DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

DEPARTMENT OF THE AIR
FORCE TECHNICAL ORDER

TM 9-8015-2
TO 19-75CAJ-5

ORDNANCE MAINTENANCE

POWER TRAIN BODY AND FRAME FOR ¼-TON 4 x 4 UTILITY TRUCK M38A1

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
AUGUST 1954

TECHNICAL MANUAL No. 9-8015-2
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WASHINGTON 25, D. C., *2 August 1954*

POWER TRAIN, BODY, AND FRAME FOR ¼-TON 4 x 4 UTILITY TRUCK M38A1

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the use of personnel responsible for field and depot maintenance of this materiel. It contains information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. It does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operator's technical manual or field manual.

b. This manual contains a description of and procedures for removal, disassembly, inspection, repair, rebuild, and assembly of the power train, body, and frame of the ¼-ton, 4 x 4 utility truck M38A1 (figs. 1, 2, and 3). The appendix contains a list of current references, including supply manuals, technical manuals, and other available publications applicable to the materiel.

c. 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., Attn: ORDFM-Pub.

d. TM 9–804A (To be renumbered TM 9–8014) contains operating and lubricating instructions for the materiel and contains all maintenance operations allocated to using organizations in performing maintenance work within their scope.

e. TM 9–8015–1 contains service information on the engine.

f. TM 9–8627 contains service information on the Delco-Remy electrical equipment.

g. TM 9–1825B (To be renumbered TM 9–8629) contains service information on Auto-Lite electrical equipment.

h. TM 9–1826A (To be renumbered TM 9–8641) contains service information on the Carter carburetor.

i. TM 9–1827C (To be renumbered TM 9–8653) contains service information on the hydraulic brakes.

j. TM 9–1828A (To be renumbered TM 9–8655) contains service information on the AC fuel pump.

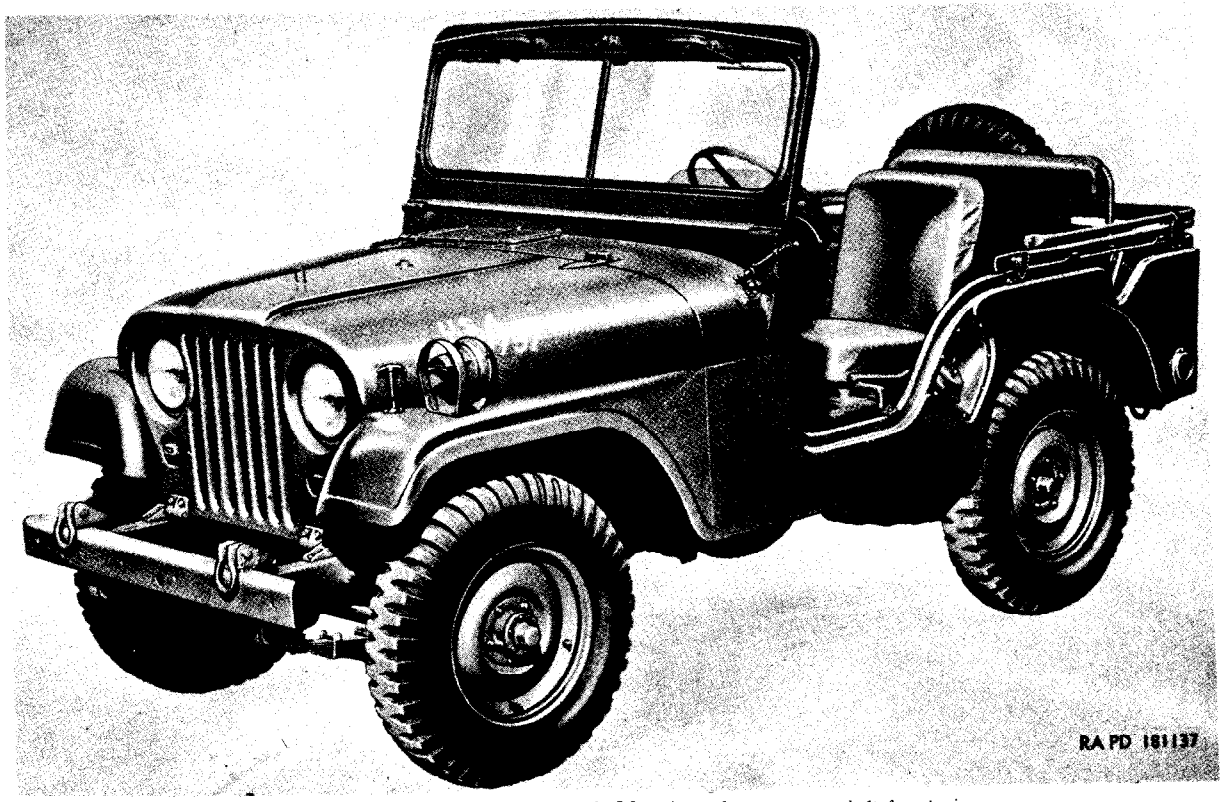

Figure 1. ¼-ton, 4 x 4 utility truck M38A1—three-quarter left front view.

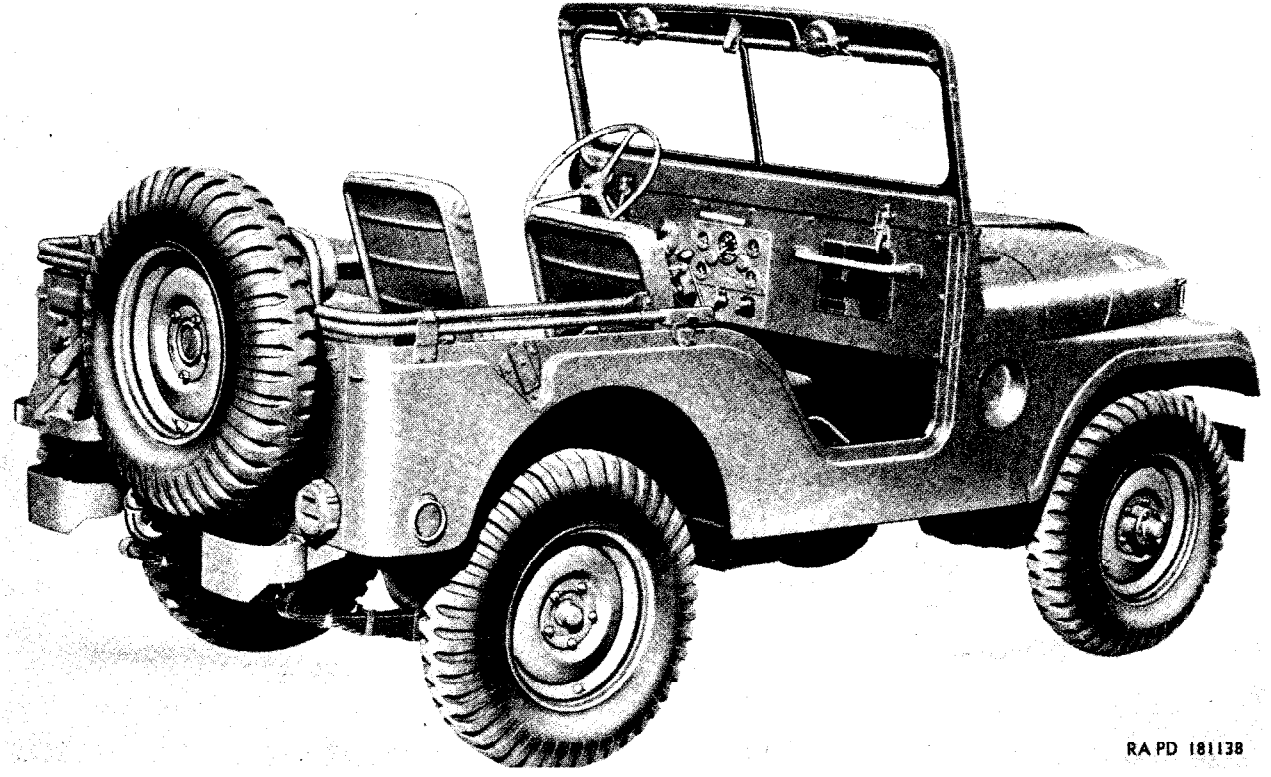

Figure 2. ¼-ton, 4 x 4 utility truck M38A1, three-quarter right rear view.

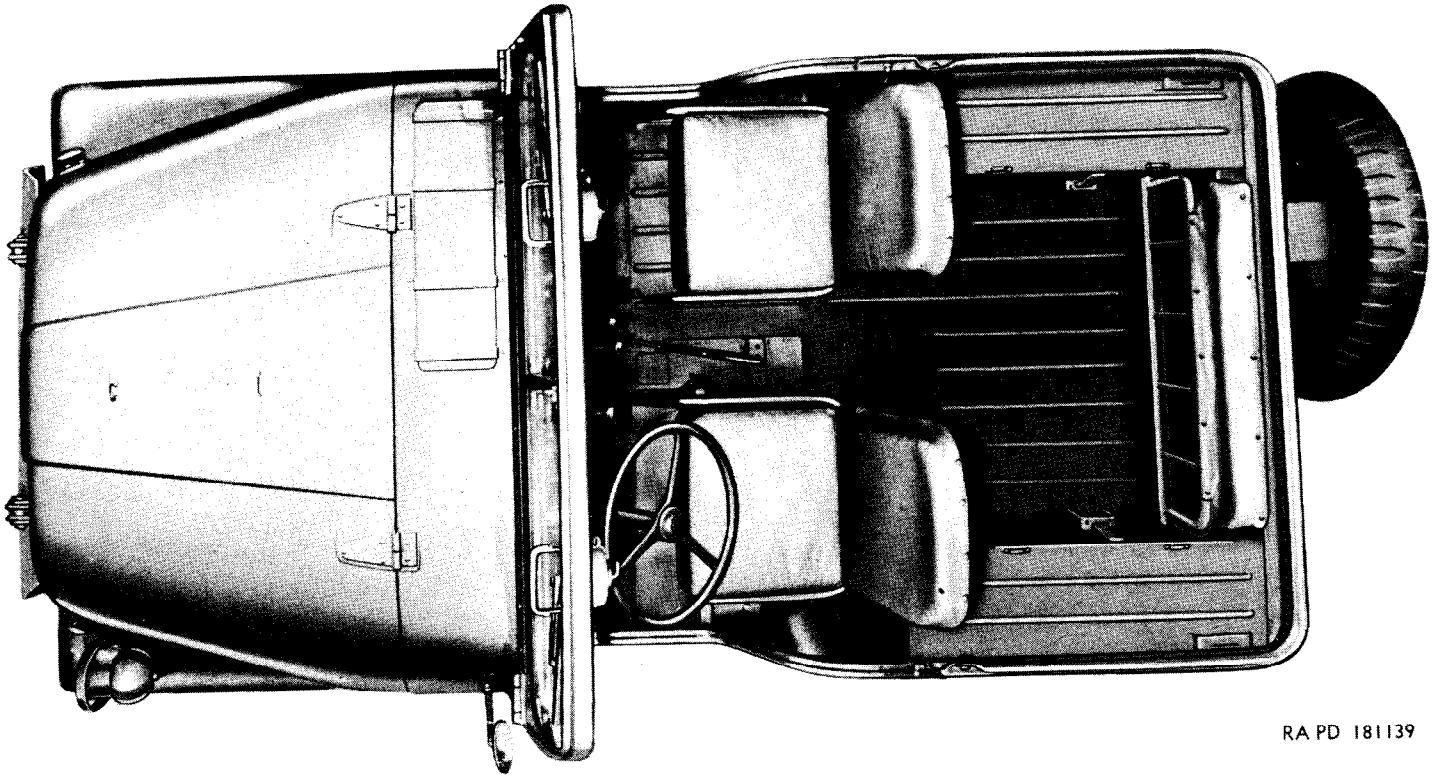

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Figure 3. ¼ ton, 4 x 4 ulility truck M38A1—top view.

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 manual pertaining to this vehicle. 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 manuals 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 type, quantity, and condition of materiel 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 materiel in the hands of troops and for delivery of materiel 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 materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units maintaining this equipment are listed in the appendix. For current and complete listing of 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 materiel occur.

d. Report of Unsatisfactory Equipment or Materiels. Any suggestions for improvement in design and maintenance of equipment and spare parts, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants, and/or preserving materials, or technical inaccuracies noted in Department of the Army Publications, 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 materiel covered in this publication comprises the power train, body, and frame of the ¼-ton, 4 x 4 utility truck M38A1. This utility truck (figs. 1, 2, and 3) is a four-wheel vehicle with both a front and rear driving axle. Designed for use as a general purpose personnel or cargo carrier, the vehicle is readily adaptable for reconnaissance, communications or other special duties. It is capable of operating with the engine completely submerged in water. Underwater operation is possible because of waterproofed components and a design which utilizes the engine ventilating system as a pressure seal against entry of water past mating surfaces. Since a majority of the waterproofed assemblies require atmospheric pressure, either to operate or prevent condensation damage, a ventilating tube system (fig. 4) is used for this purpose.

b. Vehicle Nomenclature. For identification of the location of the various groups, systems, assemblies, and component parts, the terms "front" and "rear" and "right" and "left" are defined with respect to the driver sitting in his seat in position to drive. "Front" refers to the radiator end and "rear" refers to the towing pintle end of the vehicle. "Right" and "left" are referenced with respect to the driver's right and left sides.

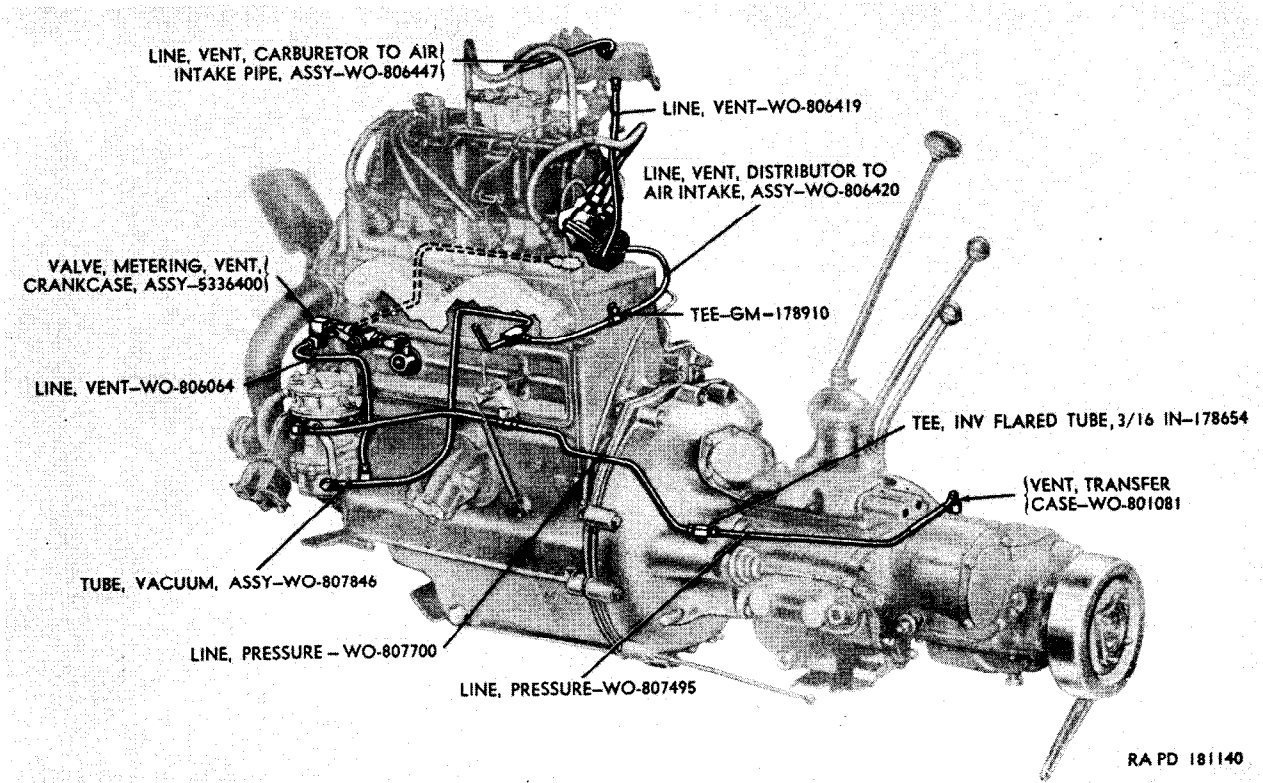


Figure 4. Underwater ventilating system.

5. Power Train

(fig. 5)

a. General. The power train is composed of clutch, transmission, transfer, front and rear propeller shafts, and front and rear axle assemblies. Power, transmitted from the engine to the transmission by the clutch, flows through the transmission, the transfer, and the propeller shafts to the driving axles.

b. Transmission. The transmission is of synchromesh design having 3 speeds forward and 1 reverse. The various gear reductions are selected by the transmission gearshift hand lever which extends from the top of the control cover into the driver's compartment. Four screws and lockwashers secure the front of the transmission to the rear of the clutch housing. The transmission is supported on a rubber insulator located on top of the engine rear support crossmember. The output of the transmission is transmitted from the mainshaft to the transfer input shaft which is mounted on the rear of the transmission mainshaft.

c. Transfer. The transfer is in effect another gear reduction unit in the power train. It functions to divide the driving torque from the transmission between the front and rear axles. Two levers provide for engaging or disengaging the front axle and selecting the low or high (direct) transfer ratio. The hand brake drum is mounted on the transfer rear axle output shaft and provides for holding the rear propeller shaft stationary while parking.

d. Propeller Shafts. The two propeller shafts transmit the output torque of the transfer to the front and rear axle assemblies. Universal joints of the needle bearing type, at both ends of each propeller shaft, provide the flexibility required to compensate for the up and down movement of the axles. Each propeller shaft is also equipped with a splined slip joint at the transfer end to allow for variations in length caused by vehicle spring action.

e. Front Axle Assembly. The front axle assembly comprises full-floating axle shafts, a conventional type differential with hypoid drive gears, and certain components of the steering mechanism. Spherical steering knuckles are constructed as part of the axle housing. These knuckles are mounted on pivot pins which ride on tapered roller bearings for ease of steering. The axle shafts are spline fitted to constant velocity universal joints which revolve within the steering knuckles. The housing is offset to the right thereby preventing loss of road clearance which would be caused if the front propeller shaft was located directly under the engine.

f. Rear Axle Assembly. The rear axle assembly is of the semi-floating, hypoid, single-reduction type. The housing is offset to the right to obtain a straight drive for the propeller shaft from the transfer to the drive pinion.

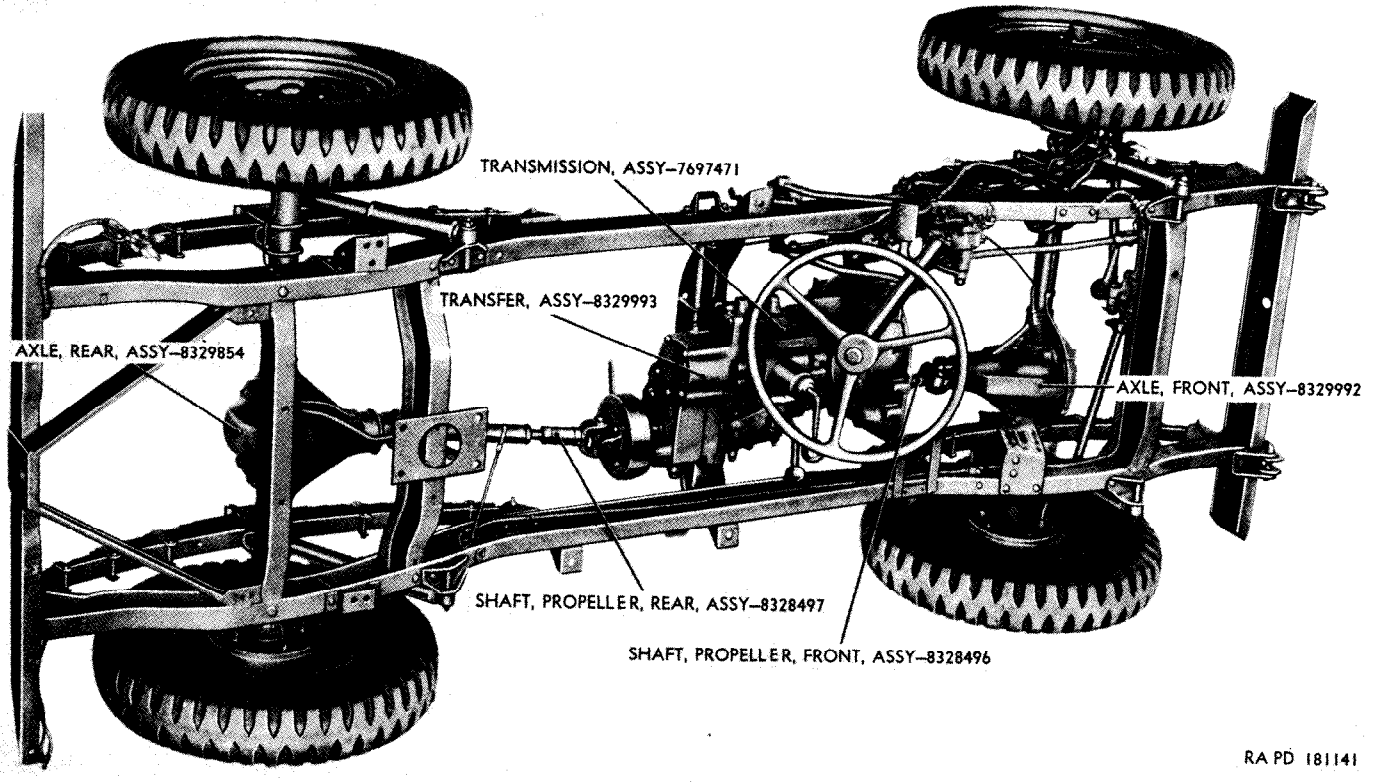


Figure 5. Power train of ¼-ton, 4 x 4 utility truck M38A1.

6. Body

(fig. 158)

a. General. The all steel, open type body provides seating space for four passengers. Provisions are made for inclosing the body with either a removable canvas top and side curtains, or a metal top. A towing pintle and trailer receptacle are provided at the rear for hauling a towed load. Two lifting shackles are installed at the rear of the body for lifting purposes. A radiator guard assembly with recessed headlight openings provides for headlight protection on the front. Two bumperettes on the rear protect the body against damage. The body is equipped with a spare wheel support bracket and a spare fuel can bracket. Footman loops provide for stowage of additional items. A rearview mirror is located at the left of the body just forward of the windshield. The body also mounts the fuel tank and provides a battery stowage box in the cowl. The engine hood is of the quick detachable type and provides for mounting a shovel on the underside.

b. Windshield Assembly. A divided windshield with dual wipers is used. The windshield assembly can be folded forward to obtain a low silhouette. The windshield wipers can be operated manually as well as by the engine vacuum system. A vacuum booster is provided on the fuel pump to prevent any slowdown of wiper action.

c. Seat Assemblies. Three seats are provided; driver's, front passenger, and rear passengers. The rear seat assembly can either be folded together in a vertical position or quickly removed if additional space is required in the rear of the vehicle. A tool compartment is located beneath the front passenger seat. The driver's seat is mounted over the fuel tank. All three seats can be quickly removed from the vehicle, if so desired.

7. Frame

(fig. 178)

a. General. The frame functions as the structural center of the vehicle, carries the load, and provides and maintains correct relationship between other units to assure their proper operation. The frame mounts practically all the major groups of the vehicle.

b. Construction. The frame is constructed of heavy steel. Two channel-type side rails, and five channel type crossmembers are used. Brackets and diagonal braces are used to maintain proper longitudinal position of the rails with reference to each other and also to offer additional resistance to torsional stresses. Each side rail is equipped with two rubber axle bumpers to prevent metal-to-metal contact between the frame and axle housing when the vehicle is subjected to severe operating conditions. A bumper bar is secured to the front of the frame for vehicle protection. Four removable type lifting shackles are secured to brackets which are attached to the frame.

8. Engine, Clutch, and Electrical System

a. Engine. The engine is an F-head, 4-cylinder, 4-cycle, water-cooled, gasoline design developing 72 brake horsepower at 4,000 rpm, and having a compression ratio of 6.9 to 1. The engine is a valve-in-head and valve-in-block type with a piston displacement of 134.2 cubic inches. Aluminum pistons, each fitted with 2 compression rings and 1 oil ring, are used. The crank shaft is supported by three steel backed babbitt inserts. A force feed, continuous circulation, lubrication system is used to lubricate the moving parts of the engine. The engine is waterproofed for operation while completely submerged in water. All mating surfaces are sealed with gaskets and plastic type gasket cement. A design which utilizes the engine ventilating system as a pressure seal, further insures prevention of water leakage past mating surfaces. The engine cooling system is of the pressure type, and the pressure, created by the expansion of the coolant as it warms up, is not relieved until it reaches 4½ psi. The radiator filler cap includes a relief valve which relieves the pressure when it reaches the predetermined setting. The pressure system reduces evaporation of the coolant and provides for more efficient engine operation by permitting a slightly higher engine operating temperature. A bypass tube provides for a small amount of coolant to bypass the thermostat for fast initial warmup.

b. Clutch. The clutch, which is located between the engine and transmission, is of the single-plate, dry-disk type. It is comprised of a pressure plate assembly and a clutch-driven disk. Segmented facings on the disk provide for smooth engagement of engine power.

c. Electrical System. Two 12-volt lead and acid type batteries, connected in series, supply 24 volts for operating the electrical components of the vehicle. All components of the electrical system are waterproofed for operation while completely submerged. Two headlights, a blackout driving light, and two signal blackout marker and service parking lights are installed on the front of the vehicle. The blackout tail and stoplight and the service tail and stoplight are located at the rear of the vehicle. An electrical trailer receptacle at the rear of the vehicle provides for connecting the electrical units of a towed trailer to the vehicle electrical system.

9. Data

Refer to TM 9–804A (to be renumbered TM 9–8014) for tabular data pertaining to general characteristics and performance of the vehicle and major components. TM 9–1804AA (to be renumbered TM 9–8015–1) contains descriptive information and tabular data pertaining to the engine and clutch. For detailed information and tabular data pertaining to components covered in this manual refer to the following paragraphs:

Section III. CLEANING, INSPECTION, AND REPAIR PROCEDURES

10. General

Because of the obvious impossibility of describing in detail all of the various kinds of wear or damage or conditions of dirt, fouling, or foreign material deposits that might be discovered in rebuilding the vehicle, the cleansing, inspection and repair paragraphs in this manual are limited to the description of the normal or common operations. Except in the cases where these specific procedures are given, maintenance personnel are expected to exercise good judgment or to consult higher authority when or if unusual conditions or difficulties are encountered during the performance of the cleaning, inspection, and repair operations.

11. Cleaning Procedures

a. Cleanliness of personnel, tools, and surroundings is a fundamental requirement where repair operations of a mechanical nature are carried on. All of the information and instructions contained in this manual are given on the assumption that these conditions prevail in the working area. Transmission, transfer, and axle repairs, except for those of an emergency nature, should never be attempted under any other conditions.

b. Use dry-cleaning solvent, volatile mineral spirits, or high pressure steam, whichever is available, for all cleaning operations. Use compressed air to dry the parts.

c. When preparing to rebuild or repair an assembly, scrape or wire brush all accumulations of dirt or road mud from external surfaces of the assembly. Note and mark, by scratching the metal parts with a sharp pointed tool, any moist oil spots or unusually heavy accumulations of oil soaked road mud, for these are good clues to the location of small cracks or holes which might escape notice in a visual inspection. Do not confuse these accumulations with those that result from leaking gaskets or oil seals.

d. After marking any questionable areas for later and more thorough inspection, complete the external cleaning operation with steam clean-

ing equipment or by hand brushing using volatile mineral spirits as a cleaning agent. Total immersion in a dip tank is also approved, provided the cleaning agent is dry-cleaning solvent or volatile mineral spirits.

12. Cleaning Component Parts After Disassembly

a. If other approved facilities are not available, all parts must be cleaned by hand using bristle brushes having the correct shape and proper size for the job to be done; that is, round brushes for internal bores and square or rectangular hand brushes for flat or external surfaces. Scrub each individual part except ball or roller bearings

Note. Bearings require special handling. Refer to TM 37–265 or TB 9–2830–93 and clean, inspect, and prepare for use all ball and roller bearings used in these assemblies according to the instructions given therein.

b. Clean all parts of hardened oil, lacquer deposits, and carbon. Wire brushes either hand wielded or power driven may be used for this purpose provided there is no possibility of their damaging finished surfaces. Otherwise, the parts must be permitted to soak in solvent until the foreign material is loosened.

c. Remove all gaskets or parts of gaskets from gasket surfaces, using a putty knife or other suitable scraper. Be careful to avoid scratching or gouging the surface metal.

d. Rinse or flush the parts in clean dry-cleaning solvent or volatile mineral spirits. Even though the dirt or foreign matter is loosened by the cleaning action, it must be completely washed away by a flushing action. This is a mandatory operation on parts that have undergone repair operations which required them to be ground, honed, or lapped. Use solvent under pressure to force-flush repaired parts. In the absence of such facilities, the parts may be rinsed by immersing them in a container of clean dry-cleaning solvent or volatile mineral spirits and then sloshing them about vigorously either manually or by some improvised mechanical means. Dry the parts with high pressure air.

13. Inspection Procedure

a. All parts, regardless of their application or use, must be thoroughly examined and inspected to determine whether they are to be used again or scrapped. The wear or damage of some parts will be evident to the eye, whereas in others it may be necessary to use tools or gages to determine the extent of wear.

b. When inspecting parts, bear in mind that the inspection procedure has two purposes. The first, to weed out any part or parts which are unsuitable for use, or doubtful parts which could conceivably cause the premature failure of the rebuilt unit. The second, and equally important purpose, is to reduce the wasteful and frequently unneces-

sary practice of scrapping parts which still retain a high percentage of useful life.

c. Instructions for the performance of minor repairs, or for the removal of minor imperfections, are given in the inspection paragraphs wherever they facilitate the inspection procedure. Every part on which even a minor repair is made must be washed, rinsed, and dried upon completion of the repair.

14. Repair Procedure

a. All good workmen like repairs which are acceptable. Makeshift or temporary repairs are not permitted, except in extreme emergencies.

b. The principal purpose of repairs is to salvage parts which would otherwise be scrapped. The decision as to whether a part is to be repaired or not rests upon three factors.

(1) The practicality of the repair, that is, can the part be repaired and be thus returned to a condition approximating new. If not, the repair should not be attempted.

(2) The cost of the repair as compared to the cost of a replacement part. If the cost factor does not favor the repair, the part should be discarded.

(3) The availability of replacement parts. If service parts are not available or in short supply, every effort should be made to salvage as many parts as possible, disregarding any of the other governing factors.

c. Upon completion of any repairs, clean and flush the parts as instructed in paragraph 12*d*.

15. Handling After Inspection and Repair

a. All parts liable to rust, whether new or used, must be lightly coated with medium preservative lubricating oil immediately after inspection and/or repair, and prior to their assembly. Oiling the parts gives them a necessary rust preventative coating and facilitates the assembly operations.

b. Make sure that all new gaskets and replacement parts are available to replace those scrapped.

c. Check to see that all parts are at hand so that the assembly operations may go forward without interruption.

CHAPTER 2

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

16. General

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

17. Parts

Maintenance parts are listed in Department of the Army Supply Manual ORD 8 SNL G–758 which is the authority for requisitioning replacements. Parts not listed in the ORD 8 supply manual but required by depot shops in rebuild operations may be requisitioned from the listing in the corresponding ORD 9 supply manual and will be supplied if available. Requisitions for ORD 9 parts will contain a complete justification of requirements.

18. Common Tools and Equipment

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

19. Special Tools and Equipment

The special tools and equipment tabulated in table I are listed in Department of the Army Supply Manual ORD 6 SNL J–16, Section 38. This tabulation contains only those special tools and equipment necessary to perform the operations described in this manual, is included for information only, and is not to be used as a basis for requisitions.

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

Item	Identifying No.	Reference		Use
		Fig.	Par.	
ARBOR, removing and replacing (countershaft), 0.751 in. diam, 6.850 in. long (transmission).	41–A–339–22	6 50 58	83 93	Removing and installing transmission countershaft without loss of bearing rollers.
GAGE SET, drive pinion setting consisting of—	41–G–535–700	6	163	Checking differential drive pinion setting.
GAGE, checking, drive pinion setting gage	41–G–98–750	6 116 117	163 181	
GAGE, drive pinion setting	41–G–177–50	6 116	163	
SPACER, drive pinion setting	41–S–3868–415	6	------	
LOCATOR, thrust washer (Intermediate shaft, transfer case).	41–L–1607–375	6 81	133	Holding thrust washers in place in transfer.
PULLER, rear spring bushing removing and replacing.	8366660	8 147 148	197	Removing and installing spring bushing type eye bearings.
REMOVER, flange, drive pinion and bearing, differential side.	41–R–2367–950	7 107	158 174	Removing differential case tapered roller bearing cones.
REMOVER, bearing cone (front)	41–R–2368–200	8 70	115	Removing transfer front bearing cones.
REMOVER and replacer (bushing, spindle front wheel).	41–R–2374–175	8 106	156	Installing spindle bushing type bearing.
REMOVER and replacer, bearing cup (drive pinion, inner, used with screw 41–S–1047–330).	41–R–2374–660	6 112	162	Removing and installing drive pinion inner bearing cup.
REMOVER and replacer, bearing cup (drive pinion, outer, used with screw 41–S–1047–330).	41–R–2374–665	6 113	162	Removing and installing drive pinion bearing cup.
REMOVER and replacer, bearing cup (spindle pin, thd ¼–16NF–2 female, used with screw 41–S–1047–300).	41–R–2374–750	6 110 114	162	Removing and installing steering knuckle flange kingpin bearing cup.

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

Item	Identifying No.	Reference		Use
		Fig.	Par.	
REMOVER and replacer, bearing cup (wheel, thd 1¼–12NF–2 female, used with screw 41–S–1047–330).	41–R–2374–845	6 187	266 268	Removing and installing front hub bearing cup.
REPLACER, bearing cone (differential side, also used to replace axle shaft inner oil seals).	41–R–2384–149	7 111 119	162 164	Installing differential case bearing cone and front axle shaft inner oil seals.
REPLACER, bearing cones and snap ring (transfer case).	41–R–2384–540	7 78 79	131	Installing transfer bearing cones and snap ring.
REPLACER, oil seal (transfer case)	41–R–2394–105	7 80 84	132 136	Installing transfer front and rear axle output shaft oil seals.
SCREW, remover and replacer (bearing cup). Threaded ¾–16NF–2, length 6 inches.	41–S–1047–300	6 110 114	162	Used with remover and replacer 41–R–2374–750.
SCREW, remover and replacer (bearing cup). Threaded 1¼–12NF–2, length 9 inches.	41–S–1047–330	6 112 113 187	162 266 268	Used with remover and replacers 41–R–2374–660, 41–R–2374–665, and 41–R–2374–845.
SLEEVE, needle bearing replacing (transmission countershaft), ID 0.760 in., OD1$\frac{1}{64}$ in., length 3 inches.	41–S–3775–675	6 58	93	For loading bearing rollers in transmission countershaft gear.
SPREADER, differential carrier	41–S–4158–500	7 128 129	150 164 172	To spread axle housing when removing or installing differential assembly.
TOOL, oil seal, shifter shaft	41–T–3280	6 85	136	For installing shifter shaft oil seals.

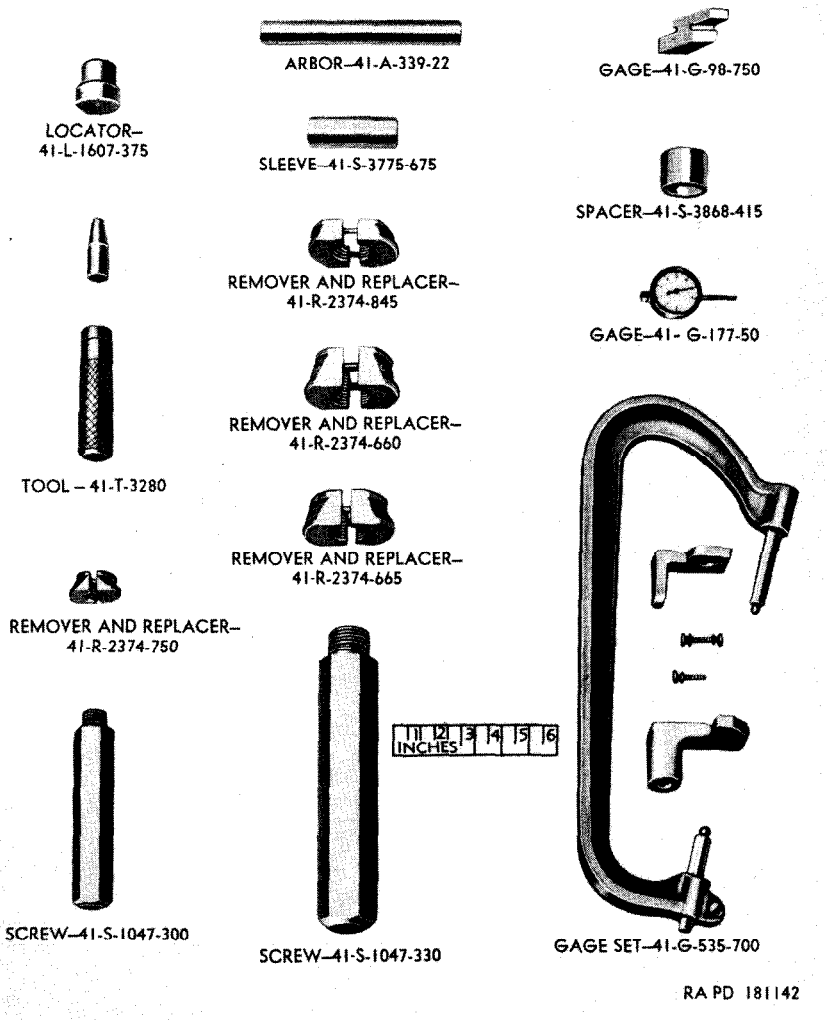
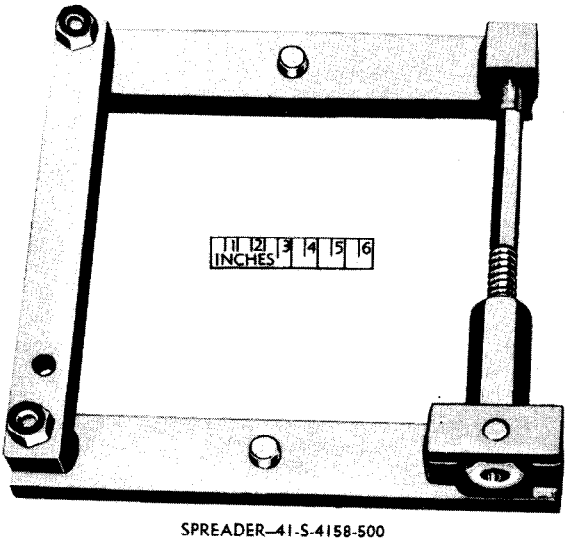
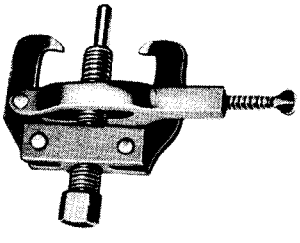


Figure 6. Special tools.



SPREADER—41-S-4158-500

REPLACER—41-R-2384-540



REMOVER—41-R-2367-950

REPLACER—41-R-2384-149

REPLACER—41-R-2394-105

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Figure 7. Special tools.

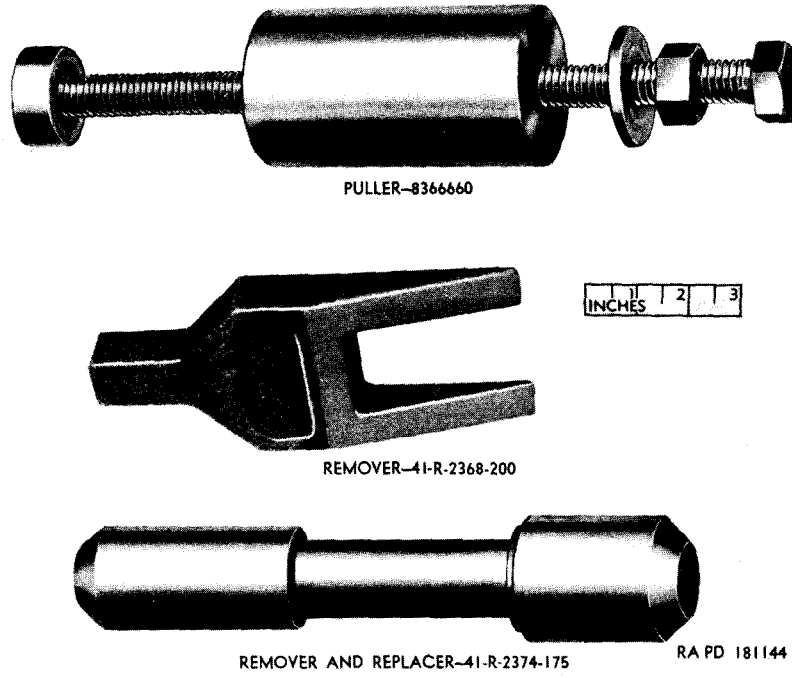

Figure 8. Special tools.

20. Improvised Tools

The improvised tool listed in table II and the dimensioned drawing (fig. 9) apply only to field and depot shops in order to enable these maintenance organizations to fabricate this tool locally, if desired. This tool is of chief value to maintenance organizations engaged in rebuilding a large number of identical components; however, it is not essential for rebuild and is not available for issue. The data is furnished for information only.

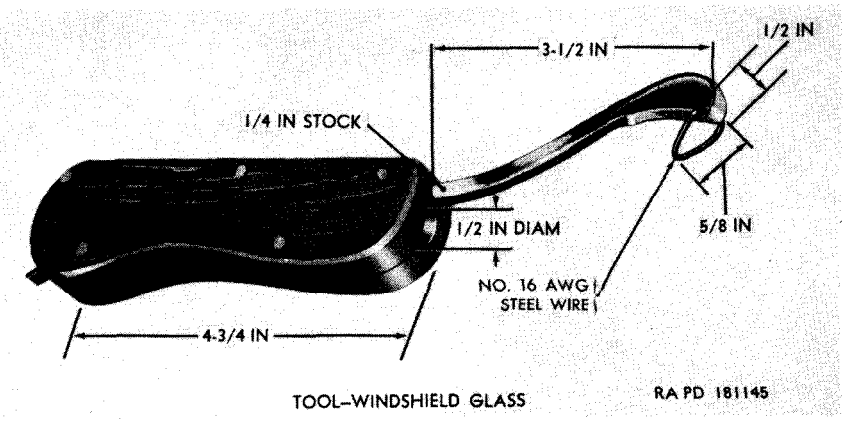

Figure 9. Improvised tool.

Table II. Improvised Tool for Field and Depot Maintenance

Item	References		Use
	Fig.	Par.	
Tool, windshield glass, weatherstrip filler.	9 170 171	222	For installing windshield glass weatherstrip filler.

CHAPTER 3
TROUBLESHOOTING

Section I. GENERAL

21. Purpose

Note. Information in this chapter is for use of ordnance maintenance personnel in conjunction with and as a supplement to the troubleshooting section in the pertinent operators manual (TM 9–804A). 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 troubleshooting 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.

22. General Instructions and Procedures

This chapter contains inspection and troubleshooting procedures to be performed while a disabled component is mounted in the vehicle.

a. The inspections made while the component is mounted in the vehicle are, for the most part, visual and are to be performed before attempting to operate the vehicle. The object of these inspections is to avoid possible damage or injury and also to determine the condition of, and when possible, what is wrong with the defective component.

b. The troubleshooting performed while the component is mounted in the vehicle is that which is beyond the normal scope of the using organization. Check the troubleshooting section of TM 9–804A, then proceed as prescribed in this chapter. These troubleshooting operations are used to determine if the fault can be remedied without removing the component from the vehicle and also, when subsequent removal is necessary, to indicate when repair can be made without complete disassembly of the component.

Section II. TRANSMISSION

23. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for the purpose of these inspections.

Note. Removal of the lower front floor pan cover (par. 48c (9)) (if body is still installed) will facilitate making the following inspections.

b. Inspect for Oil Leakage. Visually inspect the gasket joints at clutch housing, transfer, and gear shifthand lever control cover mating surfaces and drain plug for signs of escaping oil. Oil leakage at the gasket joints may be caused by missing, stripped, or loose mounting screws or by faulty gaskets. Tighten the drain plug and all mounting screws where oil leakage has occurred. If lubricant continues to leak after missing or damaged screws have been replaced and after all mounting screws have been tightened, install a new gasket. Install gasket, when possible, without removing transmission from vehicle. If lubricant continues to leak after a new gasket has been installed, the input-shaft bearing-cover oil seal may be faulty or improperly installed. Check the oil seal for damage and proper installation. Oil leakage can also be caused by cracks or sand holes in the transmission case or cover. Clean the outside of the transmission case and its cover with dry-cleaning solvent or volatile mineral spirits and check case and cover for cracks or sand holes. If case or cover is faulty due to cracks or sand holes, replace the affected item (pars. 89*a*(1) and 101*b*(1)).

Note. If oil leakage continues and all the above corrections have been made, be sure the underwater ventilator valves are open and the fording valve in the clutch housing is removed for land operation. Wipe off affected leakage areas with dry-cleaning solvent and road test vehicle. Inspect for oil leaks.

c. Inspect for Water in Transmission. Inspect for water in transmission by removing transmission drain plug and noting if water flows from opening. If there is water, drain transmission, flush transfer and transmission, replace drain plug, and fill with proper grade of oil. Refer to TM 9–804A for correct lubricant.

d. Inspect for Loose Gearshift Hand Lever. A loose gearshift hand lever may be caused by either a loose gearshift hand lever retainer or a loose control cover. Tighten the retainer or housing bolts as necessary to remedy fault. If lever continues to be loose after tightening retainer or securing cover, a missing, weak, or broken gearshift hand lever support spring can be causing the trouble. Replace spring (par. 90). If trouble still continues, remove the hand lever assembly and check for a missing or sheared gearshift hand lever ball pin. Install a new pin if pin is missing or sheared. A loose gearshift hand lever may be due to a worn gearshift hand lever ball. Remove the hand lever assembly and examine the ball. If ball is excessively worn (fits too deep in cover), replace the hand lever assembly. If the trouble persists, it may be caused by loose or damaged shifter shafts, shifter forks, or detent balls or springs. Disassemble transmission control cover assembly and check all parts. Replace all damaged or worn parts.

e. Inspect for Transmission Gearshift Hand Lever Assembly That Is Difficult To Shift. If the gearshift hand lever cannot be shifted into any gear position or if it offers resistance to any movement, the gears

within the transmission case may be worn or damaged. Disassemble the transmission (pars. 82–108) examine all parts for wear and damage, and replace faulty component parts.

f. Inspect for Gearshift Hand Lever That Is Jammed in First Speed or Reverse Speed. The trouble may be caused by a bent or damaged first and reverse speed gear shifter shaft. Remove and replace shifter shaft. If the shifter shaft is not at fault, the first and reverse speed sliding gear may be seized on the main shaft or otherwise faulty. Disassemble transmission, check sliding gear, and correct as necessary.

g. Inspect for Gearshift Hand Lever That Is Jammed in Second Speed or Third Speed. A bent or otherwise damaged second and third speed shifter shaft may be the cause of the trouble. Remove and replace the shifter shaft (pars. 88*c*, 89*a*, and 90*a*), if necessary. If the shifter shaft is not at fault, the second and third speed synchronizer assembly may be faulty. Disassemble transmission, inspect synchronizer assembly, and replace, if necessary.

24. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for purpose and scope of these troubleshooting procedures.

b. Lubricant Check. In order to make a thorough test of the transmission while it is still mounted in the vehicle, be sure that the transmission oil level has been properly checked. Operate the vehicle in all speed ranges, 3 forward and 1 reverse. Make a note of any abnormal symptoms.

c. Transmission Slips Out of Gear. The transmission usually slips out of gear because of a faulty part, or parts, within the transmission. The most usual cause of gear slipout is worn or damaged gearshifter shaft detent balls, or worn lock ball grooves in the shifter shafts. A bent shifter shaft may contribute to the trouble. Weak or broken shifter shaft detent ball springs can also cause slip-out. If the transmission consistently slips out of first or reverse speed gear, the trouble may be caused by the first and reverse speed sliding gear which is either loose on the main shaft or has damaged teeth. Remove and replace first and reverse speed sliding gear (pars. 95*a* and 96*b*). A countershaft gear with excessive end play may cause the slip-out. Remove and adjust countershaft thrust washers. Slip-out of second speed can be caused by a damaged countershaft, second speed gear, or improper clearance between second speed gear and main shaft. Disassemble transmission, repair, and/or replace faulty parts (ch. 5). If the transmission slips out of third speed, the trouble can be caused by a misalined transmission. Remove and aline transmission. Refer to TM 9–804A for correct procedures of alinement. A damaged

countershaft gear or synchronizer assembly may cause trouble. Disassemble transmission and replace damaged parts (ch. 5).

d. Transmission Operates Noisily. While troubleshooting a transmission for noisy operation, it is first necessary to determine whether the noise is unusual, or excessively loud; and second, whether the noise originates in the transmission. To determine if the transmission is actually causing the noise, raise the vehicle so the tires clear the ground. Start and operate vehicle in all its speed ranges. Listen for characteristic transmission noises. Attempt to determine their origin within the transmission. Sometimes noise can be attributed to the transfer. Place transmission in neutral and listen for increase or decrease in noise level.

(1) *Intermittent howl.* This sound is usually caused by gears out of round with center line of mating shaft. Disassemble transmission, repair and/or replace faulty parts (ch. 5).

(2) *Intermittent knocking or thudding.* Noise may be caused by wear or burs on gear teeth. Disassemble transmission, repair and/or replace faulty parts (ch. 5).

(3) *High pitched howl or whine.* Poor gear tooth contact. Disassemble transmission and replace all faulty gears (ch. 5).

(4) *High pitched squeal, thudding, or knocking.* Faulty or damaged bearings usually cause this type of noise. Disassemble transmission and replace all damaged bearings (ch. 5).

e. Transmission Sounds Noisy but Noise Caused by Outside Factors. Many times noises appear to originate in the transmission but actually are caused by outside sources. These sounds are very difficult to isolate as to their causing factors. However, to aid in making the checks for this type of noise, a list of contributing factors causing apparent transmission noises is included below:

(1) Propeller shafts out of balance or worn universal joints.

(2) Wheels out of balance or tires mismatched.

(3) Springs or axle assemblies loose or shifted.

(4) Drive pinion and drive gear teeth damaged.

(5) Engine parts (crankshaft, flywheel, or fan) out of balance.

Section III. TRANSFER

25. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

Note. Removal of the lower front floor pan cover (par. 48*c*(9)) (if body is still installed) will facilitate making the following inspections.

b. Inspect for Oil Leakage. Visually inspect all gasket joints (at transfer-to-transmission, bottom case cover-to-transfer case, rear case cover-to-transfer case, companion flange-to-rear axle uput shaft

retainer assembly, front axle output shaft bearing retainer-to-transfer case, and at the front axle output shaft yoke-to-rear axle output shaft bearing retainer) for signs of escaping oil. Also inspect the filler and drain plugs and the shim joints at the rear axle output shaft retainer assembly to transfer case mating surfaces. Oil leakage at the gasket joints may be caused by faulty, loose, or missing mounting bolts. Tighten all mounting bolts and plugs where oil leakage has occurred. If the mounting bolts are tight and oil continues to leak, install a new gasket. Install gasket, when possible, without removing transfer from vehicle. If lubricant leakage is detected at either the front or rear axle output shafts, the oil seals are usually at fault. Disassemble transfer, examine oil seals, and replace seals (ch. 6), if necessary. After corrective action has been applied to oil seals and lubricant leakage continues, cracks or sand holes in the transfer case or front axle output shaft bearing retainer may be the cause. Wipe the case and bearing retainer with dry-cleaning solvent or volatile mineral spirits and check for cracks and sand holes. If cracks or sand holes are found, disassemble transfer and replace case or bearing retainer (ch. 6), as necessary.

c. Inspect for Failure of the High and Low Range Gearshift Hand Lever To Move to Direct (High) or Underdrive (Low). Failure of the high and low range gearshift lever to move into either of its two operating positions may be caused by improper meshing of gears between the transfer and transmission. Disassemble transfer, inspect gears, and replace gears (ch. 6), if necessary. If trouble continues, the front axle output shaft clutch gearshifter fork shifter shaft may be bent or otherwise damaged. Disassemble transfer, inspect shifter shaft, and repair or replace shaft (ch. 6) if necessary. If trouble continues, the rear axle output shaft clutch gear shifter fork may be loose or damaged. Repair or replace shifter fork (ch. 6), if necessary.

d. Inspect for Water in Transfer. Inspect for water in the transfer by removing the transfer drain plug and noting if water flows from opening. If there is water, drain and flush transfer and transmission, install drain plug, and fill with proper lubricant. Refer to TM 9–804A for proper type and grade of lubricant.

e. Inspect for Failure of Front Wheel Drive Lever To Move Out of Neutral. Failure of the front wheel drive lever to move into either high or low range can be caused by a bent or otherwise damaged sliding gearshifter fork shifter shaft, damaged rear axle output shaft sliding gearshifter fork or shifter shaft, or faulty rear axle output shaft sliding gear shaft. Disassemble transfer, examine parts for damage and wear, and repair or replace faulty parts (ch. 6).

26. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it.

Refer to paragraph 22*b* for the purpose and scope of these trouble-shooting procedures.

b. Lubricant Check. Check transfer oil level before attempting to operate vehicle. Refer to TM 9–804A for proper lubricant. If cause of any lubricant leakage is doubtful (when operating vehicle after fording), remove fording valve in clutch housing, wipe outer surface of transfer, and road test. Check for lubricant leakage.

c. Transfer Slips Out of Front Wheel Drive.

(1) *Front wheel drive gear shift lever spring loose or weak.* Install gearshift lever spring correctly or replace, as necessary (ch. 6).

(2) *Bent front axle output shaft clutch gear shifter fork.* Disassemble transfer, and replace front axle output shaft clutch gearshifter fork (ch. 6).

(3) *Shifter shaft detent ball or spring damaged.* Disassemble transfer and replace shifter shaft detent ball or spring, as necessary (ch. 6).

(4) *Front axle output shaft clutch gearshifter fork loose on shifter shaft* Disassemble transfer and tighten shifter fork screw (ch. 6). Be sure setscrew is locked with locking wire.

(5) *Gear teeth worn.* Disassemble transfer and replace worn gears (ch. 6).

d. Transfer Slips Out of High or Low Range

(1) *High and low range gearshift lever spring loose or weak.* Refer to *c*(1) above.

(2) *Bent rear axle output shaft sliding gearshifter fork.* Disassemble transfer and replace damaged rear output shaft sliding gear shifter fork (ch. 6).

(3) *Shifter shaft detent ball or spring damaged.* Refer to *c*(3) above.

(4) *Rear axle output shaft sliding gearshifter fork loose on shifter shaft.* Refer to *c*(4) above.

(5) *Gear teeth worn.* Refer to *c*(5) above.

e. Transfer Gearshift Levers Shift Hard or Will Not Shift.

Note. If trouble is encountered with transfer sticking in neutral (cannot be moved to either low or high range), jack up wheel and spin to free transfer.

(1) *Shifter shaft detent balls or springs damaged.* Disassemble transfer and replace faulty parts (ch. 6).

(2) *Shifter shafts or shifter forks damaged.* Disassemble transfer and replace faulty parts (ch. 6).

(3) *Clutch gear damaged.* Disassemble transfer and replace front axle output shaft clutch gear (ch. 6).

f. Transfer Operates Noisily Transfer noise may at times be confused with noises actually originating in the transmission. Refer to paragraph 24*d* for instructions on isolating transmission noises.

However, if noise occurs only when transfer is in operation during vehicle travel, it is probably due to one of the following malfunctions:

(1) *Improperly meshed gears in transfer.* Replace faulty gears.

(2) *Gear teeth damaged or missing.* Replace faulty gears.

(3) *Damaged countershaft gear journal roller, or rear axle output shaft bearings.* Replace faulty bearings.

Note. Information on transmission noises will in general hold for those caused by transfer.

Section IV. PROPELLER SHAFTS

27. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for the purpose of these inspections.

b. Inspect for Loose Front or Rear Propeller Shaft. If the front or rear propeller shaft is loose when shaken by hand, make the following inspections and apply the stated corrective actions:

(1) Inspect the universal joint journal bearing assemblies for wear and damage. Remove and replace faulty bearing assemblies (pars. 142*b*, 143*d*, and 144*b*).

(2) Inspect the universal joint bearing U-bolts for looseness and wear. Tighten or replace damaged U-bolts, if necessary (ch. 4).

(3) Inspect for loose mounting nuts which secure the rear propeller shaft to the transfer companion flange. Tighten nuts or replace, if stripped.

(4) Inspect for loose front propeller shaft to transfer yoke nut. Remove front propeller shaft and tighten nut.

(5) Inspect for loose front or rear propeller shaft to front or rear axle yoke nut. Remove propeller shaft and tighten yoke nut.

c. Inspect for Stiff Operating Universal Joints. An excessively stiff operating universal joint can be caused by the following malfunctions:

(1) *Inadequate lubrication.* Lubricate universal joint and propeller shaft as directed in TM 9–804A.

(2) *Bent propeller shaft.* Replace propeller shaft (ch. 4).

(3) *Universal joint bearing assemblies seized.* Replace universal joint bearing assemblies (par. 144).

(4) *Damaged propeller shaft splines.* Replace propeller shaft (par. 144).

28. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. Propeller Shafts Do Not Rotate. This trouble may be caused by one of the following:

(1) *Clutch slipping.* Adjust clutch as instructed in TM 9–804A. If adjusting clutch does not remedy the trouble, replace clutch as instructed in TM 9–804A.

(2) *Faulty transmission.* Troubleshoot transmission (pars. 23 and 24).

(3) *Faulty transfer.* Troubleshoot transfer (pars. 25 and 26).

c. Excessive Vibration. Foreign matter such as mud, paint, tar, or other obstructions on propeller shaft may cause unbalance. Clean all foreign materials from propeller shaft.

Section V. FRONT AXLE

29. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect for Lubricant Leakage. Visually inspect mating joints of housing cover and housing for evidence of lubricant leakage. Leakage at gasket joint may be caused by a damaged cover gasket or loose bolts. Tighten all bolts. If bolts are tight and leakage continues, install a new cover gasket. Install new gasket, if possible, without removing front axle from vehicle. Inspect drain and filler pipe plugs for leakage. Tighten plugs, if necessary. Inspect steering knuckle flanges at mating surfaces for evidence of lubricant leakage. If leakage is evident, the steering knuckle flange oil seal gasket or steering knuckle flange oil seals may be faulty. Tighten screws which secure steering knuckle oil seal retainers. If leakage continues after tightening, replace gasket or oil seals, as necessary. Inspect for lubricant leakage at axle end yoke. If leakage is evident, the drive pinion oil seal or drive pinion oil seal gasket may be damaged. Replace as necessary.

c. Inspect for Excessive Front Wheel Play. Raise front wheels from ground and move front wheels from side to side and up and down. If excessive looseness exists, the trouble may be caused by one of the following:

(1) *Wheel bearing spindle bolts loose or damaged.* Remove wheel and tighten wheel bearing spindle bolts.

(2) *Steering knuckle flange cap bearing.* Replace worn steering knuckle flange cap bearings (par. 157).

(3) *Loose or damaged steering knuckle flange caps.* Tighten or replace steering knuckle flange caps as necessary.

30. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then trouble-

shoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. Hard Steering. Hard steering may be caused by seized steering knuckle flange cap bearings. Replace bearings (par. 166).

c. Low-Speed Shimmy. Low-speed shimmy can be caused by one of the following conditions:

(1) *Front axle shifted.* Inspect for broken spring center bolt, and replace, if necessary (par. 198*a*(1)).

(2) *Spring rebound clips or shackles loose.* Tighten or replace as necessary (pars. 62 and 198*a*(2)).

(3) *Worn steering knuckle flange cap bearings* Replace (par. 166).

(4) *Improper caster.* Refer to paragraph 167*h*.

d. High-speed shimmy.

(1) *Check low-speed shimmy.* The malfunctions causing low-speed shimmy will often be encountered at higher road speeds but will not be easily noticed. Subsequent slowing down of vehicle will usually disclose shimmy.

