blank serration on shaft with blank serration in arm. Install lock washer and nut. Tighten nut to torque of 115 to 155 pound-feet.
- (2) Connect drag link to steering gear Pitman arm by inserting link stud in Pitman arm; then install $\frac{5}{8}$ -18 nut. Tighten nut to torque of 75 to 100 pound-feet.

c. Installation Procedures.

- (1) Position steering gear with drag link on frame side member and install three $\frac{1}{2}$ -20 x $\frac{1}{2}$ cap screws (A), one $\frac{1}{2}$ -20 x $1\frac{7}{8}$ cap screw (B), and four $\frac{1}{2}$ -20 nuts. Tighten nuts to torque of 48 to 64 pound-feet.
- (2) Position steering drag link ball stud in hole in steering arm on front axle. Install $\frac{5}{8}$ -18 ball stud nut (C) and tighten to torque of 75 to 100 pound-feet.

66. Installation of Air Reservoir Assemblies

a. General.—The air reservoir assemblies, which includes air line fittings, mounting supports, "U" bolts, and safety valve on left reservoir only, can be installed as assemblies.

b. Installation Procedures.

- (1) Install air line connectors and drain cock on each tank, using plastic type gasket cement on all threads.
- (2) Install safety valve and elbow on left reservoir.
- (3) Position "U" bolts on reservoir, install reservoir supports on "U" bolts; then install assembly on frame side member. Install $\frac{5}{16}$ -24 nuts on "U" bolts and tighten nuts to torque of $9\frac{1}{2}$ to 13 pound-feet.
- (4) Connect air lines to reservoirs and tighten connections firmly.

67. Installation of Muffler Assembly

Note. Key letters in following text indicate connect points and refer to figure 41.

a. General.—The muffler assembly, which includes support bracket, strap, and brace can be installed as an assembly.

b. Installation Procedures.

- (1) Position muffler supporting bracket (V) on muffler (N). Install muffler supporting strap (M) around muffler and attach strap to muffler supporting bracket (V) with four $\frac{3}{8}$ -24 x $1\frac{1}{4}$ cap screws (W) and $\frac{3}{8}$ -24 nuts. Tighten nuts just enough to support muffler until after exhaust pipe and tail pipe are connected.
- (2) Position four $\frac{5}{16}$ -24 x $1\frac{5}{8}$ cap screws (S) in muffler, supporting bracket (V) which supports muffler to frame side member in the following manner: On each cap screw, place one washer (T), one spacer (U), and one rubber insulator (R) (over spacer) with smaller outside diameter of insulator facing threaded end of screw. Insert cap screw with washer, spacer, and insulator through muffler support bracket. Install another rubber insulator (Q) over spacer on cap screw with smaller outside diameter of insulator facing bracket.
- (3) Position muffler assembly, with cap screws installed in bracket, at frame side member. Install $\frac{5}{16}$ -24 nuts (P) on cap screws and tighten to torque of $9\frac{1}{2}$ to 13 pound-feet.
- (4) Attach muffler support brace (L) to muffler with one $\frac{5}{16}$ -24 x $\frac{5}{8}$ cap screw and $\frac{5}{16}$ -24 nut, and attach support brace to transmission rear support with one $\frac{5}{16}$ -24 x $\frac{3}{4}$ cap screw and $\frac{5}{16}$ -24 nut. Tighten each nut to torque of $9\frac{1}{2}$ to 13 pound-feet.

68. Installation of Power Plant Assembly

a. General.—The power plant assembly, which includes engine and accessories, radiator, radiator baffle, brush guards, head lights, engine

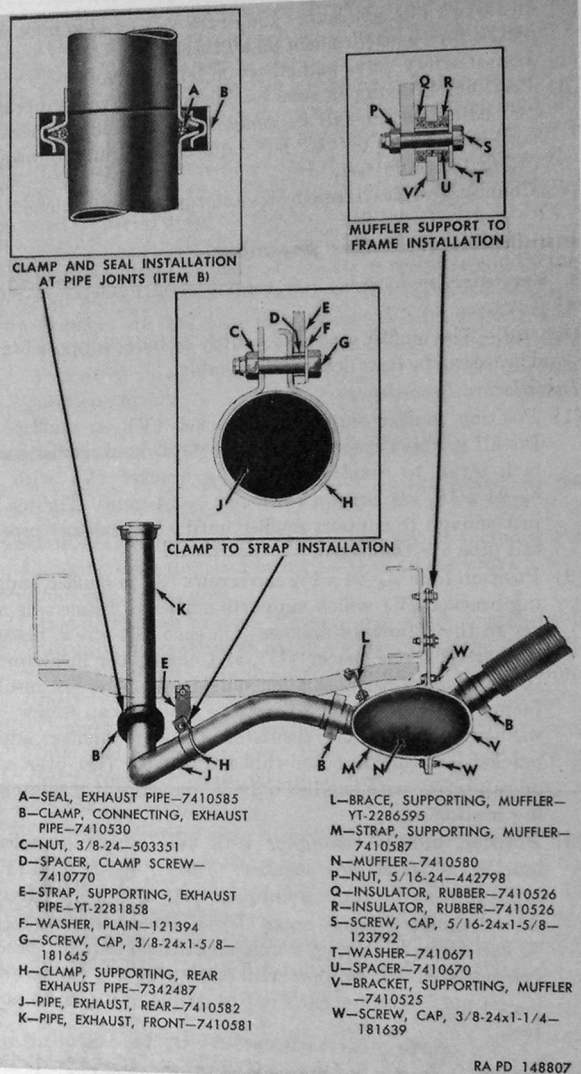


Figure 41. Rear exhaust pipe and muffler installation.

front exhaust pipe, transmission, transmission control tower, and universal joint, can be installed as an assembly.

b. Equipment.—A chain fall and one special tool are required to install power plant assembly. Engine lifting sling 41-S-3831-600 must be used to lift power plant into chassis.

c. Installation Procedures.