(2) *Steering gear loose on frame.* Tighten and adjust (par. 65*a*).

(3) *Front springs broken or settled.* Repair or replace spring (pars. 197 and 198).

(4) *Loss of control by shock absorbers.* Replace shock absorbers (par. 57*b*).

(5) *Bent steering knuckle flange arm.* Repair or replace (pars. 156 and 166).

e. Vehicle Wanders. If vehicle has been in an accident, the trouble may be due to a misalined steering system. Repair or replace damaged parts (ch. 12).

f. Front Axle Noisy on Pull.

(1) *Drive pinion and drive gear adjusted too tight.* Adjust drive pinion and drive gear (par. 164*b*).

(2) *Drive pinion roller bearings rough or damaged.* Replace drive pinion roller bearings (par. 163*a*).

(3) *Drive pinion or drive gear teeth damaged or broken.* Replace drive pinion or drive gear as necessary (pars. 160*d* and 163*a*).

(4) *Differential pinions or side gears damaged or broken.* Replace damaged or broken parts (par. 160*a* and *b*).

(5) *Front axle universal joints damaged.* Repair or replace damaged parts (pars. 153 and 154).

g. Front Axle Noisy on Coast.

(1) *Excessive backlash at drive pinion and drive gear.* Adjust backlash (par. 164*b*).

(2) *End play in drive pinion.* Adjust bearing (par. 163*b*).

h. Front Axle Noisy on Coast and Pull.

(1) *Drive pinion and drive gear adjusted too tight.* Adjust pinion and gear (par. 164*b*).

(2) *Drive pinion set too deep in drive gear.* Adjust pinion and gear (par. 164*d*).
(3) *Drive pinion roller bearings loose or worn.* Adjust or replace roller bearings (par. 163*a* and *b*).

Section VI. REAR AXLE

31. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect for Lubricant Leakage. Visually inspect mating joints of rear axle housing cover and housing for evidence of lubricant leakage. Leakage at gasket joints may be caused by a damaged housing cover gasket or loose screws. Tighten all screws. If screws are tight and leakage continues, install a new housing cover gasket. Install new gasket, when possible, without removing rear axle from vehicle. Check drain and filler plugs in cover and housing for leakage. Tighten plugs, if necessary. If lubricant leakage is evidenced at brake drums, the inner and outer oil seals may be at fault. Replace oil seals as necessary. Inspect for lubricant leakage at axle end yoke. If leakage is evident, the drive pinion oil seal or drive pinion oil seal gasket may be damaged. Replace gasket or oil seal, if necessary.

c. Inspect for Failure of Rear Wheels to Revolve. Jack up rear wheels and spin wheels. If wheels fail to revolve, trouble may be caused by one of the following:
(1) *Damaged or seized differential pinions and side gears.* Replace faulty parts (pars. 163*b* and 181).
(2) *Broken axle shaft.* Replace (par. 183).
(3) *Damaged or seized drive pinion and drive gear.* Replace faulty parts (pars. 161 and 163*b*).
(4) *Seized rear axle shaft bearing.* Replace bearing (par. 183).

32. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. Rear Axle Noisy. Rear axle noise is usually apparent as a hum in moderate cases or as a growl in severe cases. Usually the tone of a rear axle noise changes when vehicle is coasting from the tone heard when engine is driving vehicle. Often a rear axle will be noisy when engine is driving vehicle while no noise will be heard coasting. Often, difficulties with rear axle shaft bearings, universal joints, or tires are improperly diagnosed as rear axle and differential noise. The possibility of an incorrect diagnosis of these troubles is great and must not

be disregarded when attempting a diagnosis and correction of rear axle noise.

(1) *Bearings in rear axle that support axle shaft are scored or rough.* Replace damaged bearings (par. 183).

(2) *Drive pinion and drive gear not correctly adjusted to provide proper tooth contact or backlash.* Correct adjustment (par. 181).

(3) *Drive pinion and drive gear not properly matched.* Replace with proper parts (pars. 180 and 181).

(4) *Drive pinion or drive gear teeth worn or chipped.* Replace faulty parts (pars. 180 and 181).

(5) *Improper drive gear backlash.* Adjust drive gear for backlash (par. 181).

(6) *Loose or worn differential or shaft bearings.* Adjust bearings, if possible. If bearings are worn, replace (pars. 181 and 183).

(7) *Lack of lubricant.* Lubricate as directed in TM 9–804A.

c. Rear Axle Binds. Binding of the rear axle shaft may be caused by damaged or seized differential gears and pinions. Replace faulty parts (par. 181). A damaged or seized drive pinion or drive gear can also cause the trouble. Replace faulty drive pinion and drive gear, as necessary (pars. 180 and 181).

Section VII. BRAKES

33. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect for Hydraulic Brake Fluid Leakage. Inspect entire service brake system for hydraulic brake fluid leakage. Inspect for signs of fluid leakage at master cylinder, wheel cylinder, and brake line connections. Correct leakage and fill master cylinder. Refer to TM 9–804A for correct procedure for filling master cylinder.

c. Inspect Brake System for Secure Mounting. Visually inspect all brake lines to see that they are securely connected, properly supported, and in good condition. Replace damaged lines and tighten loose connections (par. 64).

d. Check Brake Pedal Adjustment. Brake pedal must have ¼- to ½-inch free travel before pressure stroke starts. Adjust brake pedal travel, if necessary. Refer to TM 9–804A for brake pedal adjustment procedure. If the brake pedal strikes the floor plate when pressure is applied, adjust the brakes and bleed brake system. Refer to TM 9–804A for brake adjustment and bleeding procedure.

34. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. All Brakes Drag. If all brakes drag, and brake pedal is correctly adjusted (par. 33*d*), incorrect fluid is probably present in the hydraulic brake system. Mineral oil, for instance, in the system will cause cups to swell, and retard or prevent their action. Disassemble brake system and replace all cups (par. 186).

c. Severe Braking Action From Light Service Brake Pedal Pressure. A loose brake backing plate is one of the principal causes of severe braking action from light service brake pedal pressure. The brake backing plate must be tight to provide rigid support for the brakes. Tighten or replace brake backing plate.

Section VIII. SPRINGS AND SHOCK ABSORBERS

35. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect the Vehicle for Sagging. See if the vehicle sags to one side. Sagging of the vehicle may be caused by one of the following faults:

(1) *Shifted or broken springs.* Repair or replace, as necessary (pars. 197 and 198).

(2) *Shifted spring leaves.* Inspect for loose U-bolts. Tighten to torque of 50 to 55 pound-feet. Inspect for other damage that may have been caused by leaves that have slipped. Broken or fanned-out spring leaves may be caused by missing or broken rebound clips. Inspect rebound clips. Correct as required (pars. 197 and 198).

(3) *Broken spring shackle.* Replace shackle (ch. 4).

(4) *Broken spring pivot bolt.* Replace pivot bolt (ch. 4).

(5) *Broken center bolt.* Replace center bolt (par. 198*a* (1)).

c. Inspect the Vehicle for High Setting on One Side. If the vehicle sets high on one side, the spring assembly may have shifted on the axle assembly. Correct as necessary. Be sure U-bolts are securely tightened. High setting can also be caused by improper spring installation. Check and correct as necessary (par. 62).

d. Inspect the Vehicle for Proper Shock Absorber Installation. Check the shock absorbers for secure fastening to the spring clip plate and frame bracket. Make sure the stop nuts are tightened securely.

36. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. Unusual Spring Noise. A misalined frame can cause abnormal twist of springs which, in turn, can cause unusual and hard to locate noises. Straighten or replace frame.

Section IX. STEERING SYSTEM

37. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect for Lubricant Leakage. Visually inspect steering gear housing side cover gasket joint and steering gear housing upper cover shim for lubricant leakage. Leakage may be caused by loose side cover cap screws, loose steering gear housing upper cover bolts, or faulty upper cover oil seal. Tighten all cap screws and bolts. If leakage continues, install new housing cover gaskets or upper cover oil seal.

c. Inspect for Damaged Worm Bearings or Worm Shaft. Disconnect pitman arm from steering drag link (par. 55*a*). Turn steering wheel from one extreme to the other.

(1) If steering wheel is excessively loose, the steering gear may be improperly adjusted. Adjust steering gear. Refer to TM 9-804A for adjustment procedure. If adjustment does not correct malfunction, remove steering wheel (par. 48*c* (11)) and inspect for worn serrations on worm shaft or in steering wheel bore. Replace steering wheel or worm shaft, as necessary.

(2) If rough spots, bumps, noises, or hard steering are evidenced while turning steering wheel, the trouble may be caused by damaged or worn worm bearings, worm shaft, or other steering gear parts. Disassemble steering gear assembly (par. 202) and examine parts for damage and wear.

38. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 22*b* for the purpose and scope of these troubleshooting procedures.

b. Hard Steering. If the steering wheel turns excessively hard, the malfunction may be caused by one of the following:

(1) *Damaged or worn worm bearings or worm shaft.* Disassemble

steering gear assembly (par. 202) and examine for damaged or worn parts.

(2) *Bent drag link or tie rods.* Remove, repair, and/or replace damaged parts (pars. 206–208 and 212–214).

(3) *Steering knuckle flanges and related parts damaged.* Refer to paragraphs 155 through 157.

c. Loose Steering. Loose steering may be caused by improper adjustment, worn or damaged steering gear parts, worn or damaged steering knuckle flanges and parts, or loose steering wheel. Adjust steering gear, or disassemble (par. 202), and replace worn or damaged parts (par. 204). Refer to TM 9–804A for steering gear adjustment procedure.

d. Wander or Weaving. Wander or weaving can be caused by worn parts or improperly adjusted steering mechanism. Adjust steering gear, or remove (par. 55*b*), disassemble (par. 202), and replace worn parts. Refer to TM 9–804A for steering gear adjustment procedure.

Section X. WHEELS

39. Troubleshooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 22*a* for purpose of these inspections.

b. Inspect for Abnormal Wear of Front Tires. Excessive or abnormal wear of the front tires can be caused by one of the following:

(1) *Tire runout from sprung wheel.* Remove distorted wheel and replace. Refer to TM 9–804A for wheel replacement procedure.

(2) *Front wheel camber incorrect.* Replace front axle assembly (par. 62).

(3) *Front wheels toe in or out.* This condition may be caused by bent tie rod assemblies. Remove and repair, or replace tie rod assemblies (pars. 212–214).

(4) *Front springs loose, shifted, or broken.* Examine springs for proper mounting and damage. Correct malfunction as necessary (pars. 197 and 198).

c. Inspect for Abnormal Wear of Rear Tires. Abnormal wear of the rear tires can be caused by one of the following:

(1) *Distorted wheel.* Replace distorted wheel. Refer to TM 9–804A for wheel replacement procedure.

(2) *Rear axle assembly sprung or broken.* Examine rear axle assembly and apply corrective action as necessary (ch. 9).

(3) *Rear springs shifted, loose, or broken.* Examine springs for proper mounting and damage. Repair or replace broken or damaged parts (pars. 197*b* and 198*a*).

d. Inspect for Worn Tire Tread at Edges of Tires. Worn tire tread at edges of tires can be caused by improper front end alinement. Refer to TM 9–804A for procedure for checking wheel alinement. Damaged steering knuckle flanges and related parts may be causing the trouble. Apply corrective action as necessary (pars. 155–157). Inspect drag link and tie rod assemblies for bent condition. Remove, repair, and/or replace damaged parts (ch. 12).

40. Troubleshooting Before Removal and During Operation

a. General. If the inspections in the preceding paragraph do not reveal causes of failure and the vehicle is operable, then troubleshoot it. Refer to paragraph 21 for the purpose and scope of these troubleshooting procedures.

b. Front Wheel Wobble. Front wheel wobble may be caused by one of the following conditions:

(1) *Improperly alined front wheels.* Refer to TM 9–804A for procedure for alining front wheels.

(2) *Bent or loose tie rod assemblies.* Remove, repair, and/or replace damaged parts (ch. 12).

(3) *Damaged or worn steering knuckle flange caps and flange cap bearings.* Replace faulty parts (ch. 8).

CHAPTER 4

REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

Section I. DISASSEMBLY OF VEHICLE INTO MAJOR COMPONENTS

41. General

a. This section contains information for the guidance of personnel performing major rebuild work on the ¼-ton 4 x 4 utility truck M38A1. 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.

b. Prior to the disassembly procedures, drain the fuel tank. Refer to TM 9–804A for drainage instructions. It is not necessary to drain the cooling system, engine crankcase, transmission, transfer, and axle differentials.

c. Before proceeding with the disassembly operations, steam clean the entire vehicle. However, before cleaning or washing, inspect the vehicle for cracks in body, and loose or shifted assemblies. Damage of this kind is more evident when parts are dirty and dusty.

d. After cleaning, again inspect vehicle for damage, missing, loose, or shifted assemblies and leaks. Make notes of the faulty parts or assemblies for reference during the rebuild operations.

42. Remove Hood

(fig. 10)

a. Unhook hood catch (A) on each side of hood.

b. Raise hood until slots in hood hinges (B) (cowl halves) are alined with flat faces of hood hinge pins (C). Lift rear of hood up, and remove from top of engine compartment.

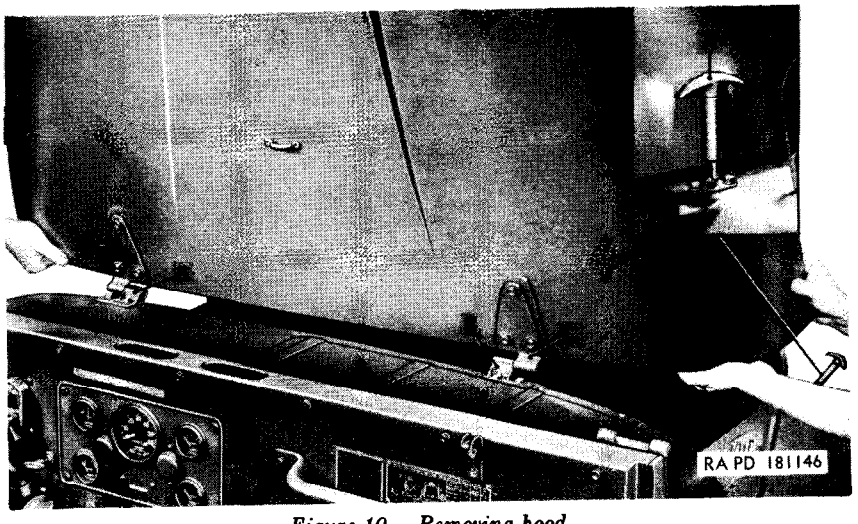

Figure 10. Removing hood.

43. Remove Windshield Assembly

a. Pull windshield wiper hose (A, fig. 11) from air regulating valve (B, fig. 11).

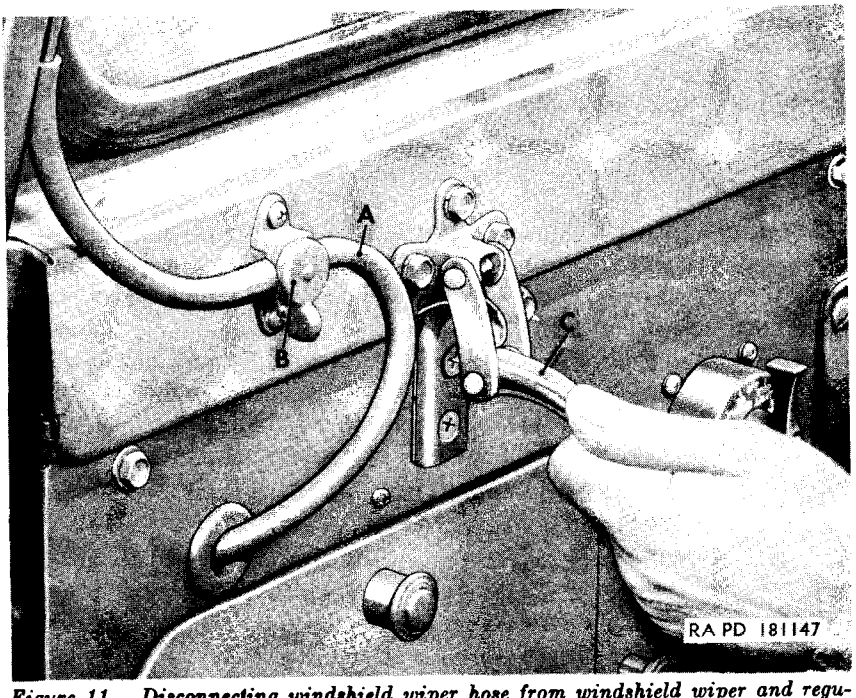

Figure 11. Disconnecting windshield wiper hose from windshield wiper and regulating valve.

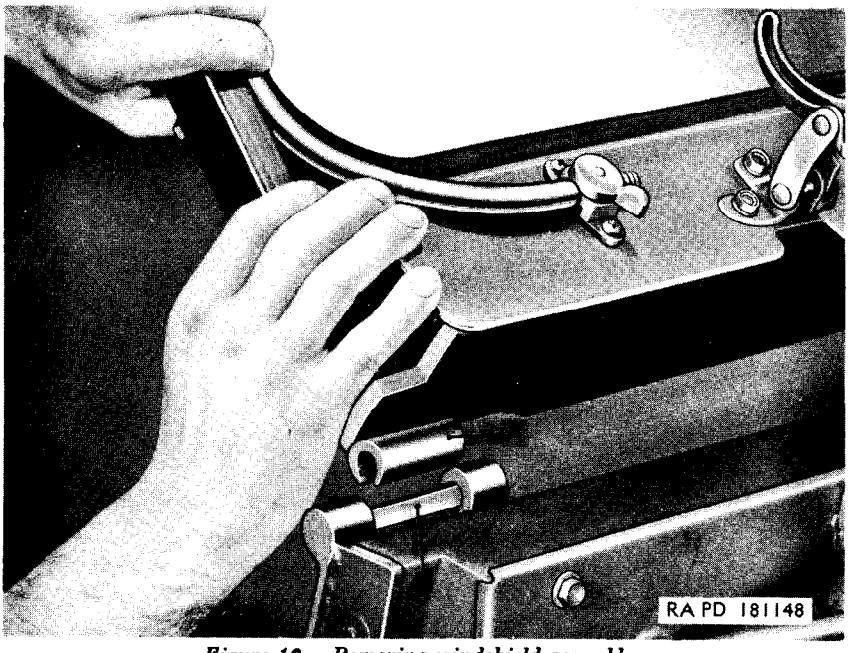

Figure 12. Removing windshield assembly.

b. Unhook windshield lock (C, fig. 11) at each side of windshield assembly. Lower windshield assembly forward until slots in male half-hinges (A, fig. 12) aline with flat faces of female half-hinges (cowl halves) (B, fig. 12). Slip female half-hinges off pins and remove windshield assembly from body.

44. Remove Batteries

(fig. 13)

Caution: Exercise extreme caution while performing maintenance operations relative to the electrical components of this vehicle. Hand jewelry (rings, watches, etc.) should be removed to prevent injury by burns which can be encountered from the 24-volt system.

a. Loosen eight thumb screws (A). Slip cowl battery box lid (B) free of screws and lift lid from body.

b. Disconnect ground cable (circuit number 7) by loosening terminal nut (G). Slip ground cable terminal off battery negative post (C).

Caution: Be sure to disconnect ground cable first.

Remove nut and remove terminal (H) from cable

c. Disconnect battery to starter cable terminal (circuit number 82) (D) from battery positive post in same manner as given in *b* above.

d. Loosen the two battery terminal nuts (F) and remove connecting cable (circuit number 68) (L) from battery negative and positive posts.

e. Remove four front holddown frame nuts (J). Lift the two holddown frames (E) from batteries. Remove the two batteries (K).

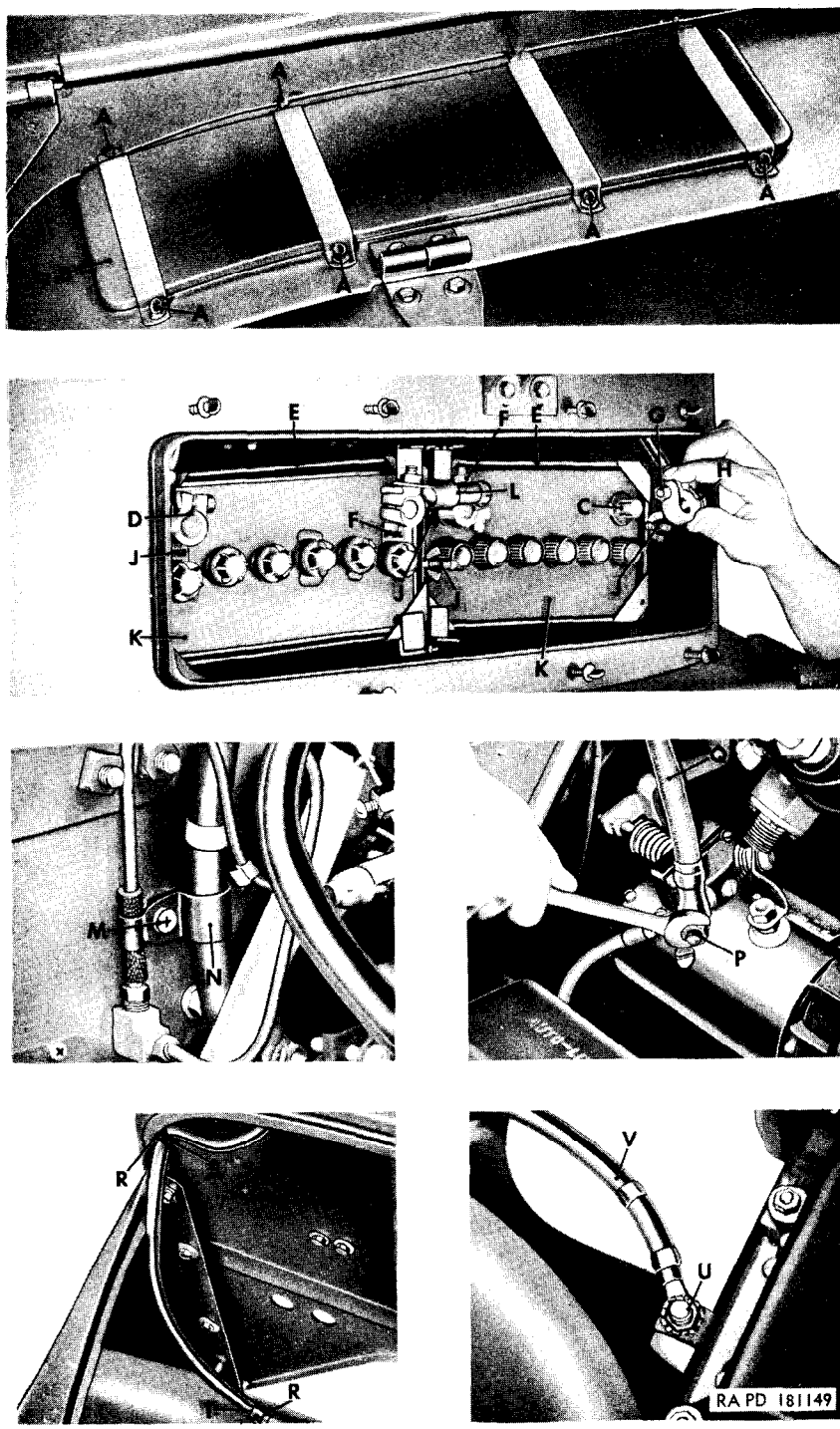

Figure 13. Battery disconnect points.

f. Remove lockwasher screw (M) and positive cable-to-dash clip (N) from dash panel. Remove lockwasher and nut (P) and pull battery-to-starter cable (Q) from starter switch. Pull cable from battery box.

g. Remove two lockwasher screws (R) securing negative cable to dash clip (S) and negative cable to splash apron clip (T). Remove ground cable-to-frame bolt and two ground cable-to-frame lockwashers (U).

Note. Washers are installed on each side of cable clip.

Pull ground cable (V) from battery box.

45. Remove Spare Wheel and Tire Assembly

(fig. 14)

a. Remove three spare wheel to carrier stud nuts (A).

b. Remove spare wheel and tire assembly (B) from spare wheel support bracket.

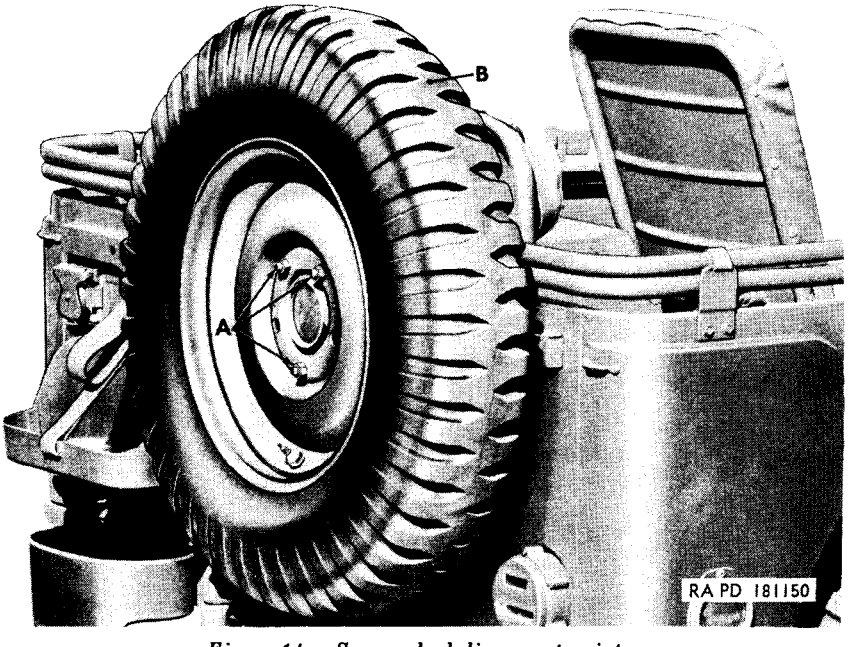

Figure 14. Spare wheel disconnect points.

46. Remove Fenders

(fig. 15)

a. Left Fender

(1) Disconnect two electrical cables (circuit number 25) (A) from horn assembly. Disconnect electrical cable (circuit

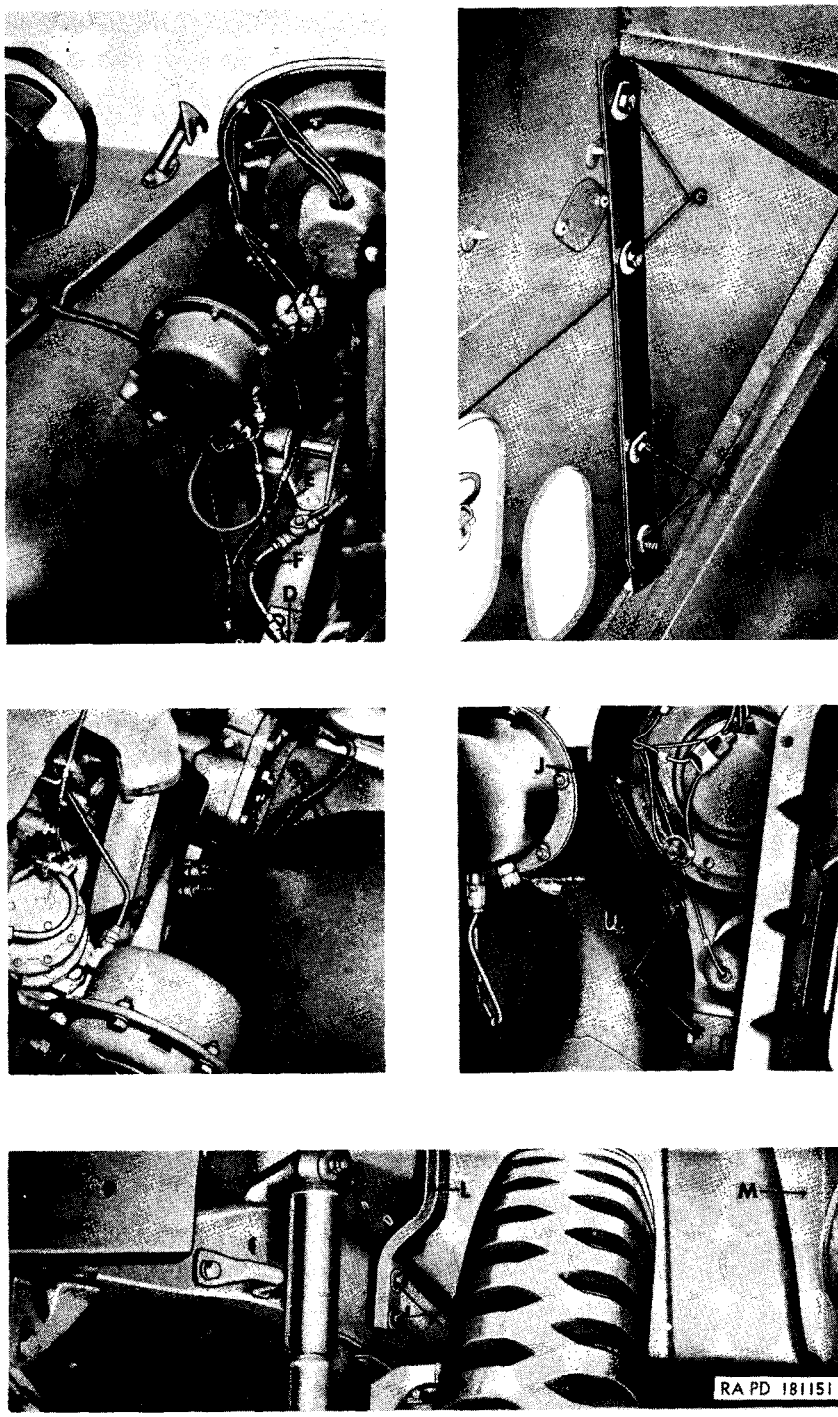

Figure 15. Fender removal points.

number 19) (B) from blackout driving light. Disconnect three electrical cables (circuit numbers 17, 18, and 20) (C) from headlight and signal blackout marker and service parking lights.

(2) Lift wiring harness from six open type clips (E). Pull fuel line (D) from push-on-type clip (F).

(3) Disconnect two electrical cables (circuit number 25) (H).

(4) Remove four lockwasher screws (G) securing rear of fender to front of body cowl.

Note. Three screws are accessible from inside of engine compartment. The other is accessible from beneath body.

(5) Remove three lockwasher screws (J) which secure front of fender to radiator guard assembly.

Note. Two bolts are accessible from inside the engine compartment. The other is accessible from under fender.

(6) Remove two lockwasher screws and flat washers (K) which secure fender brace (L) to frame.

(7) Lift left front fender (M) from body. Remove front fender to cowl side panel anti-squeak webbing.

b. Right Fender. The right fender is removed in the same manner as the left except that no electrical cable disconnects must be made.

47. Remove Radiator Guard Assembly

(fig. 16)

a. Remove two bolts and radiator-to-guard panel clips (A) on each side of radiator (B).

b. Swing radiator guard assembly forward until slots in radiator guard hinges aline with flat faces of radiator guard right and lift hinge pins (frame bracket halves). Slip hinges off pins and remove radiator guard assembly from vehicle.

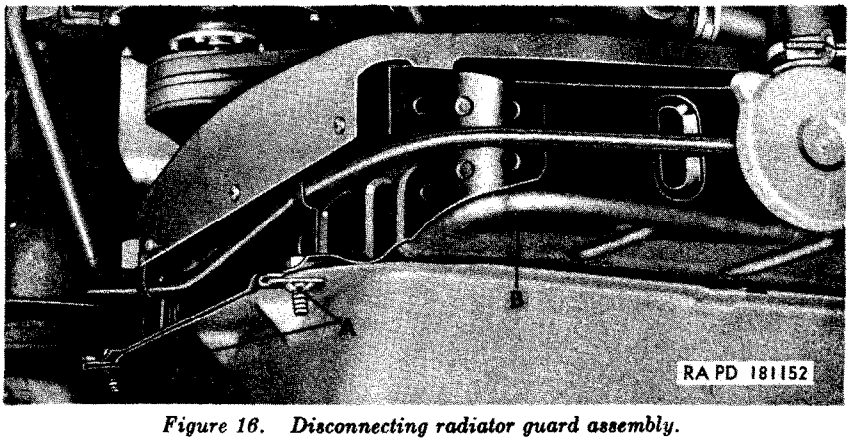

Figure 16. Disconnecting radiator guard assembly.

48. Remove Body From Frame

a. Make Disconnects at Right Side of Engine (fig. 17).

(1) *Remove air cleaner.* Loosen hose clamps (A) and remove carburetor-to-air cleaner pipe hose (B). Disconnect air cleaner-to-dash tee vent line (C). Disconnect fuel tank-to-air cleaner vent line (D). Remove four cap screws and lockwashers (E) and remove air cleaner assembly (F).

(2) *Disconnect distributor to generator regulator cable.* Unscrew electrical cable coupling nut (H) at distributor with coil assembly (G) and disconnect cable to generator regulator (circuit number 12) from distributor with coil assembly.

(3) *Disconnect generator regulator and battery to starter cables.* Remove nut and lockwasher (K). Remove the generator regulator and battery to starter cables (J and L) from starter switch.

Note. Removal of starter cable was described in paragraph 44. Illustrating it in this sequence serves for location purposes.

(4) *Disconnect generator regulator cable to generator regulator.* Unscrew small cable connector coupling nut (M) at front of generator regulator assembly. Disconnect the cable connection. Pull wiring harness (N) free of open clip (P).

(5) *Disconnect air cleaner-to-dash tee vent line and wiring harness from dash panel.* Remove lockwasher screw and nut (Q).

Note. Nut is at rear of dash panel.

Pull closed clips (R and S) away from dash panel. Separate the wiring harness clip (R) from vent line clip (S).

(6) *Disconnect electrical cables from sending units.* Disconnect electrical cables (circuit numbers 33 and 36) (T and U) from engine water temperature sending unit and engine oil pressure sending unit respectively.

(7) *Disconnect crankcase control vent valve.* Straighten bent end of crankcase control vent valve wire (V). Loosen bolts (W) and (Y). Pull crankcase control vent valve wire (V) and conduit (Z) from crankcase valve control wire swivel (AA) and crankcase control vent valve clamp (BB).

(8) *Disconnect choke control wire.* Straighten bent end of choke control wire (CC). Loosen bolts (DD and EE). Pull choke control wire (CC) and choke control conduit (FF) from choke control wire clamp and choke control conduit clamp.

(9) *Disconnect throttle control wire.* Straighten bent end of throttle control wire (GG). Loosen bolts (HH and JJ). Pull throttle control wire (GG) and throttle control conduit (KK) from hand throttle control wire clamp and throttle control conduit clamp.

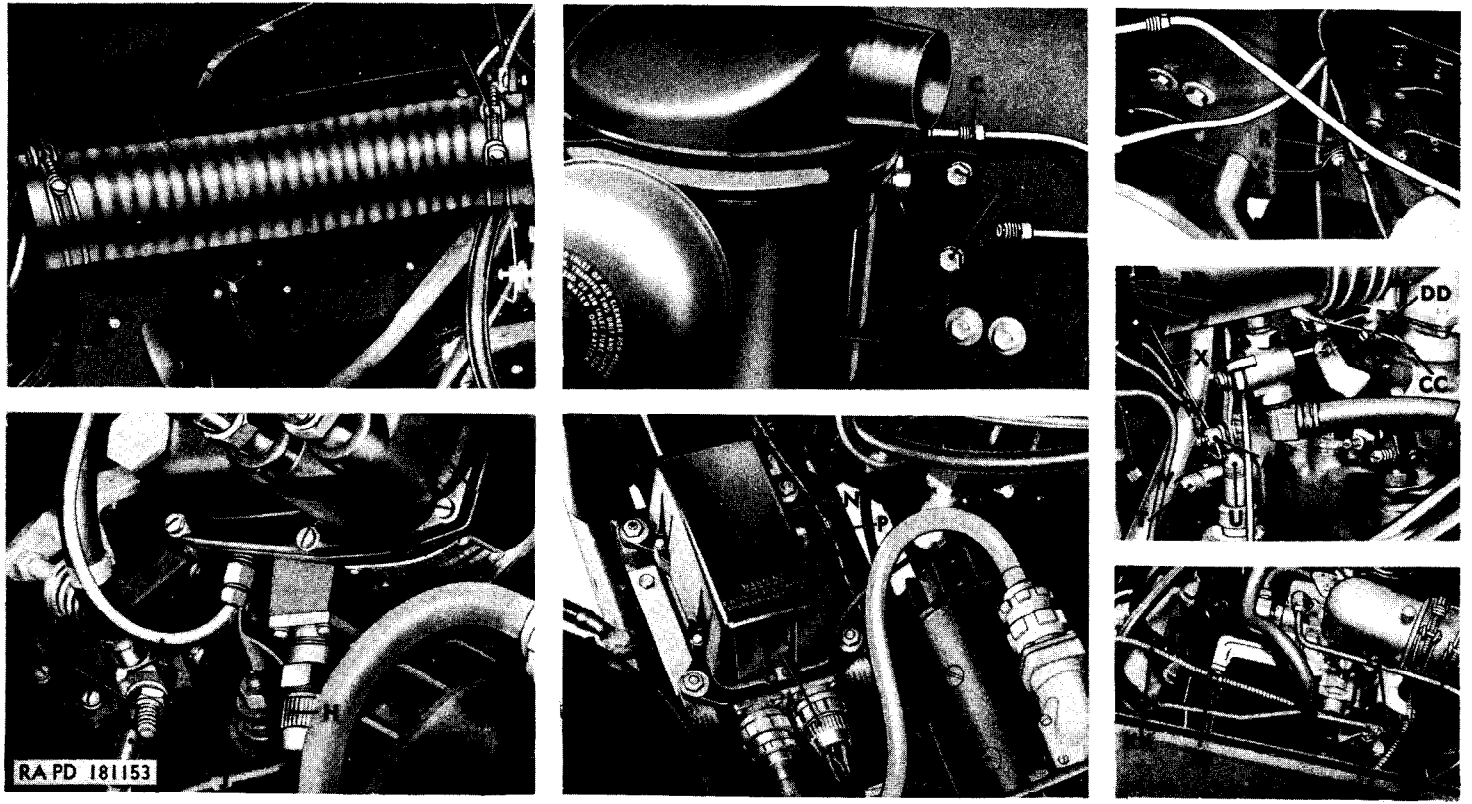

Figure 17. Disconnects at right side of engine.

b. Make Disconnects at Left Side of Engine.

(1) *Disconnect crankcase vent metering valve* (fig. 18). Straighten bent end of crankcase vent metering valve wire (A). Loosen bolts (B). Pull crankcase vent metering valve wire (A) and conduit (C) from crankcase vent metering valve swivel (D) and clamp (E).

(2) *Disconnect tee-to-windshield wiper line* (fig. 18). Disconnect the tee-to-windshield wiper line (F) from vacuum pump line (G).

(3) *Disconnect accelerator pedal* (fig. 18). Remove plain nut (H). Pull accelerator bellcrank link rod (J) from lower accelerator bellcrank (K) and into drivers compartment.

(4) *Disconnect master brake cylinder vent line* (fig. 18). Disconnect master brake cylinder vent line (L). Remove lockwasher screw (M) and pull master brake cylinder vent line-to-dash clip (N) away from dash panel.

(5) *Disconnect electrical cables* (fig. 19). Disconnect electrical cables (circuit numbers 18, 16, and 17) (P, M, and L) from headlight foot dimmer switch (N).

(6) *Remove dash panel cable access plate* (fig. 19). Remove four lockwasher screws (G). Remove dash panel cable access

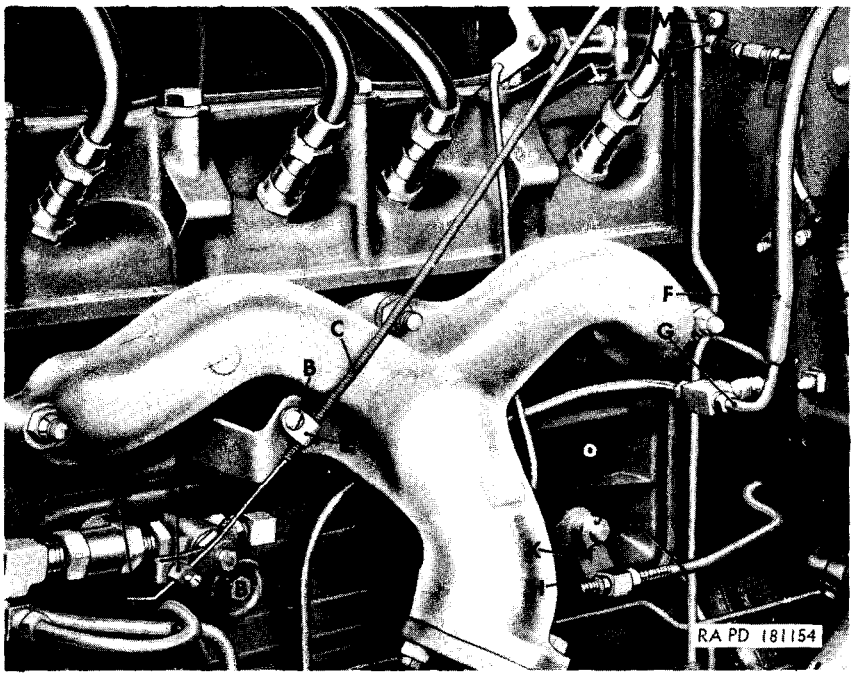

Figure 18. Disconnect points at left side of engine.

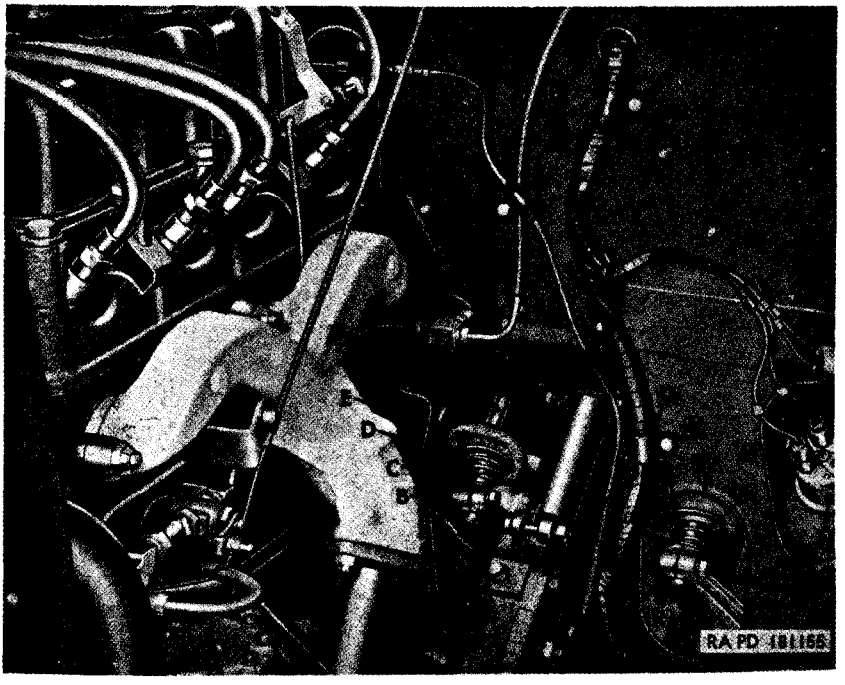

Figure 19. Disconnect points at left side of engine.

plate (H) from dash panel. Remove wiring harness grommet (J) from access plate.

Note. Clip (K) is secured by lower right access plate screw.

Remove lockwasher screw (V) and pull clip fastener (U) from dash panel.

(7) *Disconnect brake pedal pad* (fig. 19). Remove bolt and lockwasher (A). Pull brake pedal pad (F) from brake pedal (B). Remove draft pad spring (C), draft pad flat washer (D), and draft pad (E).

(8) *Disconnect clutch pedal pad* (fig. 19). Remove bolt and lockwasher (Q). Pull clutch pedal pad (R) from clutch pedal (S). Remove pedal draft pad spring (X), pedal draft pad washer (T), and pedal draft pad (W).

c. Make Disconnects Inside of Driver's Compartment.

(1) *Disconnect instrument cluster from instrument panel* (fig. 20). Turn the four instrument cluster mounting plate studs (A) a quarter turn counterclockwise. Pull instrument cluster (B) as far from instrument panel (C) as cable lengths will permit.

(2) *Disconnect electrical cables to instrument cluster and panel* (fig. 20). Disconnect electrical cables at bell connectors (circuit numbers 7, 11, 15, 25, and 40) (D, E, F, G, and H).

Note. Cables 7 and 40 connect to instrument cluster. Cable 11 connects to ignition switch. Cables 15 and 25 connect to cable 10 which connects to engine circuits.

Unscrew electrical cable coupling nut (J) and disconnect light switch wiring harness (K). Pull wiring harness out into engine compartment by pulling it through opening presented by removal of dash panel cable access plate (*b*(6) above).

(3) *Disconnect speedometer flexible shaft assembly* (fig. 20). Unscrew coupling nut (L). Pull speedometer shaft core from speedometer. Pull speedometer flexible shaft assembly (M) through instrument and dash panels. Remove rubber grommet (N) from dash panel.

(4) *Remove transfer high and low range gearshift lever and front wheel drive lever knobs* (fig. 20). Unscrew the lever knobs (P and Q) from transfer high and low range gearshift lever (R) and front wheel drive lever (S).

(5) *Remove transfer levers to floorboard boot* (fig. 20). Remove four sheet metal screws (T). Remove lever housing cover boot ring (U) and transfer levers to floorboard boot (V).

(6) *Remove steering gear jacket access plate* (fig. 20). Remove four lockwasher screws (W) Remove the two halves of the steering gear jacket access plate (X). Remove the steering jacket access plate seal (Y).

(7) *Remove master brake cylinder inspection cover* (fig. 20). Remove four lockwasher screws (Z). Remove master brake cylinder inspection cover (AA).

(8) *Remove upper front floor pan cover* (fig. 21). Remove 13 lockwasher screws (A). Remove upper front floor pan cover (C) and toe board steering gear jacket access plate (B).

(9) *Remove lower front floor pan cover* (fig. 21). Remove 11 lockwasher screws (D). Remove the lower front floor pan cover (E).

(10) *Disconnect handbrake rod* (fig. 21). Remove cotter pin (F) and two plain washers (G). Slip handbrake rod (J) free of the handbrake assembly (H).

(11) *Remove steering wheel.* Remove rubber horn button cap from steering wheel nut. Remove horn disk button. Remove steering wheel nut and remove steering wheel.

(12) *Remove mounting tube jacket to instrument panel clamp* (fig. 21). Remove two lockwasher bolts and plain nuts (K). Remove mounting tube jacket to instrument panel clamp (L). Remove liner (M).

d. Disconnect Body From Frame. Refer to figure 22 for general location of body holddown brackets and other disconnect points at bottom of body. Figures 23 and 24 illustrate the points in detail.

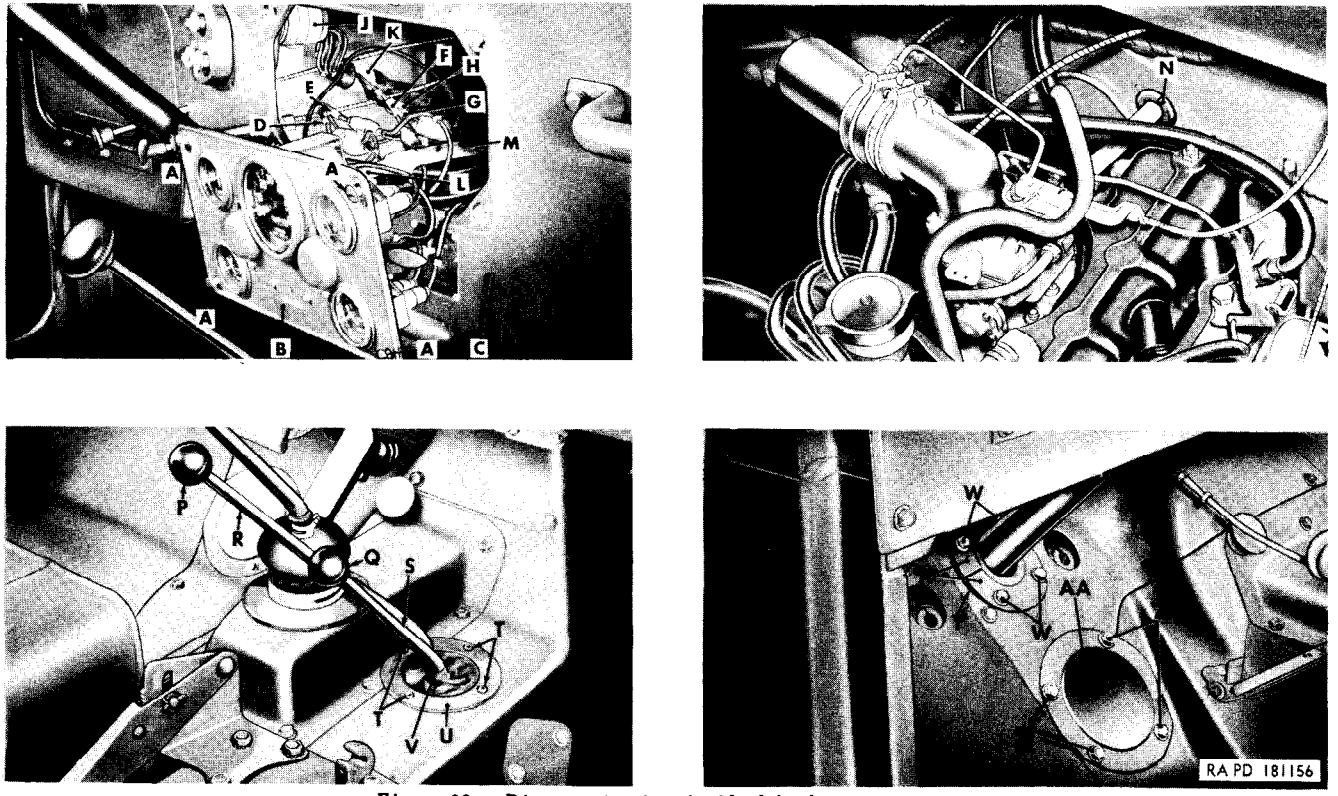

Figure 20. Disconnect points inside driver's compartment.

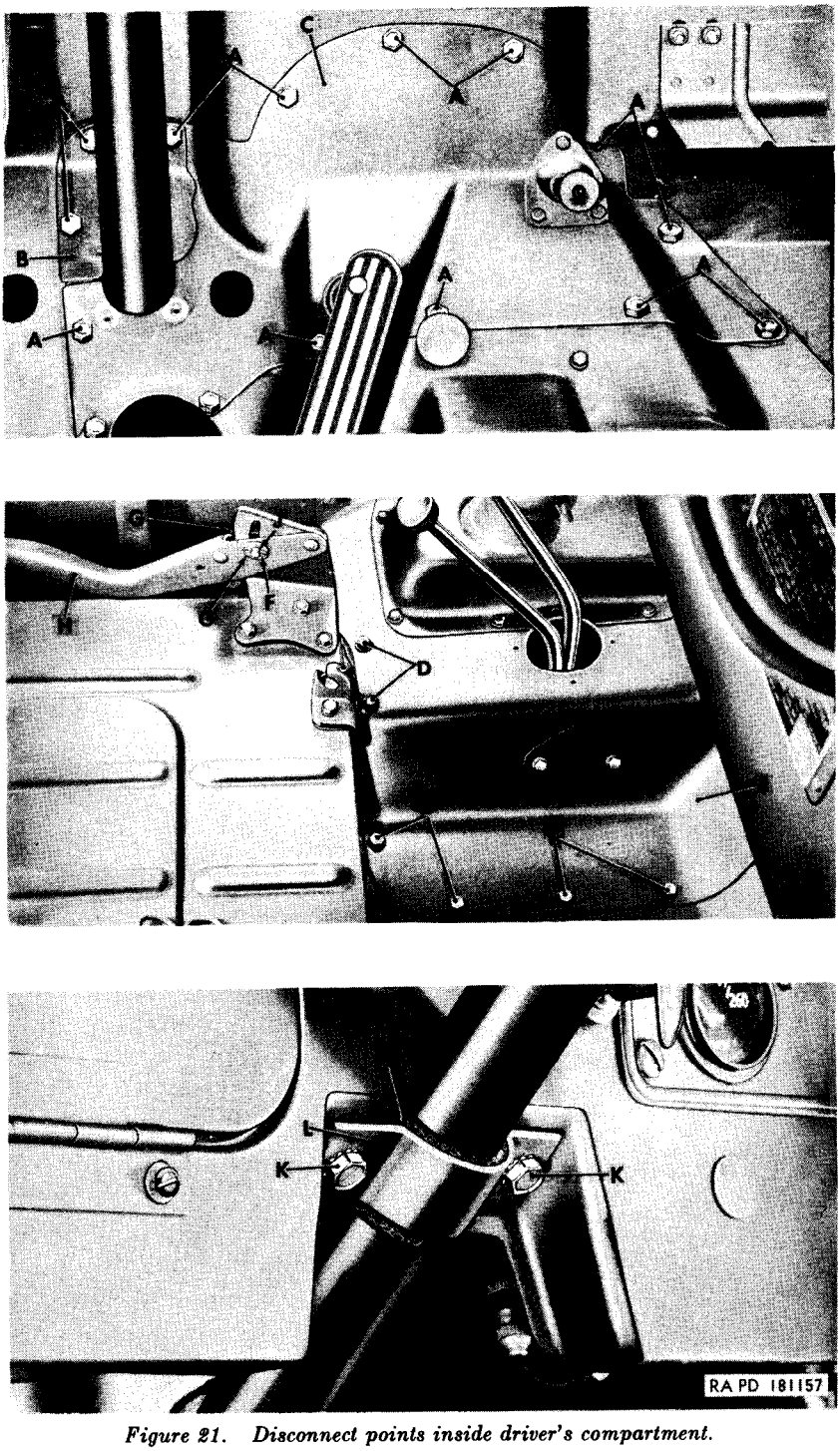

Figure 21. Disconnect points inside driver's compartment.

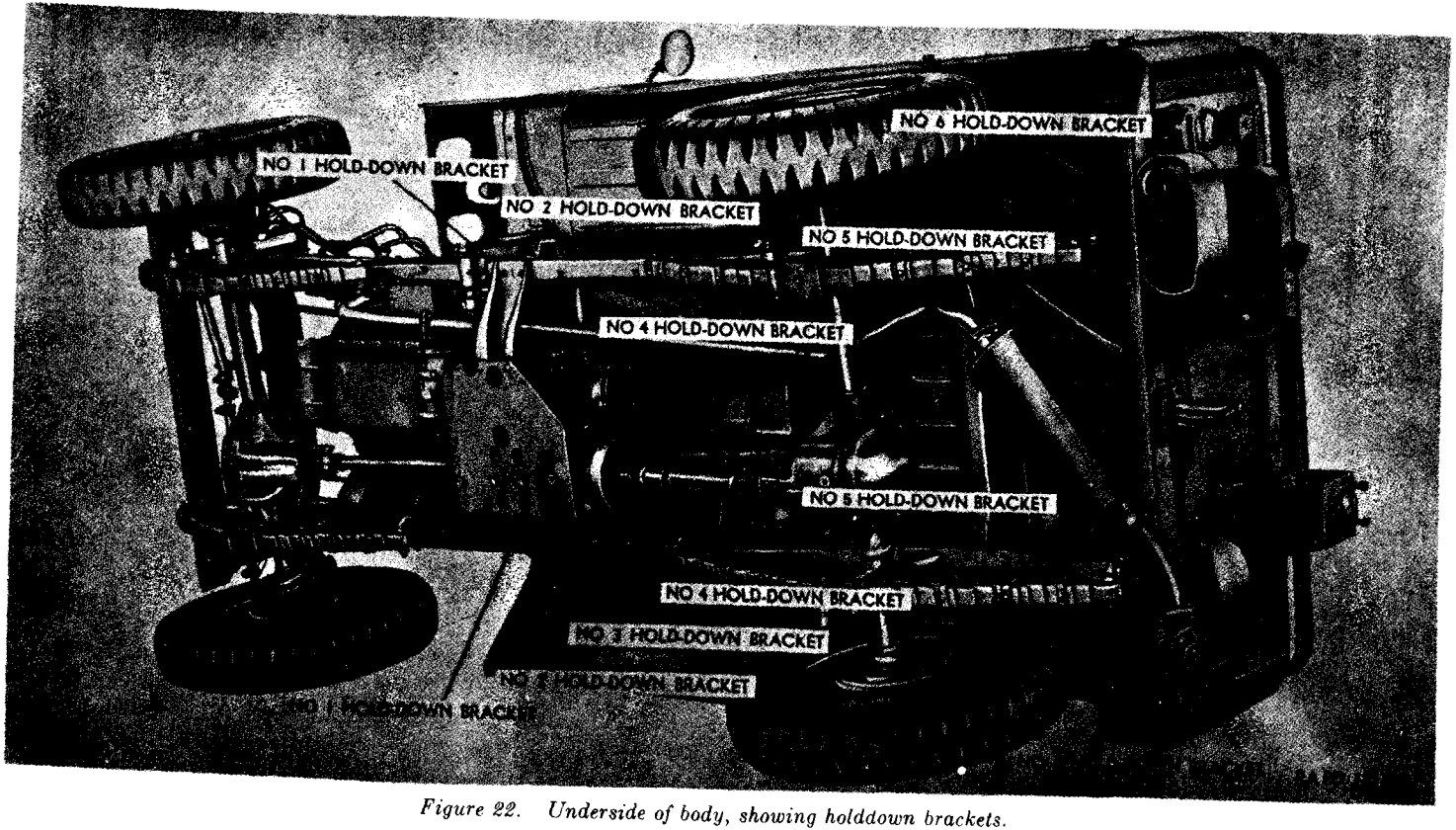

Figure 22. Underside of body, showing holddown brackets.

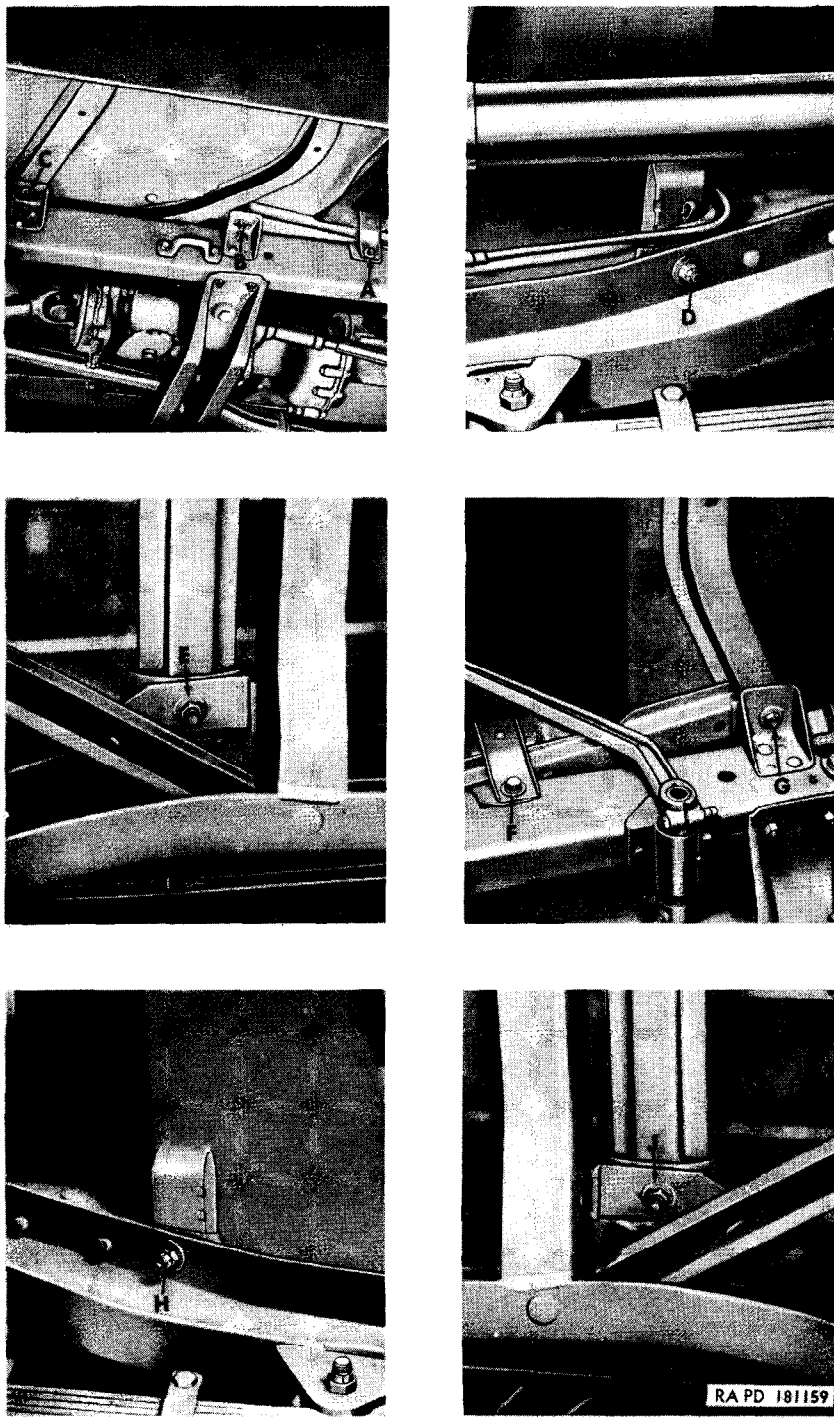

Figure 23. Body holddown brackets.

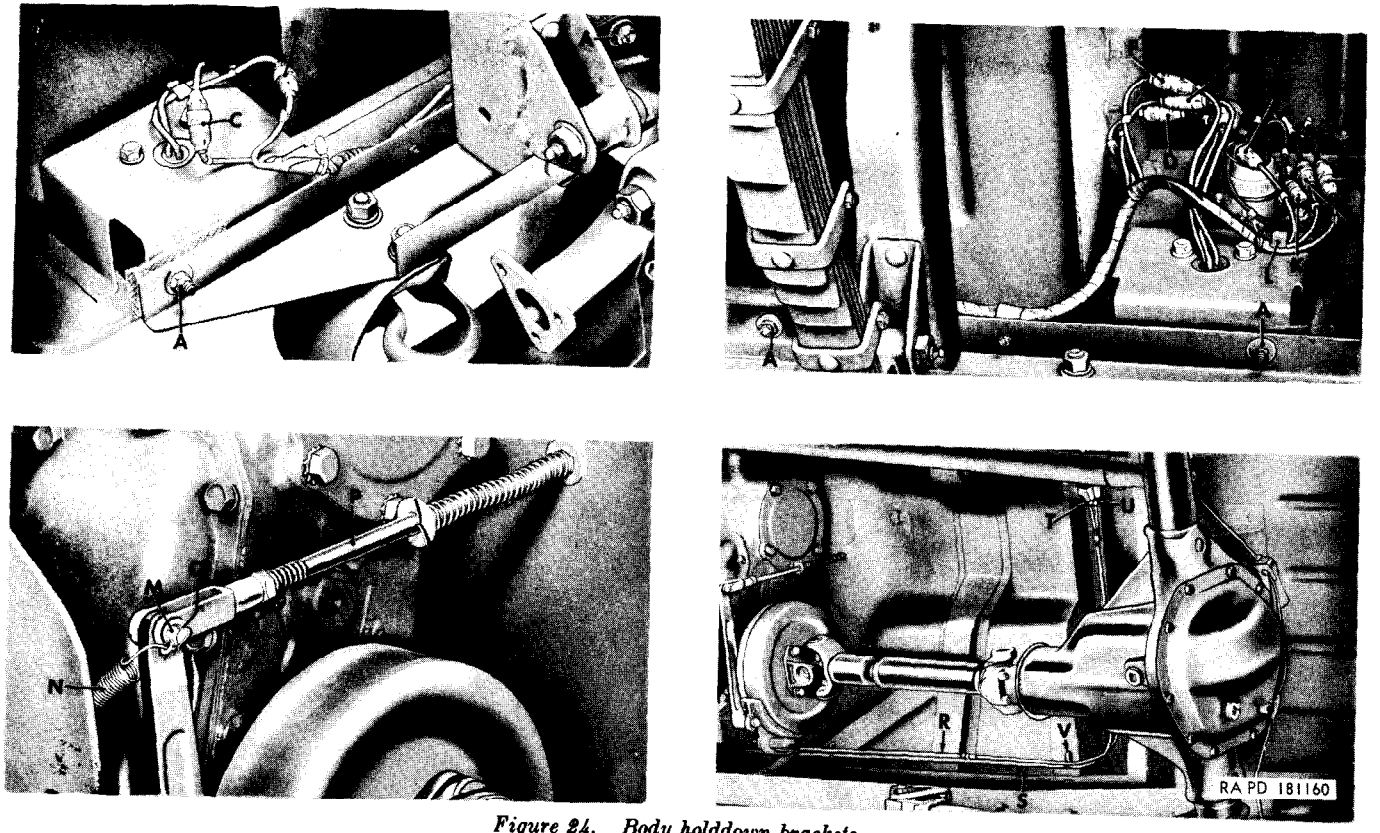

Figure 24. Body holddown brackets.

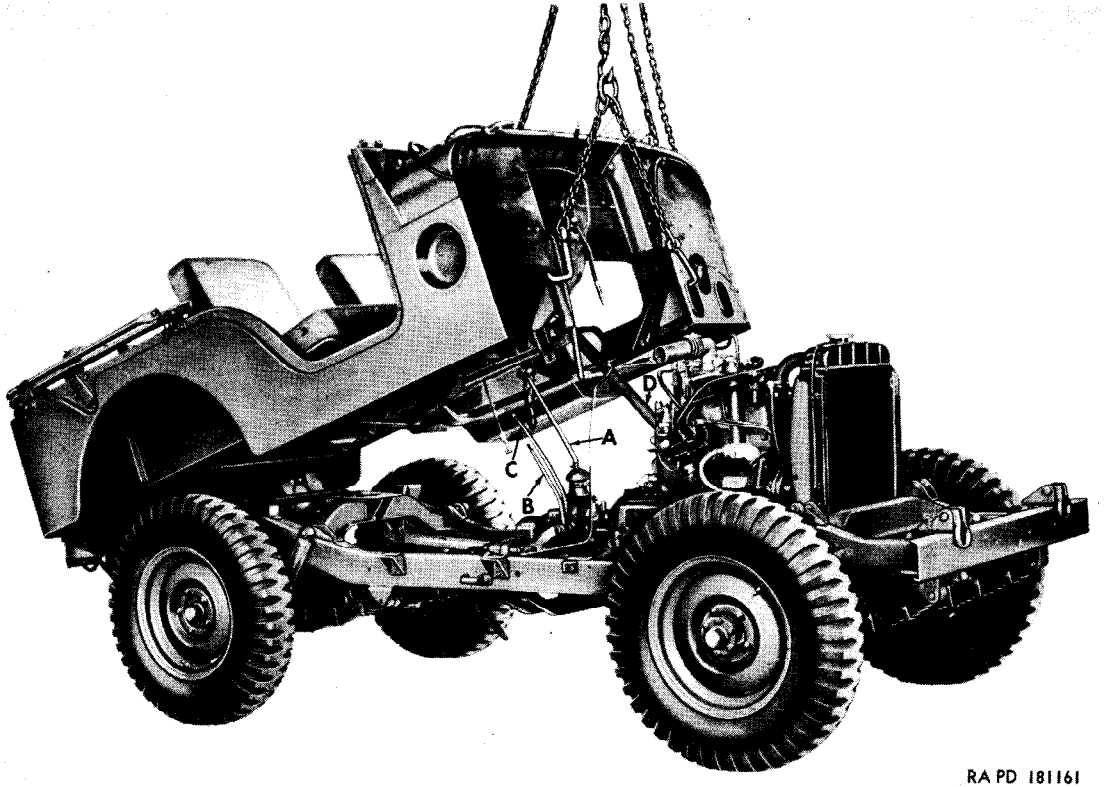

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Figure 25. Front of body lifted from frame.

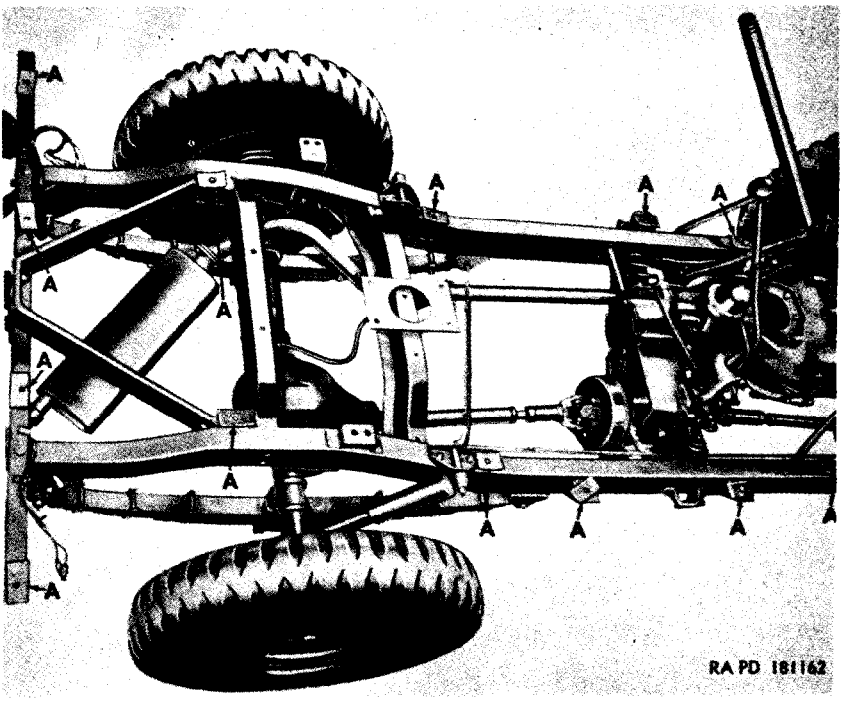


Figure 26. Body cushions and mounting bracket shims.

(1) *Remove right-side body holddown brackets* (fig. 23). Remove bolt, flat washer, and lockwasher (A) at number 1 body holddown bracket. Remove 3 bolts, 3 self-locking nuts, and 6 flat washers (B, C, and D) from numbers 2, 3, and 4 holddown brackets.

Note. Bolts for holddown brackets numbers 2 and 3 are accessible from right driver's compartment and tool box respectively. Remove square-neck bolt, self-locking nut, and lockwasher (E) from number 5 holddown bracket.

(2) *Remove left-side body holddown brackets* (fig. 23). Disconnect the left side of body from frame at the number 1, 2, 4, and 5 holddown brackets (F, G, H, and J) in same manner as described for the right side. However, number 3 body holddown bracket is omitted on left side.

(3) *Remove rear body holddown brackets* (fig. 24). Remove 4 bolts, self-locking nuts, and 8 flat washers (A) at number 6 body holddown brackets. Disconnect electrical cables (circuit numbers 23 and 24) (C and B) to service tail and stoplight. Disconnect electrical cables (circuit numbers 21, 22, and 24) (D, E, and F) from blackout tail and stoplight. Pull wiring harness from open clip (L). Disconnect electrical cables

(circuit numbers 21, 22, 23, and 24) (G, H, J, and K) to trailer coupling receptacle.

(4) *Make disconnects at bottom of body* (fig. 24). Remove retracting spring (N). Remove cotter pin (Q) and clevis pin (M). Pull hand brake rod (P) through hold in body. Disconnect fuel tank-to-air cleaner vent line (R) at flared tube elbow (U). Disconnect fuel line (S) at flared tube elbow (T). Pull fuel line from push-on-type clip (V).

Note. Tie free ends of vent and fuel lines to rear propeller shaft to prevent damage during body removal.

(5) *Lift body from frame* (fig. 25). Attach a suitable sling to dash panel. Raise front end of body until opening in front floor panel clears transmission gearshift hand lever (A), transfer gearshift high and low range lever (B), front wheel drive lever (C), and steering gear jacket (D). Have two men lift rear of body while another pushes chassis out from under body. When chassis is clear of body, lower rear of body on floor or suitable support and then lower front end of body. Remove the 15 body mounting bracket shims and body mounting cushions (fig. 26).

49. Remove Generator Regulator Assembly

(fig. 27)

Remove four lockwasher screws (A). Remove generator regulator assembly (B) and mounting bracket from support.

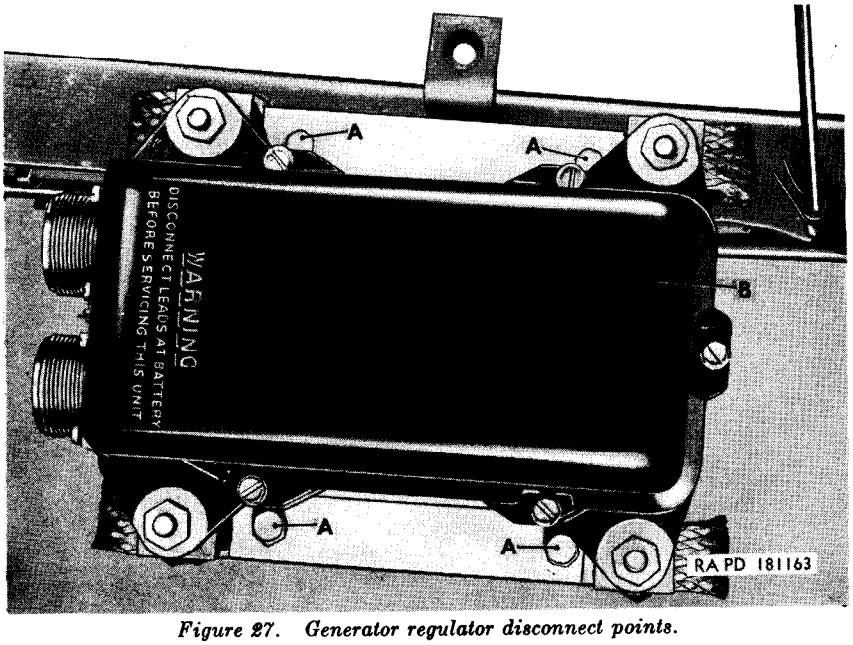


Figure 27. Generator regulator disconnect points.

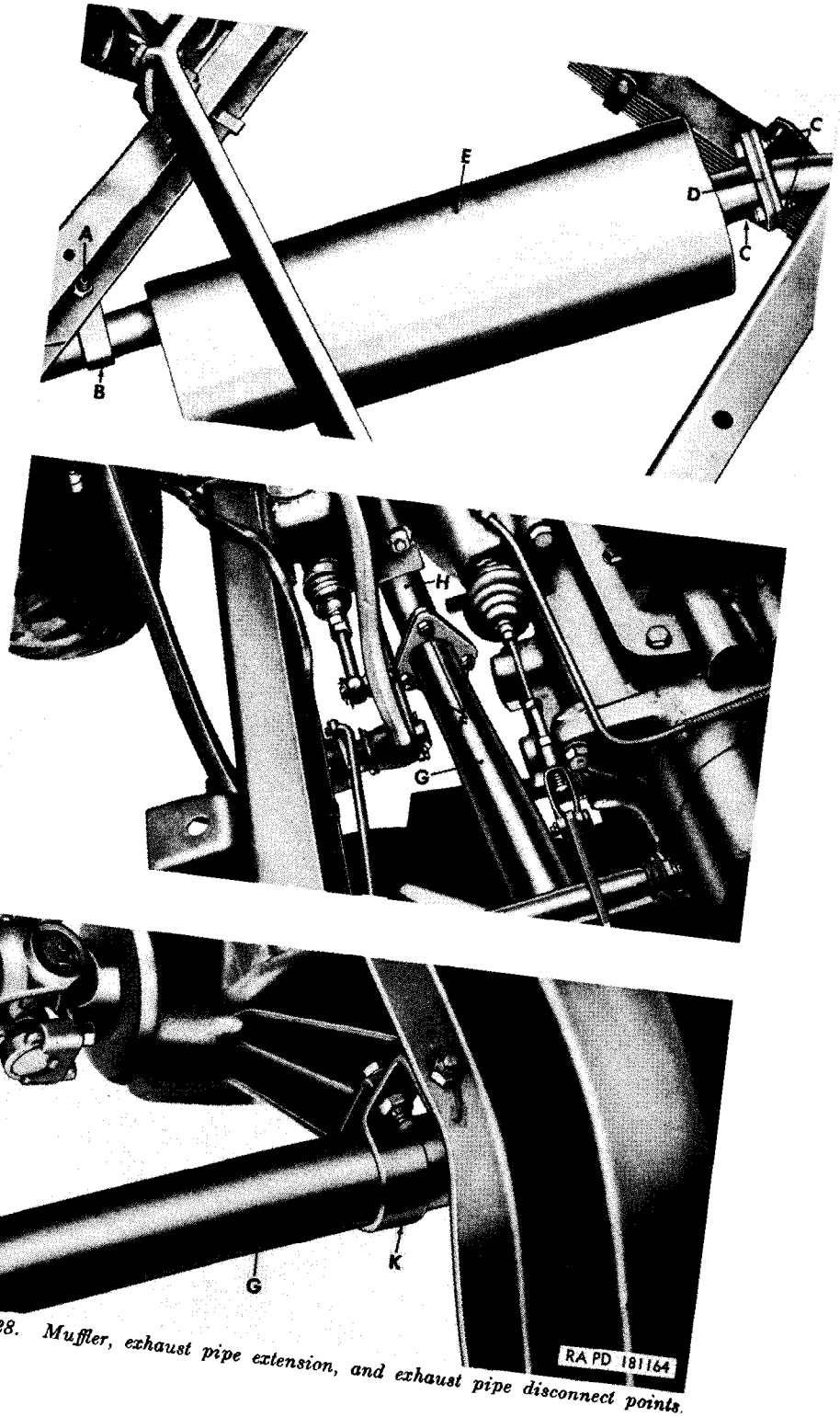


Figure 28. Muffler, exhaust pipe extension, and exhaust pipe disconnect points.

50. Remove Muffler, Exhaust Pipe, and Exhaust Pipe Extension
(fig. 28)

a. Remove Exhaust Muffler. Remove bolt and plain nut (A) securing muffler support clamp bracket (B) to frame rear crossmember. Remove three bolts and plain nuts (C) securing exhaust muffler and exhaust pipe flanges. Remove extension to muffler flange gasket (D). Remove exhaust muffler (E).

b. Remove Exhaust Pipe Extension. Remove three bolts and plain nuts (F) securing exhaust pipe to extension (G) to exhaust pipe (H). Remove exhaust pipe to extension gasket. Remove bolt and plain nut (J) securing exhaust pipe extension support bracket (K) to frame crossmember. Remove exhaust pipe extension (G).

51. Remove Propeller Shafts
(fig. 29)

a. Front Propeller Shaft. Remove eight safety nuts (A and C). Remove four universal joint journal bearing U-bolts (B). Push slip yoke on propeller shaft to collapse shaft assembly and remove shaft (D) from transfer and front axle.

b. Rear Propeller Shaft. Remove four safety nuts (E). Remove four plain nuts and lockwashers (F). Pry rear propeller shaft to transfer flange yoke (G) free of transfer companion flange with slinger assembly (H). Push slip yoke on propeller shaft to collapse shaft assembly and remove shaft (J) from transfer and rear axle.

52. Remove Power Plant
(fig. 30)

The power plant, consisting of radiator, engine, engine accessories, clutch, transmission, and transfer, is removed as a unit from the chassis. For removal of transmission and transfer, refer to TM 9–804A. To remove power plant from chassis, proceed as follows:

a. Remove Speedometer Flexible Shaft With Core and Casing Assembly. Unscrew coupling nut (A). Pull speedometer flexible shaft with core and casing assembly (B) from transfer. Remove pan head lockwasher screw and plain nut (C). Free flexible shaft retaining clip (D) from frame side rail. Remove speedometer flexible shaft.

b. Attach Sling to Power Plant. Attach a suitable sling to lifting hook provided on top of engine. Tighten sling slightly to relieve strain on power plant mounts.

c. Disconnect Transfer From Engine Rear Support Crossmember. Unscrew plain nut (E) and remove flat washer (F), case support insulator (G), case support insulator snubber bolt (H), case support insulator snubber, and case support insulator washer.

Note. Case support insulator snubber, insulator washer, and bolt are removed from bottom of engine rear support crossmember.

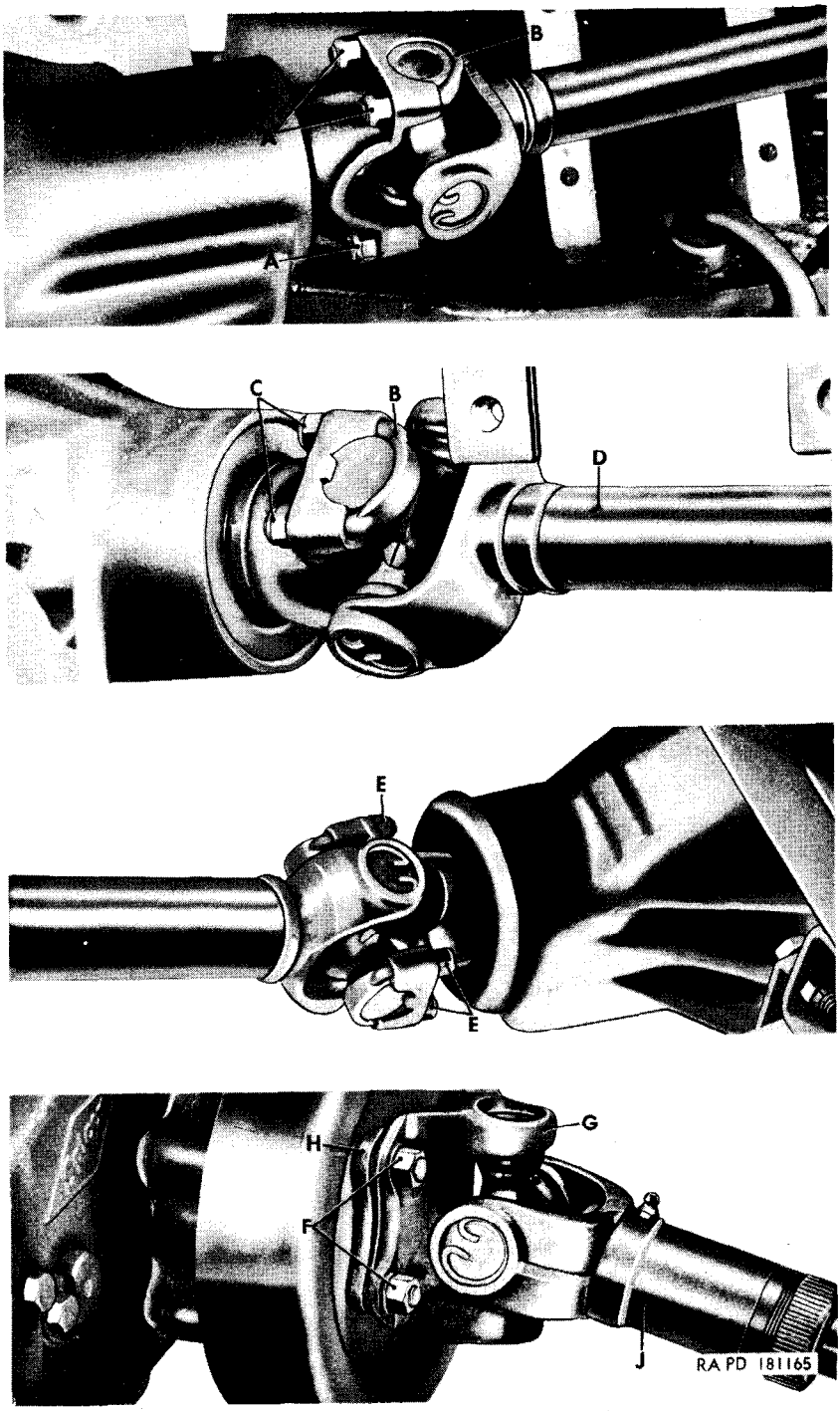


Figure 29. Propeller shaft disconnect points.

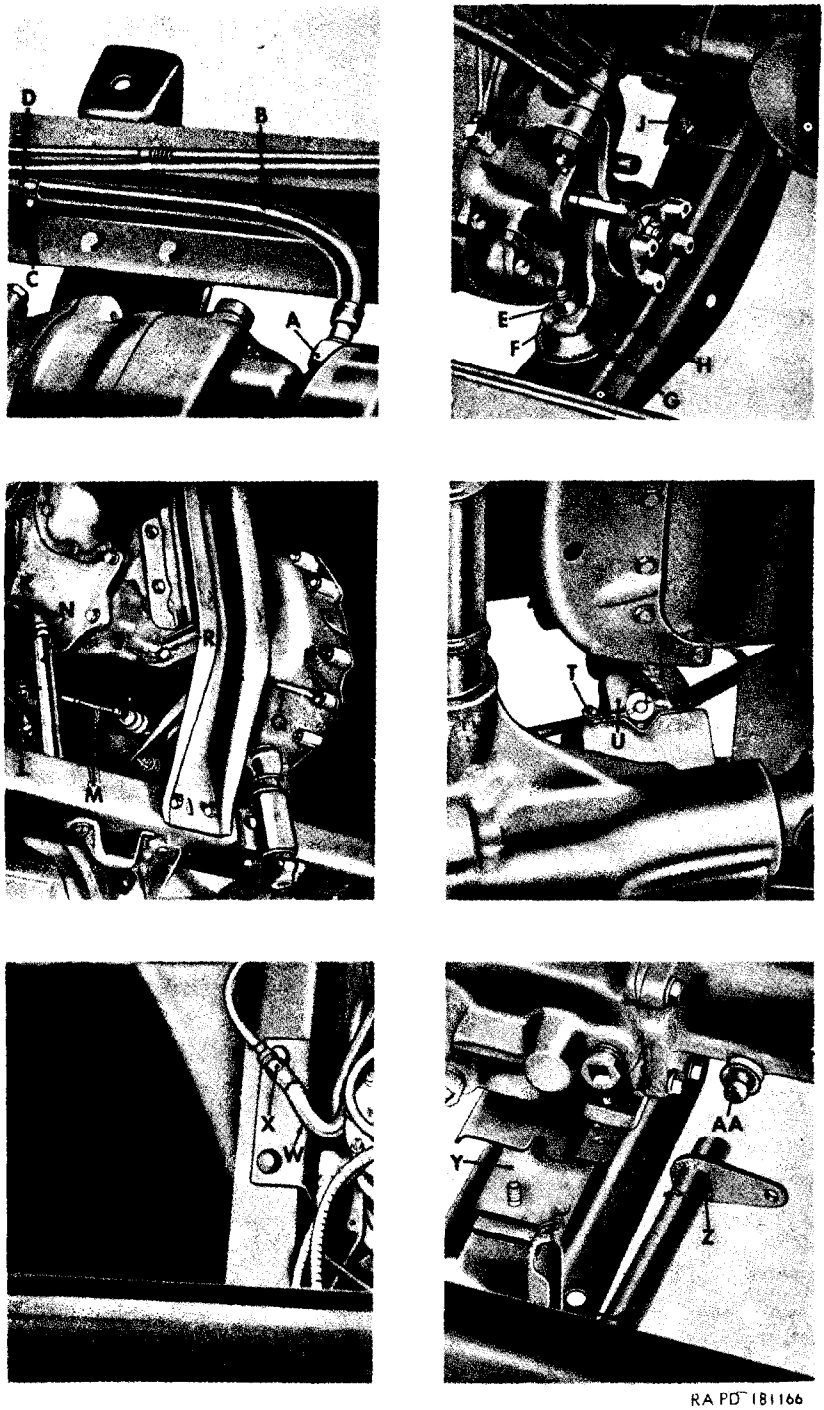


Figure 30. Power plant disconnect points.

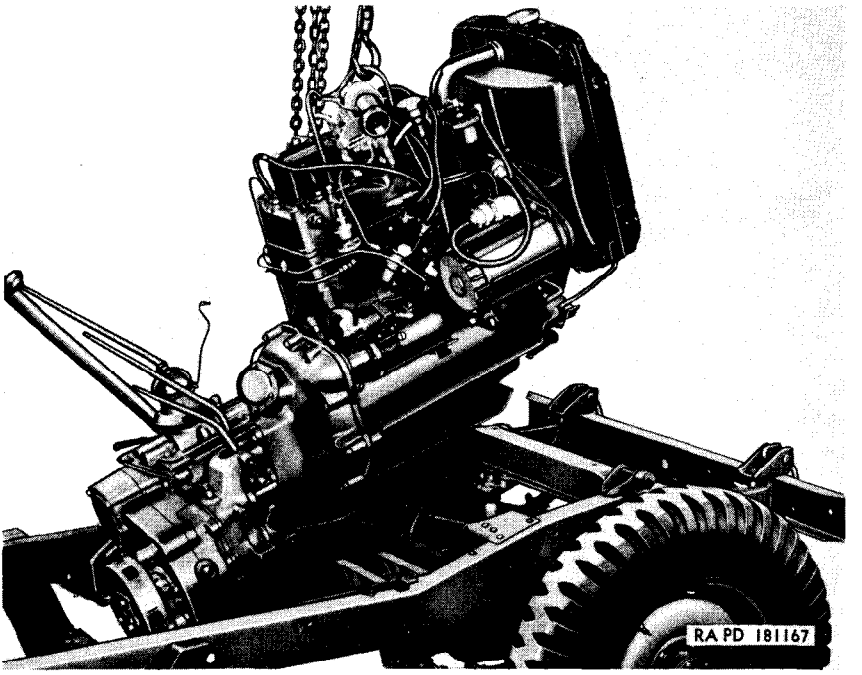


Figure 31. Removing power plant.

d. Disconnect Transmission From Engine Rear Support Crossmember. Remove lockwasher nut and flat washer (J) which secure each side of rear mounting support cushion to rear mounting bracket.

e. Disconnect Control Tube Lever Release Cable and Stay Cable. Remove cotter pin (K) and control tube lever cable adjusting yoke clevis pin (L). Free control tube lever release cable (M) from control lever with tube assembly (N).

Note. Tie control tube lever release cable to transfer vent line to prevent damage to cable during power plant removal.

Loosen two plain nuts (P) giving stay cable (Q) slack. Slip ball of stay cable (R) free of rear stay cable bracket (S).

f. Disconnect Front Mounting Support Cushions. Remove lockwasher nut, flat washer, and bolt (T) securing each side of each front mounting support cushion (U) to frame.

Note. The right support cushion secures the engine front plate to the frame ground strap (V). A $\frac{5}{16}$-inch lock washer is installed beneath the ground strap terminal.

g. Disconnect Fuel Line to Fuel Pump. Disconnect fuel line (W) from fuel pump at the flexible fuel line-to-fuel pump connector (X).

h. Remove Power Plant. Tighten sling and raise power plant until transmission just begins to clear rear mounting support cushion with studs assembly (Y). Move transmission end of power plant to the

right until the control lever with tube assembly (Z) frees the control lever tube ball stud (AA) mounted on transfer. Lift power plant from frame as shown in figure 31.

53. Remove Vent and Fuel Lines

(fig. 32)

a. Remove Vent Lines. Pull the fuel tank-to-air cleaner vent line (A) free of the five push-on-type clips (B) which secure it to the rear fuel line (C).

b. Remove Fuel Lines. Unscrew rear fuel line (C) and front fuel line (D) from flared tube tee (E) and remove tee. Free front fuel line of the two push-on-type clips (F) on frame front crossmember, pull line through hole in right front engine support bracket and remove line from frame. Free rear fuel line of three push-on-type clips (G) on frame right side rail and remove line from frame.

54. Remove Wiring Harness

(fig. 33)

a. Disconnect Electrical Cables. Disconnect two electrical cables (circuit number 25) (A) leading to bottom of steering gear. Disconnect electrical cables (circuit number 75) (B) from master cylinder assembly.

b. Remove Clips. Remove the eight wiring harness clips (C). Remove open clip (D). Remove two wiring harness clips (E). Remove open clip (F). Remove two bolts, plain nuts, and lockwashers securing open clips (G) to top of rear crossmember. Remove wiring harness from frame.

55. Remove Steering Drag Link and Steering Gear

a. Disconnect Steering Drag Link Assembly (fig. 34). Remove cotter pin from ball seat adjusting plug. Back off gear end ball seat adjusting plug (A) until it is retained by a few threads. Slide dust cover shield (B) and dust cover (C) up pitman arm so that hole in steering drag link is exposed. Pull steering drag link assembly (D) from pitman arm (E).

Note. Turn wheels by hand, if necessary, to aline hole in drag link and pitman arm ball.

b. Remove Steering Gear (fig. 35). Remove 3 bolts, 3 plain nuts, and 6 lockwashers (A) securing steering gear to frame. Remove steering gear (B) from frame.

Note. Master cylinder shield assembly (C) is retained by lower bolt.

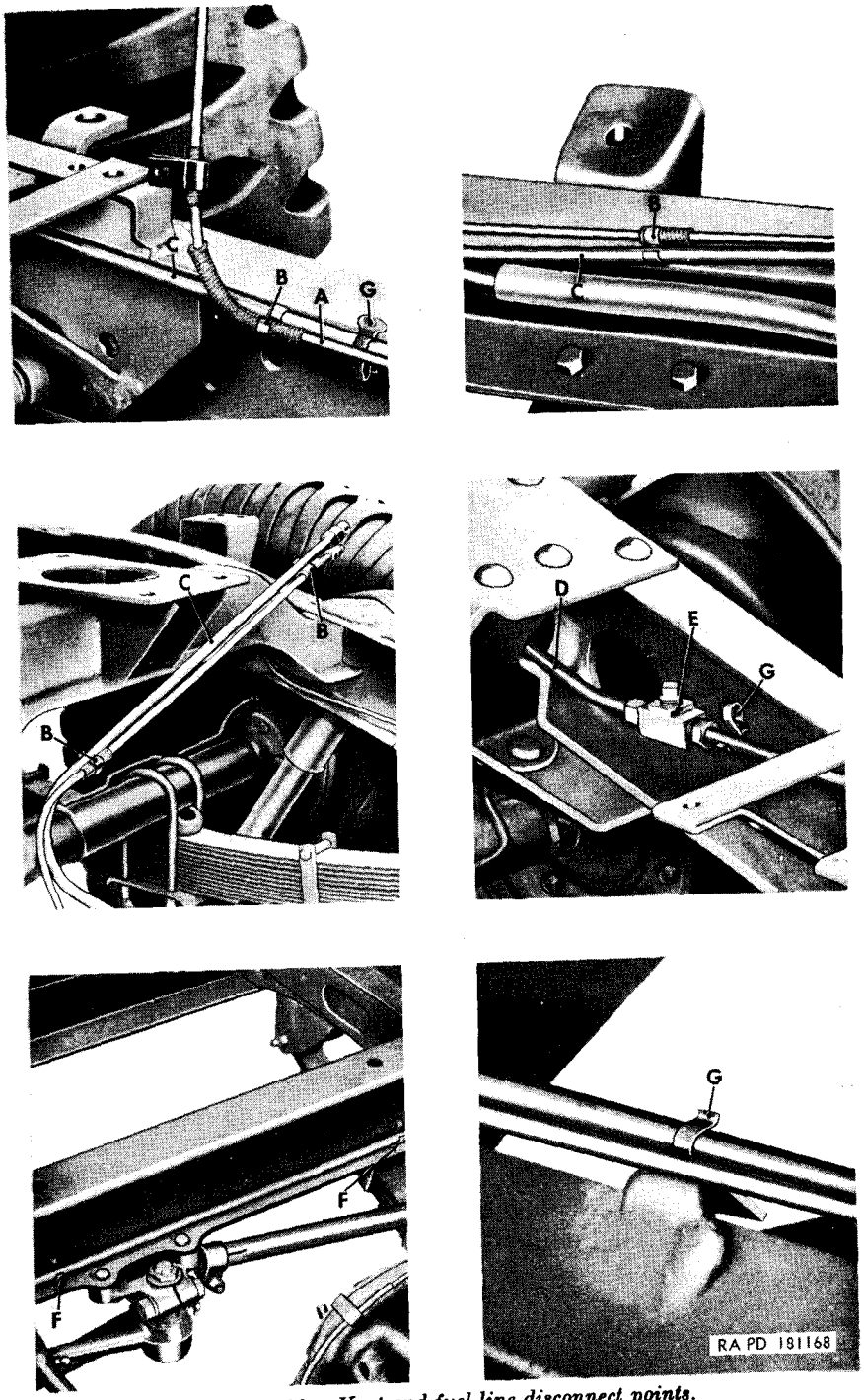


Figure 32. Vent and fuel line disconnect points.

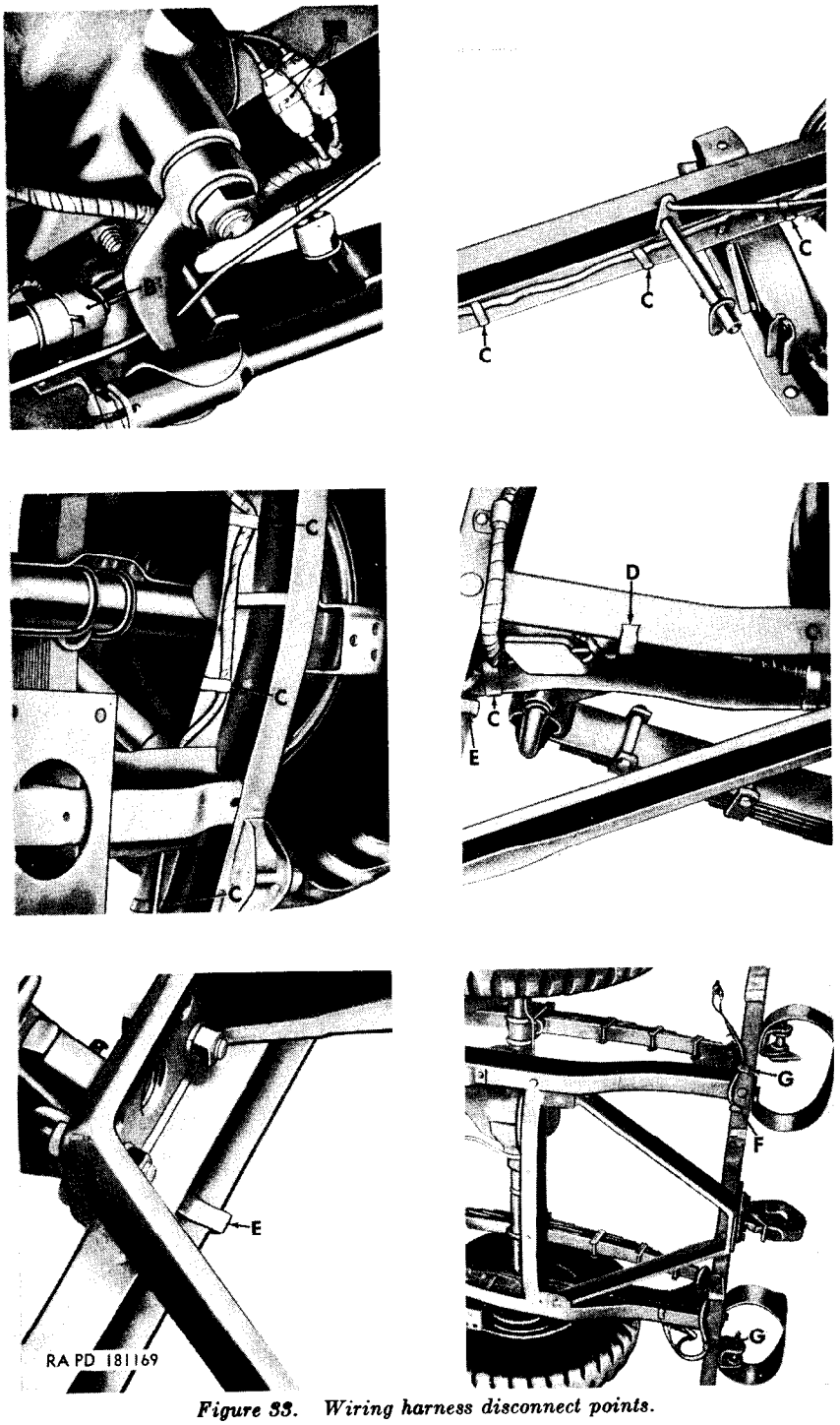


Figure 33. Wiring harness disconnect points.

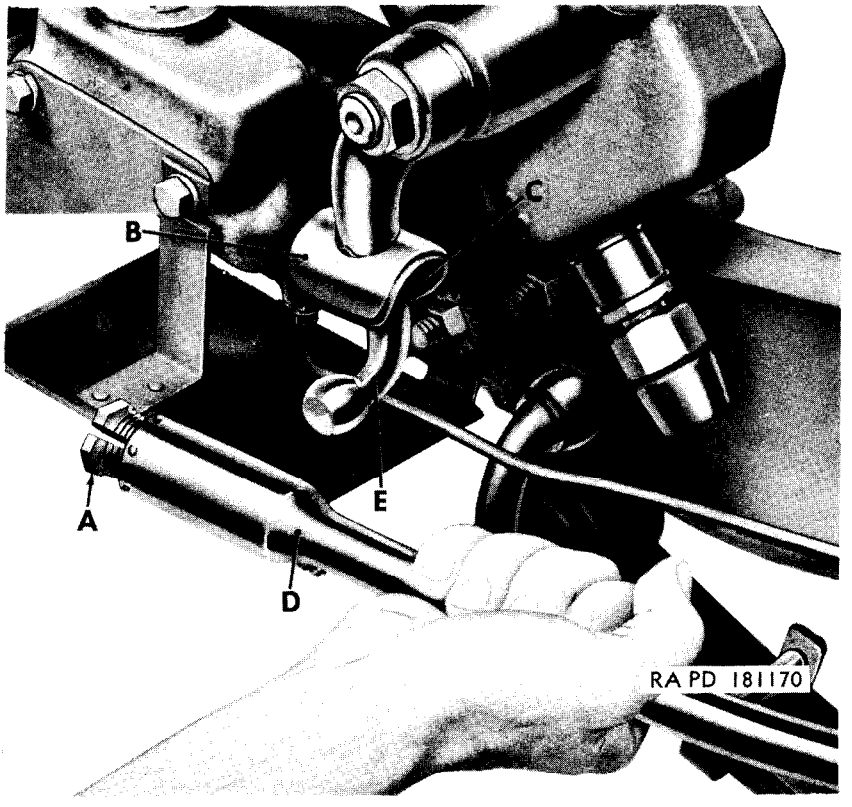


Figure 34. Disconnecting steering drag link assembly.

56. Remove Clutch Pedal, Brake Pedal, Control Lever, Master Cylinder, and Brake Lines

a. Remove Clutch Pedal (fig. 36). If the pedal retracting spring is still installed, remove it. Remove bolt (A) and lockwasher nut (B). Pull clutch pedal (C) off pedal shaft assembly (D). Remove woodruff key (E) and pedal shaft washer (F) from pedal shaft assembly.

b. Remove Brake Pedal (fig. 36). If the brake pedal retracting spring (G) is installed, remove it. Remove cotter pin and flat washer (K). Remove cotter pin (L). Remove rear tie bar bolt and lockwasher (M) securing rear of master cylinder assembly to frame side rail. Loosen front tie bar bolt (N) sufficiently so that master cylinder tie bar (P) can be lifted clear of pedal shaft assembly (Q). Push tie bar down until it clears brake pedal (R). Pull brake pedal off pedal shaft. Remove shaft washer (H). Pull pedal shaft assembly toward center of frame and remove pedal shaft from pedal shaft bracket (J).

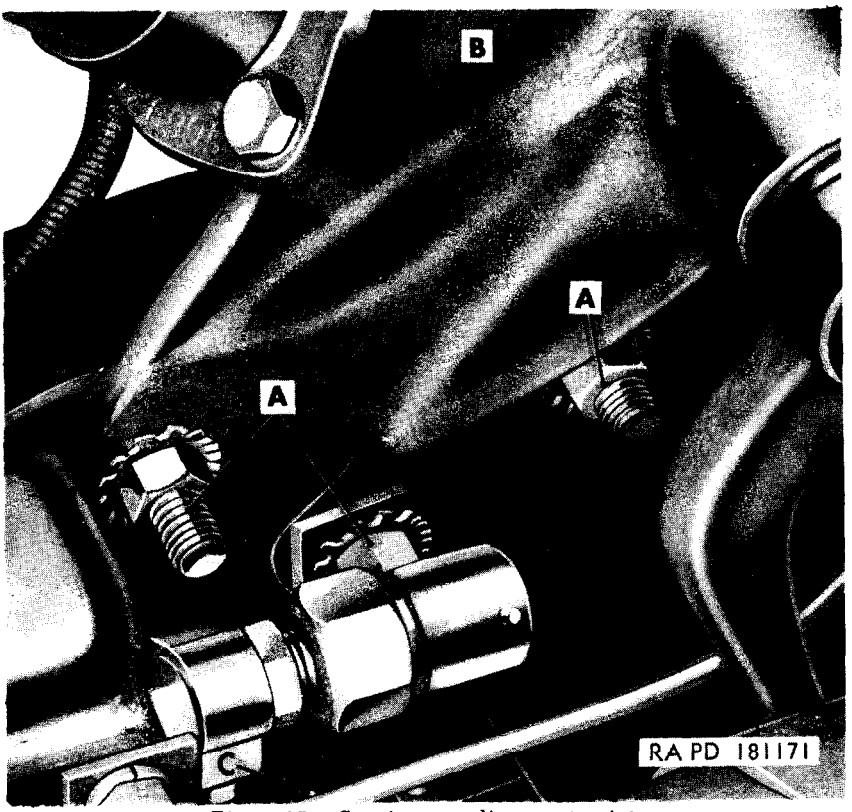


Figure 35. Steering gear disconnect points.

c. Remove Control Lever With Tube Assembly (fig. 36). Remove two cotter pins (S and T) and pull pedal shaft lever to control tube lever rod (U) from vehicle. Pull control lever with tube assembly (V) from control lever tube ball stud (W) on inside of frame left side rail. Remove control lever tube dust seal from ball stud.

d. Master Cylinder Assembly and Brake Lines.

Note. The key letters noted in parentheses are in figure 38 except where otherwise indicated.

(1) *Remove master cylinder assembly.* Disconnect brake lines (A and J, fig. 37) at outlet fitting (K, fig. 37). Disconnect master brake cylinder to elbow vent line (C) from top of master cylinder assembly. Remove two tie bar bolts and lockwashers (G). Remove master cylinder tie bar (B) shield assembly (E) master cylinder assembly (D) and brake pedal master cylinder eye bolt (A).

Note. Shield assembly is also secured by bolt (F) which additionally secures the steering gear to the frame.

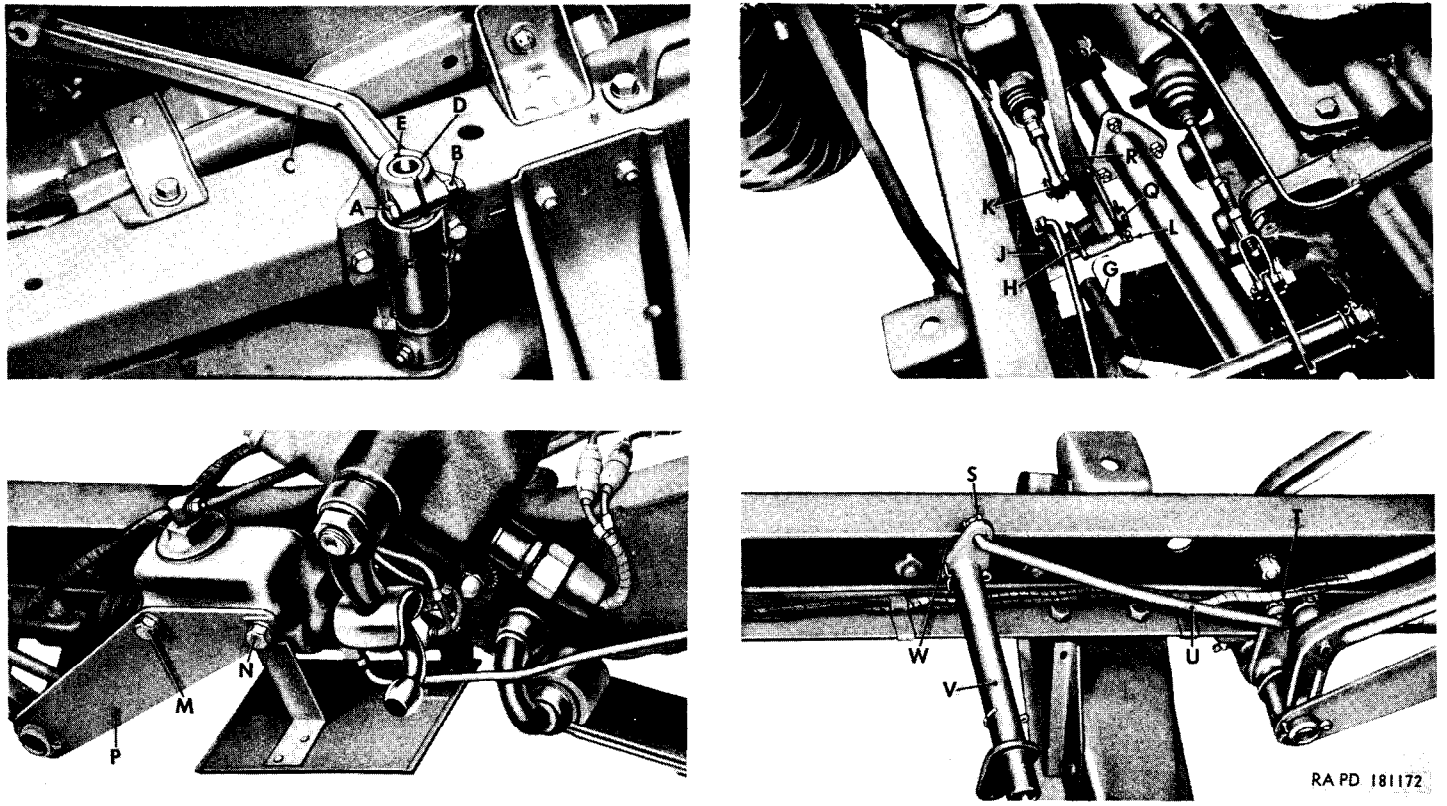


Figure 36. Clutch and brake pedal and control lever disconnect points.

(2) *Remove front master cylinder line and front axle tee to master cylinder line flexible line.* Disconnect front master cylinder line (K) from the flexible line to bracket spring lock clip (M). Free front master cylinder line from line clip (B, fig. 37) on frame left crossmember and lift front master cylinder line from frame. Disconnect front axle tee to master cylinder line flexible line (P) at flexible line to bracket spring lock clip (M) and front axle tee (S). Lift flexible line from frame.

(3) *Disconnect front tee to left flexible line.* Disconnect front tee to left flexible line (H) at left of front axle tee (S) and at the flexible line to bracket spring lock clip (J). Lift front tee to left flexible line (H).

(4) *Disconnect front brake left flexible line assembly.* Disconnect front brake left flexible line assembly (N) at flexible line to bracket spring lock clip (J) and left front wheel cylinder (L) and lift line.

(5) *Disconnect front tee to right flexible line assembly.* Disconnect the front tee to right flexible line assembly (R) at right of front axle tee (S) and at flexible line to bracket spring lock clip (D, fig. 37). Remove two axle brake tube hose clamps (Q) holding line to front axle housing. Remove two closed clips (C, fig. 37) from front axle housing.

Note. Clips are secured by two lockwasher bolts which also secure axle housing cover.

Lift front tee to right flexible line assembly.

(6) *Disconnect front brake right flexible line assembly.* Removal is identical to that for the front brake left flexible line assembly ((4) above).

(7) *Disconnect rear master cylinder line.* Disconnect rear master cylinder line (U) from the flexible line to bracket spring lock clip (T). Free line from three line clips (H, fig. 37) and remove line.

(8) *Disconnect rear axle tee to master cylinder flexible line and rear tee to rear wheel cylinder lines.* Disconnect rear axle tee to master cylinder flexible line (F, fig. 37) at the flexible line to bracket spring lock clip (T) and at rear axle tee (X). Lift rear axle tee to master cylinder flexible line from housing. Disconnect the rear tee to the right and left wheel cylinder lines (W and Y) at rear axle tee (X) and at rear wheel cylinders (G and E, fig. 37). Free the left line from axle brake tube hose clamp (V). Free the right line from closed clip (Z).

Note. The closed clip is secured to axle housing by lockwasher bolt (AA) which also secures housing cover with baffle assembly.

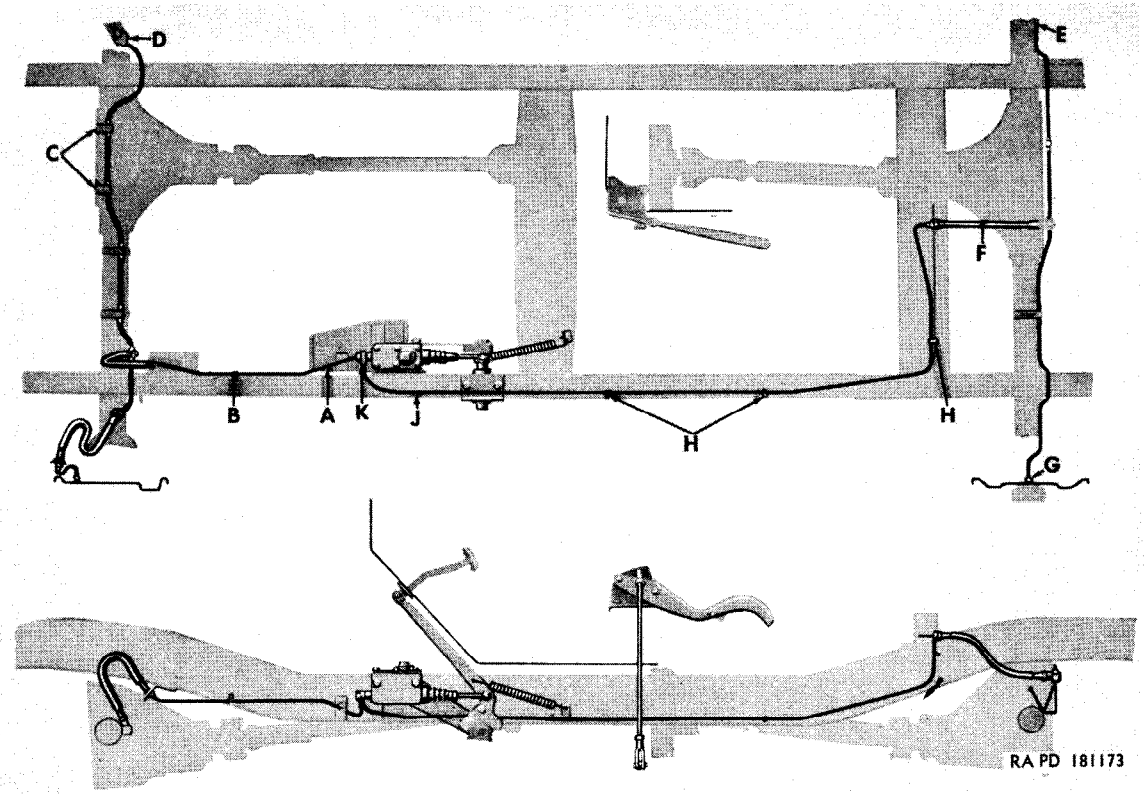


Figure 37. Master cylinder and brake line disconnect points.

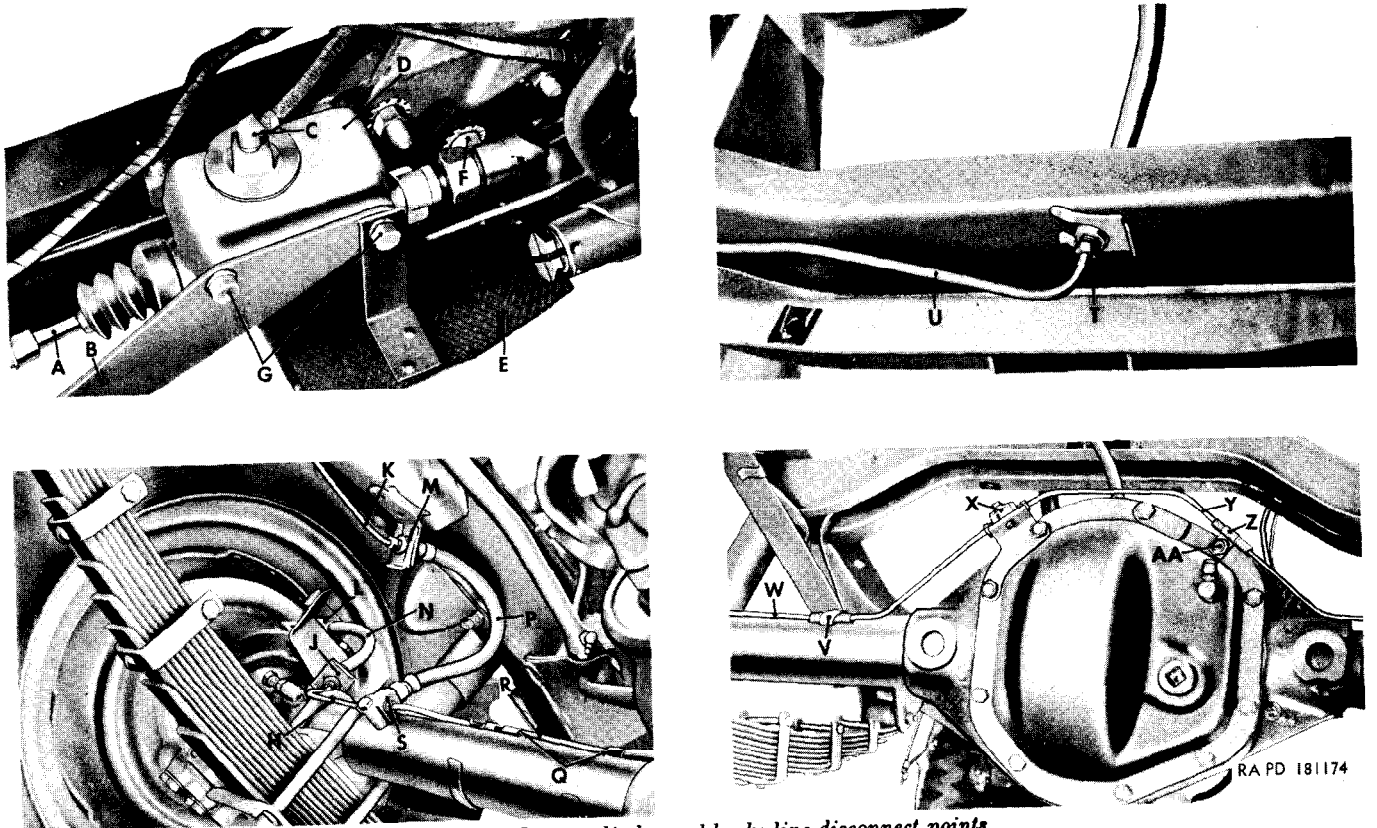


Figure 38. Master cylinder and brake line disconnect points.

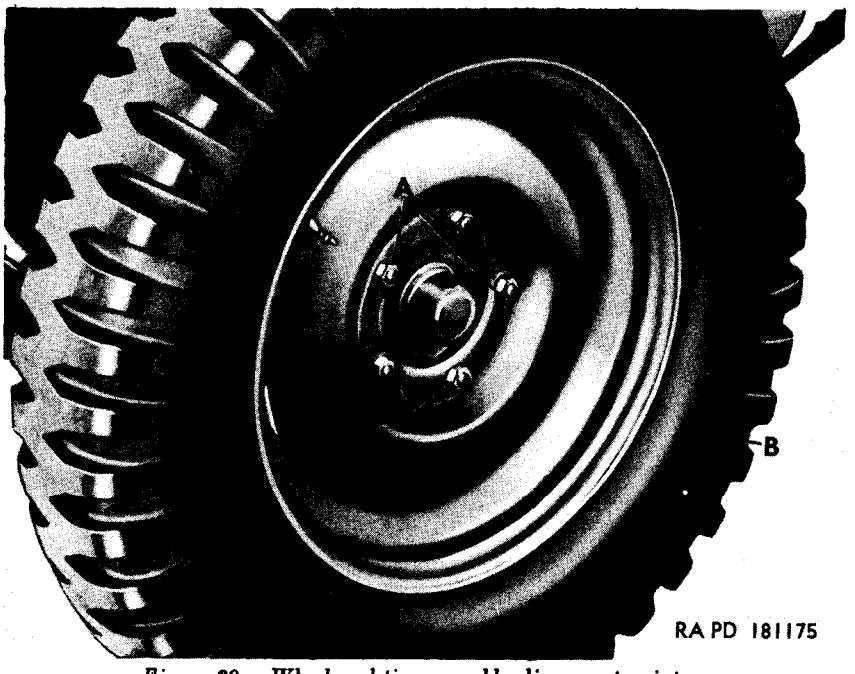


Figure 39. Wheel and tire assembly disconnect points.