(1) *Raise power plant into vehicle.*

(a) Hook engine lifting sling 41-S-3831-600 into eye nut ((A), fig. 22) and lower lifting bracket ((E), fig. 22) on engine. Attach sling to chain fall.

(b) Raise power plant assembly high enough to clear vehicle frame, then move into position above frame. Carefully lower power plant, taking care to avoid damage to lines, wiring, etc. Do not rest power plant solidly on mountings until two support cushion shims ((A), fig. 42) and support cushion ((D), fig. 42) at radiator support assembly ((E), fig. 42) are in place and bolt holes are alined. Drop engine mounting bolts ((J), fig. 42) with special washer ((M), fig. 42) through front engine mounting assemblies. Aline power plant rear mounting bolt holes; then lower power plant on mountings.

(c) Remove engine lifting sling from power plant.

(2) *Operations at front of vehicle.*—Assemble support spring washers ((G), fig. 42) and support springs ((F), fig. 42) on radiator support special bolts ((H), fig. 42), then insert bolts upward through bracket and install bolt spacer ((C), fig. 42) and $\frac{3}{8}$ -24 nuts ((B), fig. 42) on bolts. Tighten nuts firmly.

(3) *Operations at right side of vehicle.*

(a) Assemble engine mounting cushion ((K), fig. 42), special washer ((L), fig. 42), and $\frac{3}{8}$ -24 nut ((B), fig. 42) on front mounting bolt. Tighten nut firmly.

(b) Install $\frac{1}{2}$ -20 x $1\frac{3}{8}$ cap screw ((N), fig. 42) with $\frac{1}{2}$ -inch lock washer ((P), fig. 42) to anchor power plant rear mounting ((H), fig. 22) to support cushion ((Q), fig. 42).

(c) Aline holes in universal joint flanges ((J), fig. 22 and (F), fig. 23) at rear of transmission and install four bolts.

(d) Connect vent line ((D), fig. 23) at transmission filler neck ((G), fig. 22).

(e) Attach engine ground strap ((D), fig. 22) to frame side member ((Q), fig. 23) with one $\frac{1}{4}$ -28 x 1 cap screw, one $\frac{3}{32}$ -inch plain washer, one $\frac{1}{4}$ -inch internal-external-teeth lock washer and one $\frac{1}{4}$ -28 nut. Tighten nut to torque of 5 to 7 pound-feet.

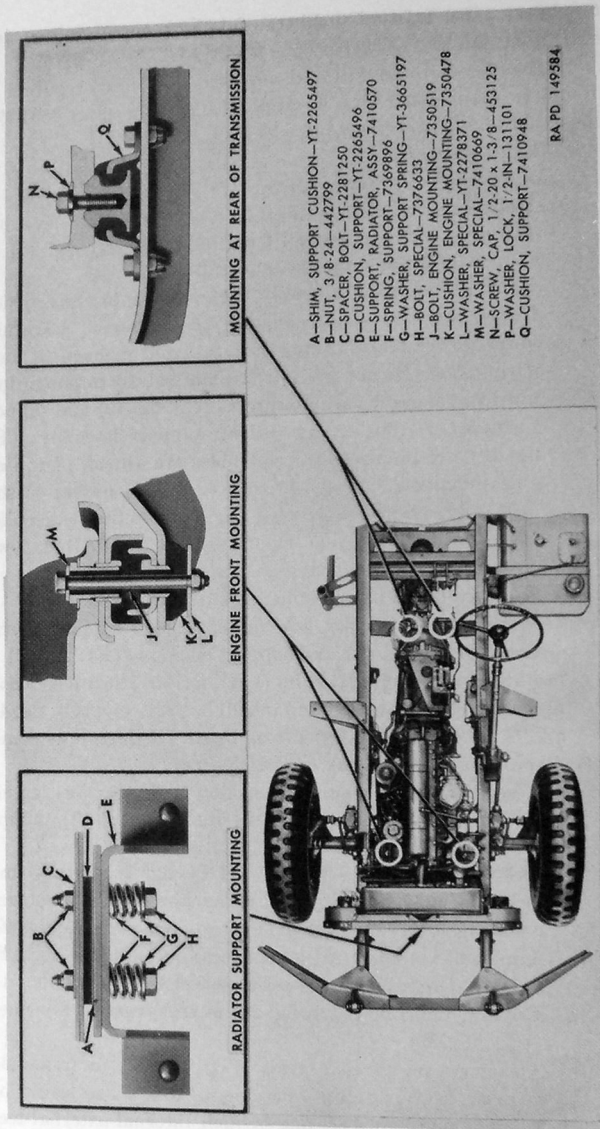


Figure 42. Power plant mountings.