Remove the rear tee to rear wheel cylinder lines from (rear axle) housing.

(9) *Remove front axle and rear axle tees.* Remove each lockwasher bolt securing each tee to housing assembly. Remove front axle and rear axle tees.

57. Remove Wheel and Tire Assemblies and Shock Absorbers

a. Remove Wheel and Tire Assemblies (fig. 39). Remove five hub nuts (A) securing each wheel to hub and brake drum assembly. Remove wheel and tire assembly (B).

Note. Turn hub nuts on right side of vehicle counterclockwise and those on left side of vehicle clockwise.

b. Remove Shock Absorbers (fig. 40). Remove two locknuts (A). Remove two flat washers and mounting pin bushings (B). Remove shock absorber (C). Remove two mounting pin bushings (D).

58. Remove Front and Rear Springs and Axle Assemblies (fig. 41).

Support the axle assemblies on jacks to take load off springs. Remove four U-bolt nuts and washers (A). Remove two spring U-bolts (B) from each spring assembly. Remove spring clip plate (C) from each spring assembly. Remove bolt and elastic stop nut (D). Unscrew two bushing type shackle bearings (G) from ends of

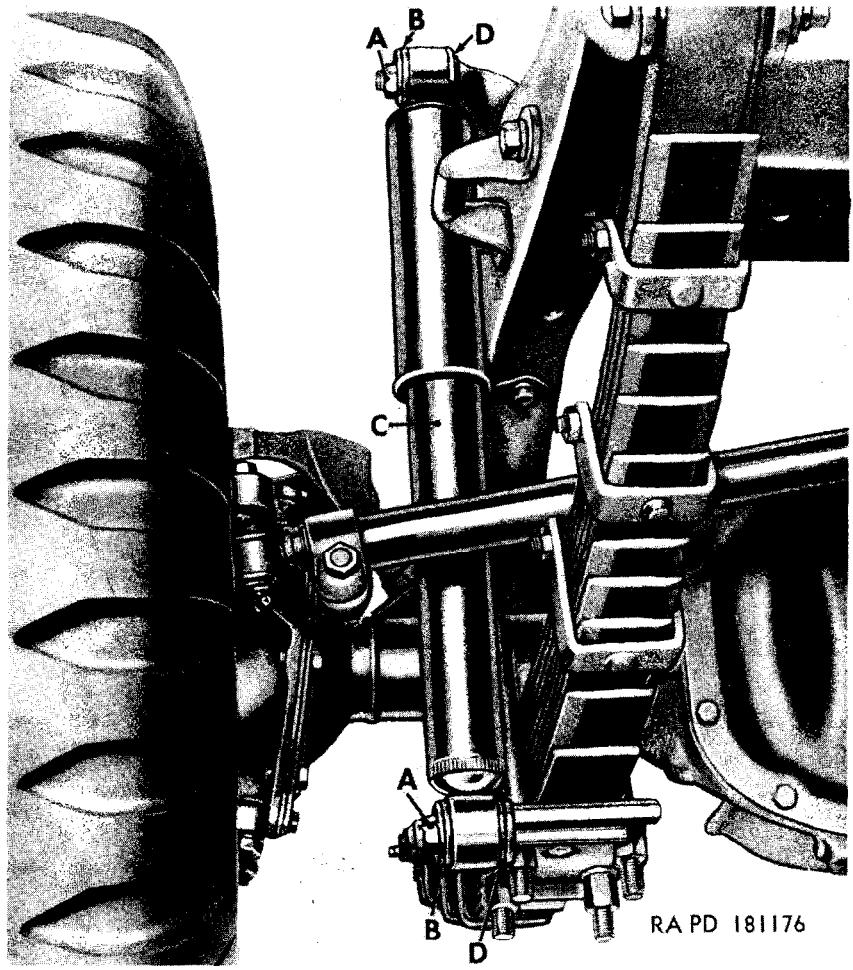


Figure 40. Shock absorber disconnect points.

shackle (E). Remove shackle from spring eye and frame side rail. Remove spring shackle grease seals and spring shackle grease seal retainers.

Note. Shackles and lower bushing type shackle bearings with left hand threads are used on the right rear and left front springs. The shackle is identified by a boss (F) and the shackle bearings (G) by notches.

Remove cotter pin, slotted nut (H), and tie rods from steering bell-crank assembly (J). Remove front spring assemblies, rear spring assemblies, front axle assembly, and rear axle assembly from frame.

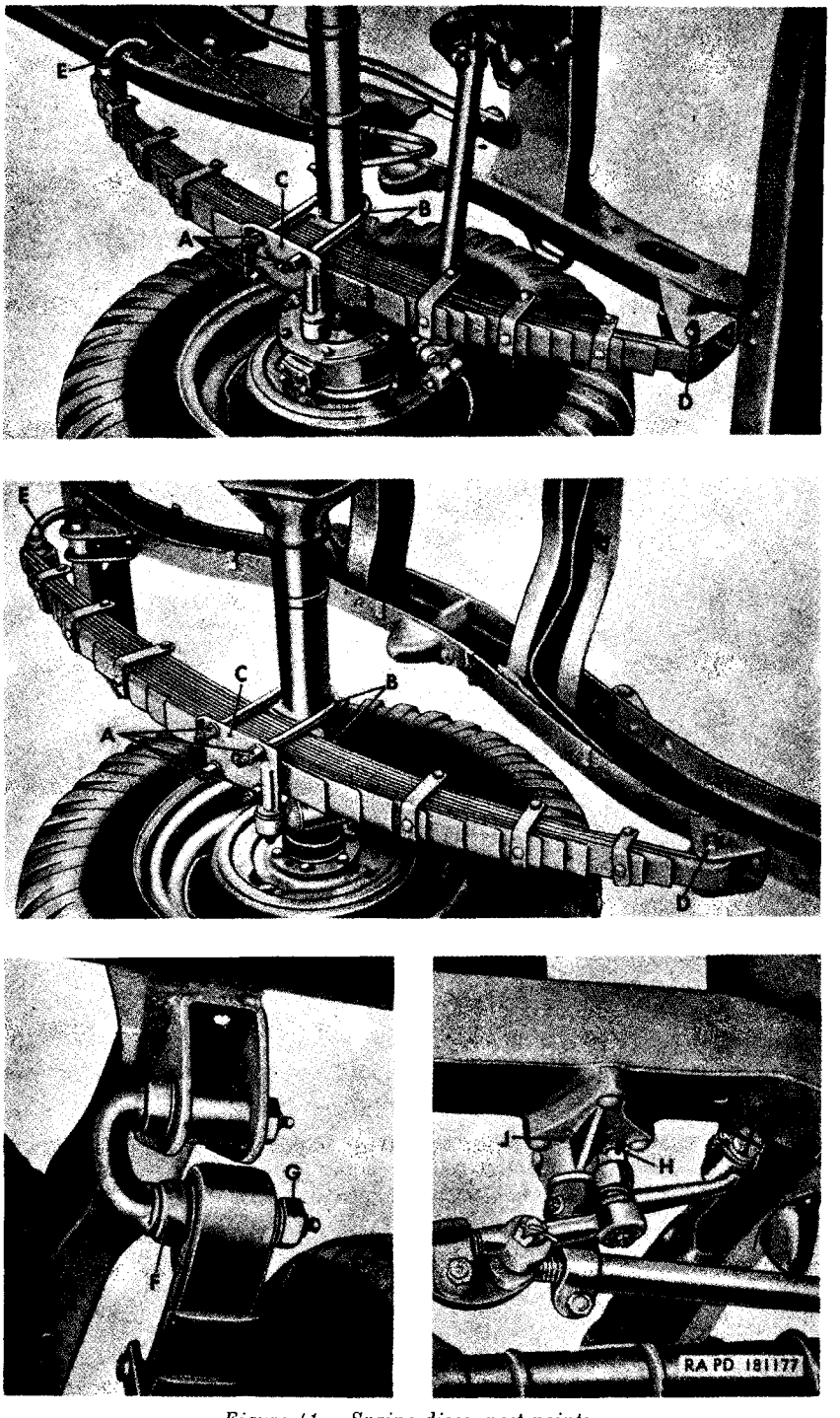


Figure 41. Spring disconnect points.

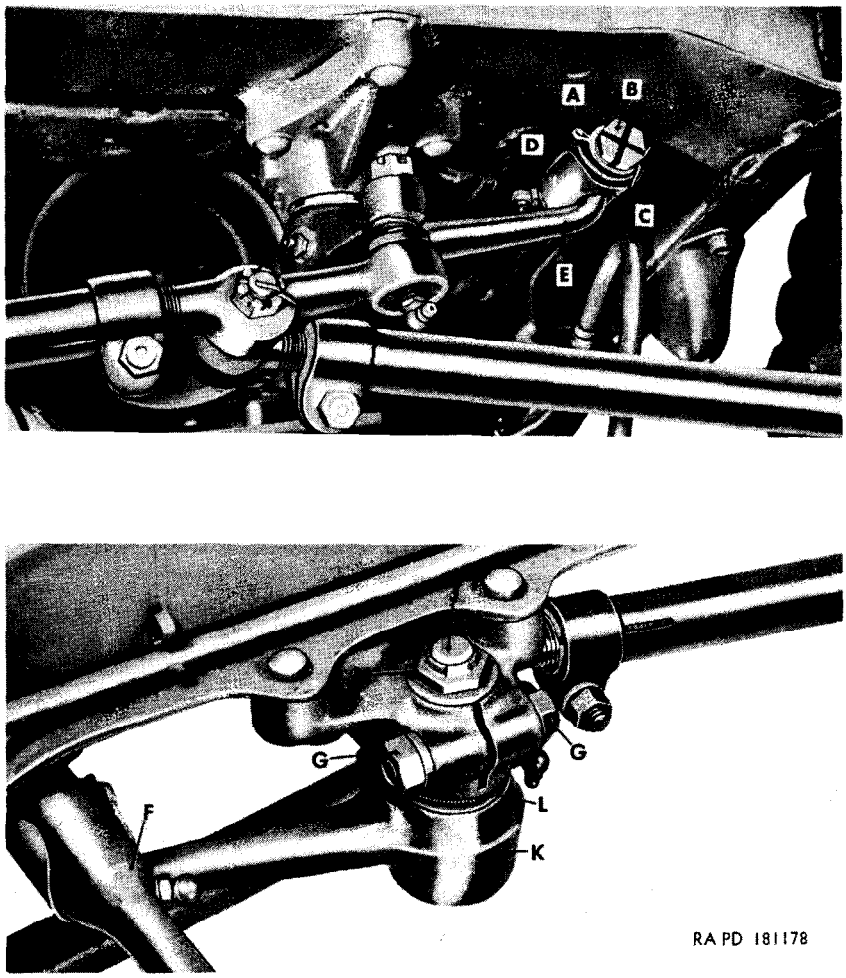


Figure 42. Bellcrank assembly disconnect points.

59. Remove Bellcrank Assembly

(fig. 42).

Remove cotter pin (A) and unscrew axle end ball seat adjusting plug (B). Slip dust cover shield (C) and dust cover (D) over steering bellcrank arm (E). Pull steering drag link (F) from steering bellcrank. Loosen bellcrank pivot shaft clamping screw and lockwasher nut (G). Remove locknut and flat washer (H) from bellcrank pivot shaft (J). Remove bellcrank pivot shaft, flat washer, and bellcrank with bearing and oil seal assembly (K). Remove bellcrank to bracket dust seal (L) from top of bellcrank.

Section II. ASSEMBLY OF VEHICLE FROM MAJOR COMPONENTS

60. General

This section provides an assembly line procedure for assembling the vehicle from its major components.

61. Install Bellcrank Assembly

(fig. 42)

Install bellcrank to bracket dust seal (L) on top of bellcrank with bearing and oil seal assembly (K). Position bellcrank on frame steering bellcrank bracket and install bellcrank pivot shaft (J), flat washer and 5/8–18NF locknut (H). Tighten 7/16–20NF x 2¼ bellcrank pivot shaft clamping screw and 7/16–20NF lockwasher hexagon nut (G).

62. Install Front and Rear Springs and Axle Assemblies

(fig. 41)

Support frame at a suitable height for installation of spring and axle assemblies. Position the front and rear axle assemblies under frame and place them on suitable supports. Place the two front and two rear spring assemblies in position beneath axles. Install the 7/16–20NF–3 x 3 bolt and 7/16–20NF–3 elastic stop nut (D) which secures each spring. Install two spring shackle grease seals and two spring shackle grease seal retainers on shackle. Install shackle (E) in frame and spring eye. Screw two bushing type shackle bearings (G) on ends of shackle (E).

Note. Shackles and lower bushing type shackle bearings with left hand threads are used on the right rear and left front springs. The shackle is identified by a boss (F) and the shackle bearings (G) by notches.

Secure each spring to axle housing with two spring U-bolts (B), spring clip plate (C), four 7/16–20NF–2 U-bolt nuts and 7/16-inch washers (A). Tighten elastic stop nut and bolt (D) to torque of 27 to 30 pound-feet. Tighten spring U-bolts to torque of 50 to 55 pound-feet. Install tie rods on steering bell-crank assembly (J) and secure with ½–20NF–2 slotted nut and 3/32 x 7/8 cotter pin (H).

63. Install Shock Absorbers and Tire and Wheel Assemblies

a. Install Shock Absorbers (fig. 40). Install mounting pin bushing (D) on spring clip plate and on shock absorber mounting pin bracket. Install shock absorber (C) and two mounting pin bushings (B), two ½ ID, 1¼ OD, 0.083 thick flat washers, and two 7/16–20NF locknuts (A). Tighten locknuts until bushings show compression behind flat washers.

b. Install Wheel and Tire Assemblies (fig. 39). Position wheel and tire assembly (B) on hub and brake drum assembly. Secure each wheel and tire assembly with five ½–20NF hub nuts (A).

Note. Hub nuts with left hand threads (identified by notches) are used on left side of vehicle only. Hub nuts with right hand threads are used on right side of vehicle.

64. Install Master Cylinder, Brake Lines, Control Lever, Brake Pedal, and Clutch Pedal

a. Install Master Cylinder Assembly and Brake Lines.

Note. The key letters noted in parentheses are in figure 38, except where other wise indicated.

(1) *Install front axle and rear axle tees.* Position the front axle and rear axle tees on their respective axle housing assemblies. Secure each tee with ¼–20NC x 1⅛ lockwasher bolt.

(2) *Install rear tee to rear wheel cylinder lines and rear axle tee to master cylinder flexible line.* Install closed clip (Z) on the rear tee to right rear wheel cylinder line (Y). Connect the rear tee to right rear wheel cylinder line (Y) to the rear axle tee (X) and to left wheel cylinder. Secure closed clip (Z) to axle with one 5/16–18NC–2 x ¾ lockwasher bolt (AA). Connect the rear tee to left rear wheel cylinder line (W) to rear axle tee (X) and to right rear wheel cylinder. Secure rear tee to left rear wheel cylinder line with the axle brake tube hose clamp (V). Connect the rear axle tee to master cylinder flexible line (F, fig. 37) at the flexible line to bracket spring lock clip (T) and at rear axle tee (X).

(3) *Install rear master cylinder line.* Connect rear master cylinder line (U) at the flexible line to bracket spring lock clip (T). Secure line with three line clips (H, fig. 37).

(4) *Install front tee to right flexible line assembly.* Install two closed clips (C, fig. 37) on front tee to right flexible line assembly (R). Connect front tee to right flexible line assembly (R) to right of front axle tee (S) and to flexible line to bracket spring lock clip (D, fig. 37). Secure closed clips (C, fig. 37) to front axle housing with two 5/16–18NC–2 x ¾ lockwasher bolts.

Note. Same bolts also are used to secure axle housing cover.

Install two axle brake tube hose clamps (Q).

(5) *Install front brake left flexible line assembly.* Connect front brake left flexible line assembly (N) at flexible line to bracket spring lock clip (J) and left front wheel cylinder (L).

(6) *Install front brake right flexible line assembly.* Installation is identical to that for the front brake left flexible line assembly ((5) above).

(7) *Install front tee to left flexible line.* Connect front tee to left flexible line (H) at left of front axle tee (S) and at the flexible line to bracket spring lock clip (J).

(8) *Install front master cylinder line and front axle tee to master cylinder line flexible line.* Connect front master cylinder line (K) at the flexible line to bracket spring lock clip (M) and secure line with line clip (B, fig. 37). Connect the front

axle tee to master cylinder line flexible line (P) at flexible line to bracket spring lock clip (M) and front axle tee (S).

(9) *Install master cylinder assembly.* Position master cylinder assembly (D), shield assembly (E), and master cylinder tie bar (B) on frame left side rail. Install two ⅜–24NF x 3 tie bar bolts and ⅜-inch lockwashers (G). Install the 7/16–20NF brake pedal master cylinder eyebolt (A). Connect brake lines (A and J, fig. 37) at outlet fitting (K, fig. 37).

Note. Servicing of brake system is covered in paragraph 79*b*.

b. Install Control Lever With Tube Assembly (fig. 36). Install new control lever tube dust seal on control lever tube ball stud (W) on frame left side rail. Position control lever with tube assembly (V) on ball stud.

c. Install Brake Pedal (fig. 36). Install pedal shaft in pedal shaft bracket (J). Install shaft washer (H) and brake pedal (R) on pedal shaft. Remove the rear tie bar bolt and lockwasher (M). Loosen the front tie bar bolt (N) just enough so that master cylinder tie bar (P) can be moved out sufficiently to engage end of pedal shaft assembly (Q). Tighten front tie bar bolt (N). Install the ⅜–24NF–3 rear tie bar bolt and ⅜-inch lockwasher (M). Install 5/32 x 1 cotter pin (L). Install flat washer and 5/32 x 1 cotter pin (K). Install the brake pedal retracting spring (G).

d. Install Clutch Pedal (fig. 36). Install pedal shaft washer (F) on pedal shaft assembly. Install 3/16 x ¼ woodruff key (E). Install clutch pedal (C) on pedal shaft assembly (D). Install 7/16–24NF–3 x 1¾ bolt (A) and 7/16–24NF–3 lockwasher nut (B). Install the pedal retracting spring. Position the pedal shaft lever to control tube lever rod (U) on the control lever with tube assembly (V) and pedal shaft bracket. Secure lever rod with two 3/32 x ½ cotter pins (S and T).

65. Install Steering Drag Link and Steering Gear

a. Install Steering Gear (fig. 35). Secure steering gear (B) to frame left side rail with three 7/16–20NF x 3 bolts, three 7/16–20NF plain nuts, and six 7/16-inch lockwashers (A).

Note. Master cylinder shield assembly (C) is secured by lower bolt.

b. Install Steering Drag Link Assembly (fig. 34). Slip the dust cover shield (B) and dust cover (C) up pitman arm. Slip dust cover shield (C, fig. 42) and dust cover (D, fig. 42) up steering bellcrank arm. Engage steering drag link holes with balls of pitman arm and steering bellcrank.

Note. Correct position of steering drag link is such that the lubrication fitting at steering bellcrank will face to the right.

Tighten the two ball seat adjusting plugs (A and B, fig. 42) tight against the steering bellcrank ball and pitman arm ball. Back the adjusting plug, at bellcrank, off one-half of a turn. Back adjusting

plug, at pitman arm, off one full turn. Install two new ⅛ x 1¾ cotter pins.

66. Install Wiring Harness

(fig. 33)

a. Connect Electrical Cables. Connect two electrical cables (circuit number 25) (A) to bottom of steering gear. Connect electrical cables (circuit number 75) (B) to master cylinder assembly.

b. Install Clips. Secure wiring harness to frame with 8 wiring harness clips (C), open clip (D), 2 wiring harness clips (E), and open clip (F). Install two open clips (G) on wiring harness and secure to top of rear crossmember with two No. 10–24NF–2 x ½ bolts, No. 10–24NC–2 plain nuts, and No. 10 lockwashers.

67. Install Fuel and Vent Lines

(fig. 32)

a. Install Fuel Lines. Position front fuel line (D) on frame front crossmember. Connect front fuel line to flared tube tee (E). Secure front fuel line by two push-on-type clips (F) to frame front crossmember. Connect rear fuel line (C) to flared tube tee (E). Secure rear fuel line by three push-on-type clips (G) to frame right side rail.

b. Install Vent Lines. Install five push-on-type clips (B) on clips (B) on rear fuel line (C). Secure the fuel tank-to-air cleaner vent line (A) to rear fuel line by the five push-on-type clips (B). Connect the master brake cylinder-to-elbow vent line (C, fig. 38) to top of master cylinder assembly.

68. Install Power Plant

(fig. 30)

a. Install Transmission and Transfer on Engine. Refer to TM 9–804A.

b. Attach Sling to Power Plant. Attach a suitable sling to lifting hook provided on top of engine. See that the rear mounting support cushion with studs assembly (Y) is installed on engine rear support cross member.

c. Install Power Plant. Carefully lower power plant onto frame as shown in figure 31. Aline slots in rear mounting bracket (mounted on transmission) with studs of rear mounting support cushion. Engage control lever with tube assembly (Z) and control lever tube ball stud (AA) on transfer. Position the transfer case support insulator in place on top of engine rear support cross member. Lower power plant until it rests on rear mounting support cushion with studs assembly (Y), case support insulator, and front of frame. Do not remove sling.

d. Connect Transmission to Engine Rear Support Crossmember. Install two 7/16 ID, 1 OD, 0.083 thick flat washers and ⅜–24 lockwasher

nuts (J) to secure each side of rear mounting support cushion to rear mounting bracket.

e. Connect Transfer to Engine Rear Support Crossmember. Install case support insulator snubber, case support insulator washer, case support insulator snubber bolt (H), 17/32 ID, 1 1/16 OD, 0.095 thick flat washer (F), and 1/2–20NF–2 plain nut (E).

Note. Case support insulator snubber, insulator washer, and bolt are installed from bottom of engine rear support crossmember.

f. Connect Front Mounting Support Cushions. Secure both sides of each front mounting support cushion (U) to frame with 5/16–24NF–3 x 7/8 bolt, 11/32 ID, 1 1/16 OD, 0.065 thick flat washer, and 5/16–24NF–3 lockwasher nut (T).

Note. Secure the engine front plate to frame ground strap (V) by one of the front mounting support cushion bolts. Install 5/16-inch lockwasher beneath ground strap terminal.

g. Connect Fuel Line to Fuel Pump. Connect fuel line (W) to pump at the flexible fuel line-to-fuel pump connector (X).

h. Connect Control Tube Lever Release Cable and Stay Cable. Secure the control tube lever release cable (M) to control lever with tube assembly (N) with the 5/16 x 27/32 adjusting yoke clevis pin (L) and 3/32 x 1/2 cotter pin (K). Position ball of stay cable (R) on rear stay cable bracket (S). Tighten the two 3/8–24NF plain nuts (P).

i. Install Speedometer Flexible Shaft With Core and Casing Assembly. Secure speedometer flexible shaft with core and casing assembly (B) to transfer with coupling nut (A). Install 5/8-inch flexible shaft retaining clip (D) on flexible shaft and secure retaining clip to frame side rail with No. 10–24NC–2 x 5/8 pan-head lockwasher screw and No. 10–24NC–2 plain nut (C).

69. Install Propeller Shafts

(fig. 29)

a. Front Propeller Shaft. Secure front propeller shaft (D) to transfer and front axle with four universal joint-journal bearing U bolts (B) and eight 5/16–24NF–3 safety nuts (A and C). Tighten U bolts to torque of 15 to 20 pound-feet.

b. Rear Propeller Shaft. Secure rear propeller shaft (J) to transfer and rear axle with four 5/16–24NF–3 safety nuts (E) and four 3/8–24NF–3 plain nuts and 3/8-inch lockwashers (F).

70. Install Muffler, Exhaust Pipe, and Exhaust Pipe Extension

(fig. 28)

a. Install Exhaust Pipe Extension. Place new exhaust pipe to extension gasket on exhaust pipe extension. Secure exhaust pipe extension (G) to exhaust pipe (H) with three bolts and 5/16–24NF–3 plain nuts (F). Secure exhaust pipe extension support bracket (K)

to frame crossmember with one 5/16–24NF–3 x 1½ bolt and 5/16–24NF–3 plain nut (J).

b. Install Exhaust Muffler. Install new extension to muffler flange gasket (D). Secure exhaust muffler (E) to exhaust pipe flanges with three 5/16–24NF–3 x 1 bolts and 5/16–24NF–3 plain nuts (C). Secure muffler support clamp bracket (B) to frame rear cross-member with one 5/16–24NF–3 x 1¼ bolt and 5/16–24NF–3 plain nut (A).

71. Install Generator Regulator Assembly

(fig. 27)

Secure mounting bracket and generator regulator assembly (B) to support with four ¼–28NF–2A x ¾ lockwasher screws (A).

72. Install Body on Frame

a. Attach Sling to Body. Attach a suitable sling to dash panel as illustrated in figure 25.

b. Install Body Mounting Cushions and Mounting Bracket Shims (fig. 26). Cement new thin body mounting cushion at number 2 holddown brackets, number 5 holddown brackets, and at number 6 holddown brackets. Cement new thick body mounting to frame bracket cushions at number 1 holddown brackets. Cement new thin body mounting bracket shims at number 1 holddown brackets. Cement new thick body mounting to bracket shims at number 3 holddown brackets.

c. Install Body on Frame (fig. 25). Raise front of body with sling. Have two men lift rear of body while another pushes chassis under body. Rest rear of body on frame and lower front of body, taking care not to jam body on transmission gearshift hand lever (A) and transfer gearshift high and low range lever (B), front wheel drive lever (C), and steering gear jacket (D).

d. Connect Body to Frame. Refer to figure 22 for general location of body holddown brackets and other connect points at bottom of body. Figures 23 and 24 illustrate the points in detail.

(1) *Install right side body holddown brackets* (fig. 23). Install number 1 holddown bracket with ⅜–24NF–3 x 1 bolt, ⅜-inch lockwasher, and 7/16 ID, 1 OD, 0.083 thick flat washer (A). Install ⅜–24NF–3 x 2 bolt, two ⅜-inch flat washers, and ⅜–24NF–3 self-locking nut at number 2 holddown bracket (B). Install number 3 holddown bracket with ⅜–24NF–3 x 2 bolt, two 7/16 ID, 1 OD, 0.083 thick flat washers, and ⅜–24NF–3 self-locking nut (C). Install number 4 holddown bracket ⅜–24NF–3 x 1¼ bolt, two ⅜-inch flat washers, and ⅜–24NF–3 self-locking nut (D). Install number 5 holddown bracket with 5/16–18NC–2 x 1½ square-neck bolt, 5/16 flat washer, and 5/16–18NC–2 self-locking nut (E).

(2) *Install rear body holddown brackets* (fig. 24). Install four

5/16–18NC–3 x 7/8 bolts, eight 7/16 ID, 1 OD, 0.083 thick flat washers, and four 5/16–18NC–3 self-locking nuts (A) at number 6 holddown brackets. Connect electrical cables (circuit numbers 23 and 24) (C and B) to service as tail and stoplight. Connect electrical cables (circuit numbers 21, 22, and 24) (D, E, and F) to blackout tail and stop light. Connect electrical cables (circuit numbers 21, 22, 23, and 24) (G, H, J, and K) to the trailer coupling receptacle. Secure wiring harness with open clip (L).

(3) *Install left side body holddown brackets* (fig. 23). Connect the left side of the body to the frame at numbers 1, 2, 4, and 5 holddown brackets (F, G, H, and J) in same manner as outlined for the right side. However, number 3 body holddown bracket is omitted on left side of vehicle.

(4) *Make connections at bottom of body* (fig. 24). Install hand brake rod (P) through hole in body and secure it to the hand brake operating lever with 5/16-inch clevis pin (M) and 1/8 x 3/4 cotter pin (Q). Connect fuel tank-to-air cleaner vent line (R) to flared tube elbow (U). Connect fuel line (S) to flared tube elbow (T). Secure fuel line by push-on-type clip (V).

Note. Secure skid plate to engine rear support crossmember with four 3/8–16NC–2 x 7/8 square-neck carriage bolts and 3/8–16NC–2 lock washer nuts.

e. Make Connections Inside of Driver's Compartment.

(1) *Install instrument cluster* (fig. 20). Pull wiring harness through opening presented by removal of dash panel access plate. Connect electrical cables (circuit numbers 7, 11, 15, 25, and 40) (D, E, F, G, and H). Connect light switch wiring harness (K) to light switch and tighten electrical cable coupling nut (J). Insert speedometer flexible shaft assembly (M) through dash and instrument panels. Be sure rubber grommet (N) is installed on dash panel. Connect speedometer flexible shaft assembly (M) to speedometer by tightening the coupling nut (L). Place instrument cluster (B) on instrument panel (C) and secure cluster by turning the four instrument cluster mounting plate studs (A) a quarter of a turn clockwise.

(2) *Install lower and upper front floor pan covers* (fig. 21). Install seal on lower and upper front floor pan covers and on toeboard steering gear jacket access plate. Secure lower front floor pan cover (E) to floor of body with eleven 1/4–20NC x 5/8 lockwasher screws (D). Secure upper front floor pan cover (C) and toe board steering gear jacket access plate (B) with thirteen 1/4–20NC x 5/8 lockwasher screws (A).

(3) *Install master brake cylinder inspection cover* (fig. 20). Install

seal on master brake cylinder inspection cover. Secure master brake cylinder inspection cover (AA) with four ¼–20NC x ⅝ lockwasher screws (Z).

(4) *Install steering gear jacket access plate* (fig. 20). Install new steering jacket access plate seal (Y). Position the two halves of the steering gear jacket access plates (X) over seal and secure plates to body with four ¼–20NC x ⅝-inch lockwasher screws (W).

(5) *Install transfer levers to floorboard boot* (fig. 20). Install transfer levers to floorboard boot (V) on lower front floor pan cover. Install lever housing cover boot ring (U) with four No. 10 x ½ sheet metal screws (T).

(6) *Install transfer high and low range gearshift lever and front wheel drive lever knobs* (fig. 20). Screw the lever knobs (P and Q) on the transfer high and low range gearshift lever (R) and front wheel drive lever (S).

(7) *Install steering wheel.* Set front wheels in straight ahead position. Install tube jacket bearing spring. Position steering wheel on shaft with integral worm, with one spoke of steering wheel in vertical position above tube jacket, and aline serrations. With a rubber mallet, tap wheel on shaft. Install 13/16–20NC–2 nut. Install horn disk button and rubber horn button cap.

(8) *Install mounting tube jacket to instrument panel clamp* (fig. 21). Install liner (M). Secure mounting tube jacket to instrument panel clamp (L) with two 5/16–24NF–2 x ⅞ lockwasher bolts and 5/16–24NF–2 plain nuts (K).

(9) *Connect hand brake rod* (fig. 21). Connect hand brake rod (J) to hand brake assembly (H) with two plain washers (G) and one 3/32 x ½ cotter pin (F).

f. Make Connections at Left Side of Engine.

(1) *Connect crankcase vent metering valve* (fig. 18). Install crankcase vent metering valve wire (A) and conduit (C) in crankcase vent metering valve swivel (D) and clamp (E) respectively. Bend over end of wire as a safety factor. Tighten bolts (B).

(2) *Connect tee-to-windshield wiper line* (fig. 18). Connect the tee-to-windshield wiper line (F) to the vacuum pump line (G).

(3) *Connect accelerator pedal* (fig. 18). Push accelerator bellcrank link rod (J) through hole in upper floor pan cover and into lower accelerator bellcrank (K). Secure rod to bellcrank with plain nut (H).

(4) *Connect master brake cylinder vent line* (fig. 18). Install master brake cylinder vent line to dash clip (N) on master brake cylinder vent line. Connect master brake cylinder

vent line (L). Secure clip to dash panel with No. 10–24NC–2 x 7/16 lockwasher screw (M).

(5) *Connect electrical cables* (fig. 19). Connect electrical cables (circuit numbers 18, 16, and 17) (P, M, and L) to head light foot dimmer switch (N).

(6) *Install dash panel cable access plate* (fig. 19). Install wiring harness grommet (J) in access plate. Install wiring harness into grommet. Secure dash panel cable access plate (H) and clip (K) to dash panel with four No. 10–24 x ½ lockwasher screws (G). Secure clip fastener (U) to dash panel with No. 10–24 x ½ lockwasher screw (V).

(7) *Connect brake pedal pad* (fig. 19). Install draft pad (E), draft pad flat washer (D), and draft pad spring (C) on brake pedal pad (F). Insert brake pedal pad into brake pedal (B). Secure brake pedal pad to brake pedal with 5/16–18NC–3 x 1¼ bolt and 5/16-inch lockwasher (A).

(8) *Connect clutch pedal pad* (fig. 19). Install pedal draft pad (W), pedal draft pad washer (T), and pedal draft pad spring (X) on clutch pedal pad (R) and insert clutch pedal pad into clutch pedal (S). Connect clutch pedal pad (R) to clutch pedal (S) with 5/16–18NC–3 x 1¼ bolt and 5/16-inch lockwasher (Q).

g. Make Connections at Right Side of Engine (fig. 17).

(1) *Connect throttle control wire.* Insert throttle control wire (GG) and throttle control conduit (KK) into throttle control wire stop and throttle control conduit clamp respectively. Tighten bolts (HH and JJ). Bend over end of throttle control wire (GG).

(2) *Connect choke control wire.* Insert choke control wire (CC) and choke control conduit (FF) into choke control wire clamp and choke control conduit clamp respectively. Tighten bolts (DD and EE). Bend over end of choke control wire (CC).

(3) *Connect crankcase control vent valve.* Insert crankcase control vent valve wire (V) and conduit (Z) into crankcase valve control wire swivel (AA) and crankcase control vent valve clamp (BB) respectively. Tighten bolts (W and Y). Bend over end of wire.

(4) *Connect electrical cables to sending units.* Connect electrical cables (circuit numbers 33 and 36) (T and U) to engine water temperature sending unit and engine oil pressure sending unit respectively.

(5) *Connect air cleaner-to-dash tee vent line and wiring harness to dash panel.* Secure wiring harness clip (R) and vent line

clip (S) to dash panel with one No. 10–24NC–2 x ½ lockwasher screw and No. 10–24NC–2 nut (Q).

Note. Nut is at rear of dash panel.

(6) *Connect generator regulator cable.* Connect the generator cable to generator regulator assembly and tighten small cable connector coupling nut (M). Secure wiring harness (N) with open clip (P).

(7) *Connect distributor to generator regulator cable.* Connect the generator regulator cable (circuit number 12) to distributor with coil assembly (G). Tighten electrical cable coupling nut (H).

(8) *Install air cleaner.* Secure air cleaner assembly (F) to dash panel with four 5/16–18NC x 5/8 cap screws and 5/16-inch lockwasher (E). Connect air cleaner-to-dash tee vent line (C) and fuel tank-to-air cleaner vent line (D). Install carburetor-to-air cleaner pipe hose (B), and secure with hose clamps (A).

73. Install Radiator Guard Assembly

(fig. 16)

a. Aline slots in radiator guard hinges with flat faces of radiator guard right and left hinge pins (frame bracket halves) and slide slots on pins.

b. Install two 5/16–10 x 5/8 bolts and radiator-to-guard panel clips (A) on each side of radiator (B)

74. Install Fenders

(fig. 15)

a. Left fender.

(1) Secure fender brace (L) to frame with two 3/8–24NF x 1½ lockwasher screws and 7/16 ID, 1 OD, 0.083 thick flat washers (K).

(2) Cement new front fender to cowl side panel antisqueak webbing on body cowl. Secure rear of fender to front of body cowl with four 5/16–18NC x 7/8 lockwasher screws (G).

(3) Secure front of fender to radiator guard assembly with three 5/16–18NC x 7/8 lockwasher screws (J).

(4) Connect two electrical cables (circuit number 25) (H). Connect three electrical cables (circuit numbers 17, 18, and 20) (C) to headlight and signal blackout marker and service parking lights. Connect electrical cable (circuit number 19) (B) to blackout driving light. Connect two electrical cables (circuit number 25) (A) to horn assembly. Secure wiring harness with six open type clips (E). Secure fuel line (D) with push-on-type clip (F).

b. Right Fender. The right fender is installed in the same manner as the left except that no electrical cable connections must be made.

75. Install Spare Wheel and Tire Assembly

(fig. 14)

a. Position spare wheel and tire assembly (B) on spare wheel support bracket.

b. Secure spare wheel and tire assembly with three ½–20NF (right-hand thread) spare wheel-to-carrier stud nuts (A).

76. Install Batteries

(fig. 13)

Caution: Exercise extreme caution when dealing with electrical system. The 24-volt system can cause serious burns.

a. Insert end of ground cable (V) into battery box. Install a ⅜-inch ground cable to frame lockwasher on each side of ground cable clip and install ⅜–24NF–3 x ⅞ ground cable to frame bolt (U). Secure negative cable to dash clip (S) and negative cable to splash apron clip (T), with two No. 10–24NC x ½ lockwasher screws (R).

b. Insert battery-to-starter cable (Q) into battery box. Secure positive cable to dash clip (N) to dash panel with one No. 10–24NC x ½ lockwasher screw (M). Connect the generator regulator and battery-to-starter cables to starter switch with 5/16–24NF–2 nut and 5/16-inch lockwasher (P).

c. Install two batteries (K). Position two holddown frames (E) on batteries and secure them with four 5/16–18NC–2 front holddown frame nuts (J).

d. Install connecting cable (circuit number 68) (L) to battery negative and positive posts. Tighten two 5/16–18NC battery terminal nuts (F).

e. Secure battery clamps to ground cable (V) and battery-to-starter cables (Q) with 5/16–18NC nuts.

f. Connect battery-to-starter cable (circuit number 82) (D) to battery positive post. Connect ground cable (circuit number 7) to battery negative post (C). Tighten 5/16–18NC negative battery terminal nut (G) and 5/16–18NC positive battery terminal nut.

g. Install cowl battery box lid (B). Secure lid with eight plain washer thumb screws (A).

77. Install Windshield Assembly

a. Aline slots in windshield hinges (A, fig. 12) with flat faces of windshield hinges (cowl halves) (B, fig. 12). Slip hinges on pins. Secure windshield assembly in upright position by locking the windshield lock (C, fig. 11) at each side of windshield assembly.

b. Connect windshield wiper hose (A, fig. 11) to windshield wiper air regulating valve (B).

78. Install Hood

(fig. 10)

a. Aline slots in hood hinges (B) (cowl halves) with flat faces of hood hinge pins (C) and slip slots over pins.

b. Secure hood with hood catch (A) on each side of hood.

79. Road Test Vehicle

a. General. Visually inspect for any incomplete assembly procedures.

b. Service Brake System. Fill master cylinder assembly and brake lines with hydraulic fluid. Adjust brake pedal free play to one-half of an inch. Adjust service brakes and hand brake. Refer to TM 9–804A for instructions relative to brake system maintenance.

c. Clutch. Adjust clutch pedal to have at least 1¼-inch free pedal travel. Refer to TM 9–804A.

d. Fill Cooling System. Fill cooling system with proper coolant. Refer to TM 9-804A.

e. Fill Fuel Tank. Refer to TM 9–804A for fuel tank filling instructions.

f. Adjust and Focus Head Lights. Proceed as prescribed in TM 9–804A to adjust and focus head lights.

g. Adjust Front Wheel Toe-In. Refer to TM 9–804A for instructions for adjusting toe-in.

h. Inspection. Perform a technical inspection as prescribed in AR 700–105, using DA form 461–5, Limited Technical Inspection, and as outlined in TM 9–804A for the 6,000-mile organizational maintenance services.

CHAPTER 5
TRANSMISSION

Section I. DESCRIPTION AND DATA

80. Description and Operation

a. General. The transmission (fig. 43) is a synchromesh, selective-gear type having 3 forward speeds and 1 reverse. The gears are selected, or shifted, manually by means of sliding shafts with attached forks and lugs which are supported in and inclosed by a control cover attached to the top of the transmission case. The transmission, which is attached to both engine assembly and transfer assembly, is supported on a rubber insulator mounted on the engine rear support crossmember. Drilled passages in the transmission and transfer cases provide for lubricant circulation between the two assemblies. This circulation of lubricant also permits internal air circulation between the two water-tight assemblies. The transmission is vented through the transfer by means of a vent on top of the case.

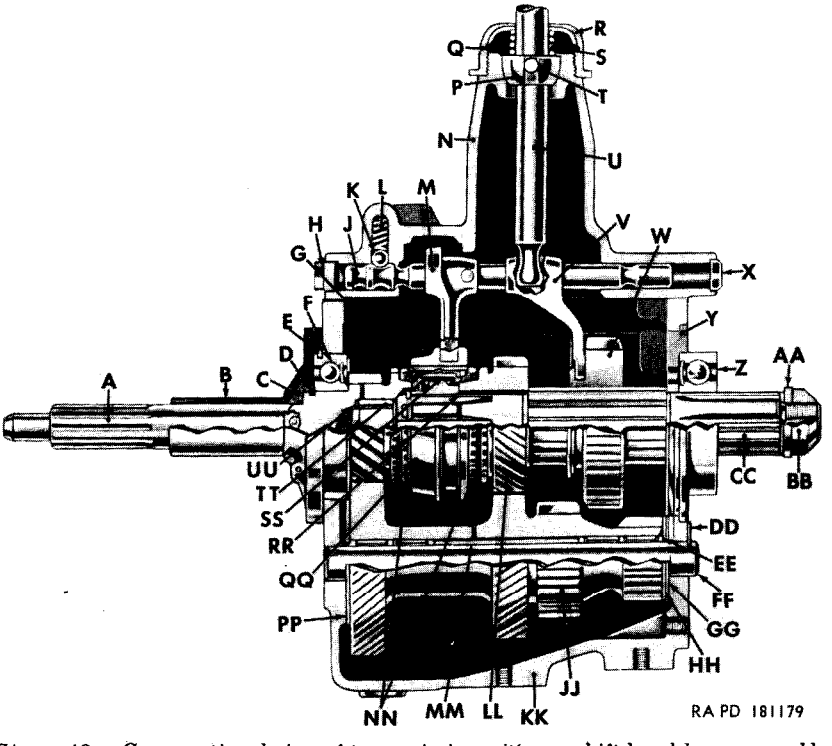


Figure 43. Cross sectional view of transmission with gearshift hand lever, assembly.

A—Shaft, input, w/integral gear—7697566
B—Cover, bearing, input shaft—7697564
C—Seal, oil, input shaft bearing cover—7697572
D—Ring, snap, bearing—(0.086 thk)—7697568
E—Ring, snap, bearing—(0.0625 thk)—7697567
F—Bearing, ball—700763
G—Plate, shifting, second and third speed synchronizer—WO–640395
H—Plug, pipe ⅜-in.—113185
J—Shaft, shifter, second and third speed—7374970
K—Ball, detent, ⅜-in.—104920
L—Spring, detent ball—7351052
M—Fork, shifter, second and third speed gear—7374979
N—Cover, control—7065900
P—Ball, hand lever—7032624
Q—Retainer, hand lever—7372447
R—Seat, hand level spring—7372448
S—Spring, support, hand lever—7374969
T—Pin, hand lever ball—7372456
U—Lever, hand, gearshift—7374974
V—Fork, shifter, first and reverse speed gear—7374980
W—Gear, sliding, first and reverse speed—7374995
X—Plug, expansion, 1 1/16-in.—501592
Y—Adapter, main shaft rear bearing—7374991
Z—Bearing, ball—700336
AA—Washer, main shaft nut—WO–A14101–2A
BB—Nut, main shaft—WO–A520
CC—Shaft, main—7374998
DD—Plate, lock—7697424
EE—Washer, countershaft cluster gear bearing roller spacer—7697427
FF—Countershaft—7697421
GG—Washer, thrust, steel—7697547
HH—Washer, thrust, bronze face, steel back—7697429
JJ—Gear, cluster, countershaft—7697422
KK—Case, transmission, assy—7372877
LL—Gear, second speed, w/bearing, assy—7374994
MM—Spacer, countershaft cluster gear bearing roller—7372667
NN—Ring, blocking, second and third speed synchronizer—WO–640397
PP—Washer, thrust, bronze—7697428
QQ—Sleeve, second and third speed synchronizer—WO–640396
RR—Hub, second and third speed synchronizer—WO–640393
SS—Spring, second and third speed synchronizer hub—7372996
TT—Ring, snap, second and third speed synchronizer hub—7374996
UU—Roller, front bearing—7374997

Figure 43—Continued.

Figure 44. Clutch release bearing.

b. Operation (fig. 43). The movement of the gearshift hand lever (U) is transmitted through the second and third speed shifter shafts (J) and forks (M and V), contained in the transmission control cover (N), to the first and reverse speed sliding gear (W) and to the second and third speed synchronizer sleeve (QQ).

(1) *First speed forward.* Power flow, when the gearshift hand lever (U) is shifted into first speed forward, is from input shaft (A) to first and reverse speed sliding gear (W), to first speed gear of countershaft cluster gear, and to main shaft (CC).

(2) *Second speed forward.* Shifting gearshift hand lever (U) into second speed forward causes second and third speed gear shifter fork (M) to slide second and third speed synchronizer sleeve (QQ) rearward on the second and third speed synchronizer hub (RR) and blocking ring (NN), thereby, locking hub and ring to second speed gear (LL). Power flow is from input shaft (A) to second speed gear of countershaft cluster gear and to main shaft (CC).

(3) *Third speed forward.* Movement of gearshift hand lever (U) to third speed forward position causes second and third speed gear shifter fork (M) to move forward. Forward movement, of fork, slides second and third speed synchro-

nizer sleeve (QQ) forward on second and third speed synchronizer hub (RR) and blocking ring (NN), thereby, locking hub and ring to input shaft gear. Power flow is from input shaft (A) to third speed gear of countershaft gear cluster and to the main shaft (CC).

(4) *Reverse.* Power flow is from input shaft (A) to reverse idler shaft gear (fig. 54), to first and reverse speed sliding gear (W), and to main shaft (CC).

c. Clutch Release Bearing (fig. 44). The clutch release bearing is mounted on the input shaft. The clutch housing is bolted to transmission. The clutch release fork pivots on the clutch release fork fulcrum which is installed in the input shaft bearing cover. The release bearing carrier spring is secured to the bearing cover.

81. Data

Make	Warner
Model	T–90
Type	Synchromesh
Gear ratios:	
Reverse	3.798 to 1
First	2.798 to 1
Second	1.551 to 1
Third	1.000 to 1
Bearing types:	
Main shaft rear	Ball
Main shaft pilot	Roller
Countershaft gear	Roller
Reverse idler gear	Bushing

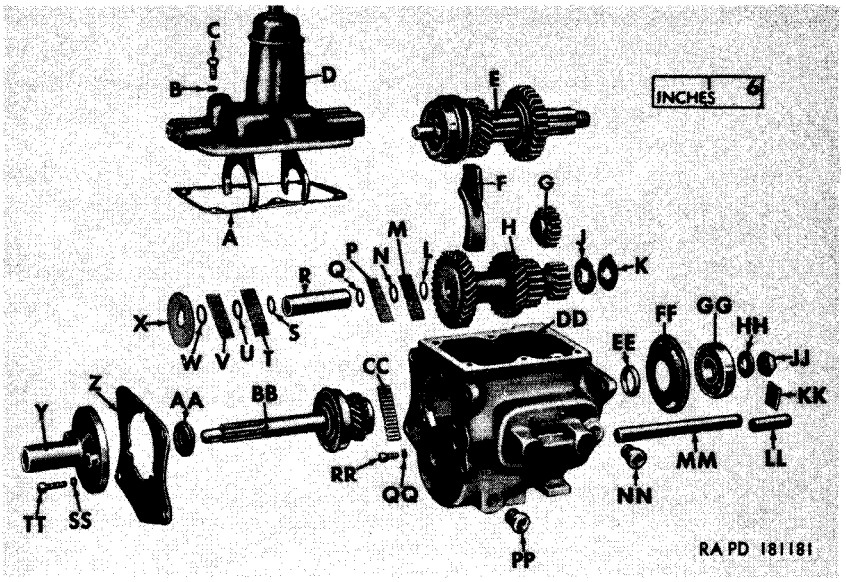
Section II. DISASSEMBLY OF TRANSMISSION ASSEMBLY INTO SUBASSEMBLIES

Note. Remove drain plug (PP, fig. 45) and drain transmission before performing the disassembly operations.

82. Remove Control Lever Cover Assembly

a. Remove Clutch Housing (fig. 44). If clutch housing assembly is installed, proceed as follows: Remove release bearing carrier spring and slide clutch release bearing off input shaft. Remove clutch release fork and clutch release fork fulcrum. Remove the four machine bolts and flat washers securing transmission to clutch housing and remove housing.

b. Remove Control Cover Assembly (fig. 45). Remove six bolts (C) and gaskets (B) which secure control cover assembly (D) to top of transmission case (DD). Remove assembly (fig. 46) from transmission case by lifting it straight up.



A—Gasket, top cover—7374977
B—Gasket, control lever cover bolt—WO–51875U
C—Bolt, 5/16–18NC–2 x 7/8—WO–635868
D—Cover, control lever assy—7032623
E—Shaft, main, w/gear and blocking ring, assy—WO–640389
F—Collector, oil, countershaft cluster gear—7697420
G—Gear, reverse idler shaft, w/bearing, assy—7697423
H—Gear, cluster, countershaft—7697422
J—Washer, thrust, bronze face, steel back—7697429
K—Washer, thrust, steel—7697547
L—Washer, countershaft cluster gear bearing roller spacer—7697427
M—Roller, countershaft cluster gear bearing—7697545
N—Washer, countershaft cluster gear bearing roller spacer—7697427
P—Roller, countershaft cluster gear bearing—7697545
Q—Washer, countershaft cluster gear bearing roller spacer—7697427
R—Spacer, countershaft cluster gear bearing roller—7372667
S—Washer, countershaft cluster gear bearing roller spacer—7697427
T—Roller, countershaft cluster gear bearing—7697545
U—Washer, countershaft cluster gear bearing roller spacer—7697427
V—Roller, countershaft cluster gear bearing—7697545
W—Washer, countershaft cluster gear bearing roller spacer—7697427
X—Washer, thrust, bronze—7697428
Y—Cover, bearing, input shaft—7697564
Z—Gasket, input shaft bearing cover—7697565
AA—Seal, oil, input shaft bearing cover—7697572
BB—Shaft, input, w/integral gear—7697566
CC—Roller, front bearing—7374997
DD—Case, transmission, assy—7372877
EE—Spacer, main shaft rear bearing—7374992
FF—Adapter, main shaft rear bearing—7374991
GG—Bearing, ball, main shaft rear—700336
HH—Washer, plain, 29/32 ID, 1 1/16 OD, 1/32 thk—7375131
JJ—Nut, 7/8–16NC–2—7743652
KK—Plate, lock—7697424
LL—Shaft, reverse idler—7697425
MM—Countershaft—7697421
NN—Plug, filler—7372879
PP—Plug, drain—7372879
QQ—Gasket, oil collector screw—WO–51875U
RR—Bolt, socket-hd, 5/16–24NF–3 x 3/4—571283
SS—Gasket, input shaft bearing cover screw—WO–51875U
TT—Screw, cap, socket-hd, 5/16–18NC–3 x 1 1/4—571279

Figure 45. Transmission with control lever cover assembly—disassembled view.

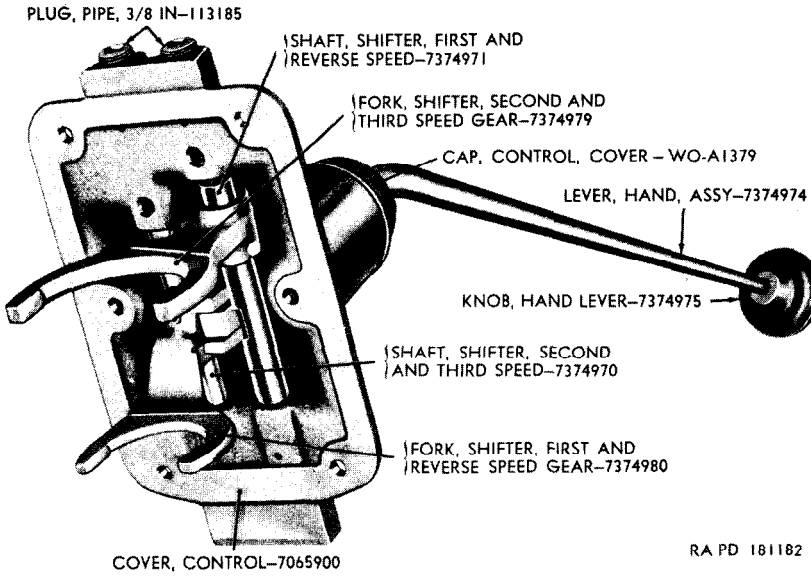


Figure 46. Transmission control lever cover assembly.

83. Remove Transmission Countershaft

a. Remove Input Shaft Bearing Cover. Remove three socket head cap screws (fig. 47) and gaskets which secure the input shaft bearing

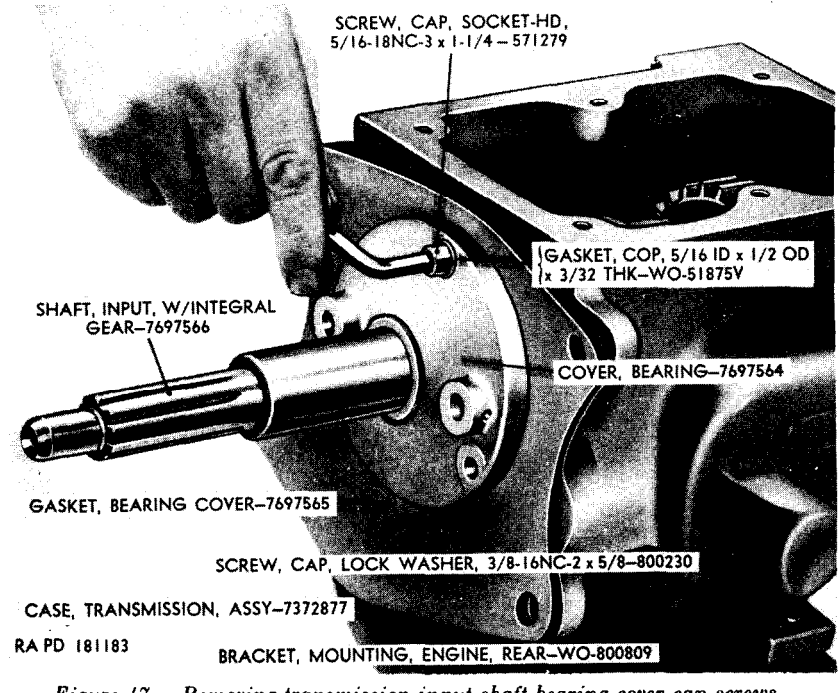


Figure 47. Removing transmission input shaft bearing cover cap screws.

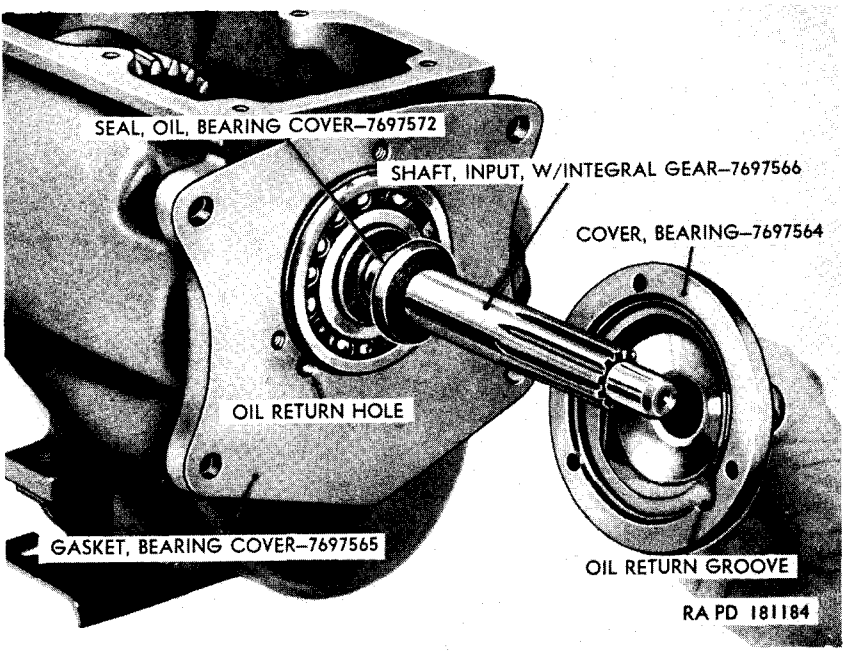


Figure 48. Removing transmission input shaft bearing cover.

cover. Slide the input shaft bearing cover (fig. 48) off input shaft with integral gear. Slide input shaft bearing cover oil seal (fig. 48) off input shaft.

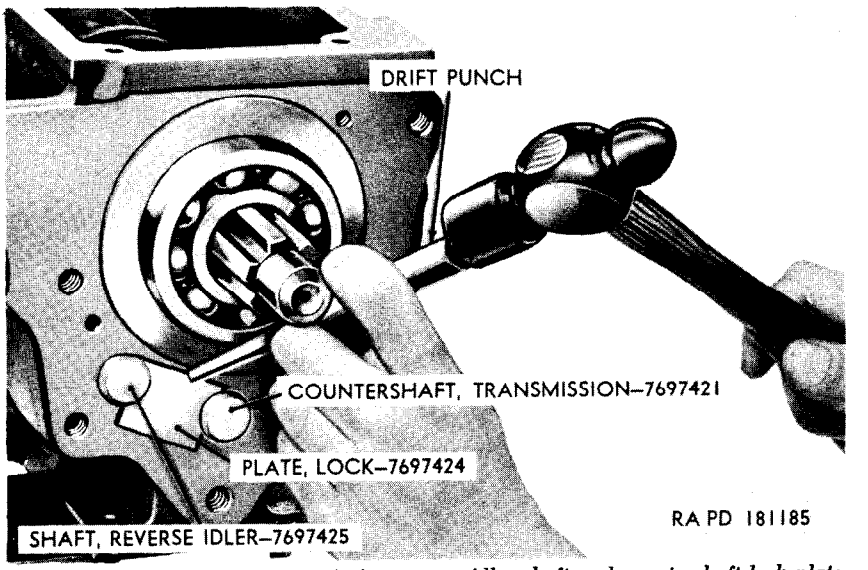


Figure 49. Removing transmission reverse idler shaft and countershaft lock plate.

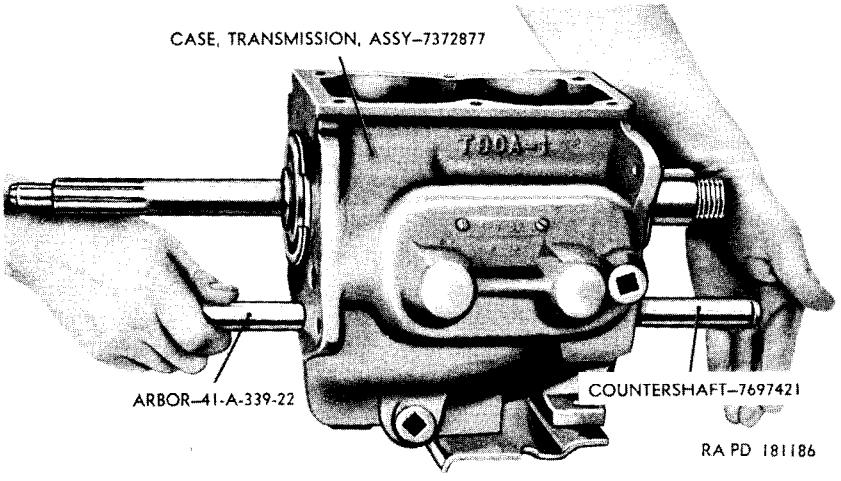


Figure 50. Removing transmission countershaft.

b. Remove Transmission Countershaft. Using a suitable drift, remove the lock plate (fig. 49) which secures the reverse idler shaft and countershaft. With a brass drift, tap transmission countershaft approximately one-fourth of an inch out of case (toward lock plate side).

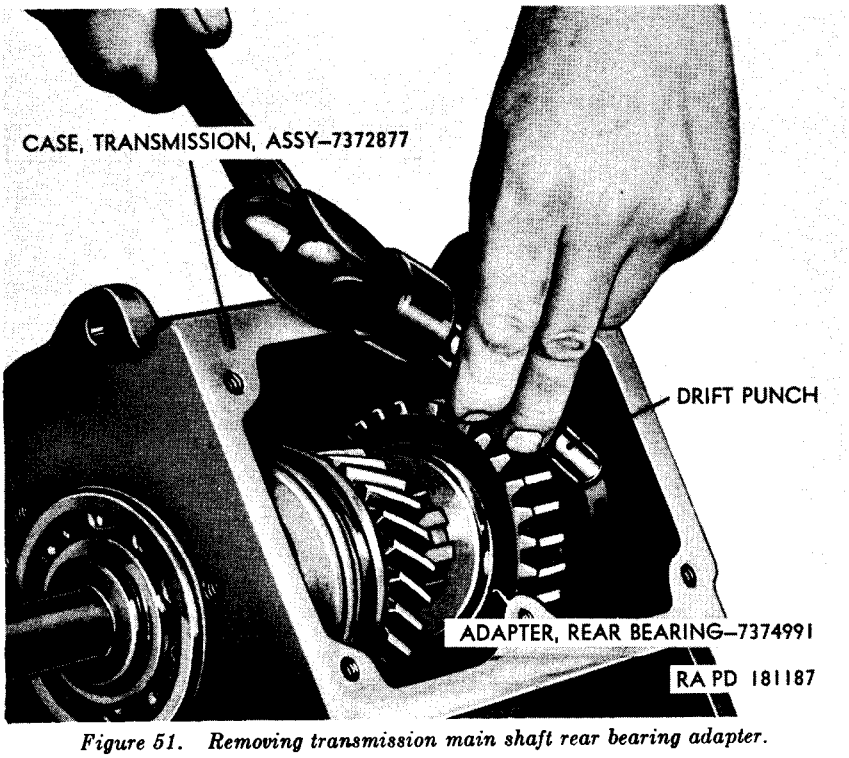


Figure 51. Removing transmission main shaft rear bearing adapter.

Using arbor 41–A–339–22 (fig. 6 and 50), push the countershaft through transmission case, from front to rear. Countershaft will drop to bottom of case after arbor is centered in countershaft cluster gear. Arbor serves to hold countershaft cluster gear bearing rollers, spacer, and washers in place.

84. Remove Transmission Main Shaft Assembly

a. Remove Main Shaft Rear Bearing Adapter (fig. 51). Using a suitable drift, tap the main shaft rear bearing adapter from the transmission case assembly.

b. Remove Transmission Main Shaft Assembly (fig. 52). Slide the transmission main shaft assembly out slightly. Separate main shaft from second and third speed synchronizer sleeve and second and third speed synchronizer blocking ring, and remove shaft assembly from the case. Remove the second and third speed synchronizer blocking ring from input shaft. Remove the front bearing rollers from the input shaft.

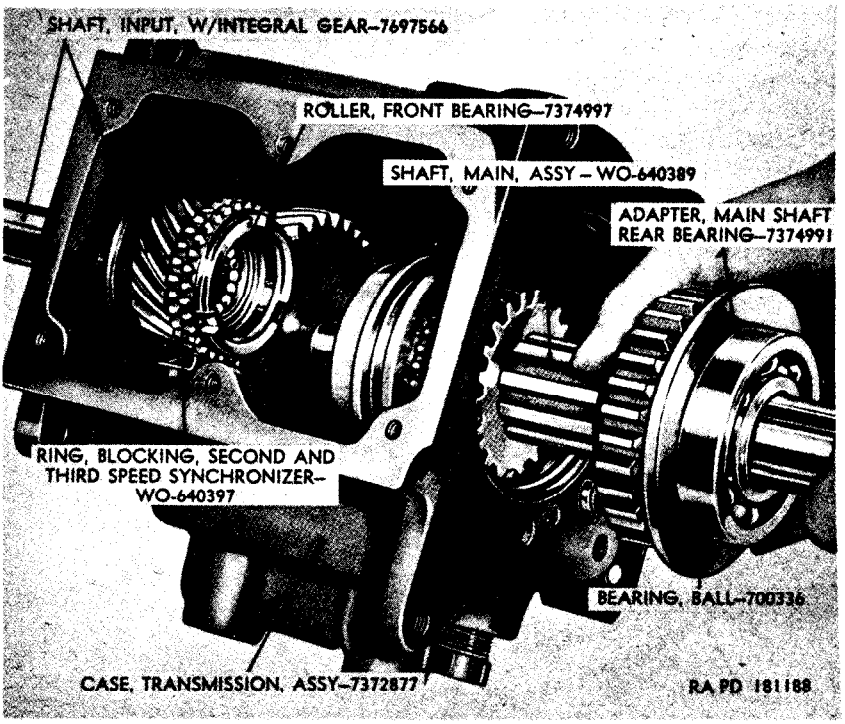


Figure 52. Removing transmission main shaft assembly.

85. Remove Input Shaft With Integral Gear

a. Remove Input Shaft With Integral Gear (fig. 53). Using a suitable block of wood, tap the input shaft with integral gear out of the

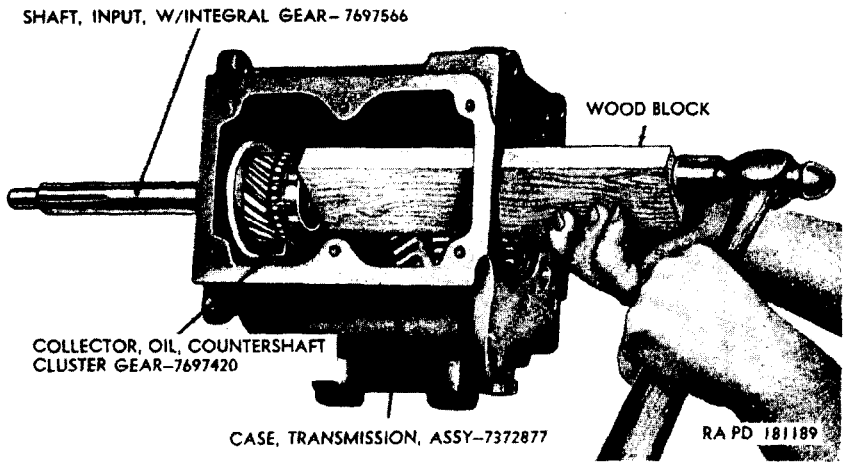


Figure 53. Removing input shaft with integral gear.

transmission case assembly. Take care not to damage the countershaft cluster gear oil collector.

b. Remove Countershaft Clus'er Gear Oil Collector (fig. 54). Remove two socket-head bolts and gaskets securing countershaft cluster gear oil collector to transmission case. Lift the collector from the transmission case assembly.

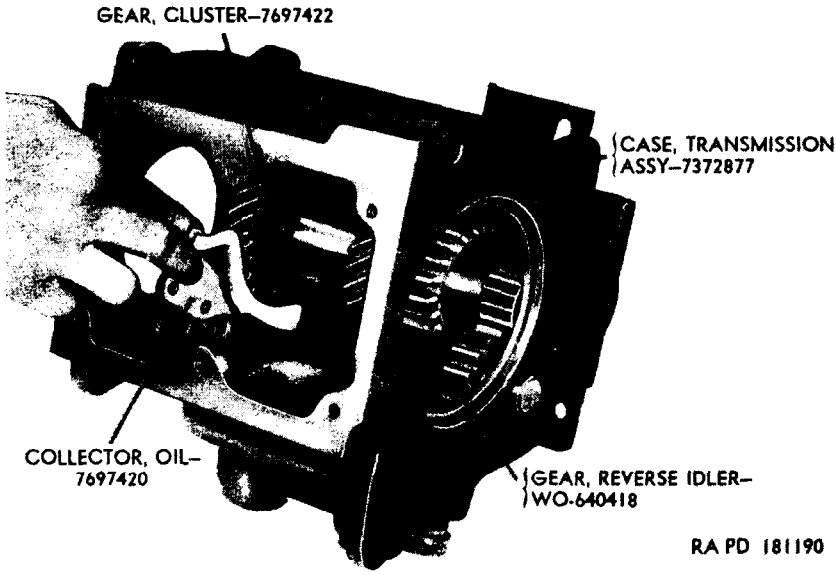


Figure 54. Removing transmission countershaft cluster gear oil collector.

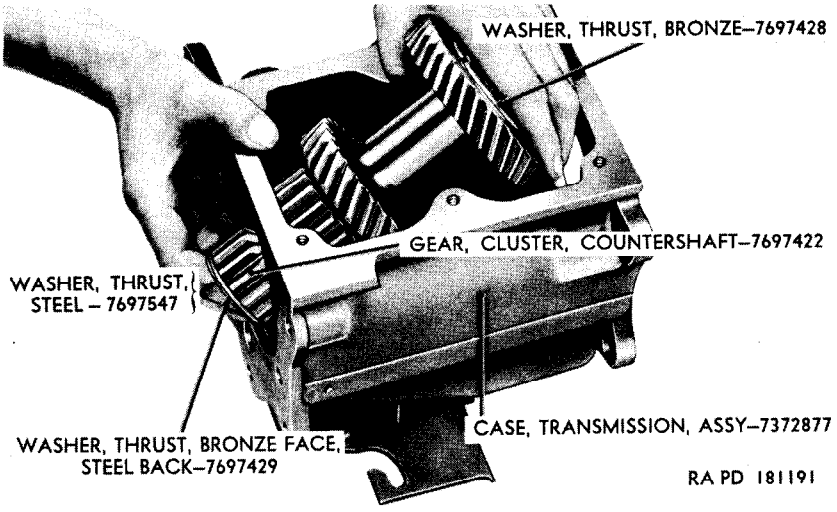


Figure 55. Removing transmission countershaft cluster gear.

86. Remove Transmission Countershaft Cluster Gear

a. Remove Countershaft Cluster Gear (fig. 55). Lift the countershaft cluster gear out of the transmission case. Keep arbor (fig. 50) in position so that it will not slip out and permit bearing rollers to slide out. Remove the three thrust washers from the cluster gear.

b. Remove Countershaft Cluster Gear Bearing Roller Spacer (fig. 45). Tip countershaft cluster gear (H) on end and remove the arbor 41–A–339–22 (fig. 50), 6 bearing roller spacer washers (L, N, Q, S, U, and W), 88 bearing rollers (M, P, T, and V), and one bearing roller spacer (R).

87. Remove Reverse Idler Shaft Gear

(fig. 45)

a. Remove Reverse Idler Shaft. Using a suitable drift, drive the reverse idler shaft (LL) out of reverse idler shaft gear (G) and transmission case assembly (DD).

b. Remove Reverse Idler Shaft Gear. Lift the reverse idler shaft gear with bearing assembly (G) out of transmission case assembly (DD).

Section III. REBUILD OF TRANSMISSION CONTROL LEVER COVER ASSEMBLY

88. Disassembly

(fig. 57)

a. Remove Gearshift Hand Lever. Unscrew hand lever knob (H). Unscrew the gearshift hand lever retainer (J) from transmission control cover (T). Remove hand lever retainer gasket (K), spring seat (L),

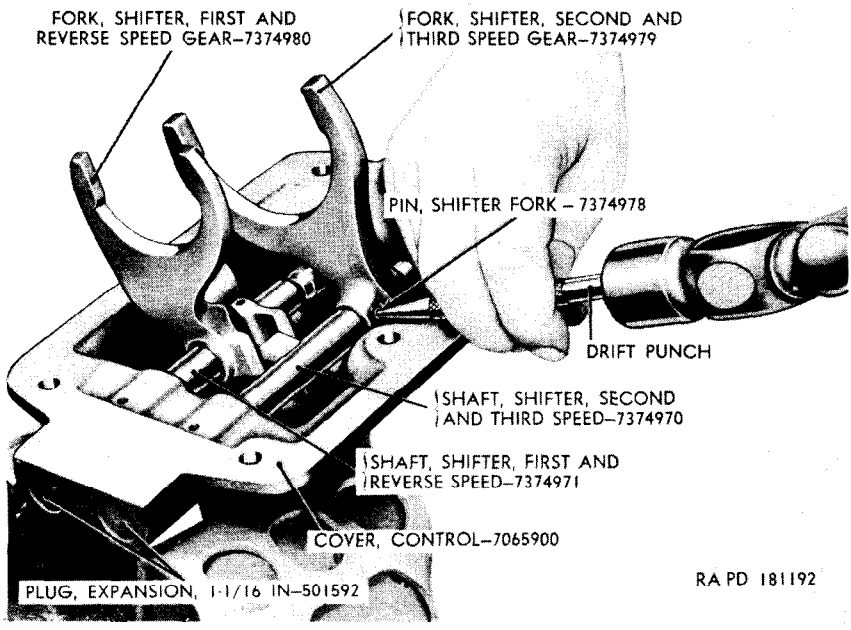


Figure 56. Removing shifter fork pin from shifter shaft.

and support spring (M). Drive out the hand lever ball pin (F) and tap hand lever ball (E) off hand lever (G).

b. Remove Shifter Fork Pins. Using a suitable drift, drive out two shifter fork pins (fig. 56) which secure the second and third speed gearshifter fork and first and reverse speed gearshifter fork to their respective shifter shafts.

c. Remove Shifter Shafts. Unscrew the two pipe plugs (D) from end of transmission control cover (T). Slide the second and third speed shifter shaft (N) and first and reverse speed shifter shaft (Q) out of shifter forks (A and V) and control cover (T) and lift the two shifter forks out of cover.

Caution: Detent ball springs are under compression when shifter shafts are in place and balls may pop out when shafts are removed. To prevent personal injury or loss of parts, hold hand over detent ball hole and withdraw shaft slowly.

Remove the two shifter shaft detent balls (B) and ball springs (C). Remove the shifter shaft interlock plunger (R) from cover.

d. Remove Expansion Plugs. Tap the two expansion plugs (P) out of end of transmission control cover (T). Tap the shifter shaft interlock hole plug (S) out of cover.

89. Inspection and Repair

(fig. 57)

a. Inspection.

(1) *Transmission control cover.* Inspect the transmission control cover (T) carefully for cracks, distortion, and sand holes. Examine machined mating surface for nicks, scores, or scratches. Inspect screw threads for damage. Replace cover if broken, cracked, distorted, or if threads have been damaged beyond repair.

(2) *Shifter shafts.* Inspect the second and third speed shifter shaft (N) and first and reverse speed shifter shaft (Q) for distortion, pitting, scores, cracks, ridges, or worn condition. Replace shifter shafts, if necessary.

(3) *Shifter forks.* Replace the second and third speed gear shifter fork (A) and first and reverse speed gearshifter fork (V) if they are bent, cracked, or the ends are worn. Slip forks on shifter shafts and check fit. Replace shifter fork if fit is excessively loose on shifter shaft. Replace shifter fork pin (U).

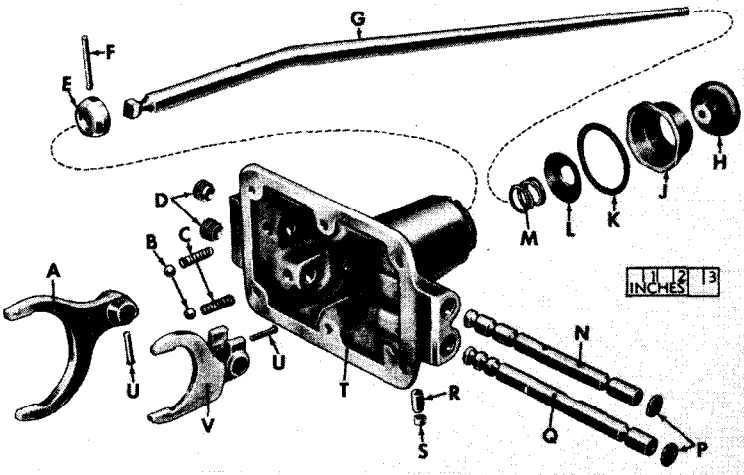
(4) *Gearshift hand lever and parts.* Inspect gearshift hand level (G) for distortion, cracks, and other damage. Examine tip of lever, which mates with shifter fork, for wear and damage. Replace hand lever, if necessary. Inspect hand lever retainer (J) for damaged threads. Replace retainer, if necessary. Replace hand lever spring seat (L), if worn or damaged. Replace the hand lever support spring (M), if broken, distorted, or if it fails to operate in its intended manner. Inspect hand lever ball (E) for wear, pitting, or out-of-round condition. Replace ball, if necessary. Replace hand lever retainer gasket (K) at each rebuild.

(5) *Shifter shaft detent balls and springs.* Inspect the shifter shaft detent balls (B) for wear, pitting, and out-of-round condition. Replace balls, if necessary. Check shifter shaft detent ball springs (C) for breaks and distortion. Replace springs if damaged or if they fail to operate in their intended manner.

(6) *Pipe plugs and expansion plugs.* Replace the pipe plugs (D) if threads are stripped or damaged. Replace the two expansion plugs (P) and shifter shaft interlock hole plug (S) at each rebuild.

b. Repair. Slight faults, such as burs, scores, or scratches on all parts may be removed with a hone. Clean tapped holes in transmission control cover with a standard tap.

A – FORK, SHIFTER, SECOND AND THIRD SPEED GEAR – 7374979
B – BALL, DETENT, SHIFTER SHAFT – 104920
C – SPRING, SHIFTER SHAFT DETENT BALL – 7351052
D – PLUG, PIPE, 3/8 IN – 113185
E – BALL, HAND LEVER – 7032624
F – PIN, HAND LEVER BALL – 7372456
G – LEVER, HAND – 7374964
H – KNOB, HAND LEVER – 7374975
J – RETAINER, HAND LEVER – 7372447
K – GASKET, HAND LEVER RETAINER – 7374976
L – SEAT, HAND LEVER SPRING – 7372448



M – SPRING, SUPPORT, HAND LEVER – 7374969
N – SHAFT, SHIFTER, SECOND AND THIRD SPEED – 7374970
P – PLUG, EXPANSION, 11/16 IN – 501592
Q – SHAFT, SHIFTER, FIRST AND REVERSE SPEED – 7374971
R – PLUNGER, INTERLOCK, SHIFTER SHAFT – 7374972
S – PLUG, 3/8 IN, SHIFTER SHAFT INTERLOCK HOLE – 7374973
T – COVER, CONTROL – 7065900
U – PIN, SHIFTER FORK – 7374978
V – FORK, SHIFTER, FIRST AND REVERSE SPEED GEAR – 7374980

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Figure 57. Transmission control lever cover assembly—disassembled view.

90. Assembly

(fig. 57)

a. Install Shifter Shafts. Place transmission control cover (T) upside down. Install the two shifter shaft detent ball springs (C) and ⅜-inch balls (B) in cover. Depress ball and spring, and slide the second and third speed shifter shaft (N) into front end of cover until it retains the ball.

Note. The three detent grooves are on the front end of both shafts.

Place the second and third speed gearshifter fork (A) in position on shifter shaft and tap shaft through fork into other side of cover. Secure fork to shaft with new shifter fork pin (U). Flange ends of pin. Install the shifter shaft interlock plunger (R) making sure it enters the groove in the shaft (N). Slide the first and reverse speed shifter shaft (Q) into front end of cover, while depressing detent ball and spring, until it retains detent ball in place. Place the first and reverse speed gearshifter fork (V) in position on shaft (Q) and tap shaft through fork into other side of cover. Secure fork to shaft with

new shifter fork pin (U). Flange ends of pin. Drive ⅜-inch shifter shaft interlock hole plug (S) into place. Install two new 1 1/16-inch expansion plugs (P). Screw the two ⅜-inch pipe plugs (D) into transmission control cover (T).

b. Install Gearshift Hand Lever. Tap gearshift hand lever ball (E) into position on hand lever (G) and secure with hand lever ball pin (F). Insert hand lever into top of transmission control cover (T). Slide the hand lever support spring (M) and spring seat (L) over hand lever. Coat new hand lever retainer gasket (K) with plastic type gasket cement. Install gasket, and screw hand lever retainer (J) into place, tightening securely. Install hand lever knob (H) on hand lever (G). Move hand lever (G) into the various positions and check to see that the shifter shafts are operating properly.

Section IV. REBUILD OF TRANSMISSION COUNTERSHAFT AND COUNTERSHAFT CLUSTER GEAR

91. Disassembly

The transmission countershaft and countershaft cluster gear require no disassembly except the removal of countershaft cluster gear bearing rollers, spacer washers, and spacer. Refer to paragraph 86*b*.

92. Inspection and Repair

(fig. 45)

a. Inspection.

(1) *Transmission countershaft.* Inspect the countershaft (MM) and replace if it is scored, pitted, ridged, or worn.

(2) *Countershaft cluster gear.* Examine the countershaft cluster gear (H) teeth for damage and wear. If teeth are chipped, broken, cracked, or worn, cluster gear must be replaced. Inspect gear bearing rollers (M, P, T, and V) for flat spots, chips, or discoloration due to overheating. Replace rollers if they do not meet repair and rebuild standards (par. 270*a*). Replace any broken, ridged, or distorted countershaft cluster gear bearing roller spacer washers (L, N, Q, S, U, and W) or thrust washers (J, K, and X). Replace washers if they do not meet repair and rebuild standards (par. 270*a*). Replace damaged or worn countershaft cluster gear bearing roller spacer (R).

b. Repair. Repair slight scores, nicks and burs on countershaft cluster gear (H) and countershaft (MM) with fine file or hone. Replace gear or countershaft if fault is not readily corrected.

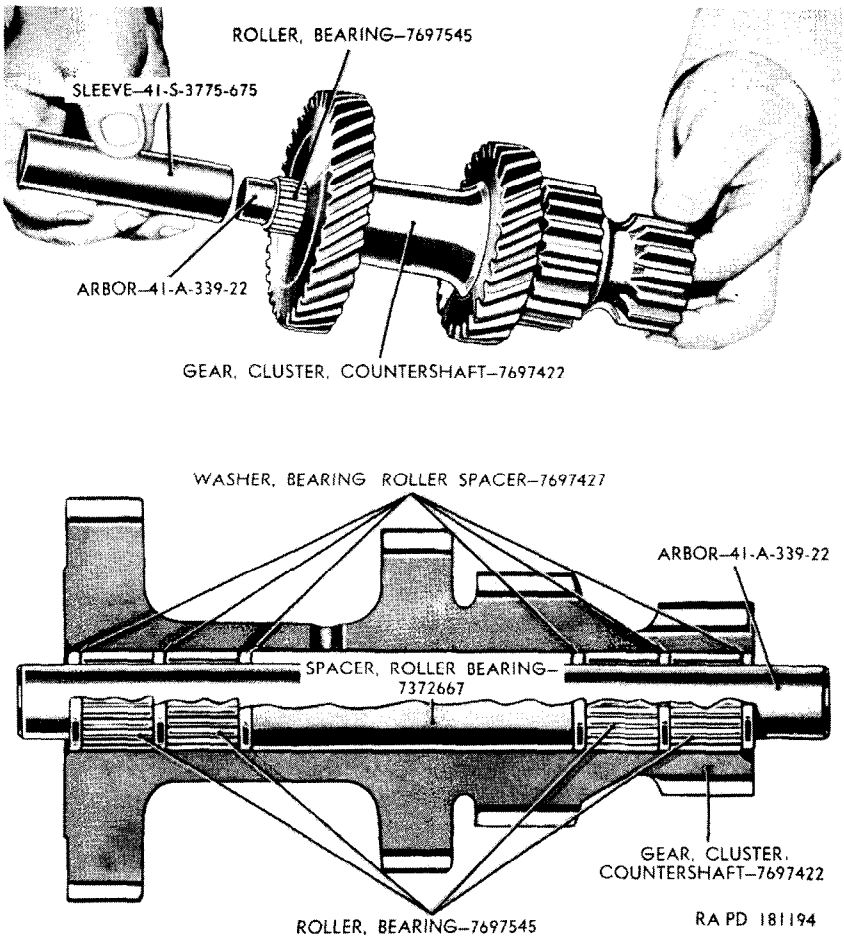


Figure 58. Installing transmission countershaft cluster gear bearing rollers.

93. Assembly

(fig. 45)

a. Install Countershaft Cluster Gear Bearing Roller Spacer. Insert the countershaft cluster gear bearing roller spacer (R) in center of the countershaft cluster gear (H).

b. Install Countershaft Cluster Gear Bearing Rollers. Coat arbor 41–A–339–22 (figs. 6 and 58) heavily with general purpose grease (GO) and insert arbor through bore of countershaft cluster gear and bearing roller spacer. Insert countershaft cluster gear bearing roller spacer washer (S), 22 bearing rollers (T), bearing roller spacer washer (U), 22 bearing rollers (V), and bearing roller spacer washer (W) into the front end of the countershaft cluster gear (H). Insert the bearing roller spacer washer (Q), 22 bearing rollers (P), bearing roller spacer washer (N), 22 bearing rollers (M), and bearing roller spacer washer

(L) into the rear end of the countershaft cluster gear. Seat rollers against washers with sleeve 41–S–3775–675 (figs. 6 and 58)

Section V. REBUILD OF TRANSMISSION MAIN SHAFT ASSEMBLY

94. Disassembly

a. Remove Synchronizer Assembly (fig. 59). Remove the second and third speed synchronizer hub snap ring (C). Remove the synchronizer assembly (sleeve (B), blocking rings (A and H), and hub (F)) as a unit from main shaft (L). Slide the second speed gear (K), and first and reverse speed sliding gear (M) off main shaft.

b. Disassemble Synchronizer Assembly (fig. 59). Slide second and third speed synchronizer sleeve (B) from second and third speed synchronizer hub (F). Remove the blocking rings (A and H). Remove the three second and third speed synchronizer shifting plates (E) from hub. Remove the two second and third speed synchronizer springs (D and G) from inside hub.

c. Remove Ball Bearing (fig. 45). Remove main shaft rear ball bearing (GG) and bearing adapter (FF) from main shaft with a suitable puller. Remove main shaft rear bearing spacer (EE).

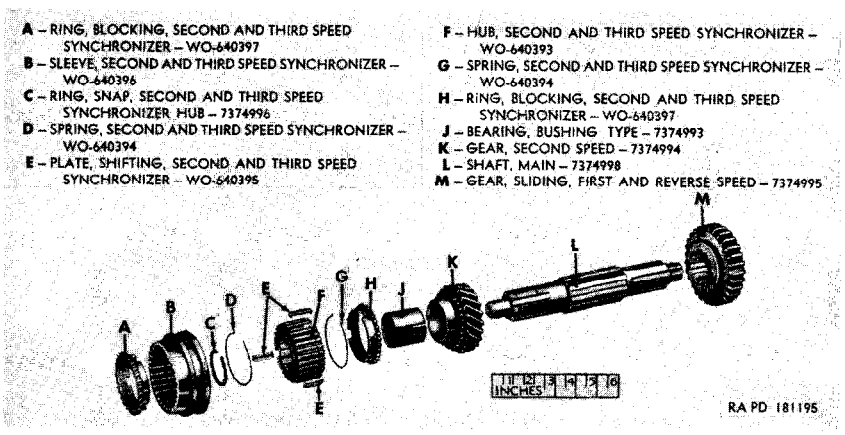


Figure 59. Transmission main shaft assembly—disassembled view.

95. Inspection and Repair

(fig. 59)

a. Inspection.

(1) *Main shaft.* Inspect main shaft (L) for twisted condition, damaged splines, damaged threads, pitting, or discolored bearing surfaces due to overheating. Check diameter of pilot end of main shaft against repair and rebuild standards

(par. 270*b*). If dimension does not conform to wear limits, replace main shaft.

(2) *First and reverse speed sliding gear.* Replace the first and reverse speed sliding gear (M) if teeth or splines are worn or if teeth are pitted, chipped, or cracked. Slide first and reverse speed sliding gear onto main shaft. If backlash between gear and shaft is not within limits established in the repair and rebuild standards (par. 270*b*), either the gear or shaft, or both must be replaced.

(3) *Second speed gear.* Inspect gear teeth for chipped, pitted, or cracked condition. Replace second speed gear (K) if worn or damaged. Measure inside diameter of bushing type bearing (J) in bore of second speed gear. If dimension does not conform to limits in repair and rebuild standards, (par. 270*b*) replace bearing (*b* below).

(4) *Second and third speed synchronizer hub, sleeve, and blocking rings.* Inspect these parts for wear or damage. Replace hub (F), sleeve (B), and blocking rings (A and H) if splines are worn or damaged. Replace second and third speed synchronizer shifting plates (E), synchronizer, and snap ring (C) if broken or distorted.

b. Repair. If necessary to remove the bushing type bearing (J) from bore of second speed gear (K), use a suitable removing tool and press or drive the bearing out of second speed gear. Install new bearing with same tool.

96. Assembly

(fig. 59)

a. Assemble Second and Third Speed Synchronizer Hub. Install the two second and third speed synchronizer springs (D and G) in the second and third speed synchronizer hub (F), with spring tension opposed. Place lipped end of one spring in slot of hub and seat spring in hub. Turn hub around and make same installation with other spring, starting with same slot in hub as used for the first spring. Install the three second and third speed synchronizer shifting plates (E) in the three slots on hub with smooth side of plates outward. Hold plates in position and slide the second and third speed synchronizer sleeve (B) over hub with long beveled edge toward long part of hub.

b. Install Second Speed and First and Reverse Speed Sliding Gear. Install main shaft rear bearing spacer (EE, fig. 45) main shaft rear bearing adapter (FF, fig. 45), and ball bearing (GG, fig. 45) on main shaft. Slide the first and reverse speed sliding gear (M) onto main shaft with shifter fork channel of the gear toward front. Slide second speed gear (K) on main shaft with tapered end away from sliding gear. Install second and third speed synchronizer blocking ring (H)

on main shaft with large surface against speed gear. Slide synchronizer hub (F), with assembled parts, onto main shaft and follow with the second blocking ring (A). Install the second and third speed synchronizer hub snap ring (C).

Section VI. REBUILD OF INPUT SHAFT ASSEMBLY

97. Disassembly

(fig. 60)

a. Remove Bearing Snap Ring. Remove the bearing snap ring from its groove in the input shaft.

b. Remove Ball Bearing. Press the ball bearing off the input shaft. Slide the oil baffle off the shaft. Do not remove the bearing snap ring from bearing outer race unless inspection (par. 98*a*) reveals bearing to be unserviceable.

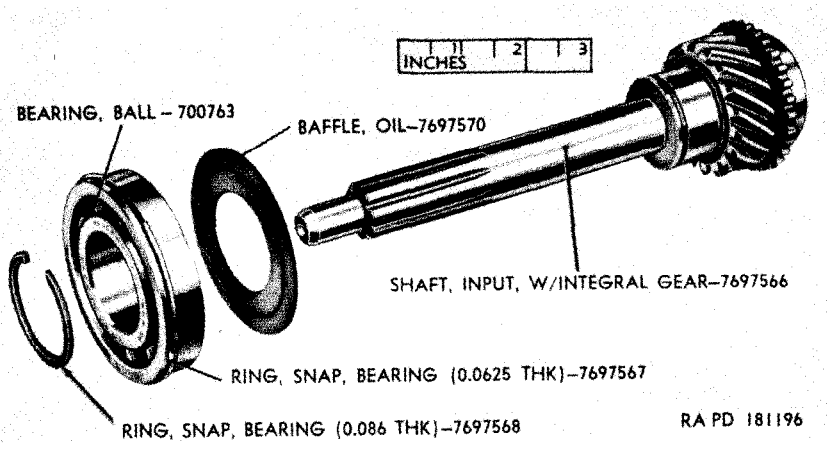


Figure 60. Transmission input shaft with integral gear—disassembled view.

98. Inspection and Repair

(fig. 60)

a. Inspection. Inspect the input shaft for twists, distortion, damaged or worn splines, and damaged or worn gear teeth. Replace shaft if any faults are evident. Check the pilot end of the input shaft and replace if this dimension does not meet repair and rebuild standards (par. 270*c*). Replace distorted or broken bearing snap ring or oil baffle. Apply clean engine oil (OE) to ball bearing and turn slowly. Ball bearing must turn smoothly and freely without bind or roughness. Replace bearing if rough, pitted, scored, or worn. Check inside diameter of ball bearing against repair and rebuild standards (par. 270*c*). Replace bearing, if necessary.

b. Repair. Smooth over any slight nicks, burs, or scratches on input shaft splines, gear teeth, and shaft portions with a hone. Replace input shaft if faults cannot be easily corrected.

99. Assembly

(fig. 60)

a. Install Ball Bearing. Slide oil baffle into position on input shaft with beveled recess of oil baffle toward integral gear of input shaft. Press ball bearing on input shaft, using an arbor press.

b. Install Bearing Snap Ring. Lock ball bearing to input shaft with the 0.086 thick bearing snap ring. If new ball bearing is being installed, install 0.0625 thick bearing snap ring in groove of bearing outer race.

Section VII. REBUILD OF REVERSE IDLER SHAFT GEAR AND TRANSMISSION CASE ASSEMBLY

100. Reverse Idler Shaft Gear

a. Disassembly. The reverse idler shaft gear (fig. 61) requires no disassembly except the removal of the bushing type bearing. Do not remove the bearing unless inspection (*b* below) reveals it to be unserviceable. To remove the bearing, press or drive bearing out of bore of gear with a suitable removing tool.

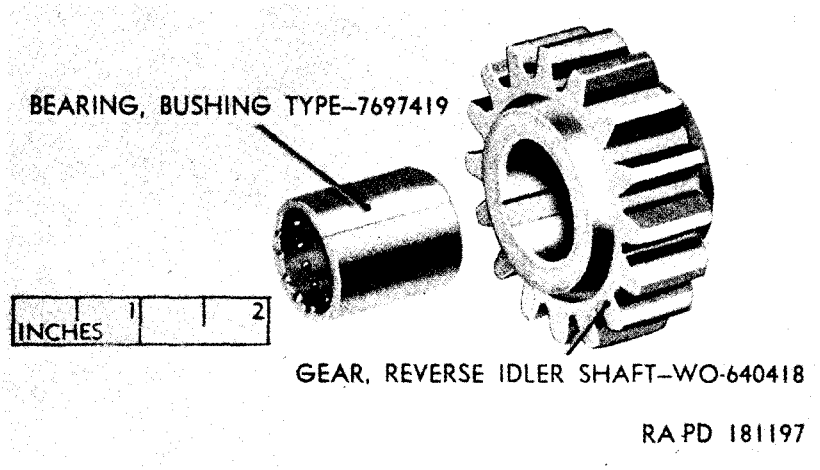


Figure 61. Transmission reverse idler shaft gear—disassembled view.

b. Inspection and Repair.

(1) *Inspection.* Inspect teeth of reverse idler shaft gear (fig. 61) for chips, pits, scores, or breaks. Replace gear if teeth are excessively damaged or worn. Measure inside diameter of

bearing. If dimension does not conform to repair and rebuild standards (par. 270*d*), replace bearing. Inspect reverse idler shaft (LL, fig. 45) for scored, worn, ridged, or pitted condition. Check diameter of shaft against repair and rebuild standards (par. 270*d*). If shaft dimension does not conform to limits established, replace shaft. Replace the reverse idler shaft and countershaft lock plate (KK, fig. 45) if it is damaged, distorted, or broken.

(2) *Repair.* Slight faults, such as nicks, burs or scratches, on reverse idler shaft and shaft gear may be removed with a hone. Replace gear or shaft if these faults cannot be easily removed.

c. Assembly. To install new reverse idler shaft gear bushing type bearing (fig. 61), place new bearing in bore of reverse idler shaft gear and press or drive into position. Ream bearing to size specified in repair and rebuild standards (par. 270*d*).

101. Transmission Case Assembly

a. Disassembly. The transmission case assembly (DD, fig. 45) requires no disassembly. It is not necessary to remove the rear engine mounting bracket (fig. 47) used to secure transmission to engine rear support crossmember unless it is damaged or if transmission case is to be replaced. To remove bracket, remove the four lockwasher cap screws securing it to bottom of transmission.

b. Inspection and Repair.

(1) *Inspection.* Examine transmission case for cracks and sand holes. Replace case if cracks or sand holes are found. Inspect mating surfaces, bearing and adapter surfaces, and shaft surfaces for burs, nicks, or out-of-round condition. Replace case if mating surfaces will not permit a good fit with transmission control cover. Replace case if bearing and shaft surfaces do not allow proper fits for bearing, adapter, or shafts. Inspect filler plug (NN, fig. 45) and drain plug (PP, fig. 45) for damaged threads. Replace plugs, if necessary. Install the ½-inch drain and filler plugs to prevent loss. Replace rear engine mounting bracket if distorted, cracked, or damaged.

(2) *Repair.* Remove all nicks, burs, or deep scratches from transmission case with a fine mill file.

c. Assembly. Secure rear engine mounting bracket on bottom of transmission case with four ⅜–16NC–2 x ⅝ lock washer cap screws (fig. 47).

Section VIII. ASSEMBLY OF TRANSMISSION ASSEMBLY FROM SUBASSEMBLIES

102. Install Reverse Idler Shaft Gear

(fig. 45)

a. Install Reverse Idler Shaft Gear. Place reverse idler shaft gear (G) in position (cone end of hub toward front of transmission case) in bottom of transmission case (DD). Start reverse idler shaft (LL) into side of transmission case. Position shaft so that slot in end is at the proper angle for later seating of reverse idler shart and countershaft lock plate (fig. 49). Tap shaft into case and through gear until one-half of an inch of shaft protrudes to permit proper seating of the lock plate.

b. Install Countershaft Cluster Gear Oil Collector. Place countershaft cluster gear oil collector (F) in place within transmission case. Do not secure oil collector to transmission case at this time.

103. Install Transmission Countershaft Cluster Gear

a. Install Countershaft Cluster Gear. Coat the countershaft cluster gear thrust washers (J, K and X) with universal gear lubricant (GO) to aid in their assembly. Insert ear of front thrust washer (X) in slot provided in front of transmission case. Place the rear thrust washer (J) on rear of cluster gear so that ear of washer engages slot in gear. Place countershaft cluster gear (H) in bottom of transmission case. Slide the rear thrust washer (K) between thrust washer on cluster gear and transmission case. Lift cluster gear into position and start the transmission countershaft (MM) into rear of transmission case. Drive countershaft through case and bore of cluster gear, driving out the arbor used for securing bearing rollers (M, P, T, and V), bearing roller spacer (R), and bearing roller spacer washers (L, N, Q, S, U, and W). Drive countershaft in until one-half of an inch of shaft protrudes from case. Be sure that all thrust washers are installed and secured by countershaft.

b. Check Countershaft Cluster Gear End Play. The countershaft cluster gear (H), when installed in transmission case, must have 0.012 to 0.018 inch end play on countershaft for lubrication purposes. This clearance is obtained by selective thickness of the rear countershaft cluster gear thrust washers (J and K) which are available in thicknesses of 0.0555 and 0.0625 inch. To measure end play, place a feeler gage between the two rear thrust washers. If end play is not correct, remove cluster gear, install proper size thrust washers to establish correct end play, and install cluster gear.

104. Install Input Shaft With Integral Gear

(fig. 45)

a. Install Front Bearing Rollers. Coat front bearing rollers (CC) with general purpose grease (GO) to aid in assembly. Install the 14 front bearing rollers in the recess at gear end of input shaft (BB). Place input shaft in position through opening in front of transmission case so that countershaft cluster gear oil collector (F) is engaged behind input gear in groove provided for locking collector to gear. Tap input shaft (BB) into bore of case until the snap ring installed in the groove of ball bearing rests against transmission case.

b. Secure Countershaft Cluster Gear Oil Collector. Secure countershaft cluster gear oil collector (F) to transmission case with two 5/16–24NF–3 x 3/4 socket-head bolts (RR) and 5/16 ID x 1/2 OD x 3/32 thick gaskets (QQ). Tighten bolts to a torque of 15 pound-feet.

c. Install Input Shaft Bearing Cover. Coat new input shaft bearing cover gasket (Z) with plastic type gasket cement and place it in position against the front of the transmission case. Slide new input shaft bearing cover oil seal (AA) (rubber side first) and bearing cover (Y) onto input shaft (BB). Secure input shaft bearing cover with three 5/16 ID x 1/2 OD x 3/32 thick input shaft bearing cover screw gaskets (SS) and 5/16–18NC–3 x 1 1/4 socket-head cap screws (TT).

105. Install Transmission Main Shaft Assembly

(fig. 45)

a. Install Transmission Main Shaft Assembly. Insert transmission main shaft assembly (E) into transmission case through large opening at rear of case, making sure leading edge of main shaft rides in the 14 front bearing rollers (CC) in input shaft (BB). Tap main shaft rear bearing adapter (FF) until it is properly seated in the transmission case.

b. Install Reverse Idler Shaft and Countershaft Lock Plate. Secure the transmission countershaft (MM) and reverse idler shaft (LL) by tapping the reverse idler shaft and countershaft lock plate (KK) into position in the slots in ends of the two shafts.

106. Install Transmission Control Lever Cover Assembly

(fig. 45)

a. Install Top Cover Gasket. Make sure all old gasket material and gasket cement is scraped off mating surface of transmission case. Coat new top cover gasket (A) with plastic type gasket cement. Place gasket in position on top of case.

b. Install Control Lever Cover Assembly. Place control lever cover assembly (D) in position on top of transmission case, being careful to observe that shifter forks engage collars on first and reverse sliding gear and second and third speed synchronizer assembly. Secure

cover assembly to case with six 5/16–18NC–2 x 7/8 bolts (C) and control lever cover bolt gaskets (B).

c. Install Clutch Housing (fig. 44). Secure clutch housing assembly to transmission case with four 7/16–14NC–3 x 1¼ machine bolts and 15/32 ID, 59/64 OD, 0.065 inch thick flat washers. Install clutch release fork fulcrum in input shaft bearing cover. Install clutch release fork, clutch release bearing, and release bearing carrier spring.

Section IX. TESTS AND ADJUSTMENT

107. Preparation for Tests

Fill transmission with lubricant as directed in TM 9–804A.

108. Tests

a. If transmission has been correctly assembled, internal gears should rotate freely and without bind when the input shaft is turned by hand.

b. To test transmission, turn input shaft through at least 10 complete revolutions in each gear position. Gears should turn freely and smoothly under normal hand pressure.

c. If there is noise, binding, or looseness, the transmission must be disassembled, inspected for damaged parts or improper assembly, and correctly assembled.

CHAPTER 6
TRANSFER

Section I. DESCRIPTION AND DATA

109. Description and Operation

a. Description. The transfer (fig. 62) is a two speed unit driven through gearing by the transmission. The transfer functions to distribute power to the front and rear axles through propeller shafts, to connect and disconnect power from the front axle, and to give low and high speeds. The handbrake drum and shoe assemblies are mounted on the companion flange of the transfer. The handbreak lever in the drivers compartment operates the handbrake assembly through a linkage connection. The transfer case, which is secured to the transmission, is mounted on a case support insulator located on

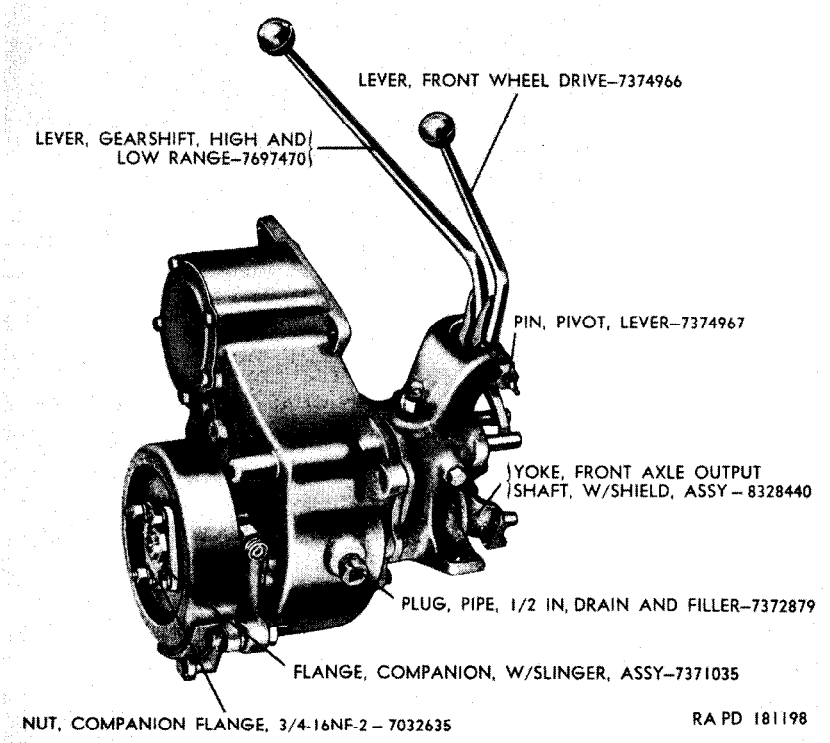


Figure 62. Transfer assembly with handbrake—overall view.

the right top side of the engine rear support cross member. The transfer is vented to the air cleaner to provide the necessary air circulation for underwater operation. A rear case cover is provided on the transfer case for access to the interior of the assembly when installing a power-takeoff.

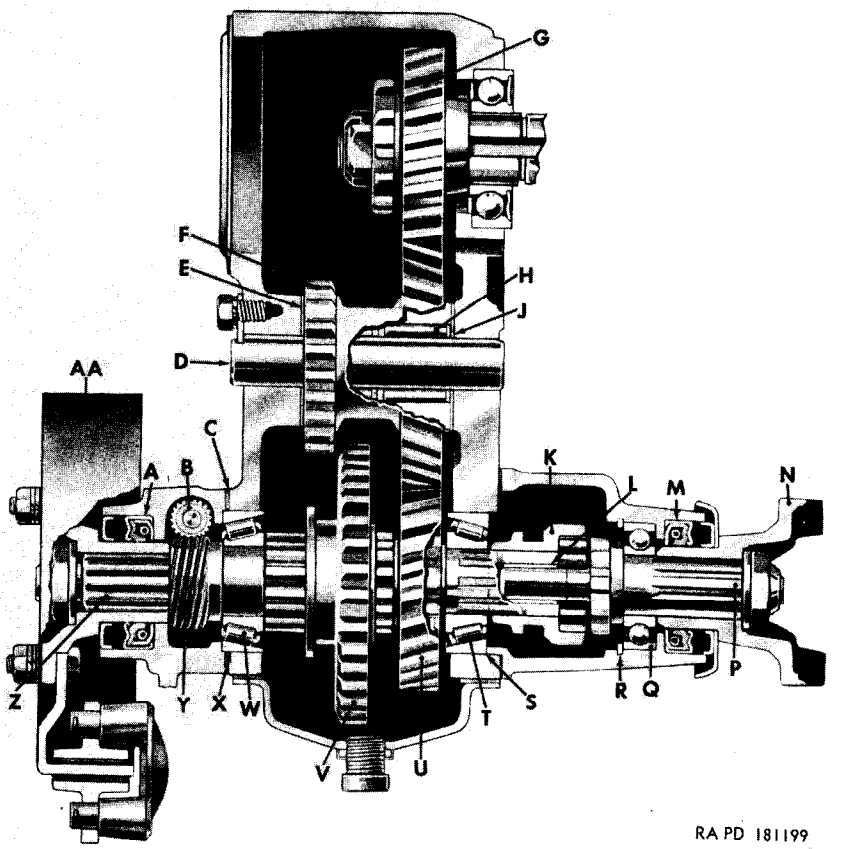
b. Operation. When following the discussion of the operating features of the transfer, reference should be made to the cross-sectional view, figure 63.

(1) *General.* Power is transmitted by the transmission to the transfer through the input shaft drive gear (G, fig. 63) which is mounted on the transmission main shaft. This gear meshes with the transfer countershaft gear (F).

(2) *Four wheel drive.* Connecting the drive to the front axle is accomplished by the front wheel drive lever which is connected to the front axle output shaft clutch gearshifter fork shifter shaft. The clutch gearshifter fork shifter shaft carries the front axle output shaft clutch gearshifter fork which is linked to the front axle output shaft clutch gear. Shifting the front wheel drive lever to the IN position causes the front axle output shaft clutch gear (K) to be slipped over the splines of the front axle output shaft (P) thereby locking the front axle output shaft to the rear axle output shaft. Thus, a drive line is offered to both the rear and front propeller shafts. When the front wheel drive lever is in the OUT position, the front axle output shaft is not connected to the rear axle output shaft. Thus, no rotation is given to the front propeller shaft.

(3) *Transfer in low range.* Shifting the high and low range gearshift lever into low range moves the rear axle output shaft sliding gearshifter fork shifter shaft. This causes the rear axle output shaft sliding gearshifter fork to move the rear axle output shaft sliding gear (V) rearward thereby connecting the rear axle output shaft (Z) with the small gear on the countershaft gear cluster. The power flow is from the transfer input shaft drive gear to the small gear cluster on the countershaft gear to the rear axle output shaft sliding gear (V) which drives the rear axle output shaft.

(4) *Transfer in high range.* Shifting the high and low range gearshift lever in high range moves the rear axle output shaft sliding gearshifter fork shifter shaft which causes the rear axle output shaft sliding gearshifter fork to move the rear axle output shaft sliding gear (V) forward. This forward movement of the sliding gear connects the rear axle output shaft (Z) with the large gear of the countershaft gear cluster. Power flow is from the transfer input shaft drive gear to the large gear cluster on the countershaft gear and then to the rear axle output shaft.



A—Seal, oil, type ML, rear axle output shaft, 1 9/16 x 2.504 x ½—500068
B—Gear, driven, speedometer—WO-806718 (part of kit—8328477)
C—Shim, rear axle output shaft bearing retainer—part of shim set—7371591
D—Countershaft, transfer—7375133
E—Washer, thrust, countershaft gear—7375135
F—Gear, countershaft—7375134
G—Gear, drive, input shaft—7375132
H—Bearing, roller, journal, countershaft gear— 708234
J—Washer, thrust, countershaft gear—7375135
K—Gear, clutch, front axle output shaft—7371212
L—Bearing, bushing type, pilot, front axle output shaft—7373115
M—Seal, oil, type ML, front axle output shaft, 1 9/16 x 2.504 x ½—500068
N—Yoke, front axle output shaft, w/shield, assy—8328440
P—Shaft, output, front axle—8329674
Q—Bearing, ball, front axle output shaft—700079
R—Ring, snap, front axle output shaft bearing—7373185
S—Cup, bearing, rear axle output shaft, inner—706821
T—Cone, bearing, rear axle output shaft, inner—705399
U—Gear, driven, rear axle output shaft—7697467
V—Gear, sliding, rear axle output shaft—7697468
W—Cone, bearing, rear axle output shaft, outer—705399
X—Cup, bearing, rear axle output shaft, outer—706821
Y—Gear, drive, speedometer—7373166 (also part of kit—8328477)
Z—Shaft, output, rear axle, w/bearing, nut and washer, assy—8328479
AA—Drum, brake—8329632

Figure 63. Transfer assembly with handbrake—cross sectional view.

110. Data

Make	Spicer
Model	18
Ratios:	
Underdrive (low range)	2.43 to 1
Direct (high range)	1.00 to 1
Bearing types:	
Countershaft	roller
Rear axle output shaft	tapered roller
Lubricant capacity	3 pt

Section II. DISASSEMBLY OF TRANSFER ASSEMBLY INTO SUBASSEMBLIES

Note. Drain the transfer as prescribed in TM 9–804A before proceeding with any disassembly operations.

111. Remove Handbrake Drum and Companion Flange

a. Remove the companion flange nut (fig. 62) and companion flange nut washer which secure the companion flange with slinger assembly and handbrake drum to the rear axle output shaft.

b. Using a suitable puller, pull the companion flange and handbrake drum off the rear axle output shaft.

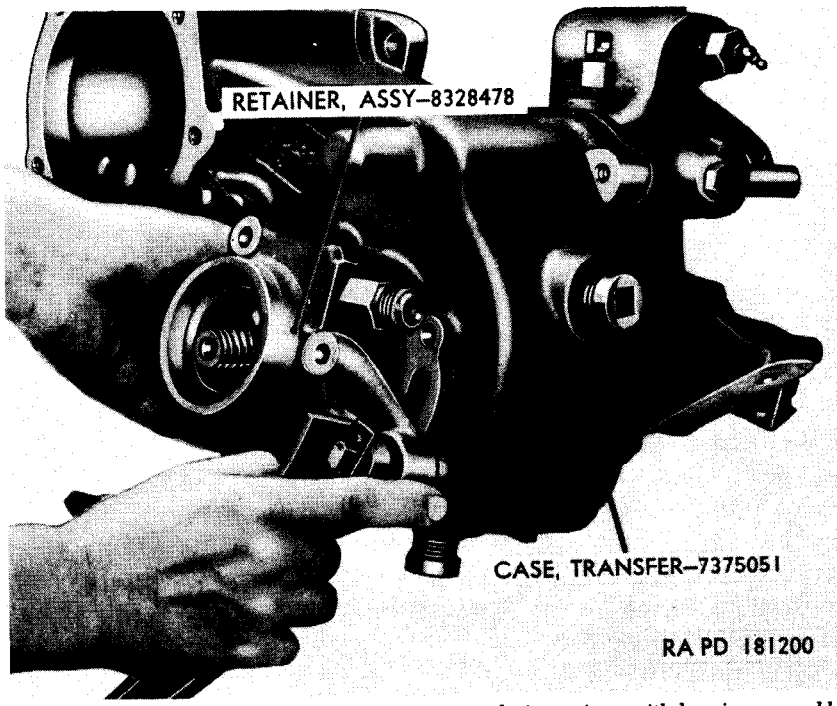


Figure 64. Removing transfer rear axle output shaft retainer with bearing assembly.

c. Remove the four bolts, plain nuts, and lockwashers which secure the brake drum to the companion flange, and remove the drum from the flange.

112. Remove Transfer Rear Axle Output Shaft Retainer With Bearing Assembly

a. Remove four bolts and lockwashers which secure the rear axle output shaft retainer with bearing assembly to the transfer case and lift the retainer (fig. 64) from the transfer case.

b. Remove the speedometer drive gear (fig. 65) and the three bearing retainer shims.

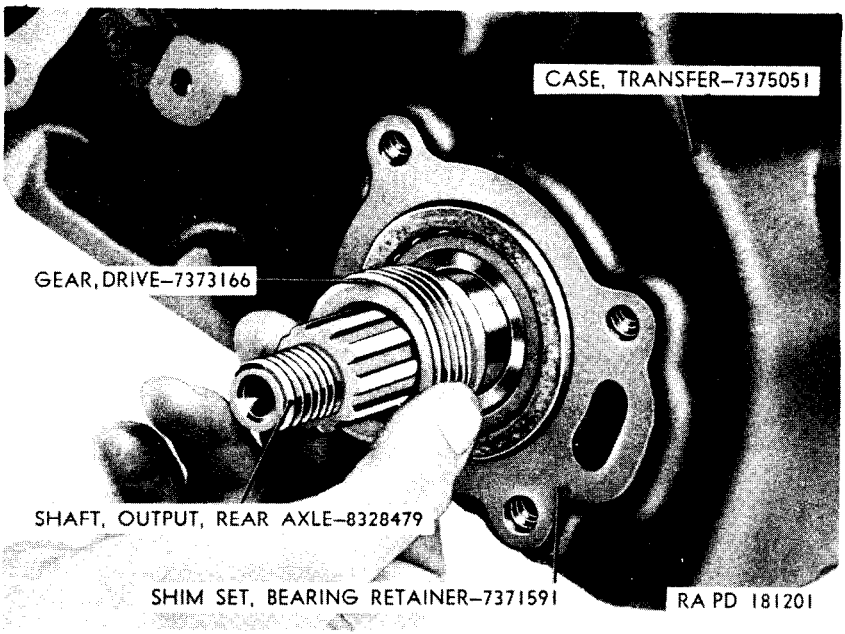


Figure 65. Removing speedometer drive gear.

113. Remove Transfer Front Axle Output Shaft Bearing Retainer

a. Remove yoke nut and yoke nut washer (fig. 66) securing the yoke with shield assembly to the front axle output shaft. Using a suitable puller, pull the yoke from the front axle output shaft.

b. Shift transfer into four-wheel drive and remove the two lever springs (fig. 67) from the levers. While holding the high and low range gearshift lever and front wheel drive lever, unscrew the lever pivot pin from the front axle output shaft bearing retainer and remove the lockwasher and levers.

c. Unscrew the 2 shifter shaft detent ball spring plugs (fig. 67) from the 2 sides of the front axle output shaft bearing retainer. Withdraw

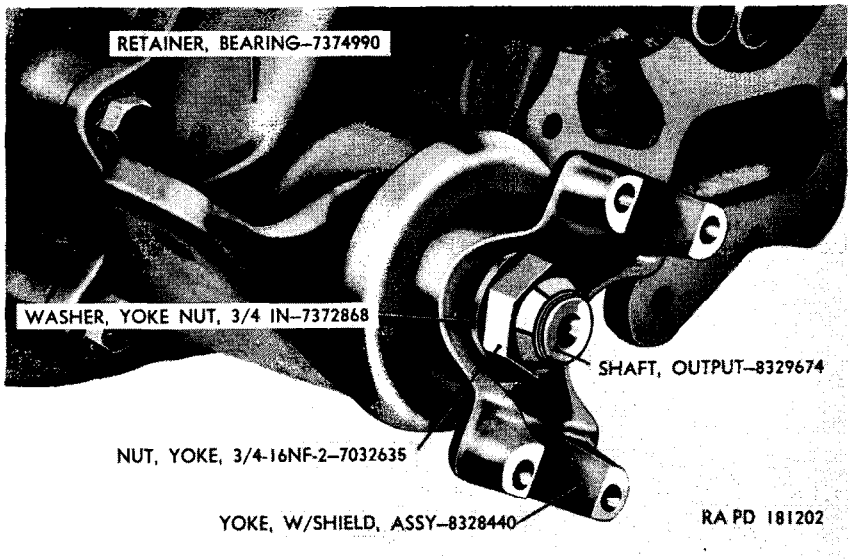


Figure 66. Transfer front axle output shaft bearing retainer installed.

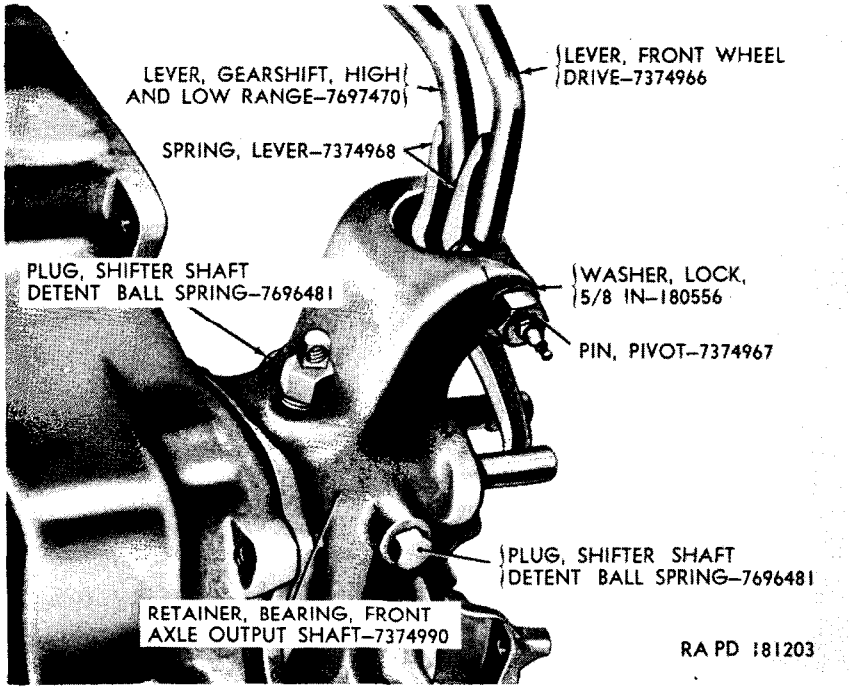


Figure 67. Transfer high and low range gearshift lever and front wheel drive lever installed.

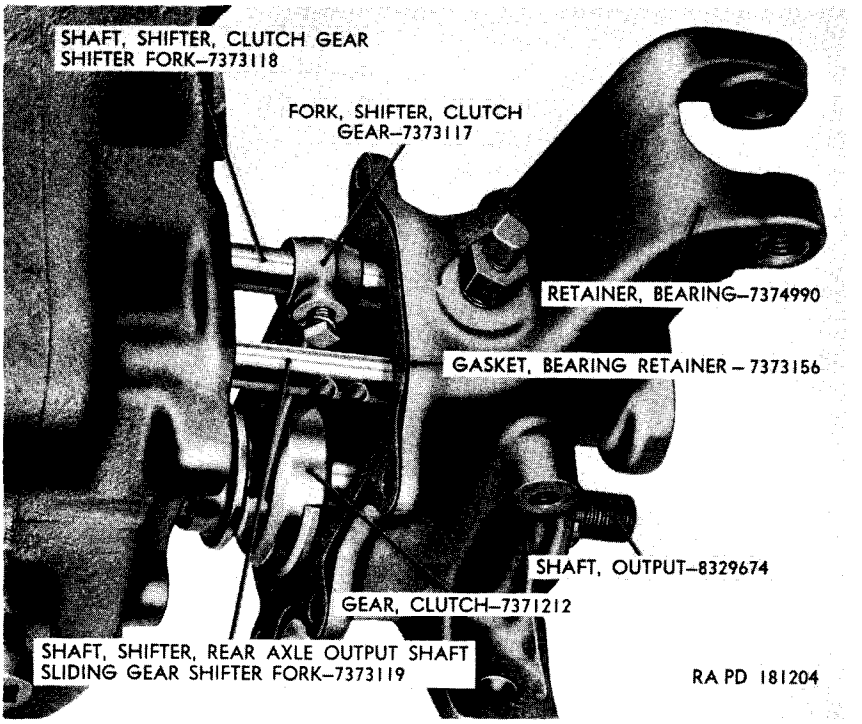


Figure 68. Transfer front axle output shaft bearing retainer partially removed.

the two shifter shaft detent ball springs and shifter shaft detent balls from their cavities in front axle output shaft bearing retainer.

d. Remove the five bolts and lockwashers securing the front axle output shaft bearing retainer to transfer case. Pull the bearing retainer from the transfer case by sliding it off the two shifter shafts.

Note. It may require some slight movement of the bearing retainer and transfer case in a lifting manner (right and left) to place the shifter shaft interlock in proper position so that shifter shafts can clear it.

The front axle output shaft clutch gear, front axle output shaft, front axle output shaft clutch gearshifter fork and shifter fork shaft, and ball bearing will remain in the bearing retainer (fig. 68). Remove the bearing retainer gasket.

114. Remove Transfer Countershaft

(fig. 73)

a. Remove the 10 lockwasher bolts (WW) securing the transfer case bottom cover (XX) to the transfer case (U) and remove the bottom cover and bottom cover gasket (YY).

b. Remove bolt (UU) and lockwasher (TT) which secure the countershaft lock plate (SS) to the transfer case and remove the lock

plate. Using a brass drift, drive the transfer countershaft (RR) from the transfer case.

Note. Drive the transfer countershaft from side opposite lock plate location.

Lift the countershaft gear (AA) out of the transfer case. Remove the two countershaft gear thrust washers (BB and QQ) from inside of transfer case. Remove the two countershaft gear journal roller bearings (PP) from within the countershaft gear bore.

115. Remove Transfer Rear Axle Output Shaft

a. Tap the rear axle output shaft (fig. 69) until the rear axle output shaft inner and outer bearing cones (fig. 71) clear their respective bearing cups in sides of transfer case.

Note. Drive rear axle output shaft on nonthreaded end.

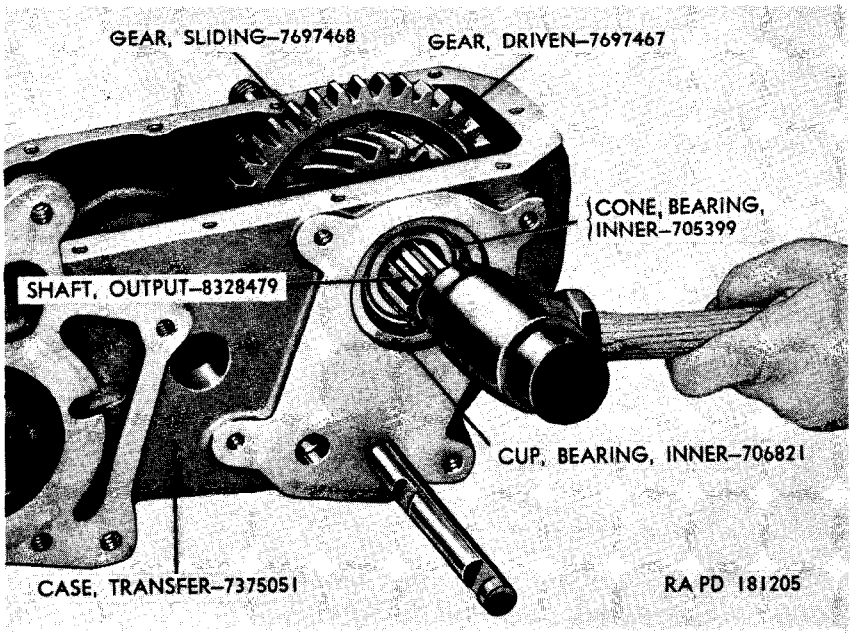


Figure 69. Tapping transfer rear axle output shaft.

b. Install remover 41–R–2368–200 between rear axle output shaft driven gear and the inner bearing cone and tap remover (fig. 70) until bearing cone is free of its seat on rear axle output shaft. Remove the thrust washer snap ring (fig. 71) from its groove in rear axle output shaft. Pull shaft out from rear of case. Lift the rear axle output shaft thrust washer, driven gear, sliding gear, and inner bearing cone out of transfer case. Using a suitable puller, remove the outer bearing cone from the rear axle output shaft. Do not remove the front axle output shaft bushing type pilot bearing (JJ, fig. 73), which supports the rear end of the front axle output shaft,

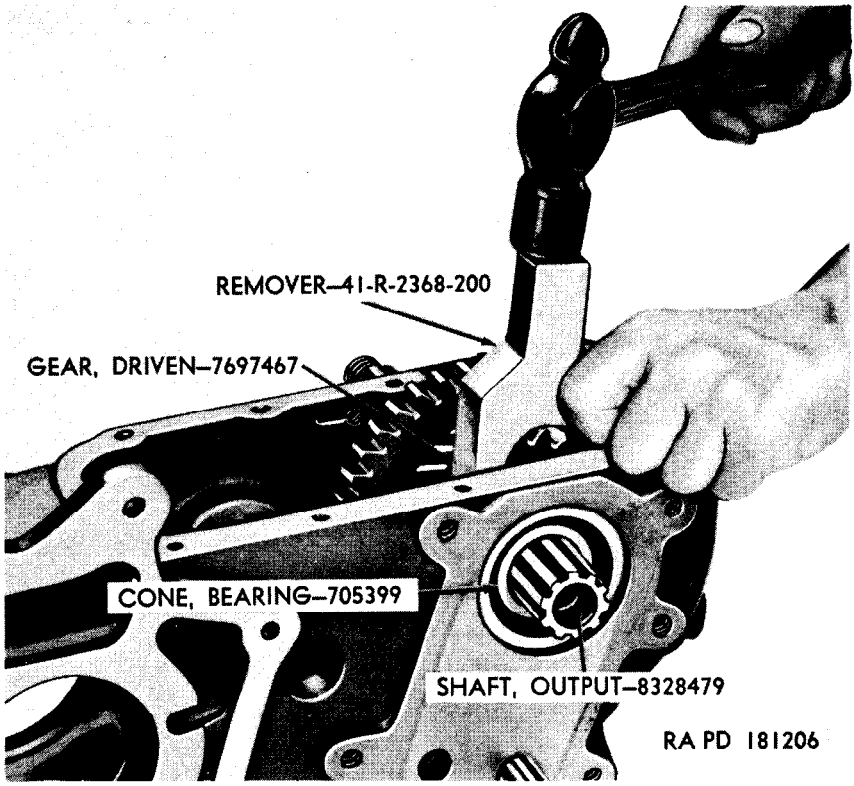


Figure 70. Removing transfer rear axle output shaft inner bearing cone.

from interior of the rear axle output shaft unless proven faulty by inspection (par. 127*a*).

c. Using a suitable remover, remove the rear axle output shaft inner and outer bearing cups (CC and MM, fig. 73) from their recesses in sides of transfer case.

116. Remove Transfer Rear Axle Output Shaft Sliding Gear Shifter Fork Shaft and Shifter Fork

(fig. 74)

a. Remove the shifter fork screw locking wire (NN) which locks the shifter fork setscrew (MM) to the rear axle output shaft sliding gear shifter fork (A) and remove the setscrew.

b. Pull the rear axle output shaft sliding gear shifter fork shifter shaft (C) from shifter fork and transfer case. Lift the shifter fork out of transfer case.

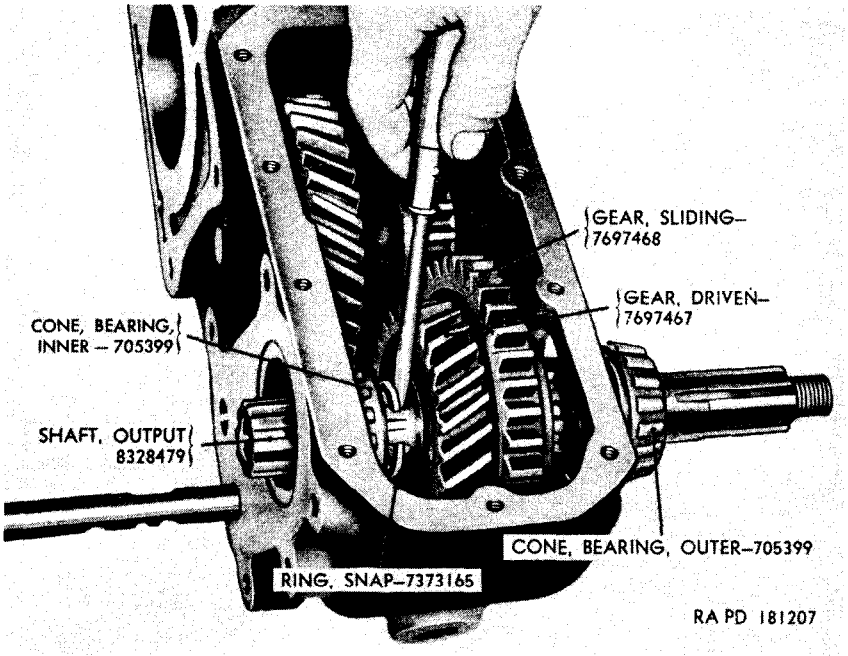


Figure 71. Removing thrust washer snap ring from transfer rear axle output shaft.

Section III. REBUILD OF TRANSFER REAR AXLE OUTPUT SHAFT RETAINER WITH BEARING ASSEMBLY

117. Disassembly

a. Remove Handbrake Assembly (fig. 72). Remove the cotter pin, lift the handbrake stop from handbrake anchor pin, and follow by lifting the operating lever and inner and outer shoe assemblies off anchor pin. Remove the two cotter pins which secure the inner and outer shoe assemblies to the operating lever and remove shoe assemblies from lever. Unscrew the plain nut from anchor pin, remove lockwasher, and pull anchor pin from the rear axle output shaft bearing retainer.

b. Remove Speedometer Driven Gear (fig. 72). Unscrew the speedometer driven gear sleeve from the rear axle output shaft bearing retainer. Pull the speedometer driven gear from within retainer. Do not remove the speedometer drive gear bearing from the bearing retainer unless inspection (par. 118*a*) reveals it to be unserviceable. To remove the speedometer drive gear bearing, it is only necessary to pry it out of its recess with a suitable prying tool. Using a suitable removing tool, remove the rear axle output shaft oil seal from the bearing retainer and remove the oil seal gasket.

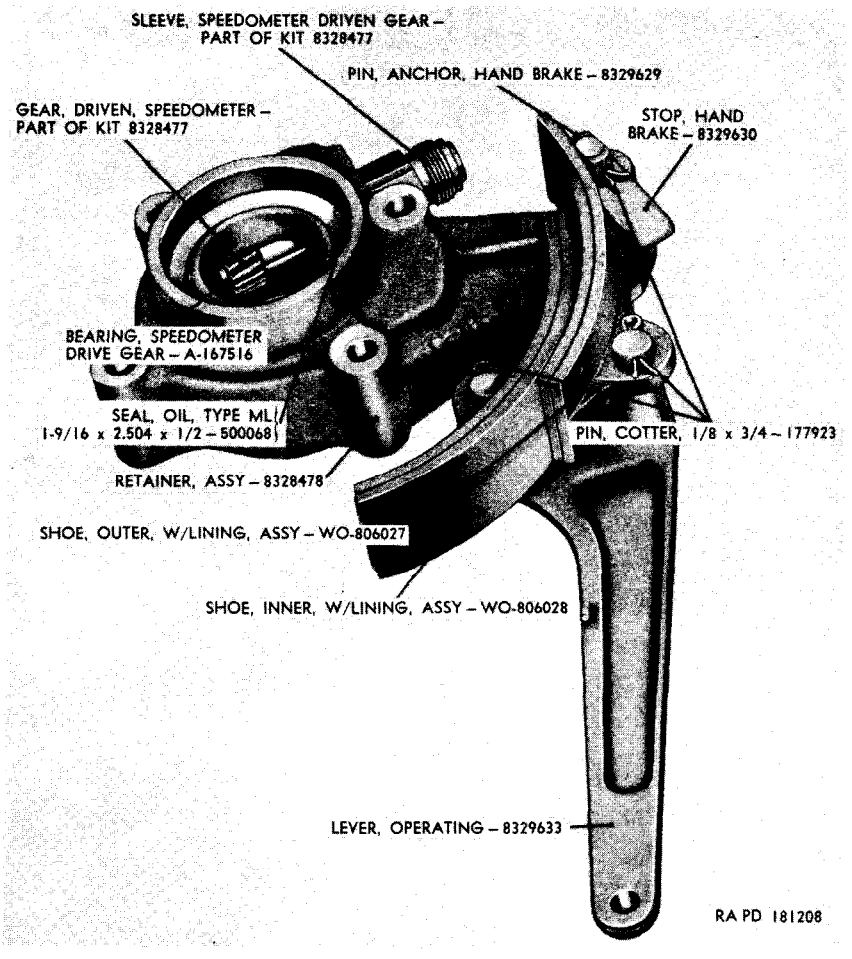


Figure 72. Transfer rear axle output shaft retainer with bearing assembly.

118. Inspection and Repair
(fig. 72)

Note. Refer to paragraph 187 for inspection and repair procedures of handbrake drum and shoe assemblies.

a. Inspection. Inspect the rear axle output shaft bearing retainer for cracks, sand holes, and other damage. Replace retainer if cracks or sand holes are found. Inspect machined surfaces of retainer for burs, nicks, or deep scratches. Inspect the speedometer driven gear for chipped or broken teeth. The outside diameter of pilot end of speedometer driven gear must not be less than 0.244 inch (par. 271*a*). Replace speedometer driven gear, if necessary. Check the speedometer drive gear bearing, installed in rear axle output shaft bearing retainer, for excessive wear and damage. The inside diameter of speedometer drive gear bearing must not exceed 0.2580 inch (par. 271*a*). Replace bearing, if necessary. Replace the speedometer driven gear sleeve if it is bent, cracked, or has damaged threads.

Note. The speedometer drive gear and drive gear bearing and the speedometer driven gear and driven gear sleeve are supplied as speedometer gear set service kit 8328477. The drive gear bearing and the drive gear are also available separately.

Inspect companion flange with slinger assembly (C, fig. 73), companion flange nut (A, fig. 73), and nut washer (B, fig. 73) for damage. Replace faulty parts, if necessary.

b. Repair. Remove all burs, abrasions, or raised metal and nicks, on speedometer driven gear sleeve, speedometer drive gear, and rear axle output shaft bearing retainer, with a fine mill file. Discard the rear axle output shaft oil seal and oil seal gasket at each rebuild.

119. Assembly

a. Install Speedometer Driven Gear (fig. 72). Install new speedometer drive gear bearing, if necessary, in recess of rear axle output shaft bearing retainer using a suitable replacing tool. Insert speedometer driven gear into retainer. Screw speedometer driven gear sleeve into retainer.

b. Install Handbrake Assembly (fig. 72). Install inner and outer shoes with lining assemblies on operating lever and secure with two ⅛ x ¾ cotter pins. Install handbrake anchor pin, ⅝-inch lockwasher, and ⅝–18NF–2 plain nut on rear axle output shaft bearing retainer. Install operating lever and shoe assemblies on anchor pin. Install handbrake stop and secure lever and shoe assemblies with ⅛ x ¾ cotter pin.

Note. Do not install rear axle output shaft oil seal gasket and oil seal until rear axle output shaft end play is adjusted.

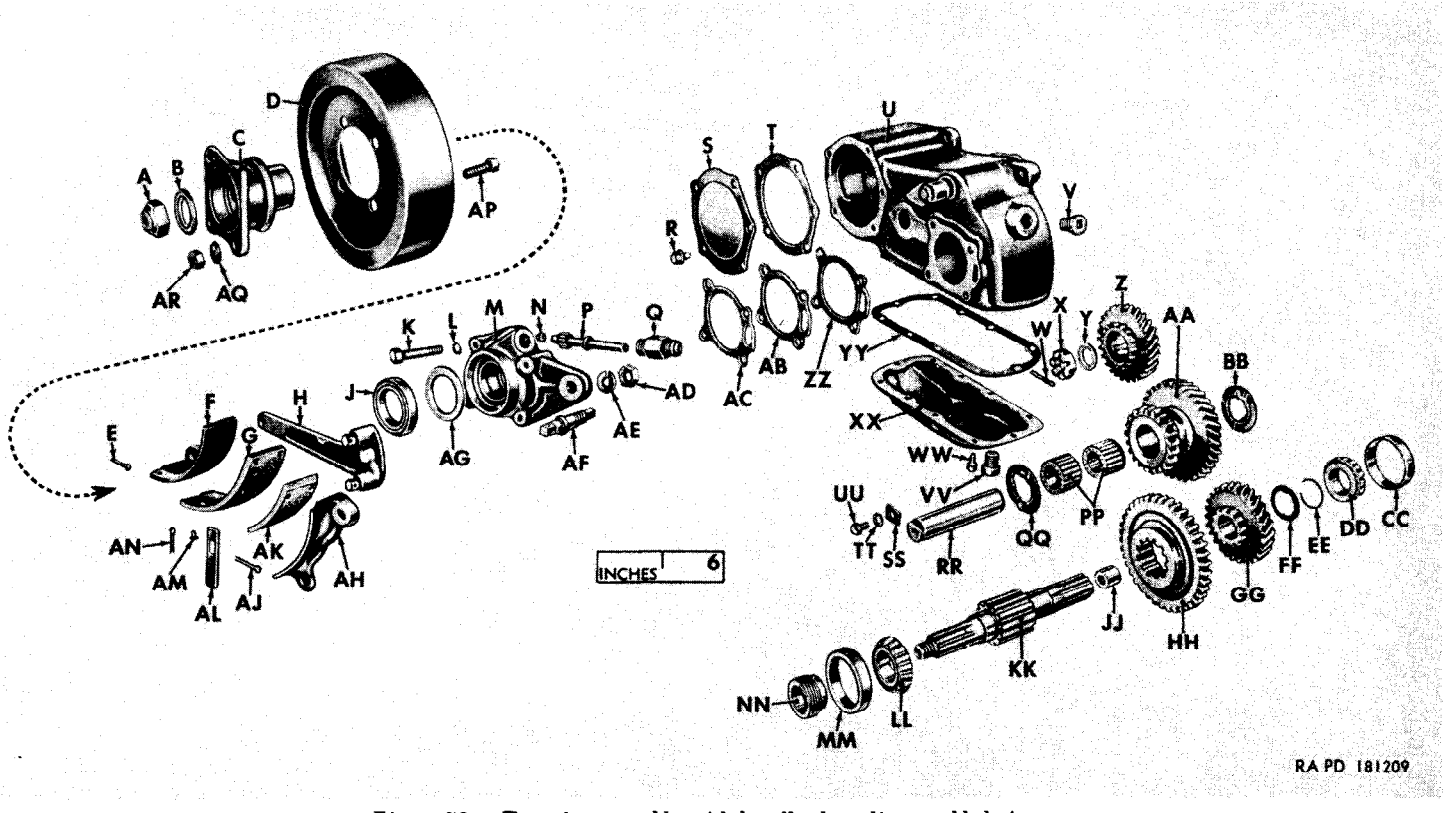
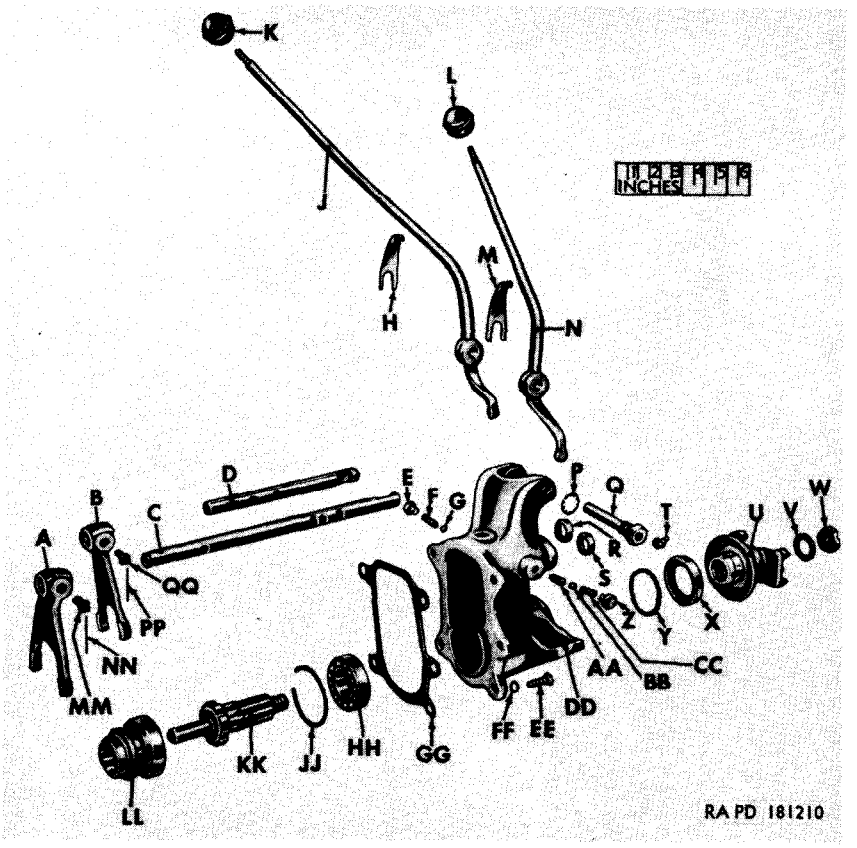


Figure 73. Transfer assembly with handbrake—disassembled view.

A—Nut, companion flange, ¾–16NF–2—7032635
B—Washer, companion flange nut, ¾-in.—7372868
C—Flange, companion, w/slinger, assy—7371035
D—Drum, brake—8329632
E—Pin, cotter, ⅛ x ¾—177923
F—Shoe, inner, w/lining, assy—WO–806028
G—Lining, inner—WO–199476
H—Lever, operating—8329633
J—Seal, oil, type ML, rear axle output shaft, 1 1/16 x 2.504 x ½—500068
K—Bolt, ⅜–16NC–3 x 2¼—180132
L—Washer, lock, ⅜-in.—7697469
M—Retainer, rear axle output shaft, w/bearing, assy—8328478
N—Bearing, speedometer drive gear—A167516 (Part of kit—8328477)
P—Gear, driven, speedometer—WO–806718 (Part of kit—8328477)
Q—Sleeve, speedometer driven gear—WO–806719 (Part of kit—8328477)
R—Bolt, lockwasher, ⅜–16NC–2 x ¾—443608
S—Cover, rear, case—7369850
T—Gasket, rear cover—7373162 (Part of gasket set—7375080)
U—Case, transfer—7375051
V—Plug, pipe, ½-in., drain and filler—7372879
W—Pin, cotter, ⅛ x 1¼—120123
X—Nut, ctl, ⅞–16NC–2—7743652
Y—Washer, plain, 2 9/32 ID, 1 1/16 OD, 5/32 thk—7375131
Z—Gear, drive, input shaft—7375132
AA—Gear, countershaft—7375134
BB—Washer, thrust, countershaft gear—7375135
CC—Cup, bearing, rear axle output shaft, inner—706821
DD—Cone, bearing, rear axle output shaft, inner—705399
EE—Ring, snap, rear axle output shaft thrust washer—7373165
FF—Washer, thrust, rear axle output shaft—7371204
GG—Gear, driven, rear axle output shaft—7697467
HH—Gear, sliding, rear axle output shaft—7697468
JJ—Bearing, bushing type, pilot, front axle output shaft—7373115
KK—Shaft, output, rear axle, w/bearing, nut and washer, assy—8328479
LL—Cone, bearing, rear axle output shaft, outer—705399
MM—Cup, bearing, rear axle output shaft, outer—706821
NN—Gear, drive, speedometer—7373166 (Part of kit—8328477)
PP—Bearing, roller, journal, countershaft gear—708234
QQ—Washer, thrust, countershaft gear—7375135
RR—Countershaft, transfer—7375133
SS—Plate, lock, countershaft—7371213
TT—Washer, lock, ⅜-in.—120382
UU—Bolt, ⅜–16NC–3 x ⅝—180118
VV—Plug, pipe, ½-in., drain and filler—7372879
WW—Bolt, lockwasher, 5/16–18NC–2 x ¾—217233
XX—Cover, bottom, case—7375052
YY—Gasket, bottom, cover—7375053 (Part of gasket set—7375080)
ZZ—Shim, bearing retainer, 0.003 thk—WO–A982 (Part of shim set—7371591)
AB—Shim, bearing retainer, 0.010 thk—WO–A982 (Part of shim set—7371591)
AC—Shim, bearing retainer, 0.031 thk—WO–A984 (Part of shim set—7371591)
AD—Nut, plain, ⅝–18NF–2—124944
AE—Washer, lock, ⅝-in.—131205
AF—Pin, anchor, brake—8329629
AG—Gasket, rear axle output shaft oil seal—WO–A1134 (Part of gasket set—7375080)
AH—Shoe, outer, w/lining, assy—WO–806027
AJ—Pin, cotter, ⅛ x ¾—177923
AK—Lining, outer—WO–119475
AL—Stop, brake—8329630
AM—Rivet, lining—WO–119477
AN—Pin, cotter, ⅛ x ¾—177923
AP—Bolt, drum, ⅜–24NF–3 x 1⅛—7324918
AQ—Washer, lock, ⅜-in.—120382
AR—Nut, plain, ⅜–24NF–3—121932

Figure 73—Continued.



A—Fork, shifter, rear axle output shaft sliding gear—7373116
B—Fork, shifter, front axle output shaft clutch gear—7373117
C—Shaft, shifter, rear axle output shaft sliding gearshifter fork—7373119
D—Shaft, shifter, front axle output shaft clutch gearshifter fork—7373118
E—Plug, shifter shaft detent ball spring—7696481
F—Spring, shifter shaft detent ball—5214784
G—Ball, detent, shifter shaft ⅜-in.—104920
H—Spring, lever—7374968
J—Lever, gearshift high and low range—7697470
K—Knob, lever—7696491
L—Knob, lever—7696491
M—Spring, lever—7374968
N—Lever, front wheel drive—7374966
P—Washer, lock, ⅝-in.—180556
Q—Pin, pivot, lever—7374967
R—Seal, oil, type ML, shifter shaft, ⅝ x 1.128 x ⅜—500007
S—Seal, oil, type ML, ⅝ x 1.128 x ⅜, shifter shaft—500007
T—Fitting, lubr, pivot pin, ¼-28NF—504205
U—Yoke, front axle output shaft, w/shield, assy—8328440
V—Washer, yoke nut, ¾-in.—7372868

Figure 74. Transfer front axle output shaft bearing retainer and shifter shafts—disassembled view.

Section IV. REBUILD OF TRANSFER FRONT AXLE OUTPUT SHAFT BEARING RETAINER

120. Disassembly

(fig. 74)

a. Remove Front Axle Output Shaft Clutch Gearshifter Fork Shifter Shaft. Remove shifter fork screw locking wire (PP) securing shifter fork setscrew (QQ) to front axle output shaft clutch gearshifter fork (B) and remove setscrew. Remove front axle output shaft clutch gearshifter fork (B), clutch gear (LL) and front axle output shaft (KK) from front axle output shaft bearing retainer (DD). Pull front axle output shaft clutch gearshifter fork shifter shaft (D) from bearing retainer.

b. Remove Front Axle Output Shaft Ball Bearing. Remove the front axle output shaft bearing snap ring (JJ) as shown in figure 75. Using a suitable removing method, pressure against outer race, press or drive the front axle output shaft ball bearing (HH) out of the front axle output shaft bearing retainer.

Note. Bearing must be removed from inside of bearing retainer.

c. Remove Shifter Shaft Oil Seals. Using a chisel and hammer, remove the two shifter shaft oil seals (R and S).

d. Remove Front Axle Output Shaft Oil Seal. Using a brass drift, remove the front axle output shaft oil seal (X) from the front axle output shaft bearing retainer (DD) and remove the oil seal gasket (Y).

W—Nut, yoke, ¾-16NF-2—7032635
X—Seal, oil, type ML, front axle output shaft 1 1/16 x 2.504 x ½—500068
Y—Gasket, front axle output shaft oil seal—7373157
Z—Plug, shifter shaft detent ball spring—7696481
AA—Interlock, shifter shaft—7373112
BB—Ball, detent, shifter shaft, ⅜-in.—104920
CC—Spring, shifter shaft detent ball—5214784
DD—Retainer, bearing, front axle output shaft—7374990
EE—Bolt, machine, ⅜-16NC-3 x 1—180122
FF—Washer, lock, ⅜-in.—7697469
GG—Gasket, bearing retainer—7373156
HH—Bearing, ball, front axle output shaft—700079
JJ—Ring, snap, front axle output shaft bearing—7373185
KK—Shaft, output, front axle—8329674
LL—Gear, clutch, front axle output shaft—7371212
MM—Screw, set, shifter fork, ⅜-24NF x 0.72—5214776
NN—Wire, locking, shifter fork screw—22-W-1631-110
PP—Wire, locking, shifter fork screw—22-W-1631-110
QQ—Screw, set, shifter fork, ⅜-24NF x 0.72—5214776

Figure 74—Continued.

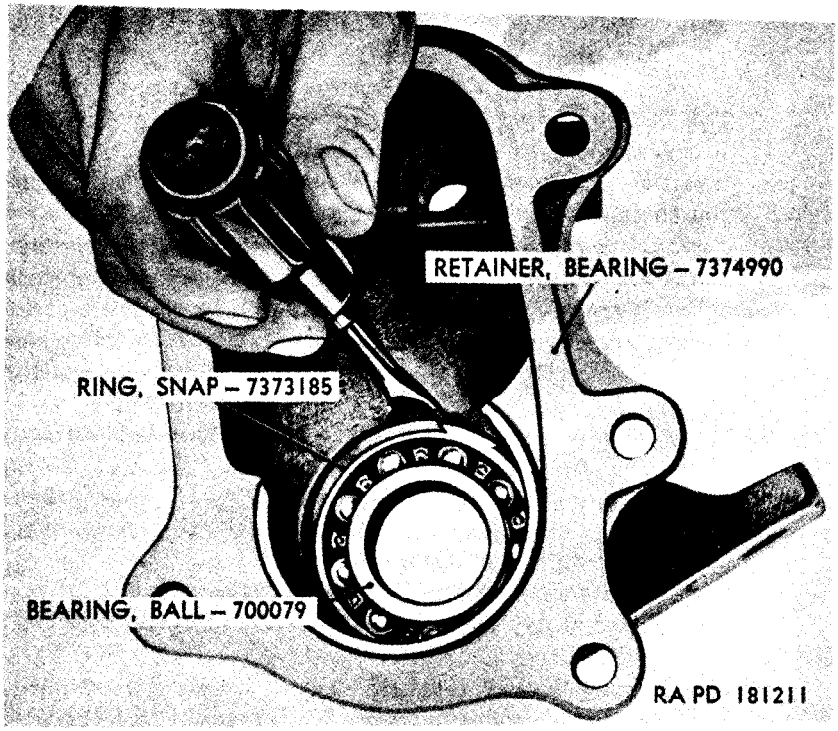


Figure 75. Removing transfer front axle output shaft bearing snap ring.

121. Inspection and Repair

(fig. 74)

a. Inspection.

(1) *Front axle output shaft bearing retainer.* Inspect the front axle output shaft bearing retainer (DD) for cracks, sand holes, and other damage. Replace bearing retainer, if necessary. Examine the machined surfaces on bearing retainer for burs, abrasions, and nicks.

(2) *Front axle output shaft.* Examine the front axle output shaft (KK) for worn, chipped, or missing gear teeth. Inspect splines on the shaft for wear or chipped condition. Check outside diameter of pilot end of the shaft. If diameter does not meet repair and rebuild standards (par. 271*b*), replace the shaft. Inspect threads on end of shaft for damage.

(3) *Front axle output shaft clutch gear.* Inspect the front axle output shaft clutch gear (LL) for damaged or worn splines or other damage. Replace, if necessary. Place clutch gear on output shaft and slide it back and forth. Clearance between clutch gear and output shaft must not exceed 0.005 inch (par. 271*b*). If clutch gear does not slide smoothly over

output shaft or is not within dimensions, replace either the gear or shaft.

(4) *Front axle output shaft ball bearing.* Replace front axle output shaft ball bearing (HH) if it shows evidence of loose or discolored balls, pitted or cracked races, and resistance to rotation. Replace bent, broken, or distorted front axle output shaft bearing snap ring (JJ).

(5) *Front axle output shaft yoke with shield assembly* (U). Inspect the front axle output shaft yoke (U) for damaged or worn splines, cracks, or bent condition. Inspect shaft yoke against repair and rebuild standards (par. 271*b*). Replace, if necessary. Examine yoke nut (W) and yoke nut washer (V) for damage. Replace damaged parts, if necessary.

(6) *Shifter shaft oil seals.* Discard the two shifter shaft oil seals (R and S), front axle output shaft oil seal (X), and oil seal gasket (Y) at each rebuild.

(7) *Shifter shafts and forks.* Replace the rear axle output shaft sliding gearshifter fork shifter shaft (C) and the front axle output shaft clutch gearshifter fork shifter shaft (D) if they are bent or otherwise damaged. Replace the rear axle output shaft sliding gearshifter fork (A) and the front axle output shaft clutch gearshifter fork (B) if they have stripped setscrew threads; or if forks are bent, cracked, or otherwise damaged. Replace shifter fork setscrews (MM and QQ) if their threads are damaged.

(8) *Lever pivot pin.* Inspect lever pivot pin (Q) for damaged threads. Measure pin diameter. If not in conformance with repair and rebuild standards (par. 271*b*), replace the pin. Inspect the pivot pin lubrication fitting (T), which is installed in end of the lever pivot pin, for damage. Replace fitting, if necessary.

(9) *Shifter shaft detent balls, springs, plugs, and interlock.* Replace the shifter shaft detent balls (G and BB) if they are chipped or show evidence of out-of-round condition. Replace shifter shaft detent ball springs (F and CC) if they are distorted, broken, weakened, or fail to operate as intended. Replace shifter shaft detent ball spring plugs (E and Z) if their threads are damaged. Replace shifter shaft interlock (AA) if it is chipped or broken.

(10) *Gearshift high and low range lever, front wheel drive lever, and lever springs.* Replace the high and low range gearshift lever (J) and front wheel drive lever (N) if they are bent, broken, or cracked. Inspect the lever springs (H) and (M) for breaks and damage. Replace springs, if necessary.

b. Repair. Remove all burs or raised metal, on machined surface of front axle output shaft bearing retainer (DD), with a fine mill file.

Replace retainer if nicks or deep scratches on machined surfaces will interfere with a good seal between the retainer and transfer case. Correct slight damage, such as nicks, burs, or scores, on front axle output shaft (KK) and clutch gear (LL) with a hone.

Caution: Replace shaft or gear if damage cannot be readily corrected. Repair damaged threads on front axle output shaft, if possible.

122. Assembly

(fig. 74)

a. Install Front Axle Output Shaft Ball Bearing. Press or drive the front axle output shaft ball bearing (HH) into place in the front axle output shaft bearing retainer (DD). Secure bearing by installing the front axle output shaft bearing snap ring (JJ).

b. Install Front Axle Output Shaft Clutch Gearshifter Fork Shifter Shaft. Insert the front axle output shaft (KK), through the front axle output shaft ball bearing, from inside the front axle output shaft bearing retainer. Insert the front axle output shaft clutch gearshifter fork shifter shaft (D) in the bearing retainer. Place the front axle output shaft clutch gearshifter fork (B) in position on shifter shaft and slide the shifter fork and clutch gear onto the shifter shaft together. Install the ⅜–24NF x 0.72 shifter fork setscrew (QQ) in the shifter fork and secure with shifter fork screw locking wire (PP).

c. Front Axle Output Shaft Oil Seal and Shifter Shaft Oil Seals. Do not install the front axle output shaft oil seal (X) and shifter shaft oil seals (R and S) until the front axle output shaft bearing retainer (DD) is installed on transfer case (par. 132).

Section V. REBUILD OF TRANSFER COUNTERSHAFT ASSEMBLY

123. Disassembly

(fig. 73)

The transfer countershaft (RR), countershaft gear (AA), and countershaft gear journal roller bearings (PP) require no disassembly.

124. Inspection and Repair

(fig. 73)

a. Inspection.

(1) *Transfer countershaft.* Inspect the transfer countershaft (RR) for scores, abrasions, and burs. Replace the transfer countershaft if it does not conform to the repair and rebuild standards (par. 271*c*).

(2) *Countershaft gear.* Inspect the teeth of countershaft gear (AA) for damage and wear. A countershaft gear with broken, chipped, cracked, or excessively worn teeth must be replaced. Check the inside diameter of countershaft

gear. If it is not within dimensions specified in repair and rebuild standards (par. 271*c*), replace the gear.

(3) *Countershaft gear journal roller bearings.* Inspect countershaft gear journal roller bearings (PP) for pitting, scoring, roughness, flat spots, or excessive wear. Bearings must turn freely and smoothly.

(4) *Countershaft lock plate, bolt, and washer.* Replace the countershaft lock plate (SS), bolt, and lockwasher if they are damaged.

b. Repair. Slight faults, such as scores, nicks, or burs on the countershaft gear (AA) may be corrected with a hone. However, if the damage cannot be readily repaired, replace the countershaft gear.

125. Assembly

(fig. 73)

The transfer countershaft (RR), countershaft gear (AA), and countershaft gear journal roller bearings (PP) are installed during the assembly of the transfer (par. 133).

Section VI. REBUILD OF TRANSFER REAR AXLE OUTPUT SHAFT ASSEMBLY

126. Disassembly

(fig. 73)

a. The transfer rear axle output shaft assembly requires no disassembly except the removal of the front axle output shaft bushing type pilot bearing (JJ) which provides the support for the front axle output shaft.

b. Remove the bushing type pilot bearing (fig. 76) from the rear axle output shaft only if it does not meet the inspection requirements (par. 127*a*).

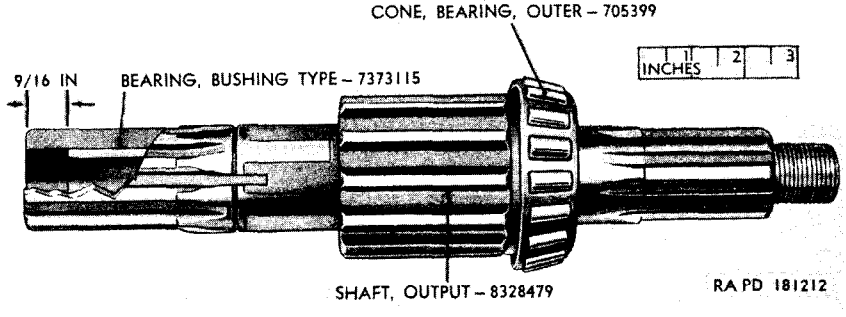


Figure 76. Bushing type pilot bearing installed in transfer rear axle output shaft.

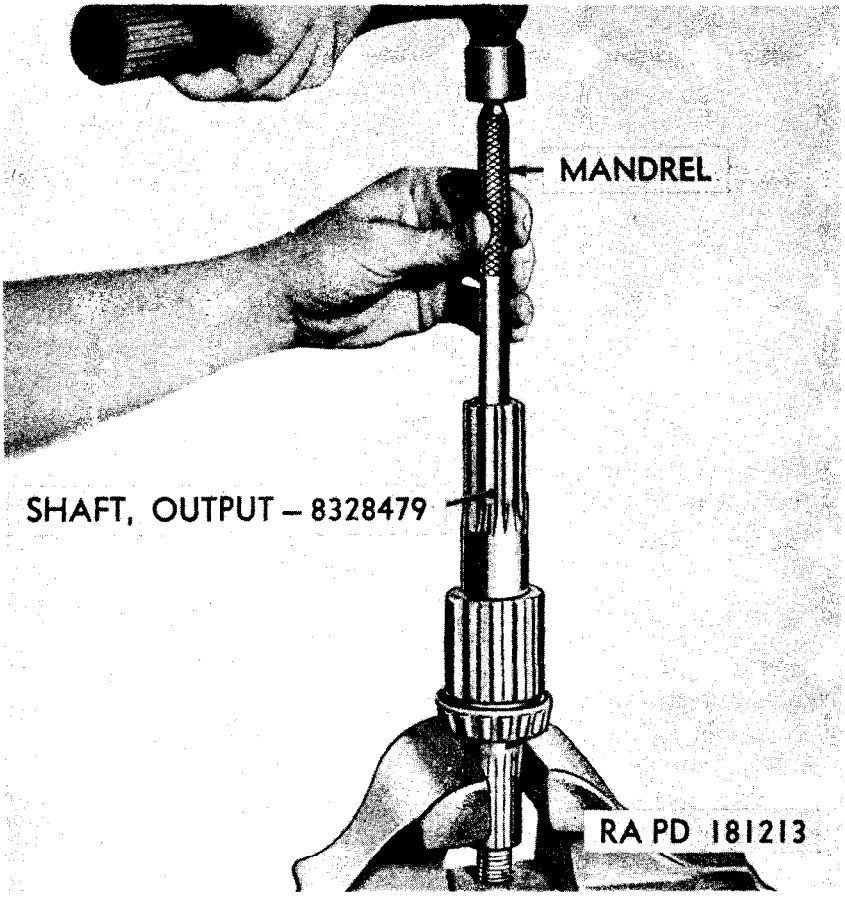


Figure 77. Seating bushing type pilot bearing in transfer rear axle output shaft.

127. Inspection and Repair

(fig. 73)

a. Inspection.

(1) *Rear axle output shaft.* Examine the splines of the rear axle output shaft (KK) for scoring or twisting. Replace shaft if cracks, twists, or scores are found. Inspect threads on end of rear axle output shaft. If threads are damaged or crossed, repair or replace shaft. Measure the inside diameter of the front axle output shaft bushing type pilot bearing (JJ). Replace bearing if it does not conform to repair and rebuild standards (par. 271*d*).

(2) *Rear axle output shaft sliding and driven gears.* Inspect teeth of the rear axle output shaft sliding gear (HH) and driven gear (GG) for chipped, broken, cracked, or worn condition. Gears with such damage must be replaced. Clearance be-

tween sliding gear and output shaft (par. 271*d*) must not exceed 0.005 inch.

(3) *Rear axle output shaft bearing cups and cones.* Examine the rear axle output shaft inner and outer bearing cups (CC and MM) for chipped areas, cracks, or wear. Replace worn or damaged bearing cups. Inspect rear axle output shaft inner and outer bearing cones (DD and LL) for pitting, scoring, excessive wear, or roughness. Bearing cones must turn freely and smoothly. Replace cones if worn or damaged.

b. Repair. Repair of the rear axle output shaft assembly is limited to honing slight faults, such as nicks, burs, or scores.

128. Assembly

(fig. 73)

a. No assembly of the rear axle output shaft is required except the installation of the front axle output shaft bushing type pilot bearing (JJ), if it has been removed.

b. If the bushing type pilot bearing is to be installed, place rear axle output shaft in a vise (use jaw protectors) with the pilot end up. Place a new bearing in pilot end of shaft. Using a suitable mandrel (⅝ x ¾), seat the bearing (fig. 77) until top of bearing is nine-sixteenths of an inch from top of bore in the rear axle output shaft (fig. 76).

Section VII. REBUILD OF TRANSFER CASE AND COVERS

129. Transfer Case

(fig. 73)

a. Disassembly. No disassembly of the transfer case (U) is required except the removal of the control lever tube ball stud (fig. 83). Do not remove the stud unless inspection (*b* below) reveals it unserviceable. If the stud must be removed, unscrew it from transfer case and follow by removing lockwasher.

b. Inspection and Repair. Inspect the transfer case (U) for cracks and sand holes. Replace transfer case if cracks and sand holes are found. Examine the bearing cup openings and machined surface for burs, nicks, abrasions, or deep scratches. Remove all burs, raised metal and nicks with a fine mill file. Replace transfer case if damage on machined surface will interfere with a good seal. Check drain and filler pipe plugs (V and VV) for damaged or crossed threads. Replace any plug with damaged threads. Inspect and control lever tube ball stud for out-of-round condition. Replace stud, if necessary.

c. Assembly. Install the ½-inch drain and filler pipe plugs (V and VV) in transfer case. Install 7/16-inch lockwasher on control lever tube ball stud and screw stud into transfer case.

130. Transfer Case Covers

(fig. 73)

a. Disassembly. No disassembly of the transfer case bottom (XX) and rear (S) covers is required.

b. Inspection and Repair. Inspect the transfer case bottom and rear covers (XX and S) for warpage and cracks. Replace covers if these faults are found. Check machined surfaces for nicks, burs, and deep scratches. Repair all burs, nicks, and abrasions with a fine mill file. Replace covers if damage on mating surfaces will prevent a good seal with transfer case. Replace all damaged lockwasher bolts.

c. Assembly. No assembly of the transfer case bottom (XX) and rear (S) covers is required.

Section VIII. ASSEMBLY OF TRANSFER ASSEMBLY FROM SUBASSEMBLIES

Note. Be sure all portions of gaskets and gasket cement have been removed from transfer case and cover mating surfaces.

131. Install Transfer Rear Axle Output Shaft Assembly

a. Install Rear Axle Output Shaft Sliding Gearshifter Fork (fig. 74). Insert the rear axle output shaft sliding gear shifter fork (A) in transfer case and slip the rear axle output shaft sliding gearshifter fork shifter shaft (C) through hole in transfer case and shifter fork. Secure shifter fork to shifter shaft with ⅜–24NF x 0.72 shifter fork setscrew (MM). Secure setscrew with shifter fork screw locking wire (NN).

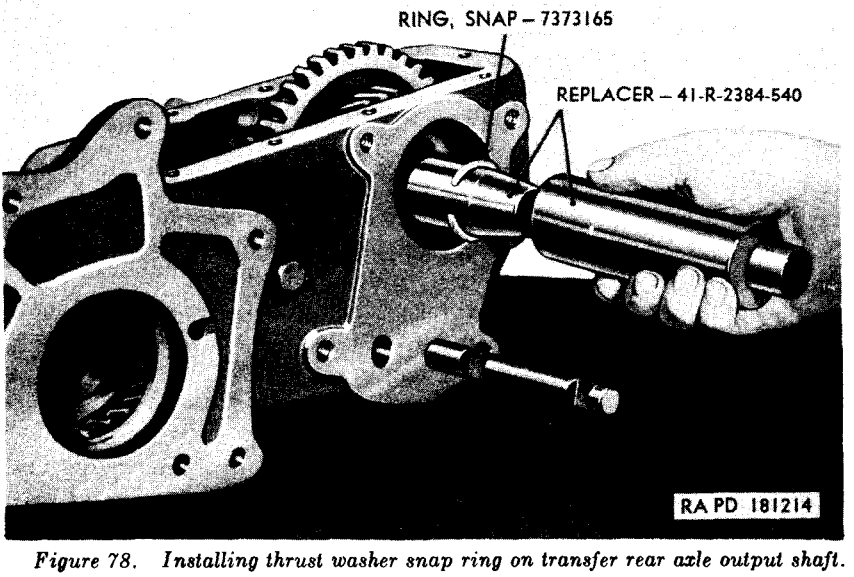


Figure 78. Installing thrust washer snap ring on transfer rear axle output shaft.

b. Install Outer Bearing Cone on Rear Axle Output Shaft (fig. 73). Press the rear axle output shaft outer bearing cone (LL) on the rear axle output shaft (KK).

c. Install Rear Axle Output Shaft Driven and Sliding Gears (fig. 73). Place the rear axle output shaft sliding gear (HH) in the transfer case (U) with the rear axle output shaft sliding gearshifter fork in the channel of the sliding gear. Insert the rear axle output shaft driven gear (GG) in transfer case with shoulder of driven gear facing sliding gear. Insert the rear axle output shaft into the transfer case and through the bores of the sliding and driven gears. Slide the rear axle output shaft thrust washer (FF) onto the shaft. Slide thimble of replacer 41–R–2384–540 over inner end of rear axle output shaft and slip thrust washer snap ring (fig. 78) over small end of thimble. Position large end of replacer 41–R–2384–540 over end of thimble until it contacts thrust washer snap ring. Push snap ring over thimble and onto rear axle output shaft until it falls into groove of shaft.

d. Install Inner Bearing Cone on Rear Axle Output Shaft. Slide the rear axle output shaft inner bearing cone (DD, fig. 73) onto the rear axle output shaft. Using replacer 41–R–2384–540 (fig. 79), tap the bearing cone until it is snug against thrust washer snap ring.

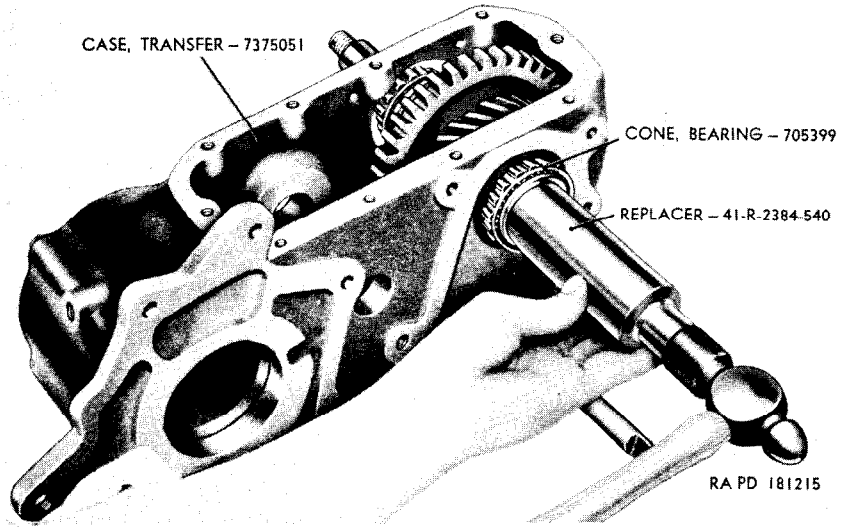


Figure 79. Installing transfer rear axle output shaft inner bearing cone.

e. Install Rear Axle Output Shaft Inner and Outer Bearing Cups (fig. 73). Place the rear axle output shaft outer bearing cup (MM) in bore of transfer case (U) and tap it into position with a suitable replacer until its outer edge is in slightly from the face of the transfer case. Install the rear axle output shaft inner bearing cup (CC) in

the same manner. Outer edge of inner cup must be approximately one-eighth of an inch above machined surface of transfer case.

132. Install Transfer Front Axle Output Shaft Bearing Retainer (fig. 74)

a. Install Bearing Retainer Gasket. Coat bearing retainer gasket (GG) with plastic type gasket cement and place gasket in position on rear face of transfer case. Place the shifter shaft interlock (AA) in the interlock opening of front axle output shaft bearing retainer (DD). Slide the front axle output shaft bearing retainer onto the front axle output shaft clutch gearshifter fork shifter shaft. Secure bearing retainer to transfer case with five ⅜-inch lockwashers (FF) and ⅜-16NC–3 x 1 machine bolts (EE).

b. Install Shifter Shaft Detent Balls. Install a ⅜-inch shifter shaft detent ball (G and BB), ball spring (F and CC) and ball spring plug (E and Z) on each side of the front axle output shaft bearing retainer (DD).

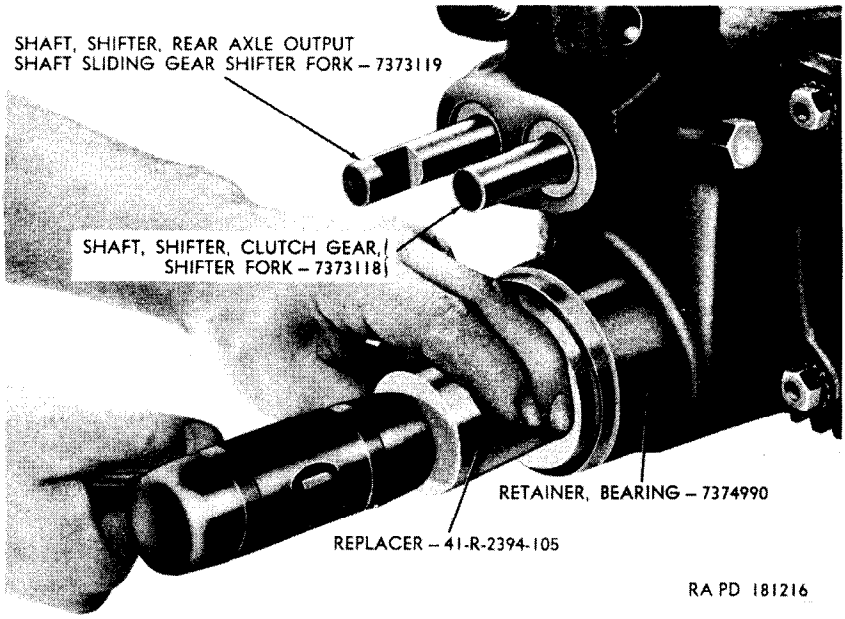


Figure 80. Installing transfer front axle output shaft oil seal.

c. Install Front Axle Output Shaft Oil Seal. Position a new front axle output shaft oil seal gasket (Y) in front axle output shaft bearing retainer (DD). Using replacer 41–R–2394–105, install the front axle output shaft oil seal against the seal gasket as shown in figure 80.

133. Install Countershaft Gear

(fig. 73)

a. Install Countershaft Gear Journal Roller Bearing. Insert the two countershaft gear journal roller bearings (PP) in bore of the countershaft gear (AA).

b. Install Transfer Countershaft. Apply a thick coat of universal gear lubricant (GO) to the countershaft gear thrust washer (QQ) and place in position inside of transfer case. Start the transfer countershaft (RR) through transfer case (U) just enough to hold the thrust washer from slipping. Apply a thick coat of universal gear lubricant (GO) to the countershaft gear thrust washer (BB) and place in position within transfer case. Insert locator 41–L–1607–375 through countershaft opening, in transfer case, so that countershaft gear thrust washer is over it as shown in figure 81. Position the countershaft gear, with journal roller bearings installed, between the two gear thrust washers. Tap the transfer countershaft through countershaft gear and opposite side of transfer case thereby removing the locator.

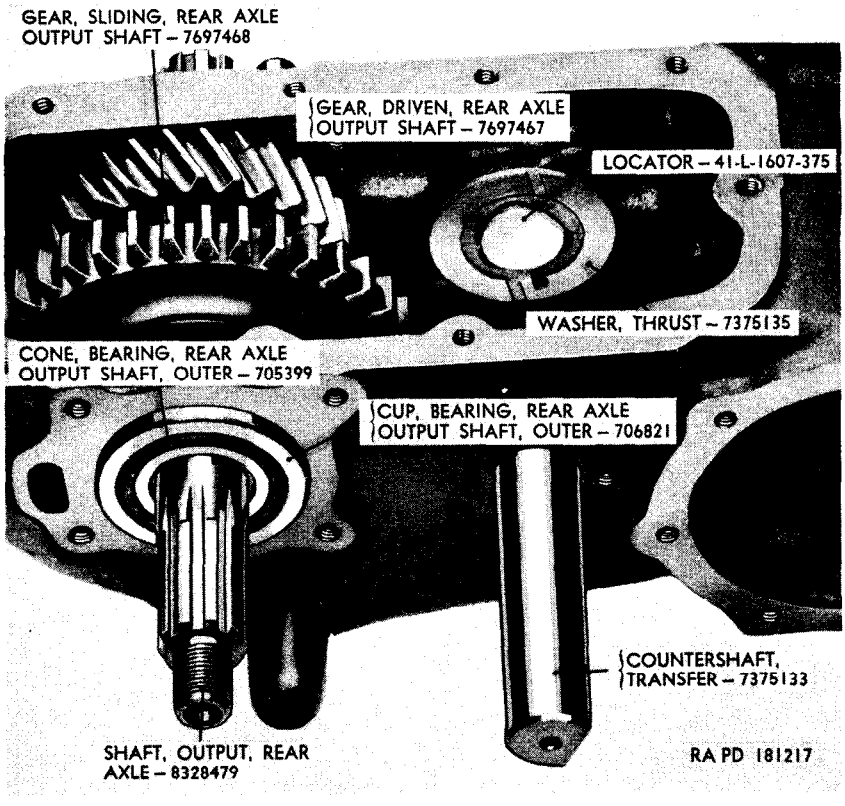


Figure 81. Positioning countershaft gear thrust washer with locator— 41–L–1607–375.

Install the countershaft lock plate (SS) and secure it with a ⅜-inch lockwasher (TT) and ⅜–16NC–3 x ⅝ bolt (UU).

134. Install Transfer Rear Axle Output Shaft Retainer With Bearing Assembly

(fig. 73)

a. Install Bearing Retainer Shim Set. Install three bearing retainer shims (ZZ, AB, and AC) in position on rear axle output shaft bearing retainer (M).

Note. This is a temporary installation at this time. Shims may have to be removed or added, as necessary, to establish correct rear axle output shaft end play. Install the speedometer drive gear on the rear axle output shaft in position as illustrated in figure 65.

b. Install Rear Axle Output Shaft Bearing Retainer. Install rear axle output shaft bearing retainer (M) and shims on side of transfer case (U) and secure with four ⅜-inch lockwashers (L) and ⅜–16NC–3 x 2¼ bolts (K).

135. Adjust Transfer Rear Axle Output Shaft End Play

a. Install Dial Indicator. Assemble dial indicator to transfer case as illustrated in figure 82.

Note. Secure transfer case so it cannot move.

b. Check Rear Axle Output Shaft End Play. Place a screwdriver between the rear axle output shaft driven gear and transfer case to

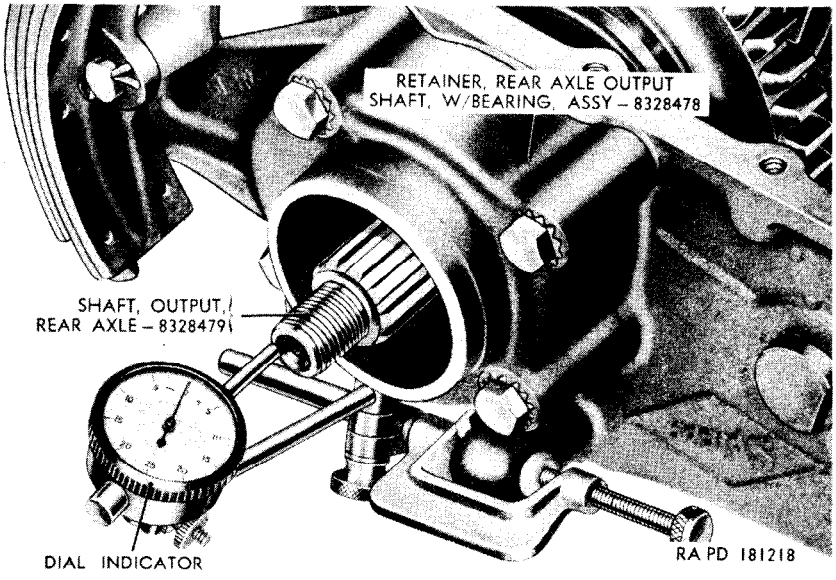


Figure 82. Dial indicator installed.

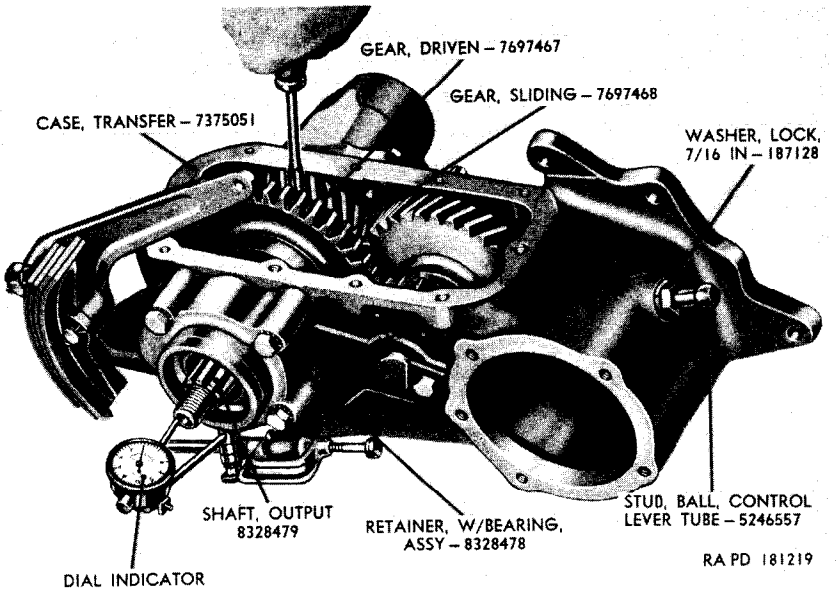


Figure 83. Checking transfer rear axle output shaft end play.

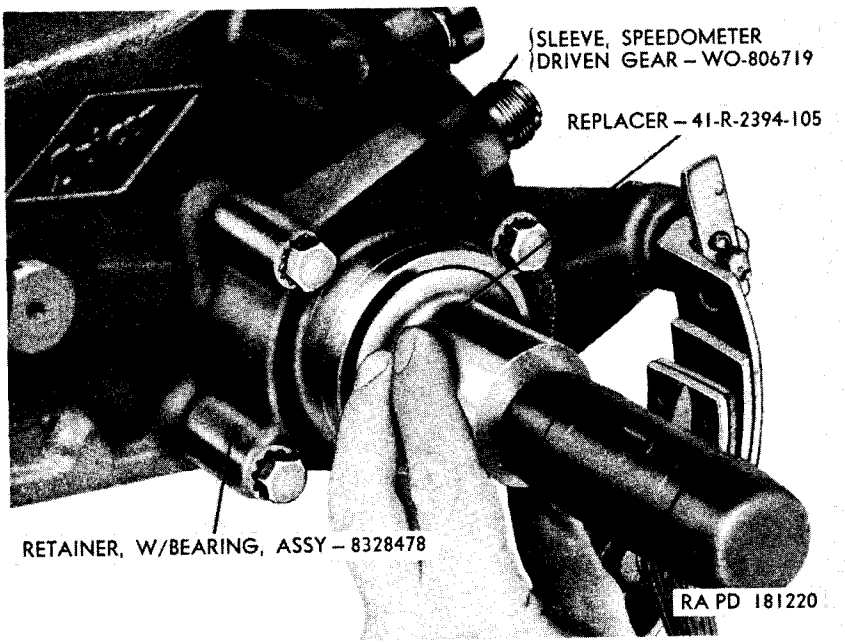


Figure 84. Installing transfer rear axle output shaft oil seal.

act as a lever and move rear axle output shaft to check end play as illustrated in figure 83. The rear axle output shaft must have from 0.004 to 0.008 inch end play. Adjustment is made by adding or removing bearing retainer shims, as necessary. These shims are supplied in 0.003, 0.010, and 0.031 inch thickness. After establishing correct end play, remove the rear axle output shaft bearing retainer, coat shims with plastic type gasket cement and install retainer.

136. Install Transfer Rear Axle Output Shaft Oil Seal and Shifter Shaft Oil Seals

a. Install Rear Axle Output Shaft Oil Seal. Place the rear axle output shaft oil seal gasket (AG, fig. 73) in the rear axle output shaft bearing retainer. Using replacer 41–R–2394–105 install the rear axle output shaft oil seal (fig. 84).

b. Install Shifter Shaft Oil Seals. Using tool 41–T–3280 in the manner illustrated in figure 85, install the two shifter shaft oil seals (R and S, fig. 74) on the front axle output shaft clutch gearshifter fork shifter shaft and rear axle output shaft sliding gearshifter fork shifter shaft.

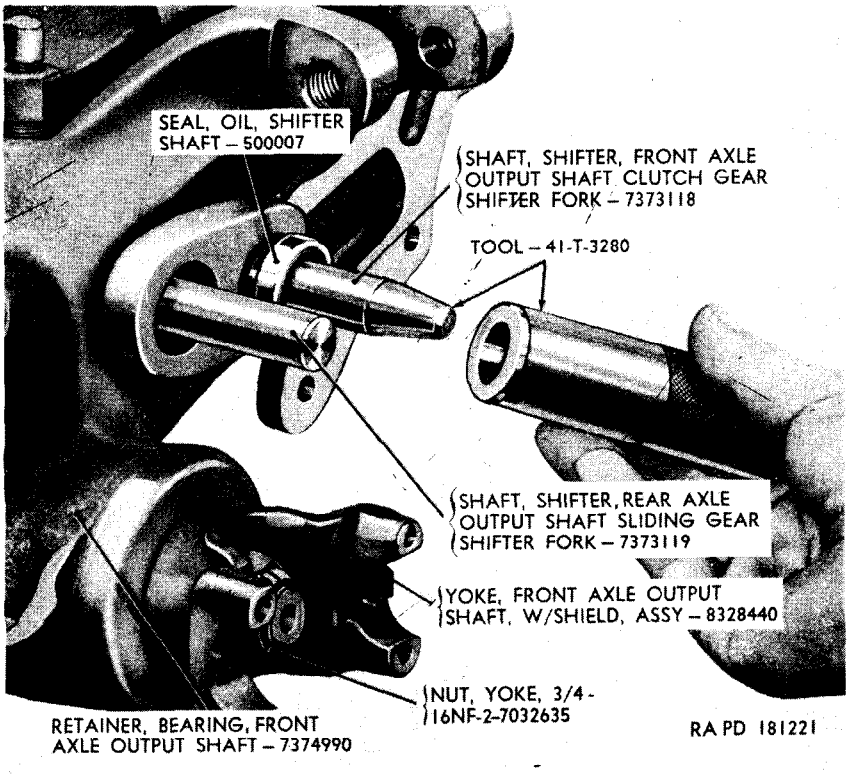


Figure 85. Installing transfer shifter shaft oil seal.

137. Install Transfer Covers, Gearshift and Front Wheel Drive Levers, and Companion Flange

a. Install Transfer Covers (fig. 73). Coat the bottom and rear cover gaskets (YY and T) with plastic type gasket cement. Place gaskets on respective covers and position covers on transfer case. Secure transfer case bottom cover (XX) with ten 5/16–18NC–2 x 3/4 lockwasher bolts (WW). Secure transfer case rear cover (S) with five 3/8–16NC–2 x 3/4 lockwasher bolts (R).

b. Install Gearshift and Front Wheel Drive Levers (fig. 74). Place the gearshift high and low range lever (J) and front wheel drive lever (N) in position between flanges of front axle output shaft bearing retainer. Place the two lever springs (H and M) in position on levers. Install 3/8-inch lockwasher (P) over lever pivot pin (Q) and secure levers by installing the lever pivot pin. Install 1/4–28NF pivot pin lubrication fitting (T) in end of lever pivot pin.

c. Install Companion Flange With Slinger Assembly (fig. 73). Place the brake drum (D) on the companion flange with slinger assembly (C). Install four 3/8–24NF–3 x 1 1/8 drum bolts (AP), 3/8-inch lockwashers (AQ) and 3/8–24NF–3 plain nuts (AR) that secure brake drum to companion flange. Tap companion flange into position on the rear axle output shaft. Secure companion flange with 3/4-inch companion flange nut washer (B) and 3/4–16NF–2 companion flange nut (A).

d. Install Front Axle Output Shaft Yoke With Shield Assembly (fig. 74). Tap the front axle output shaft yoke (U) onto the front axle output shaft. Secure yoke with 3/4-inch yoke nut washer (V) and 3/4–16NF–2 yoke nut (W).

Section IX. TEST AND ADJUSTMENT

138. Preparation for Tests

Place transfer in upright position so that opening for entry of the transfer input drive gear is vertical. Fill transfer with lubricant as directed in TM 9–804A, being careful to control amount so that lubricant does not overflow through opening. Check transfer case bottom cover mating surfaces for leakage.

139. Tests

a. Shift the gearshift high and low range lever and front wheel drive lever into their operating positions. Observe whether levers shift properly without excessive noise, binding, or looseness.

b. Shift transfer into four-wheel drive. Turn rear axle output shaft by hand. The front axle output shaft should turn.

c. If there is binding, looseness, or abnormal noise, the transfer must be disassembled, inspected for damaged parts and improper assembly, and assembled.

CHAPTER 7
PROPELLER SHAFTS

Section I. DESCRIPTION AND DATA

140. Description

a. General. Two propeller shafts are used to transmit power from the transfer to the two axle assemblies. A splined slip yoke (G, fig. 86 and F, fig. 88) is used at one end (nearer the transfer) of each propeller shaft to allow change of shaft length to compensate for the motion of the axle assemblies on the springs. This slip joint arrangement consists of external splines on the shaft and internal splines in yoke.

b. Universal Joints. Both the front and the rear propeller shafts have universal joints at both ends. The joints furnished on the front and rear ends of the front propeller shaft and the front end of the rear propeller shaft are of the U-bolt type. In this construction the flange is secured to the joint by means of threaded U-bolts as shown in (V) figure 88. Except for this difference, the parts of all four universal joints are the same and consist of a journal, bearing assemblies, snap rings, and tie bars.

141. Data

a. Propeller Shafts.

Make	Spicer
Type	Tubular
Number used	2

b. Universal Joints.

Make	Spicer
Type	Needle bearing
Number used (on each shaft)	2

Section II. REBUILD OF PROPELLER SHAFT ASSEMBLIES

142. Disassembly
(fig. 86)

Note. Most of the procedures given herein for rebuilding the front propeller shaft also apply to the rebuild of the rear propeller shaft. The few procedures which are different between the two shafts are covered individually at the appropriate places.

a. Remove Slip Yoke Assembly From Propeller Shaft. Unscrew the slip yoke dust cap (K). Slide the slip yoke (G) off the propeller shaft

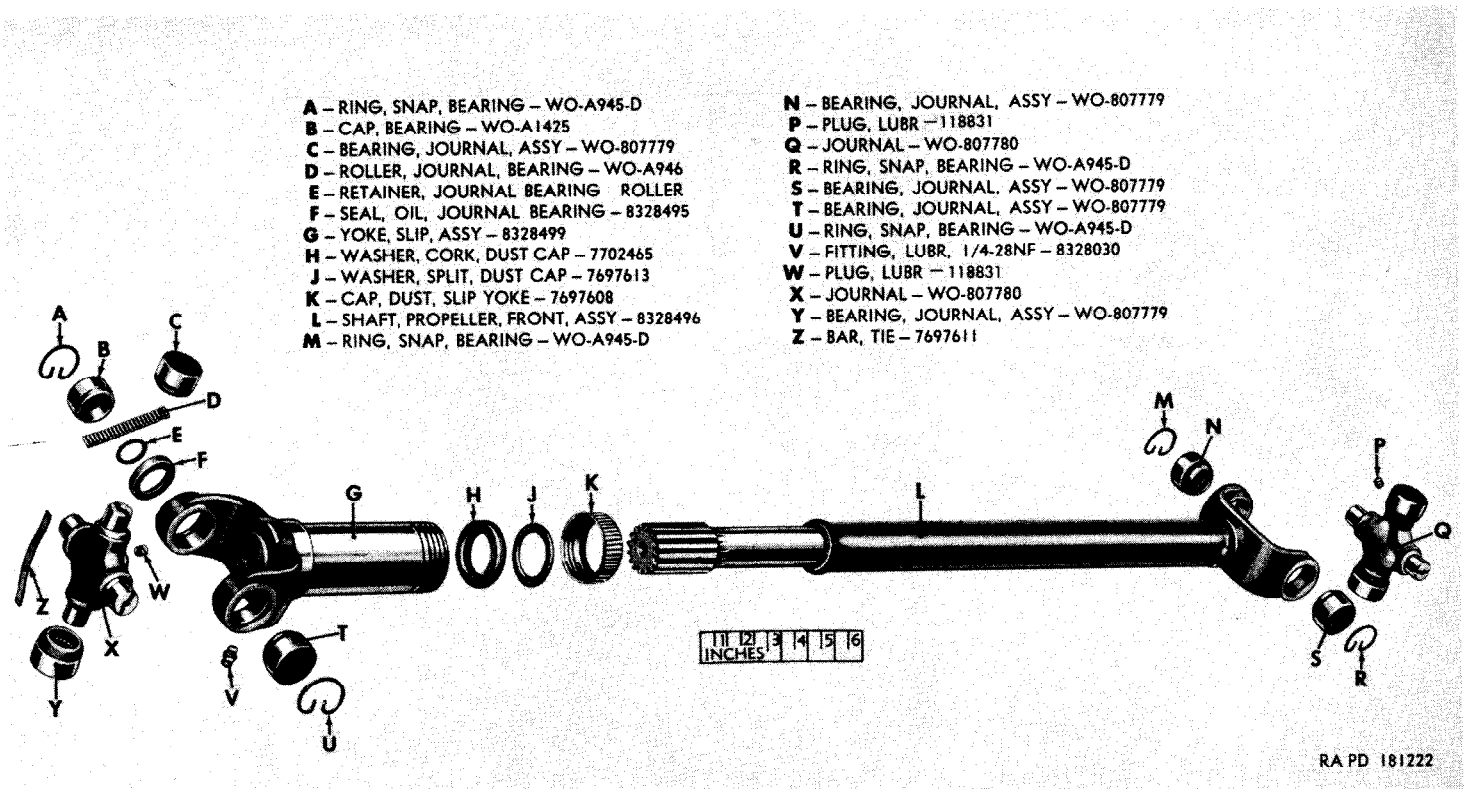


Figure 86. Front propeller shaft and universal joints—disassembled view.

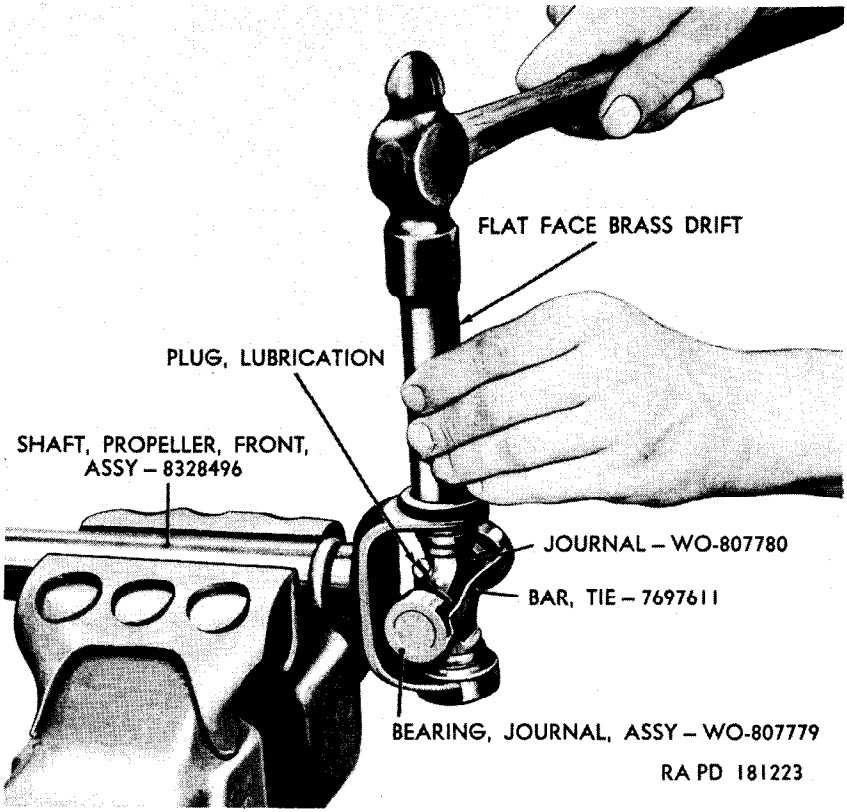


Figure 87. Removing journal from slip yoke (front universal joint).

(L). Remove the dust cap cork washer (H) and dust cap split washer (J) from the shaft. Remove the lubrication fitting (V) from the yoke.

b. Remove Bearing Assemblies From Free Ends of Journals. Cut each tie bar (Z) in two and remove journal bearing assemblies from the two free ends of each journal (X and Q). Remove the journal bearing oil seals (F) from the ends of the journals.

c. Remove Journal From Propeller Shaft and Slip Yoke. Secure propeller shaft in vise. Remove the two bearing snap rings (M and R). Using a flat face brass drift approximately one thirty-second of an inch smaller in diameter than the journal bearing hole in propeller shaft, drive lightly on the end of a bearing assembly until the opposite bearing assembly is pushed out of propeller shaft (fig. 87). Turn the propeller shaft over in vise and drive the first (one originally tapped on) journal bearing assembly back out of the propeller shaft by driving on the exposed end of journal. Remove the journal from propeller shaft. Remove journal bearings from the slip yoke and the rear propeller shaft to transfer flange yoke (Y, fig. 88) in the same manner as described above. Remove lubrication plugs (W and P) from the

journals. Remove the journal bearing oil seals (F) from the journals. Do not remove journal bearing roller retainers (E) from within bearing caps (B).

143. Inspection and Repair

(fig. 86)

a. Propeller Shafts. Inspect the propeller shafts (L) for cracks, wear, broken welds, worn or damaged splines, or bent condition. Replace propeller shaft if any of these faults are evident. Smooth off raised metal at nicks with a fine mill file. Inspect journal bearing surfaces for nicks, burs, and scratches. Remove any scores or burs with a fine stone. Replace propeller shaft if any bearing surface marks cannot be removed. Check the clearance between the propeller shaft splines and the splines of the slip yoke (G). Replace propeller shaft or yoke, as necessary, if clearance does not conform with repair and rebuild standards (par. 272).

b. Slip Yokes. Inspect slip yokes for cracks, wear, broken welds, worn or damaged splines, or bent condition. Slip yokes with any of these faults must be replaced. Clean slight nicks or burs with a fine stone. Check journal bearing surfaces for wear and damage. Remove light marks with a fine stone. Replace slip yoke if marks cannnot be removed. Inspect threads of slip yoke dust cap (K) and threads on outer surface of slip yoke for damage. Clean threads, if necessary, with a standard tap or die.

c. Journals. Inspect bearing surfaces of journal (Q and X) for burs, nicks, or scratches. Smooth off light marks with a fine mill file. Replace, if marks cannot be removed. Replace bearing assemblies if journal is replaced.

d. Bearing Assemblies. Inspect each bearing assembly for wear, damage, and freedom of rotation. Worn condition is indicated by marks on journal bearing surface and by bearing rollers dropping out of retainer. Replace all four bearing assemblies and journal if wear is indicated. Check outside diameter of journal bearing against repair and rebuild standards (par. 272). Replace bearing if not within limits.

e. Miscellaneous Parts. Replace bearing snap rings (A, M, R and U) if they show unnatural bends. Replace lubrication fitting (V) if damaged. Repair damaged threads of U-bolts with a standard die. Replace U-bolts if threads are beyond repair or if bolts are bent out of shape. Replace slip yoke dust cap cork washer (H) at each rebuild. Replace journal bearing oil seal (F) and slip yoke dust cap split washer (J) if they are worn or damaged sufficiently to impair their proper operation. Inspect the rear propeller shaft to transfer flange yoke (Y, fig. 88) for cracks, wear, or damage. Clean slight nicks or burs with a fine stone.

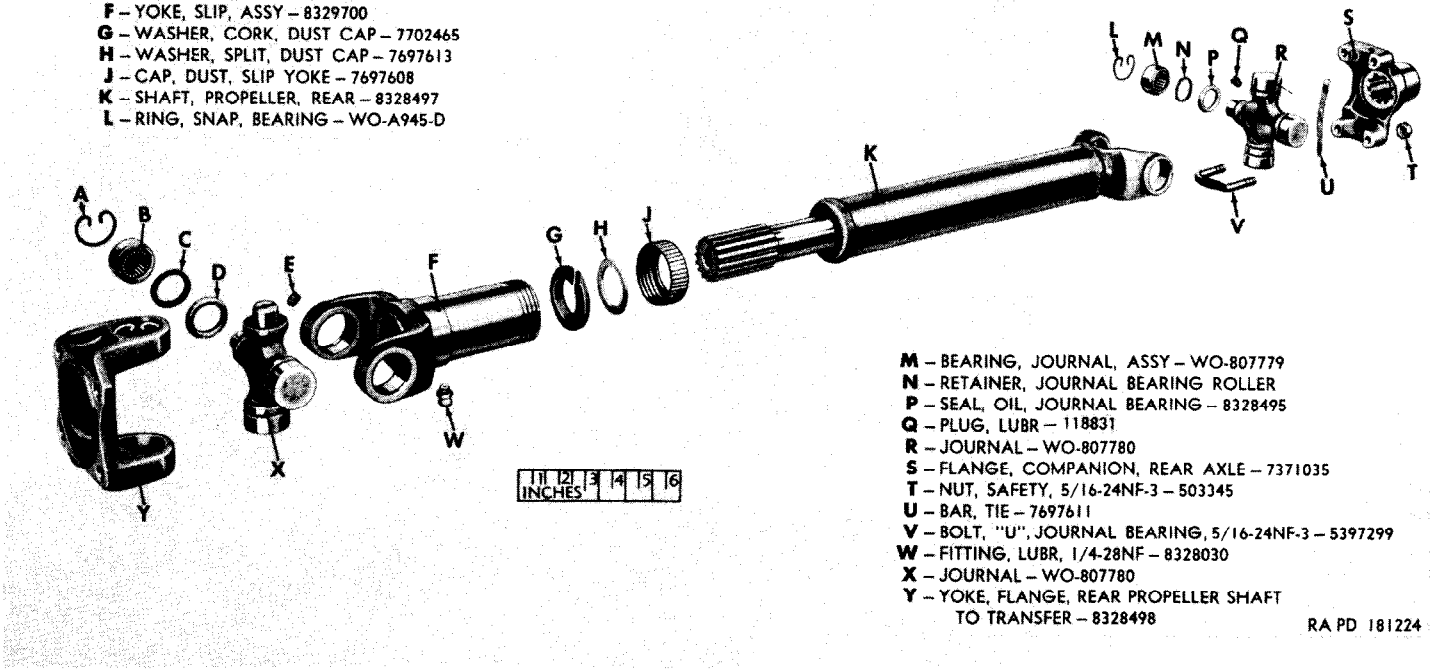


Figure 88. Rear propeller shaft and universal joints—disassembled view.

144. Assembly

(fig. 86).

a. Install Journal in Slip Yoke or Propeller Shaft. Install lubrication plug (W and P) in journals (X and Q). Install the journal bearing oil seal (F) in the journal bearing roller retainer (E). Place the journal (fig. 89) in position, in the slip yoke or shaft.

Note. Lubrication plug must face inward.

Start the journal bearing assemblies into bores of slip yoke or shaft. Using a vise (fig. 90), press the bearing assemblies flush with outside surface. With two suitable pressing arbors (about one thirty-second of an inch less in diameter than bearing assemblies) (fig. 91) press the bearing assemblies in further until they are alined with bearing snap ring groove in slip yoke. Install the two bearing snap rings. Assemble the remaining bearings and journals in same manner as prescribed above.

b. Install Bearing Assemblies on Free Ends of Journals. Install the journal bearing assemblies on the free ends of the journals previously secured in the slip yokes or propeller shaft (*a* above). If journal bearing assemblies with halves of tie bars still attached are being installed, bind the free ends of tie bar together with suitable wire.

Note. The tie bar serves only to prevent loss of bearing assemblies from free ends of journals during shipping and storage. To prevent loss of bearing assemblies when not secured by tie bar, use soft wire to tie the bearing assemblies together.

c. Install Slip Yoke Assembly on Propeller Shaft. Place propeller

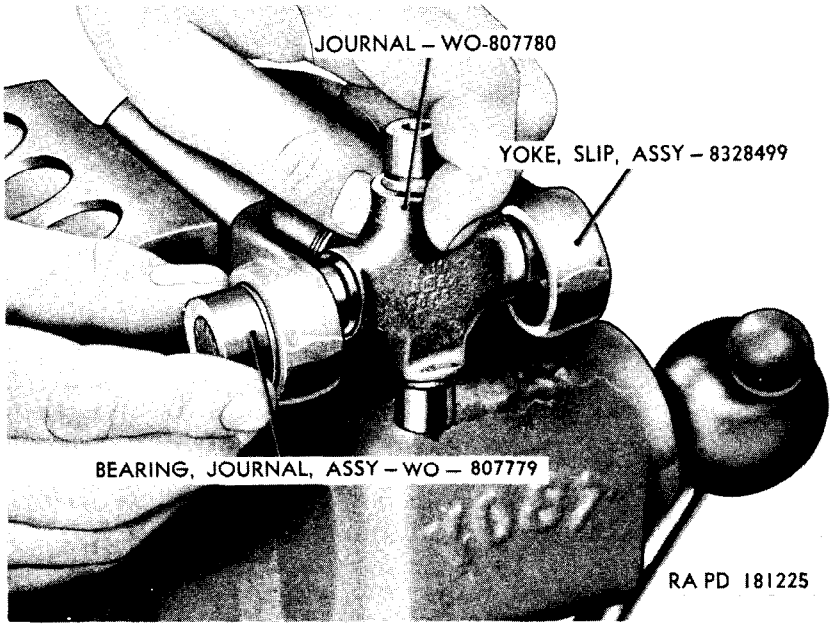


Figure 89. Placing universal joint journal in position in slip yoke assembly.

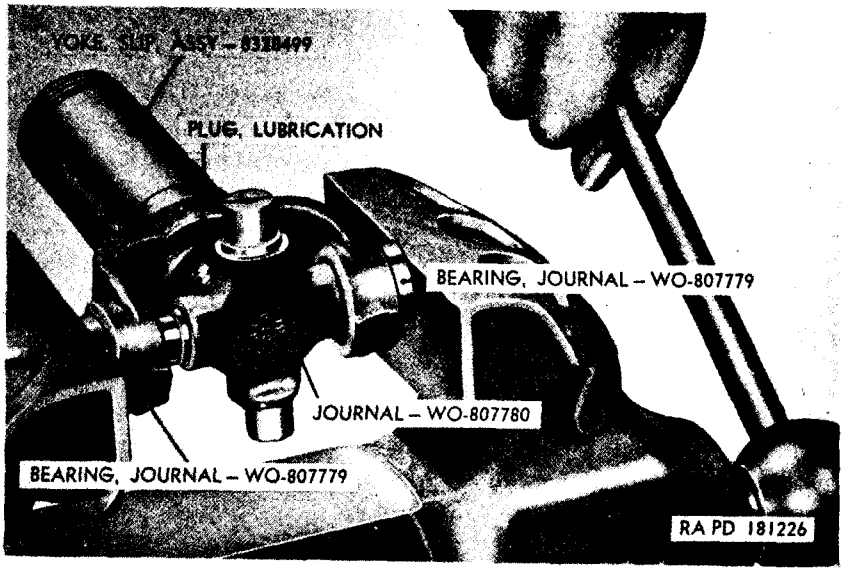


Figure 90. Pressing universal joint bearing assemblies into position.

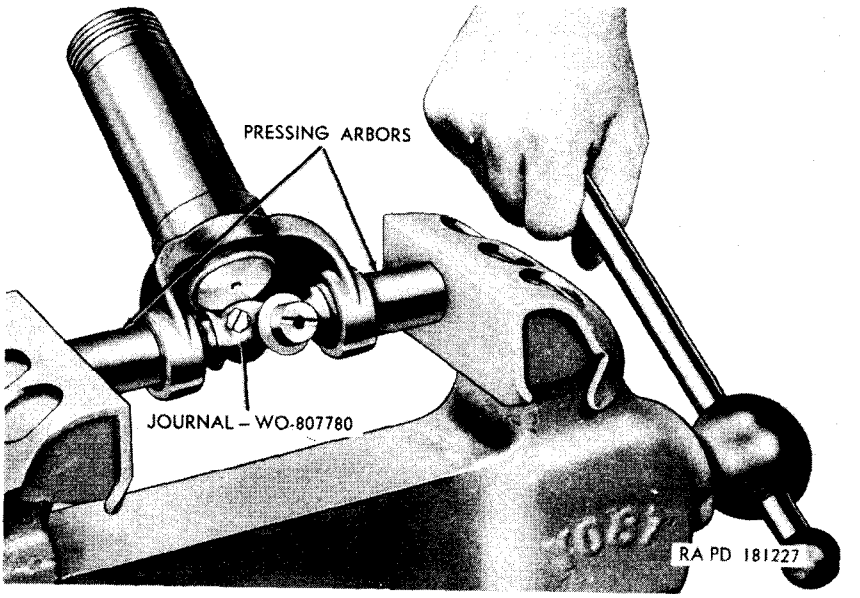


Figure 91. Using vise to press universal joint bearing assemblies into proper position.

shaft in vise. Place the slip yoke dust cap split washer (J) and dust cap cork washer (H) in slip yoke dust cap (K) and slide the assembly onto the propeller shaft. Aline the wide internal spline in the slip yoke with the wide area (missing external spline) on propeller shaft and push the shaft into slip yoke. Tighten the slip yoke dust cap securely. Install lubrication fitting (V) in slip yoke.

CHAPTER 8
FRONT AXLE

Section I. DESCRIPTION AND DATA

145. Description and Operation

a. General. The front axle (fig. 92) is a driving unit with hypoid type driving gears and spherical steering knuckles. The front axle is composed of the housing, end yoke assembly, the differential assembly, tie rod assemblies, axle shafts and universal joint assemblies, and steering knuckle flange assemblies. The drive is of the full-floating type, through axle shafts built integral with constant velocity universal joints which revolve in the steering knuckle flanges.

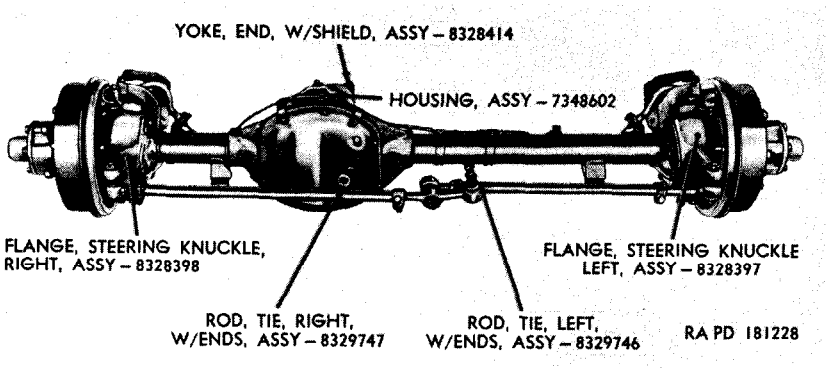


Figure 92. Front axle assembly.

b. Housing Assembly (fig. 99). The housing is of welded construction with an opening provided near the center for mounting the differential case and gears. The housing is provided with a spherical shaped extension at each end for mounting the steering knuckle flanges. An air vent plug is provided on the housing cover for venting purposes.

c. Axle Shafts. Each axle shaft comprises an inner shaft and an outer shaft connected by a universal joint. Two types of universal joints (fig. 93) are used. Axle shafts using the different type universal joints are identified by a tag attached to the steering knuckle oil seal retainer.

d. Bendix Universal Joint (fig. 93). The Bendix joint functions to drive through balls held in a circle. The Bendix universal joint comprises basically five universal joint balls and two pins which secure

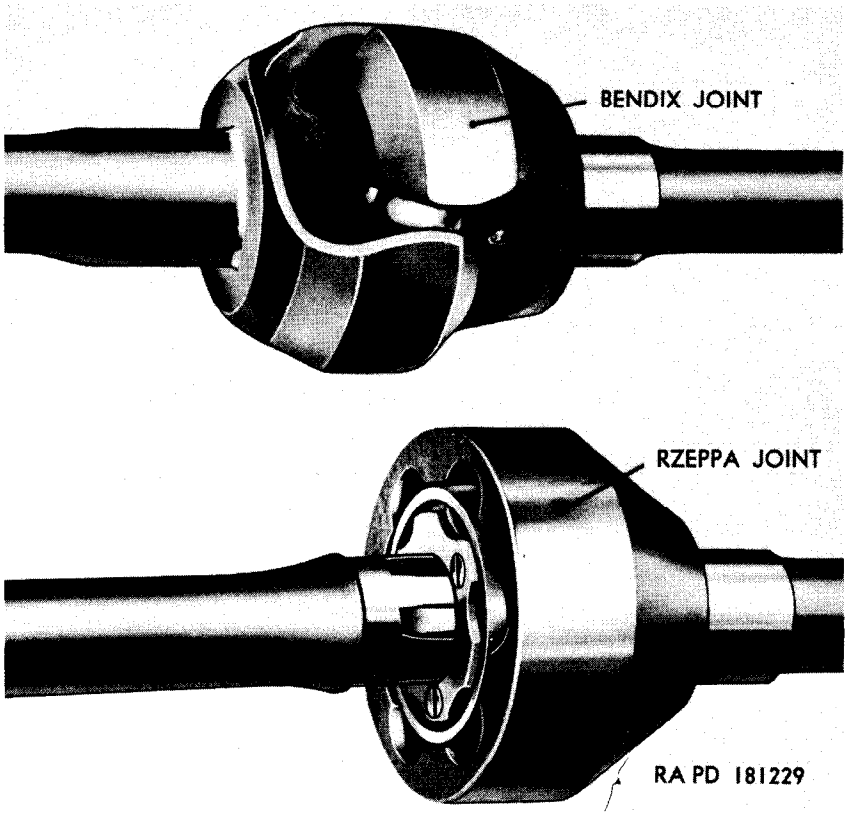


Figure 93. Front axle Bendix and Rzeppa joints.

the inner and outer shafts together. The end play of the Bendix universal joint and axle shaft is predetermined in manufacture by the position and flange thickness of the bushing type spindle bearing and the shaft to housing thrust washer. These parts, of the correct thickness, are positioned to provide satisfactory end play of the axle shaft. They also permit rotation of the universal joint center point at the center line of the kingpins. The bushing type spindle bearing requires no reaming as it is so designed that when it is pressed into the wheel spindle, it will be compressed sufficiently to provide the correct running clearance.

e. Rzeppa Universal Joint (fig. 93). The Rzeppa joint consists of a hollow end of an axle shaft which fits over a solid member of the mating axle shaft. The Rzeppa universal joint comprises a ball cage and race in conjunction with four universal joint balls which are held in place by the universal joint inner shaft retainer. The end play of the Rzeppa universal joint is also predetermined in manufacture by the position and thickness of the bushing type spindle bearing and shaft to housing thrust washer in conjunction with snap ring at the outer

end of the axle shaft. The shaft to housing thrust washer is not effective with the Rzeppa joint, but is installed in all axle housings so that both types of axle shafts may be used. The snap ring and bushing type spindle bearing are so positioned, and of the correct thickness, to provide satisfactory end play of the axle shaft and to allow rotation of the universal joint center point at the center line of the kingpins.

f. Steering Knuckle Flanges. The steering knuckle flanges are mounted on the spherical ends of the housing by tapered roller bearings. Kingpins which extend through these bearings provide the pivot points when the wheels are turned from side to side. The steering knuckle arms are constructed as parts of the steering knuckle flanges. An oil seal, between the steering knuckle flange and tube portion of housing, is provided for preventing entrance of foreign matter into flange and loss of lubricant. Caster and camber are built into the steering knuckle flanges and tube portion of housing and cannot be changed. Steering knuckle flange stop bolts are installed to limit turning radius of wheels.

g. Spindles. Spindles are secured to the steering knuckle flanges. These spindles, which mount the front hub bearings, transmit the turning force of the axle shafts to the shaft drive flanges which, in turn, are secured to the wheel hubs. Spindles are threaded for the front hub bearing adjusting nuts.

h. Differential Assembly. The differential assembly is of the conventional cage type employing drive gear and pinion, case, pinion shaft and pin, side gears and pinions, and thrust washers. Differential side bearings are the tapered roller type supported in bearing cups mounted in the housing.

i. Tie Rods. The tie rods are connected to the steering knuckle flange arms. The tie rods function to transmit turning effort of the steering mechanism to the front wheels and also to control the toe-in of the front wheels.

146. Data

Make	Spicer
Model	25
Ratio	5.38 to 1
Type	full floating
Lubricant capacity	1¼ qt
Universal joint make	Bendix or Rzeppa

Section II. DISASSEMBLY OF FRONT AXLE ASSEMBLY INTO SUBASSEMBLIES

147. General

a. The disassembly instructions in this chapter are based on the assumption that the front axle is removed from the vehicle. Many

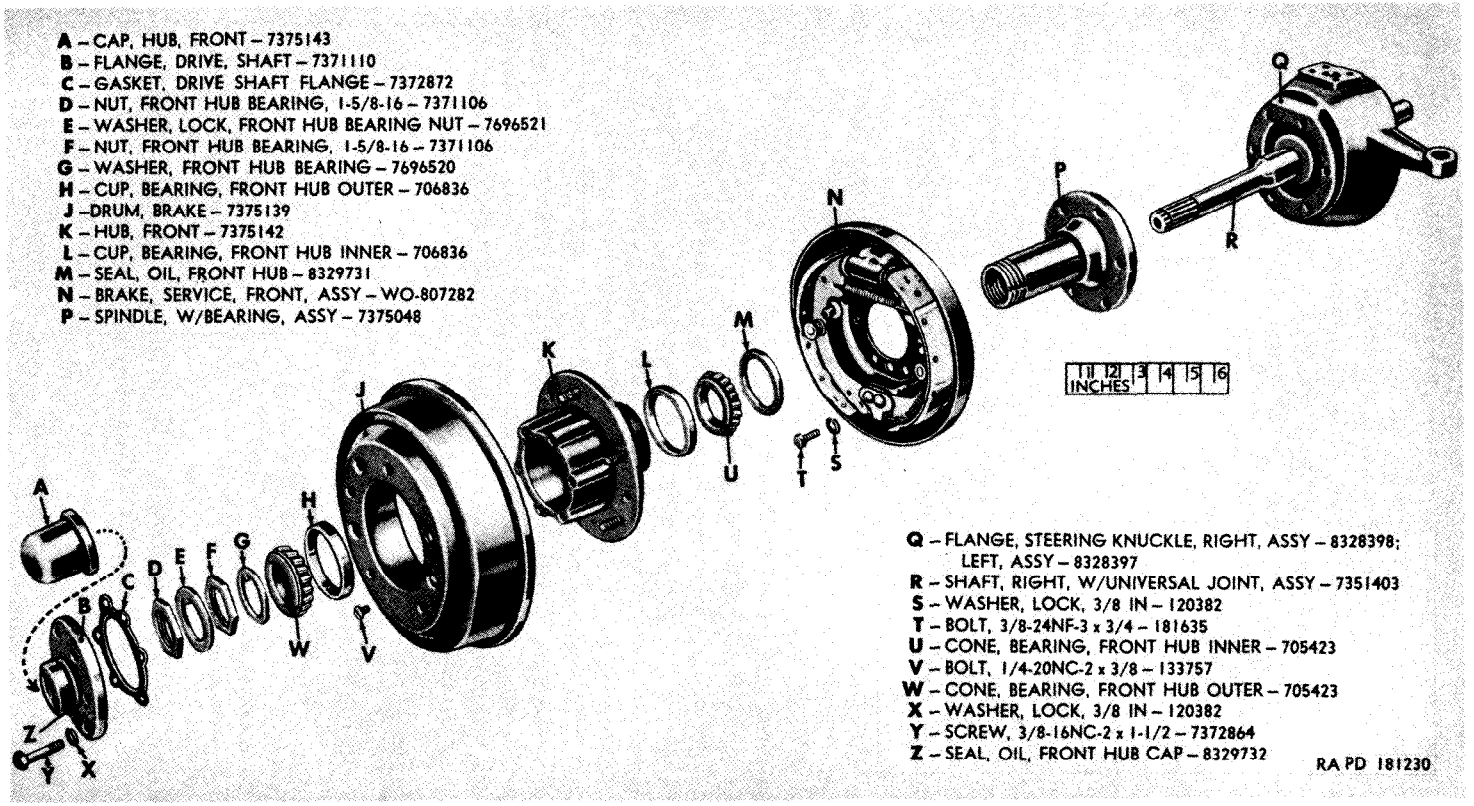
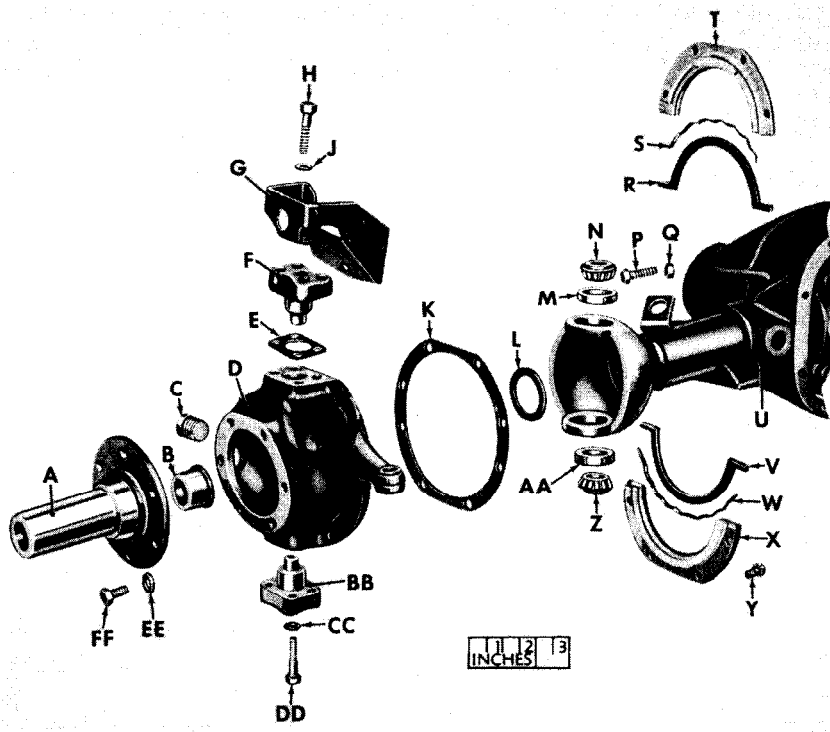


Figure 94. Front axle brakedrum, and hub assembly—disassembled view.



A – SPINDLE – WO-A852
B – BEARING, BUSHING TYPE, SPINDLE – 7375045
C – PLUG, PIPE, 1/2 IN – 219200
D – FLANGE, STEERING KNUCKLE, RIGHT, ASSY – 8328398 LEFT, ASSY – 8328397
E – SHIM SET, STEERING KNUCKLE FLANGE CAP – 7371589
F – CAP, STEERING KNUCKLE FLANGE, W/KINGPIN AND LOCK PIN, ASSY – 7371108
G – GUARD, FRONT BRAKE FLEXIBLE LINE – 7032625
H – BOLT, 3/8-24NF-3 x 1-5/8 – 181645
J – WASHER, LOCK, 3/8 IN – 120382
K – GASKET, STEERING KNUCKLE FLANGE OIL SEAL (PART ONLY)
L – WASHER, THRUST, SHAFT-TO-HOUSING – 7372870
M – CUP, BEARING, STEERING KNUCKLE FLANGE CAP – 706813
N – CONE, BEARING, STEERING KNUCKLE FLANGE CAP – 705381
P – BOLT, STOP, STEERING KNUCKLE FLANGE – 7373188
Q – NUT, JAM, STOP BOLT, 3/8-24NF-3 – 122236
R – SEAL, OIL, STEERING KNUCKLE (PART ONLY)
S – SPRING, STEERING KNUCKLE OIL SEAL (PART ONLY)
T – RETAINER, STEERING KNUCKLE OIL SEAL (PART ONLY)
U – HOUSING, ASSY – 7348602
V – SEAL, OIL, STEERING KNUCKLE (PART ONLY)
W – SPRING, STEERING KNUCKLE OIL SEAL (PART ONLY)
X – RETAINER, STEERING KNUCKLE OIL SEAL (PART ONLY)
Y – SCREW, LOCK WASHER, 5/16-24NF-3 x 11/16 – 7348605
Z – CONE, BEARING, STEERING KNUCKLE FLANGE CAP – 705381
AA – CUP, BEARING, STEERING KNUCKLE FLANGE CAP – 706813
BB – CAP, STEERING KNUCKLE FLANGE, W/KINGPIN AND LOCK PIN, ASSY – 7371108
CC – WASHER, LOCK, 3/8 IN – 120382
DD – BOLT, 3/8-24NF-3x 1-5/8 – 181645
EE – WASHER, LOCK, 3/8 IN – 120382
FF – BOLT, 3/8-24NF-3 x 3/4 – 181635

NOTE: OIL SEAL SERVICE KIT – 7418141 INCLUDES ITEMS T, S, R, V, W, X, AND K. ITEMS T AND K INCLUDED IN OIL SEAL W/RETAINER AND SEAL, ASSY – 7375049

RA PD 181231

Figure 95. Front axle steering knuckle flange and spindle—disassembled view.

of the disassembly operations can be performed with the front axle installed on the vehicle. But, to assure efficient and proper rebuild, it is recommended that the front axle be removed from the vehicle prior to rebuilding.

b. Thoroughly inspect the housing assembly and steering knuckle flanges for evidence of lubricant leakage. Clean the axle assembly prior to rebuild to prevent entrance of foreign matter into axle parts during disassembly. Drain front axle, as instructed in TM 9–804A, before proceeding with disassembly instructions.

148. Remove Front Axle Shaft Assembly

a. Remove Wheel and Tire Assembly. Refer to paragraph 57*a*.

b. Remove Front Hub and Drum Assembly (fig. 94). Pry off front hub cap (A). Remove snap ring from end of axle shaft if axle shaft is equipped with Rzeppa universal joints. Remove six lockwashers (X) and screws (Y) securing shaft drive flange (B) to front hub. Remove flange with a universal type puller. Remove front hub cap oil seal (Z) from recess in flange. Discard drive shaft flange gasket (C). Bend lip of front hub bearing nut lockwasher (E) off front hub bearing nut (D) and remove nut with hub nut wrench.

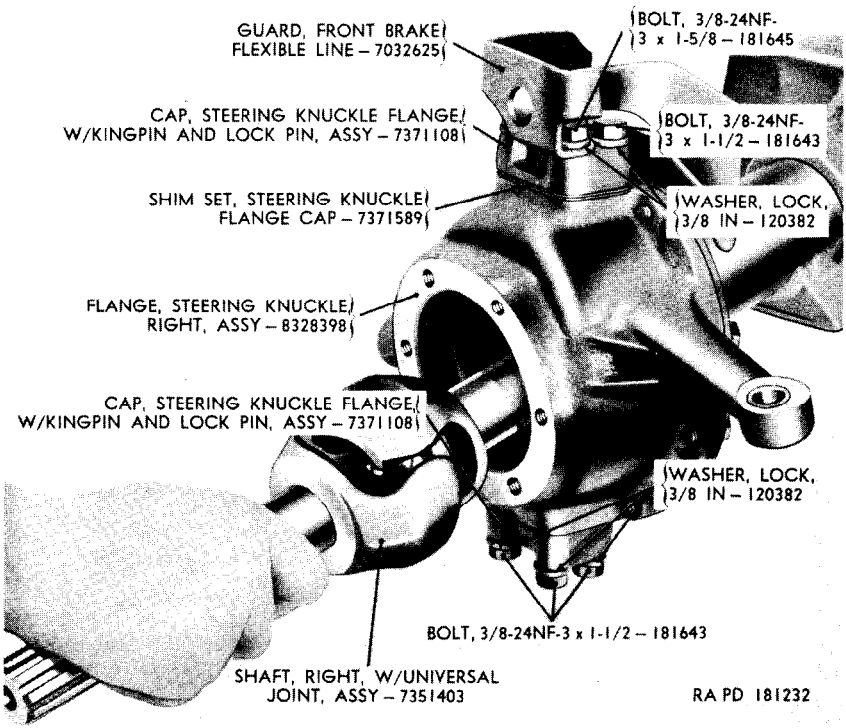


Figure 96. Removing front axle shaft with universal joint.

Remove lockwasher. Remove front hub bearing nut (F) and front hub bearing washer (G) in similar manner. Pull front wheel hub and brake drum off wheel spindle. Remove the outer front hub bearing cone (W). Remove inner front hub bearing cone (U) from inside of front hub. Remove the front hub oil seal (M) from within front hub.

c. Remove Spindle With Bearing Assembly (fig. 95). Remove six bolts (FF) and lockwashers (EE) securing the front service brake assembly to spindle with bearing assembly. Remove service brake assembly and spindle with bearing assembly.

d. Remove Axle Shaft Assembly. Pull front axle shaft with universal joint assembly directly out of steering knuckle flanges (fig. 96).

e. Remove Opposite Axle Shaft. Procedures for removing the opposite axle shaft with universal joint assembly are identical to those described above.

149. Remove Front Axle Steering Knuckle Flanges

a. Remove Front Brake Flexible Line Guard. Remove the two bolts and lockwashers securing the front brake flexible line guard (fig. 96) and lift guard from the top steering knuckle flange cap assembly.

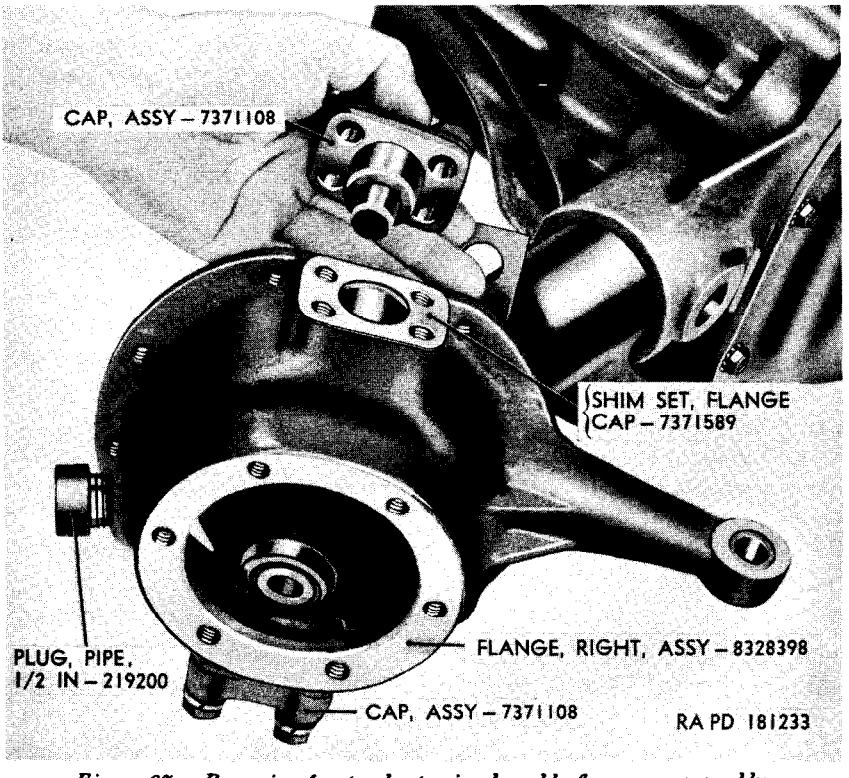


Figure 97. Removing front axle steering knuckle flange cap assembly.

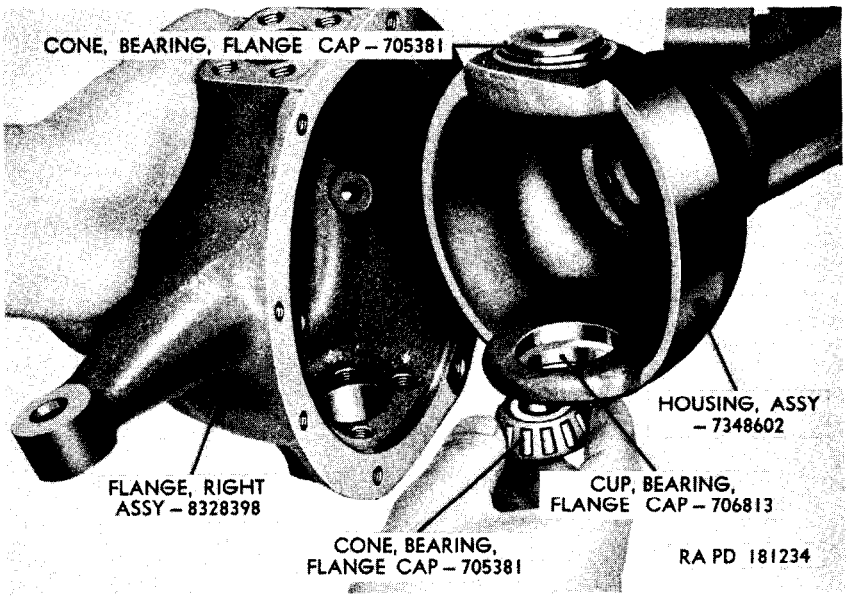


Figure 98. Removing front axle steering knuckle flange.

b. Remove Steering Knuckle Flange Cap Assemblies. Remove the two remaining bolts and lockwashers securing the top steering knuckle flange cap assembly to top of the flange. Lift the cap from recess in top of steering knuckle flange (fig. 97). Remove the flange cap shim set. Remove the lower cap assembly in the same manner.

c. Remove Steering Knuckle Oil Seal (fig. 95). Remove the 8 lockwasher screws (Y) securing the 2 halves of the steering knuckle oil seal retainers (T and X) to the steering knuckle flange. Remove the two steering knuckle oil seal retainers (T and X), oil seals (R and V), and oil seal springs (S and W). Discard the steering knuckle flange oil seal gasket (K). Remove the steering knuckle flange from tube end of housing (fig. 98) and remove the two steering knuckle flange cap bearing cones.

d. Remove Opposite Steering Knuckle Flange. Remove the opposite steering knuckle flange in the same manner as prescribed above.

150. Remove Front Axle Differential Assembly

a. Remove Housing Cover (fig. 99). Remove the 10 lockwasher cap screws (J) securing the housing cover to the housing assembly. Remove housing cover (G). Discard the cover gasket (E).

b. Remove Differential Bearing Caps (fig. 99). Remove the 2 bolts and lockwashers securing each of the 2 differential bearing caps (C and D) to the housing and remove the caps. Mark the caps and the adjacent sides of housing for identification to assure proper assembly,

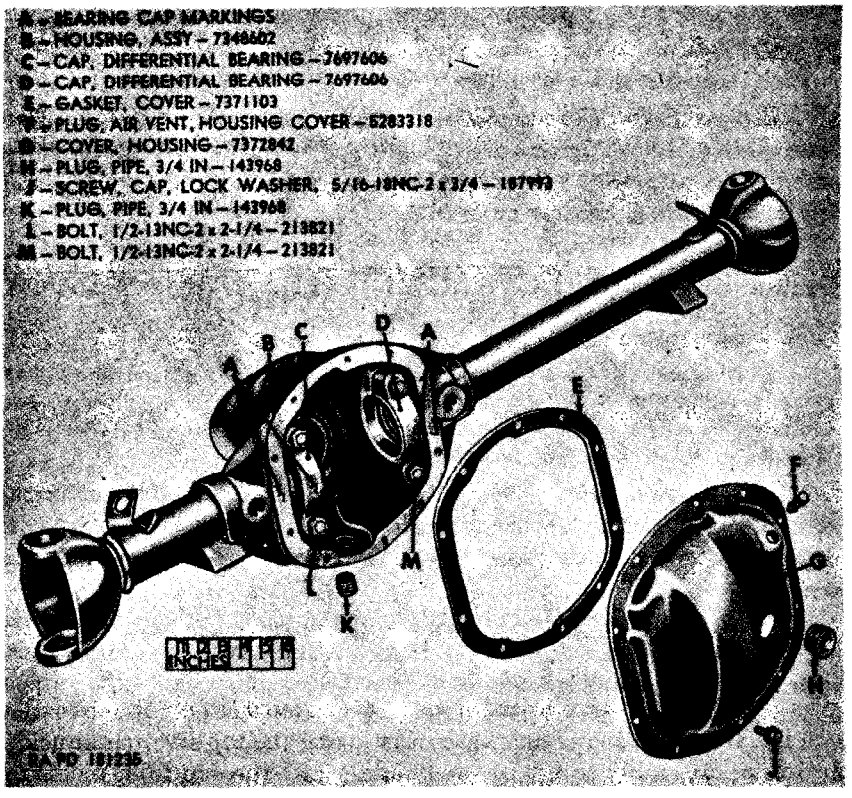


Figure 99. Front axle housing assembly.

if not already marked. Place spreader 41–S–4158–500 in position on the housing assembly.

Note. Spreader is illustrated in use in figure 128.

Spread housing enough to provide adequate clearance and remove the differential assembly. The differential assembly may have to be pried out in order to clear the differential case. Install the differential bearing caps (C and D) in housing, noting the correct bearing cap marking to assure correct location.

151. Remove Front Axle Differential Drive Pinion

(fig. 108)

a. Remove Axle End Yoke With Shield Assembly. Remove the "Huglock" nut (Z) and plain washer (Y) which secure the axle end yoke with shield assembly (X) to the drive pinion. Using a suitable puller, pull the end yoke assembly from end of drive pinion.

b. Remove Drive Pinion. Using a suitable block of wood, drive the drive pinion (M–2) from the housing. Remove the drive pinion

shim set (R) from the drive pinion, noting the thickness of shims removed.

Note. The drive pinion inner bearing cone (N) will remain on drive pinion.

c. Remove Drive Pinion Outer Bearing Cone. Remove the drive pinion oil seal (W) from end of housing assembly. Remove drive pinion oil seal gasket (V), drive pinion bearing oil slinger (U), and drive pinion outer bearing cone (T).

Section III. REBUILD OF FRONT AXLE SHAFT ASSEMBLY

152. Disassembly

Note. It is not necessary to disassemble the axle shaft with universal joint assembly, unless a check for excessive play or backlash (*b* below), indicates wear requiring replacement of parts or further inspection (par. 153*a*). To disassemble axle shaft with universal joint, proceed as follows:

a. Clean Axle Shaft. Clean the entire axle shaft with universal joint assembly with volatile mineral spirits or dry-cleaning solvent. Be sure to remove all grease from the universal joint for ease of disassembly.

b. Check Universal Joint for Play or Backlash. Place axle shaft with universal joint assembly vertically in vise with jaw protectors, with vise jaws gripping inner shaft just below universal joint. Push down on outer shaft firmly and at the same time attempt to twist universal joint in both directions. If play or backlash is evidenced, oversize universal joint balls must be installed at time of assembly (par. 154).

c. Disassemble Axle Shaft With Bendix Universal Joint.

(1) *Remove universal joint pin.* Support axle shaft with universal

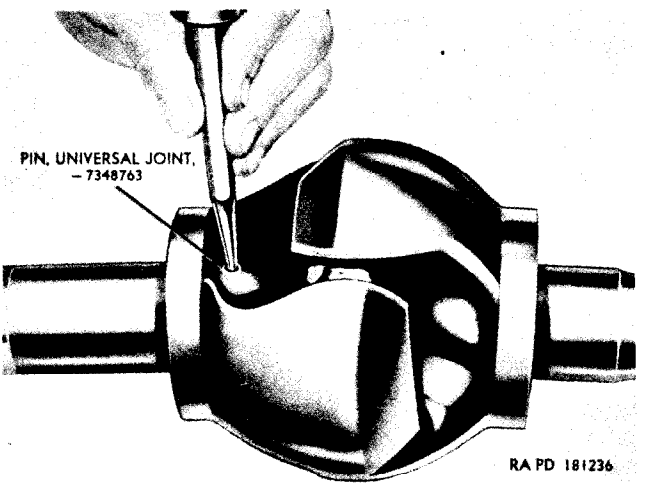


Figure 100. Removing front axle universal joint pin.

joint assembly in a vise with jaw protectors. Using a suitable drift, remove the universal joint pin (fig. 100).

(2) *Dislodge universal joint center ball pin.* Hold axle shaft with universal joint assembly in a vertical position and bounce it on a suitable block of wood until the universal joint center ball pin drops clear of the universal joint center ball.

(3) *Remove universal joint balls* (fig. 101). Secure outer end of shaft with universal joint assembly in vise with jaw protectors. Bend axle shaft so universal joint drilled center ball can be rotated until its grooved surface faces the first universal joint ball that is to be removed. With axle shaft in bent position, raise axle shaft until first universal joint ball to be removed slides against groove of universal joint drilled center ball, and remove universal joint ball. Remove the remaining three universal joint balls and separate axle shafts. Tap short end of axle shaft to remove universal joint center ball pin.

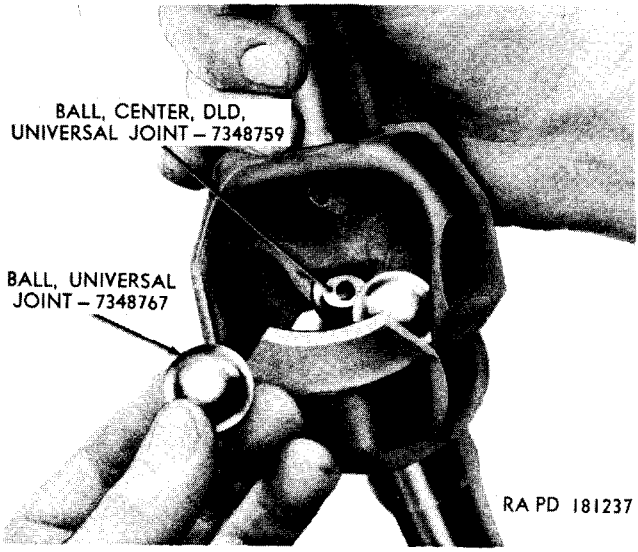


Figure 101. Removing front axle universal joint ball.

d. Disassemble Axle Shaft With Rzeppa Universal Joint.

(1) *Remove universal joint inner shaft retainer.* Remove the three bolts (fig. 102) which secure the universal joint inner shaft retainer to the universal joint inner race. Pull the inner axle shaft out of the inner universal joint race. Remove inner shaft snap ring and slide the universal joint inner shaft retainer from axle shaft.

(2) *Remove universal joint balls.* Push universal joint cage down on one side of outer axle shaft until opposite side of universal joint cage is out of outer axle shaft. Use brass drift and

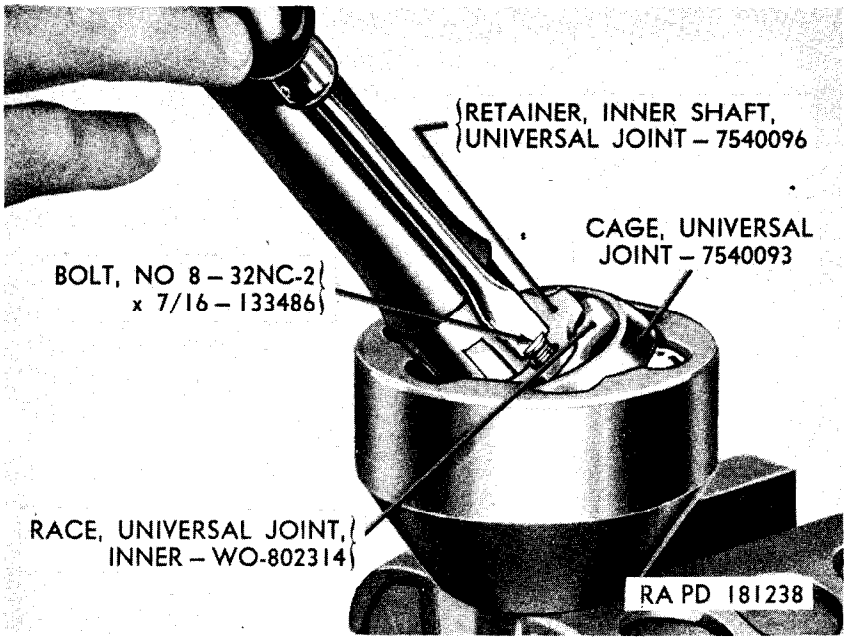


Figure 102. Removing front axle universal joint inner shaft retainer.

hammer, if necessary, to tilt universal joint cage. Using a suitable small screwdriver, pry the exposed universal joint ball out of the universal joint cage. Repeat the above operation until the three remaining universal joint balls are removed.

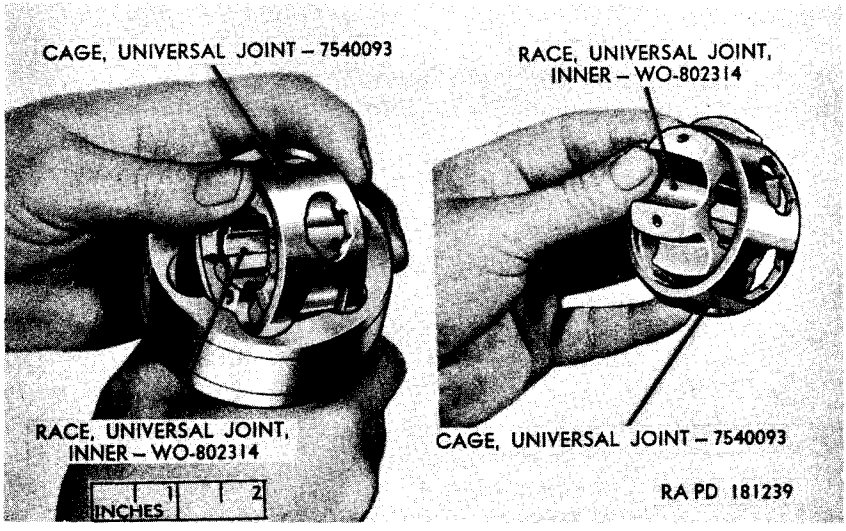


Figure 103. Removing front axle universal joint cage.

(3) *Remove universal joint cage and inner universal joint race.* Turn the universal joint cage in the outer axle shaft so that the 2 larger elongated holes of cage are between the 2 bosses in outer axle shaft as shown in figure 103. Lift the universal joint cage and inner universal joint race from outer axle shaft.

(4) *Remove inner universal joint race from universal joint cage.* Turn the inner universal joint race in the universal joint cage so that 1 of the bosses on the inner universal joint race can be dropped into 1 of the 2 elongated holes in universal joint cage as shown in figure 103. Separate inner universal joint race from universal joint cage.

153. Inspection and Repair

a. Inspection.

(1) *Axle shafts.* Examine the axle shafts with universal joint assemblies for twisted, bent, or broken condition. Inspect axle shaft splines for damage and wear. Examine universal joint ball races in axle shaft for excessive wear. If any of these faults are evidenced, replace the entire axle shaft with universal joint assembly. If axle shaft is equipped with Rzeppa joint, replace the inner and outer shaft retaining snap rings if they are broken or distorted.

(2) *Universal joint balls.* Inspect the universal joint balls for rough spots, cracks, or chipped condition. Check balls for out-of-round condition. If balls are out-of-round, replace them with balls of the same diameter unless backlash, (par. 152*b*) is excessive. If backlash is excessive, install oversize universal joint balls.

(3) *Universal joint cage and inner universal joint race.* Inspect these parts for wear and damage. Replace, if necessary. Check screw threads in inner universal joint race for damage. Replace the three bolts, which are used to secure the universal joint inner shaft retainer, at each rebuild. Replace the universal joint inner shaft retainer if it is broken or bent. Replace the universal joint pin at each rebuild.

b. Repair. If necessary, clean threads in inner universal joint race with a standard tap. Smooth over any slight faults such as burs, scores, and abrasions on axle shaft splines.

154. Assembly

a. Assemble Axle Shaft With Bendix Universal Joint.

(1) *Selective fit of universal joint balls.* Universal joint balls are available in various sizes. When installing new balls, keep them within 0.001 inch of the same size, if possible. Variation should not exceed 0.002 inch. During assembly, install the two largest balls diagonally across from each other.

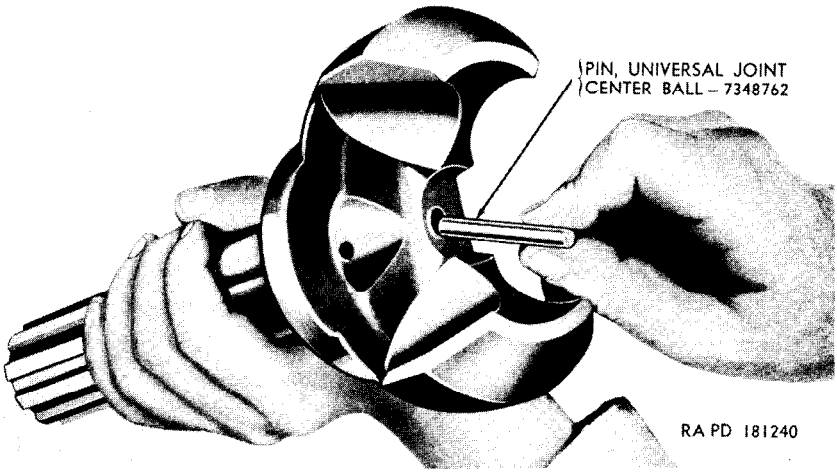


Figure 104. Installing front axle universal joint center ball pin.

Selective fit is not required if universal joint drilled center ball, or if universal joint center ball pin, is being replaced.

(2) *Install universal joint drilled center ball.* Insert the universal joint center ball pin (fig. 104) in hole of outer axle shaft. Secure outer shaft in vise. Place the universal joint drilled center ball in its race, on universal joint center ball pin hole, with groove of ball facing away from pin hole. Place the inner axle shaft over the outer axle shaft.

(3) *Install universal joint balls* (fig. 101). Slip three universal joint balls in their raceways. Turn the universal joint center drilled ball until its groove alines with remaining universal joint ball to be installed. Insert the remaining universal joint ball into its raceway. Rotate the universal joint center ball until hole in ball alines with universal joint center ball pinhole in outer axle shaft. Remove axle assembly from vise. Turn axle assembly over so that universal joint center ball pin drops into hole of universal joint center ball. Install the universal joint pin and stake pin in place on both sides.

b. Assemble Axle Shaft With Rzeppa Universal Joint.

(1) *Install inner universal joint race in universal joint cage* (fig. 103). Position universal joint cage horizontally. Hold inner universal joint race vertically and insert it in universal joint cage, dropping one of the race bosses into one of the larger elongated holes of the cage. When inner universal joint race is in universal joint cage, turn race so that it is entirely in cage.

(2) *Install inner universal joint race and universal joint cage in outer axle shaft* (fig. 103). Aline the two larger elongated

Figure 105. Installing front axle Rzeppa universal joint ball.

holes in universal joint cage with bosses in outer axle shaft and slip cage into axle shaft.

(3) *Install universal joint balls* (fig. 105). Tilt the universal joint cage so that a universal joint ball can be inserted into an elongated hole. After universal joint ball is in position, push universal joint cage down until opposite end of cage is exposed and insert another universal joint ball. Repeat the above operation for the remaining two universal joint balls.

(4) *Install inner axle shaft.* Slip the universal joint inner shaft retainer on the inner axle shaft and secure it in place with the inner shaft snap ring. Insert inner axle shaft in inner universal joint race. Secure universal joint inner shaft retainer with three new No. 8–32NC–2 x 7/16 bolts (fig. 102).

Section IV. REBUILD OF FRONT AXLE STEERING KNUCKLE FLANGE ASSEMBLIES

155. Disassembly
(fig. 95)

The steering knuckle flange (D) requires no disassembly.

156. Inspection and Repair

a. Inspection.

(1) *Steering knuckle flanges* (fig. 95). Carefully examine steering knuckle flanges for cracks or distortion. Inspect tapped holes for damaged threads. Inspect the steering arm for

cracks, distortion, and excessive out-of-round condition of holes which engage the tie rod studs. Replace steering knuckle flange (D) if any of the above faults are evident.

(2) *Steering knuckle flange cap assemblies* (fig. 95). Examine kingpins in steering knuckle flange cap assemblies for wear, damage, and out-of-round condition. Inspect the caps (F and BB) for damage, wear, out-of-round condition, and loose fit in steering knuckle flanges. Replace the cap assemblies, if necessary.

(3) *Steering knuckle flange cap bearing cones* (fig. 95). Steering knuckle flange cap bearing cones (N and Z) must not be pitted, scored, rough, or excessively worn. Bearing rollers must turn smoothly and freely.

(4) *Steering knuckle oil seal retainers* (fig. 95). Inspect steering knuckle oil seal retainers (T and X) for cracks, distortion, and damage. Check the steering knuckle oil seal springs (S and W) for breaks and other damage. Replace the steering knuckle oil seals and gasket at each overhaul.

(5) *Spindle with bearing assembly* (fig. 95). Inspect the spindle with bearing assembly for damaged threads, out-of-round condition, cracks, and distortion. Replace spindle assembly if necessary. Inspect the bushing type spindle bearing (B) for wear and damage. Replace bearing, if necessary (*b* below).

(6) *Front hub inner and outer bearing cones, cups, seal, washers, and nuts* (fig. 94). Front hub inner and outer bearing cones (W and U) must not be pitted, scored, rough, or excessively worn. Bearing rollers must turn freely and smoothly. Inspect front hub inner and outer bearing cups (H and L) for chipped, cracked, or worn condition. Replace faulty cones and cups. Discard the front hub oil seal (M) at each rebuild. Replace all damaged lockwashers and nuts.

(7) *Shaft drive flange* (fig. 94). Inspect shaft drive flange (B) for distortion, cracks, and breaks. Replace, if damaged. Discard the drive shaft flange gasket (C) and front hub cap oil seal (Z) at each rebuild.

(8) *Miscellaneous parts* (fig. 95). Replace the front brake flexible line guard (G), if broken. Replace all damaged bolts, and pipe plugs, if necessary.

b. Repair

(1) If the bushing type spindle bearing must be replaced, proceed as follows: Remove bushing type spindle bearing from spindle with a suitable drift. Position new bushing type spindle bearing in place in bore of spindle and drive it in position with the remover and replacer 41–R–2374–175 (fig. 106).

(2) Clean all damaged bolt holes with standard taps.

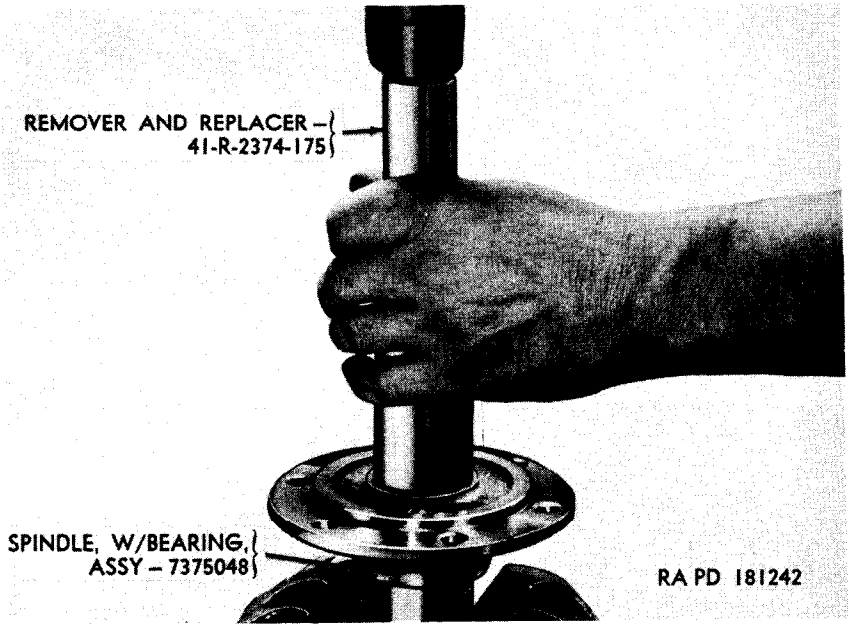


Figure 106. Installing front axle bushing type spindle bearing.

(3) Using a fine mill stone, smooth over burs, scores, or raised metal at nicks on the kingpins of the steering knuckle flange caps.

157. Assembly

(fig. 95)

The steering knuckle flange (D) does not require any assembly prior to installation on housing.

Section V. REBUILD OF FRONT AXLE DIFFERENTIAL ASSEMBLY

158. Disassembly

(fig. 108)

a. Remove Differential Bearing Cones. Using remover 41–R–2367–950 (fig. 107) remove the differential bearing cones (D and H) at each end of the differential case. Remove the bearing shim sets (E and G), noting the thickness of those removed at each end.

b. Remove Drive Gear. Mark drive gear and differential case to assure assembly in identical position. Straighten bent ears of drive gear screw lock plates (M-3) which secure the drive gear screws and remove the 8 drive gear screws (M–4) and 4 drive gear screw lock plates. Pull drive gear (M–1) from differential case (F). If nec-

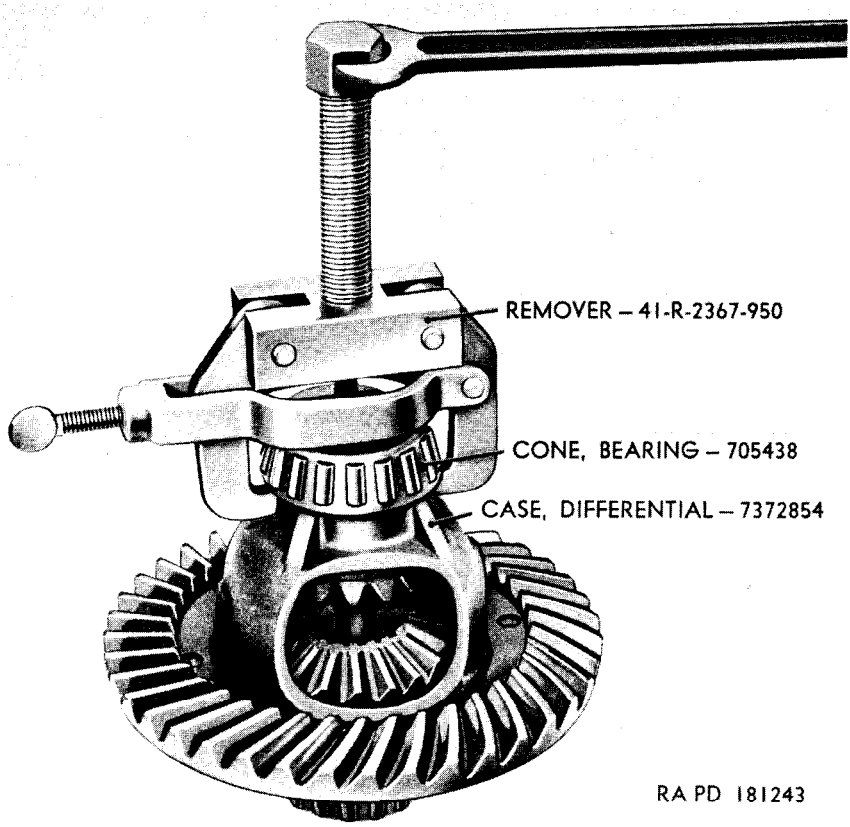


Figure 107. Removing front axle differential bearing cone.

essary, use a brass drift to tap drive gear off differential case, being careful not to damage drive gear or differential case.

Note. Do not attempt to pry drive gear off by wedging a chisel between gear and case.

c. Remove Differential Pinions and Side Gears. Using a long nose drift, drive the lock pin (AA–9) out of the differential case with brass drift and hammer. Roll the pinions (AA–3 and 7) around on the side gears until they can be lifted out through holes in differential case. Remove the pinion thrust washer (AA–8) from each pinion. Remove the two side gears (AA–2 and 6) and side gear thrust washers (AA–1 and 5) from differential case.

159. Inspection and Repair

(fig. 108)

a. Inspection.

(1) *Drive gear.* Inspect all teeth of drive gear (M–1) for wear, pitting, cracking, or chipping. Replace drive gear and drive

pinion (M–2), as a set, if drive gear shows damage. Examine tooth contact pattern (fig. 123) to see if drive gear has been meshing correctly with drive pinion. If tooth pattern indicates improper mesh, it will be necessary to replace both the drive gear and pinion. The drive gear and pinion are run-in and lapped together, during factory production, as a matched set. Inspect screw threads in drive gear for damage.

(2) *Differential case.* Inspect differential case (F) for cracks or distortion. Examine machined surfaces for scores or grooves. Replace, if necessary.

(3) *Side gears.* Examine side gears (AA–2 and 6) for worn, cracked, or chipped teeth. The side gears should present a snug fit to their respective axle shaft splines. Inspect fit of side gears in differential case bores. This fit must not be excessively loose. Too much play will cause excessive backlash in the drive line.

Note. If the side gears require replacement, the side gears and pinions (AA–3 and 7) must be replaced as a set.

(4) *Pinions.* Inspect teeth of pinions (AA–3 and 7) for wear, cracks, or chipping. Install the pinion shaft (AA–10) through hole of each pinion. The clearance between pinion and pinion shaft must not exceed 0.0069 inch. If pinion holes exceed the wear limit (par. 273), replace the pinions and side gears as a set.

(5) *Differential bearing cones.* Inspect the differential bearing cones (D and H) and cups (C and J) for excessive wear, scoring, chipped conditions, and overheating. Replace faulty cones or cups, if necessary.

b. Repair. Use a fine stone and smooth over any slight burs or scratches on gear teeth and pinion shaft. Replace parts as sets (*a* above) if faults on gear teeth can not be readily repaired. Clean damaged threads of drive gear with a standard tap.

160. Assembly

(fig. 108)

a. Install Side Gears. Use new side gear thrust washers (AA–1 and 5), behind the side gears (AA–2 and 6), and install the two side gears in ends of differential case (F). Lubricate side gears with lubricant and rotate side gears to be sure they turn without binding.

b. Install Pinions. Install new pinion thrust washers (AA–4 and 8) behind pinions (AA–3 and 7). Mesh pinions with side gears so that they are directly opposite each other in differential case. Roll pinions and side gears around until holes in pinions aline with pinion shaft holes in differential case. Install the pinion shaft (AA–10) in differential case and through pinions. Secure pinion shaft by installing the lock pin (AA–9). Stake lock pin in place.

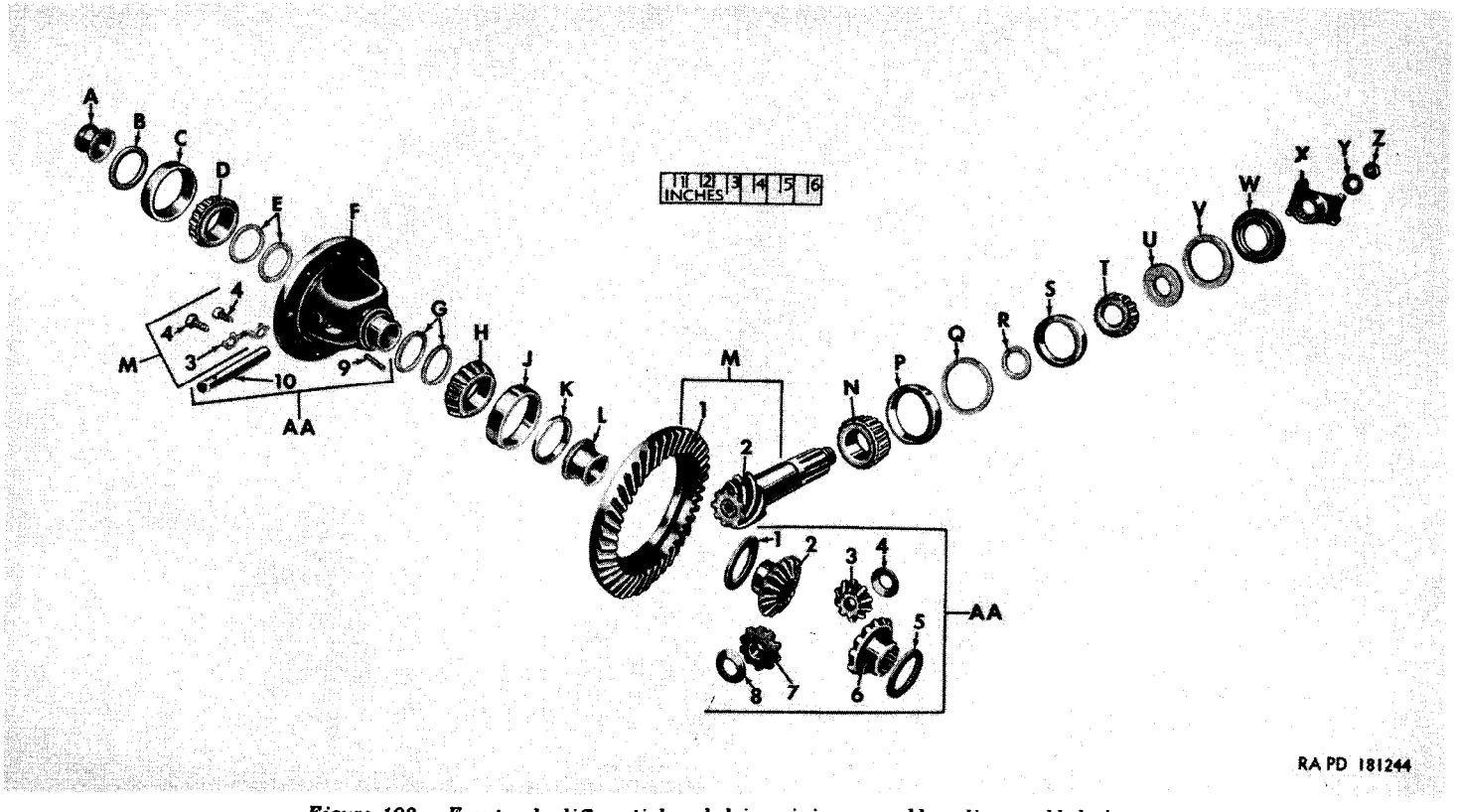


Figure 108. Front axle differential and drive pinion assembly—disassembled view.

A—Guide, axle shaft—7372869
B—Seal, oil, type MW, 1 9/16 x 2.000 x ¼, inner axle shaft—500030
C—Cup, bearing—706849
D—Cone, bearing—705438
E—Shim set, bearing—7371440
F—Case, differential—7372854
G—Shim set, bearing—7371440
H—Cone, bearing—705438
J—Cup, bearing—706849
K—Seal, oil, type MW, 1 9/16 x 2.000 x ¼, inner axle shaft—500030
L—Guide, axle shaft—7372869
M—Kit, repair, drive gear and pinion—7032627
Composed of:
1—Gear, drive
2—Pinion, drive
3—Plate, lock, drive gear screw [1]
4—Screw, drive gear, ⅜–24NF–3 x 1 5/16 [2]
N—Cone, bearing, drive pinion, inner—705478
P—Cup, bearing, drive pinion, inner—706877
Q—Shim, bearing, drive pinion, inner—7372847
R—Shim set, drive pinion—7371439
S—Cup, bearing, drive pinion, outer—707063
T—Cone, bearing, drive pinion, outer—705271
U—Slinger, oil, drive pinion bearing—7696512
V—Gasket, drive pinion oil seal—7372855
W—Seal, oil, type MLS, 1 9/16 x 3.165 x 1 9/32, drive pinion—500071
X—Yoke, end, axle, w/shield, assy—8328414
Y—Washer, plain, ¾-in.—7372868
Z—Nut, "Huglock," ¾–16NF–2—7032635
AA—Kit, repair, differential—7371441
Composed of:
1—Washer, thrust, side gear
2—Gear, side
3—Pinion
4—Washer, thrust, pinion
5—Washer, thrust, side gear
6—Gear, side
7—Pinion
8—Washer, thrust, pinion
9—Pin, lock [3]
10—Shaft, pinion

Figure 108—Continued.

[1] Also available separately—7372857.
[2] Also available separately—7372863.
[3] Also available separately—7372858.

c. Install Differential Bearing Cones. Since the differential bearing cones (D and H) may require adjustment, do not install them at this time. Install bearing cones during installation of differential assembly into housing (par. 164*a*).

d. Install Drive Gear. Place drive gear (M–1) over shoulder of differential case (F). If using same gear as removed, aline match marks on drive gear and differential case. Secure gear to case with eight ⅜–24NF–3 x $^{15}/_{16}$ drive gear screws (M–4) and four drive gear screw lock plates (M–3). Bend ears of lock plates on gear screws. Tighten gear screws to torque of 38 to 42 pound-feet

Section VI. REBUILD OF FRONT AXLE DIFFERENTIAL DRIVE PINION AND HOUSING

161. Drive Pinion

(fig. 108)

a. Disassembly. Remove the drive pinion inner bearing cone (N) from drive pinion (M–2) by a suitable removing method (arbor press).

b. Inspection and Repair.

(1) Inspect the drive pinion (M–2) for worn, chipped, or cracked teeth. Replace the drive pinion if its teeth are faulty. Inspect screw threads on end of drive pinion for damage. Inspect pinion and drive gear to be sure they are matched. Marking on drive gear and pinion must be the same.

Note. If drive pinion must be replaced, replace drive pinion and drive gear as a matched set.

Inspect drive pinion inner and outer bearing cones (N and T) for wear, pitting, scoring, and roughness. Bearing rollers must turn smoothly and freely.

(2) *Repair.* Correct any slight faults; such as scores, burs, and scratches; on drive pinion with a hone. Repair damaged threads on drive pinion (M–2) with a standard thread chaser or on lathe, if possible.

c. Assembly (fig. 109). Using a suitable arbor press, press the drive pinion inner bearing cone in position on the drive pinion.

162. Housing Assembly

a. Disassembly.

(1) Remove the inner axle shaft oil seal (B, fig. 108) by prying it from each side of housing assembly.

(2) Do not remove the axle shaft guides (A, fig. 108) unless inspection reveals them to be unserviceable. To remove axle shaft guides, drive them out of housing with a suitable improvised bar.

(3) It is not necessary to remove the drive pinion inner and outer bearing cups (P and S, fig. 108) unless inspection

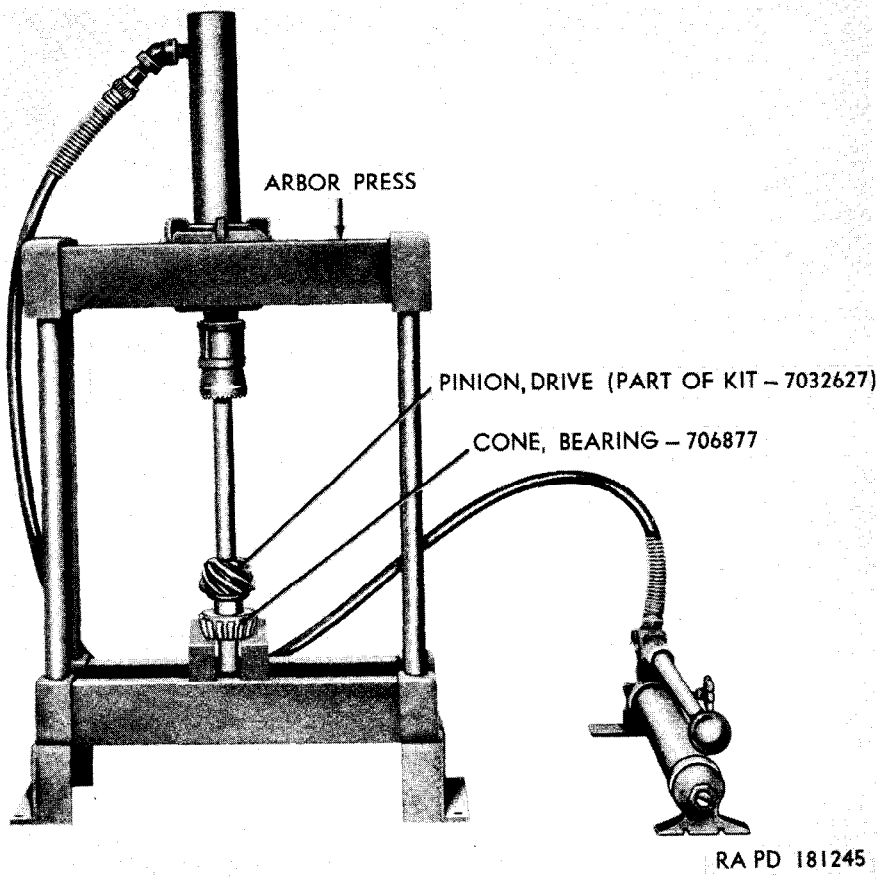


Figure 109. Installing front axle drive pinion inner bearing cone.

reveals them to be unserviceable. To remove the drive pinion inner bearing cup, drive it out of housing with remover and replacer 41–R–2374–660 and screw 41–S–1047–330. Remove the drive pinion inner bearing shim (Q, fig. 108). To remove the drive pinion outer bearing cup, drive it out of housing using remover and replacer 41–R–2374–665 and screw 41–S–1047–330.

(4) Do not remove the steering knuckle flange cap bearing cups (M and AA, fig. 95), from the spherical ends unless inspection reveals them to be unserviceable. To remove bearing cups, drive them out with remover and replacer 41–R–2374–750 and screw 41–S–1047–300 (fig. 110).

b. Inspection and Repair.

(1) *Inspection.* Discard the inner axle shaft oil seals (B and K, fig. 108) at each rebuild. Examine the axle shaft guides

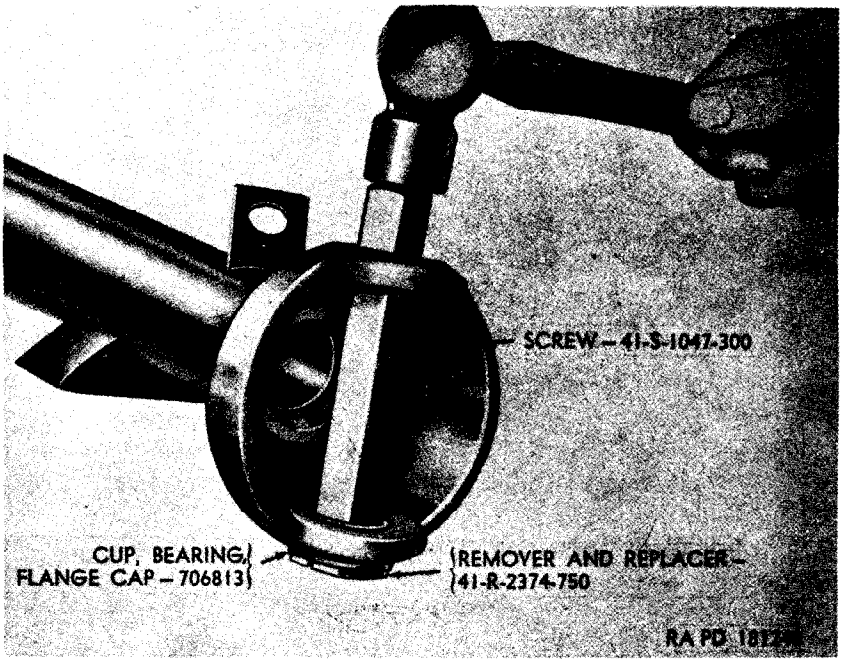


Figure 110. Removing bearing cup from front axle steering knuckle.

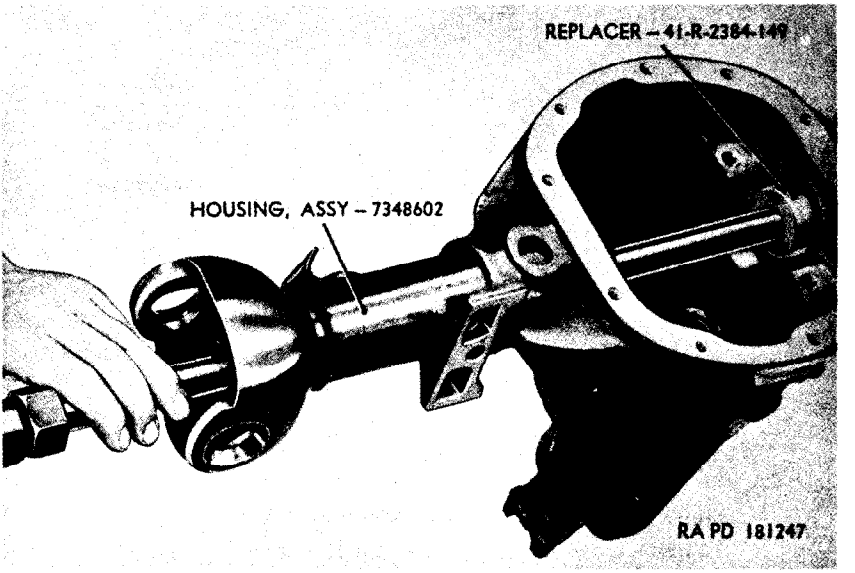


Figure 111. Installing front axle inner axle shaft oil seal.

(A, fig. 108) for wear, damage, and loose fit. Replace axle shaft guides, if necessary Inspect the bearing cups, drive pinion, and steering knuckle flange cap for cracks, chipped

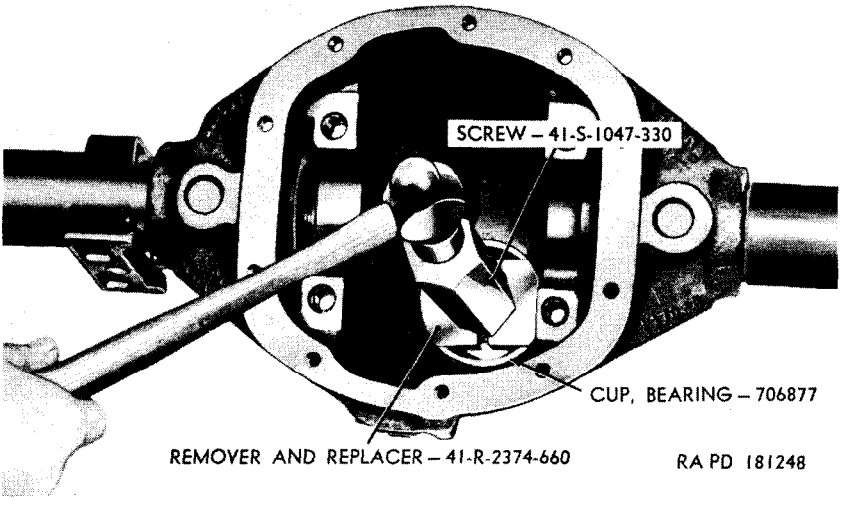


Figure 112. Installing front axle drive pinion inner bearing cup.

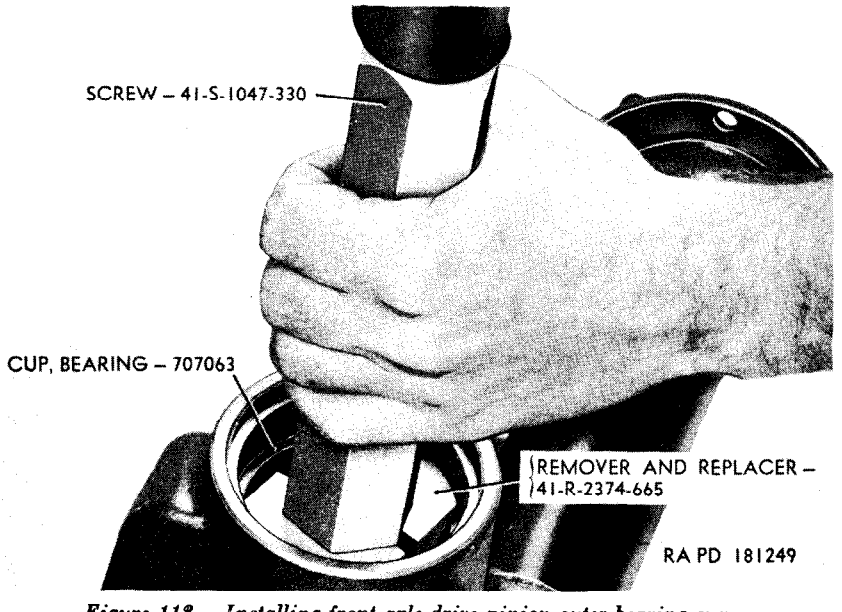


Figure 113. Installing front axle drive pinion outer bearing cup.

spots, or wear. Replace damaged or worn bearing cups. Inspect the housing assembly (fig. 99) for cracks and twisted or distorted condition. Inspect the differential bearing caps for damage. Examine housing cover tapped screw holes for damaged threads. Inspect the housing cover for sprung or broken condition. Replace, if necessary. Replace damaged pipe plugs. Replace damaged housing cover air vent plug.

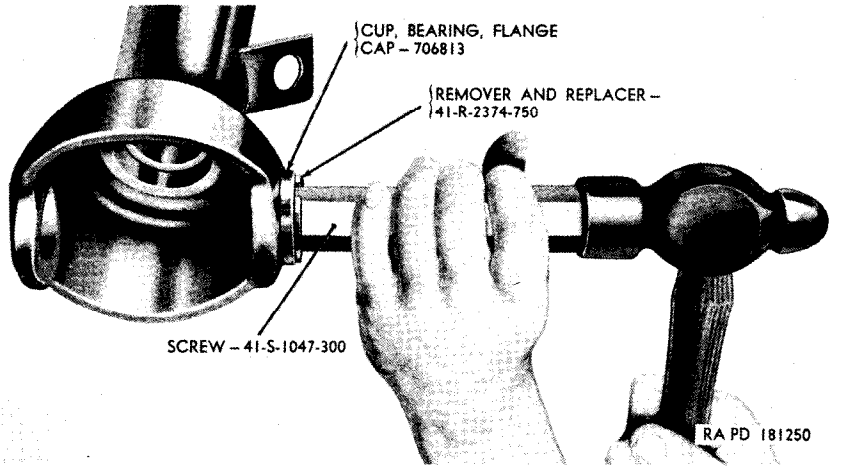


Figure 114. Installing bearing cup in front axle steering knuckle.

(2) *Repair.* Secure all loose spring saddles to underside of housing by welding. Clean damaged threads in housing with standard taps. Straighten bent mating surfaces of housing cover. Replace housing cover if it cannot be straightened sufficiently.

c. Assembly.

(1) To install axle shaft guides (A, fig. 108), drive them into proper position in housing, using a suitable improvised driving tool.

(2) Install a new inner axle shaft oil seal in each side of housing with replacer 41–R–2384–149 (fig. 111).

(3) Install drive pinion inner bearing cup with remover and replacer 41–R–2374–660 and screw 41–S–1047–330 (fig. 112). Be sure to install the drive pinion inner bearing shim (Q, fig. 108) beneath bearing cup before driving bearing cup in place.

(4) Install drive pinion outer bearing cup with remover and replacer 41–R–2374–665 and screw 41–S–1047–330 (fig. 113).

(5) Install the steering knuckle flange cap bearing cups (M and AA, fig. 95) with remover and replacer 41–R–2374–750 and screw 41–S–1047–300 (fig. 114).

Section VII. ASSEMBLY OF FRONT AXLE ASSEMBLY FROM SUBASSEMBLIES

163. Install Drive Pinion

(fig. 108)

a. Install Drive Pinion Outer Bearing Cone. Slide the drive pinion

(M–2) into housing until the inner bearing cone rests in bearing cup. Slide drive pinion shim set (R) onto drive pinion.

Note. This is a temporary installation until correct shim thickness is determined during drive pinion adjustment (*b* below).

Using a suitable driver, drive the drive pinion outer bearing cone (T) in place on drive pinion. Install the drive pinion bearing oil slinger (U). Slide the axle end yoke with shield assembly (X) onto drive pinion and secure with ¾-inch plain washer (Y) and ¾–16NF–2 "Huglock" nut (Z).

Note. Do not install the drive pinion oil seal gasket (V) and drive pinion oil seal (W) until pinion bearings have been adjusted.

b. Adjust Drive Pinion. To compensate for manufacturing tolerances, drive pinions and drive gears are tested for quietness and tooth contact at a standard cone setting. Since drive pinions may vary from this setting, the variation is marked on the polished head of the pinion (fig. 115). The drive pinion is marked plus or minus the number of thousands that it is above or below standard. Plus indicates that drive pinion is too close to center line of axle. Minus indicates that drive pinion is too far from center line of axle. Refer to figure 115 for typical inspection mark which shows that drive pinion is 0.003 inch too close to center line of axle. The drive pinion setting gage set 41–G–535–700 is provided to measure the distance from finished surface on drive pinion head to the center line of the differential case bearing bore. By establishing this distance, the correct amount of drive pinion shims to be installed or removed may be determined to correctly position drive pinion. The drive pinion setting checking gage 41–G–98–750, a component of gage set

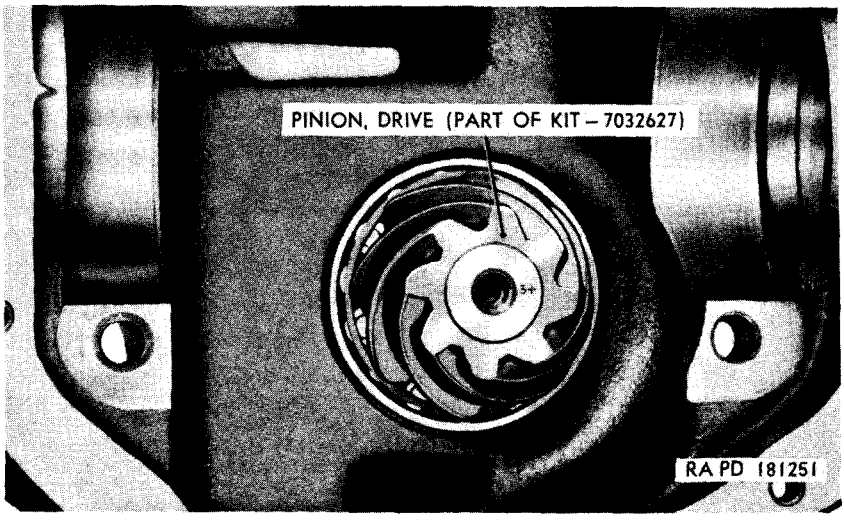


Figure 115. Front axle drive pinion inspection mark.

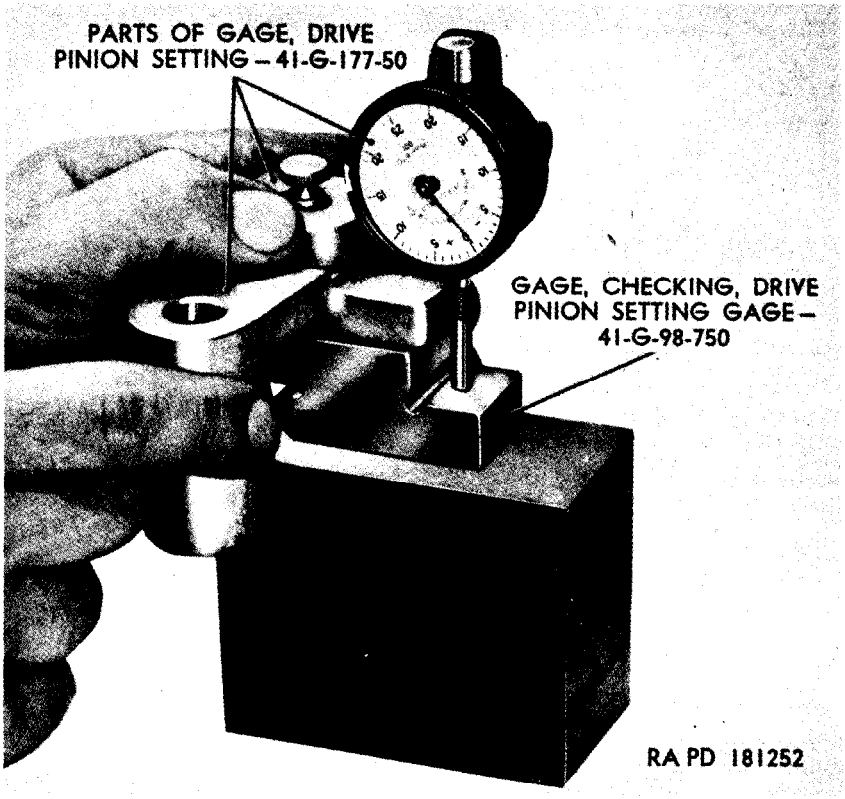


Figure 116. Adjusting drive pinion setting gage.

41–G–535–700, is used to set the gage to the standard or theoretical dimension between face of drive pinion and center line of differential case bearing.

(1) *Adjust Gage Indicator of Gage 41–G–177–50 to Checking Gage 41–G–98–750.* Support checking gage 41–G–98–750 on a suitable block of wood with the "D" surface up. Assemble gage indicator to two other gage 41–G–177–50 components and position gage indicator on checking gage 41-G–98–750 (fig. 116). Set dial bezel to position the hand at zero with one-half of a turn tension on gage pin. This sets dial to register at zero when mounted in housing as distance between finished face of a standard bevel pinion and center of differential case is spanned.

Note. After checking dial, use care not to jar or turn bezel so as to disturb the setting.

(2) *Seat Drive Pinion Setting Gage To Drive Pinion* (fig. 117). Assemble dial indicator head to the clamp of gage 41–G–177–50 by slipping the dial gage support over the

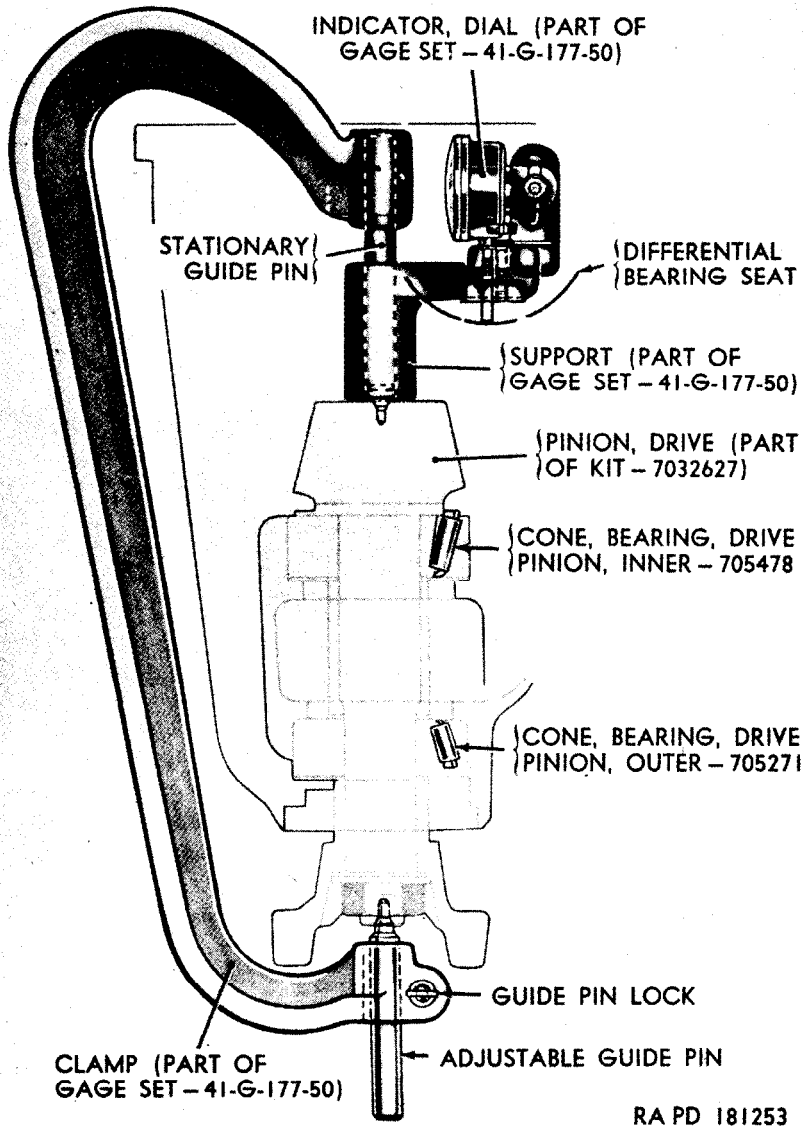


Figure 117. Seating drive pinion setting gage 41–G–177–50.

stationary guide pin. Hold indicator head and large end of clamp in one hand and position it over the pinion. Press adjustable guide pin at small end of clamp into threaded end of drive pinion shaft lathe center and lock in position with the adjustable guide pin lock.

(3) *Check drive pinion adjustment.* With clamp correctly seated,

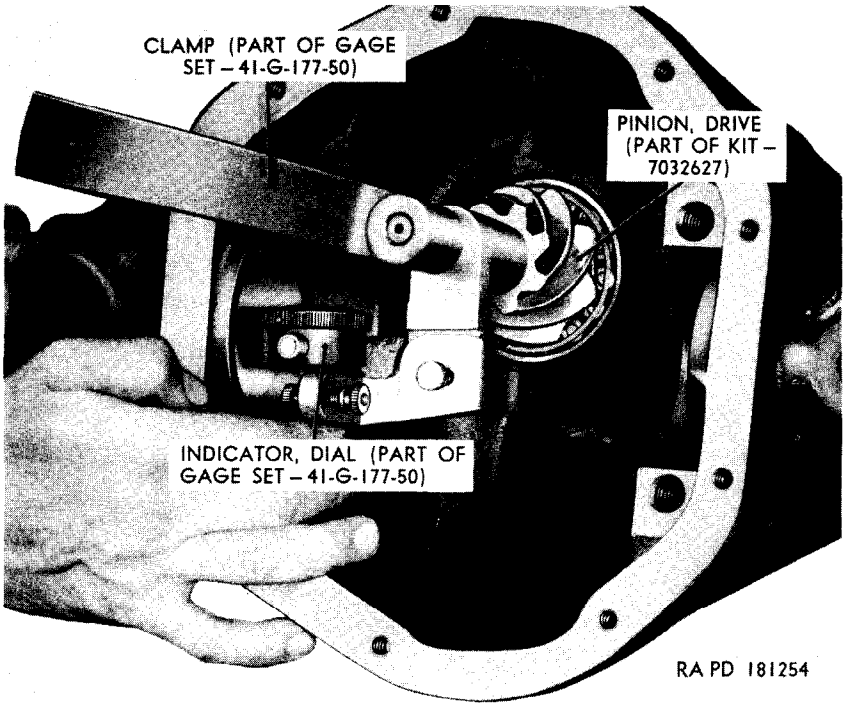


Figure 118. Checking front axle drive pinion setting.

position dial indicator so that contact point bears against the bearing bore, inside of differential case, as shown in figure 118. Swing indicator head back and forth across bearing bore and observe indicator dial reading. Lowest reading indicates center of bearing bore. If the drive pinion shim pack is of the correct thickness, the indicator reading will be the same as the etched marking on the drive pinion. For example, if drive pinion is marked "3+", the dial should indicate plus 0.003 inch. If pinion is marked "—3", the dial should read minus 0.003 inch. If dial reading fails to agree with marking on drive pinion, note the difference, and add or subtract the corresponding amount of shims to secure correct adjustment. Recheck adjustment if any shim changes are made. When rechecking, always adjust gage to checking gage.

(4) *Check preloading of drive pinion bearings.* After the drive pinion has been correctly located in housing, it must be checked for preloading. To compensate for expansion of housing under heat of operating condition, the drive pinion bearings must be preloaded. To test for preloading of bearings, turn the drive pinion. The drive pinion should

turn with a slight drag and without end play. To establish correct preloading, add or subtract drive pinion inner bearing shims.

c. Install Drive Pinion Oil Seal. After the drive pinion has been adjusted, remove the axle end yoke with shield assembly (X, fig. 108) and install the drive pinion oil seal gasket (V, fig. 108) and drive pinion oil seal (W, fig. 108). Install axle end yoke with shield assembly and secure with ¾-inch plain washer and ¾–16NF–2 "Huglock" nut.

164. Install Differential Case

a. Install Differential Case in Housing. The adjustment of the differential bearing cones (D and H, fig. 108) is maintained by bearing shim sets (E and G, fig. 108) installed between differential case and bearing cones with an 0.008-inch pinch fit when assembled in housing. Install the differential bearing cones, without the bearing shims, with replacer 41–R–2384–149 (fig. 119). Install the two differential bearing cups (C and J, fig. 108) on bearing cones and

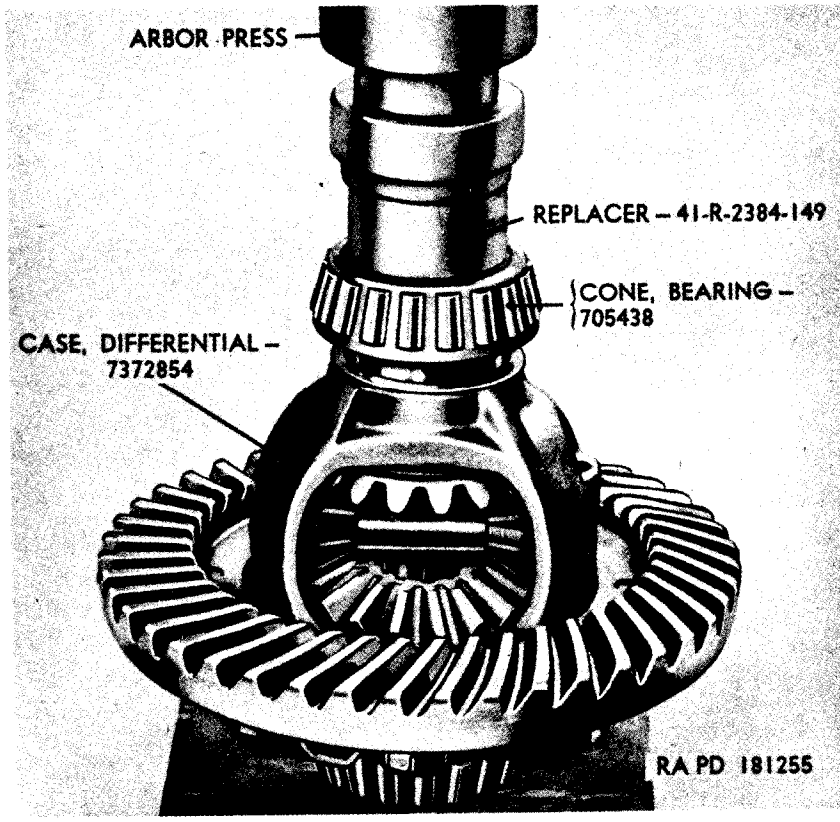


Figure 119. Installing front axle differential bearing cone.

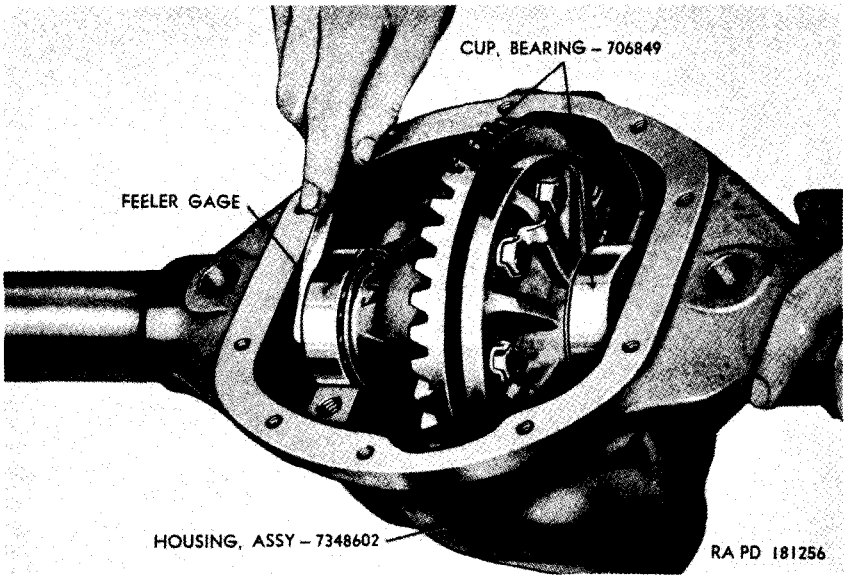


Figure 120. Checking clearance between front axle differential bearing cup and housing.

place differential assembly in housing. Force differential assembly to one side and check clearance between bearing cup housing assembly with feeler gage (fig. 120). After clearance has been determined, add 0.008 inch which will give proper thickness of shims required. Remove bearing cones from differential assembly, install equal thickness of bearing shims on each side and install bearing cones. Use spreader 41–S–4158–500 to spread housing (fig. 128). Install bearing cups on bearing cones and place differential assembly in position in housing. Remove spreader. Place the differential bearing caps in position, making sure they are installed in same position as that from which they were removed. Each cap must be installed so that marking (numeral) on housing corresponds with marking on cap. Secure each cap with two ½–13NC–2 x 2¼ bolts and ½-inch lockwashers. Tighten bolts to torque of 39 to 42 pound-feet.

b. Check Differential Case Backlash. Install a dial indicator on housing so that indicator point rests on surface of drive gear tooth (fig. 121). Rotate drive gear back and forth and observe reading on dial indicator. If backlash is less than 0.005 inch or more than 0.007 inch, remove differential assembly from housing. If backlash is less than 0.005 inch, the drive gear must be moved away from drive pinion. If backlash is greater than 0.007 inch the drive gear must be brought closer to drive pinion. To obtain correct backlash, remove bearing shims equal to the error in backlash from the drive flange side of differential case and add them to the other side.

Note. Never change the total thickness of shims.

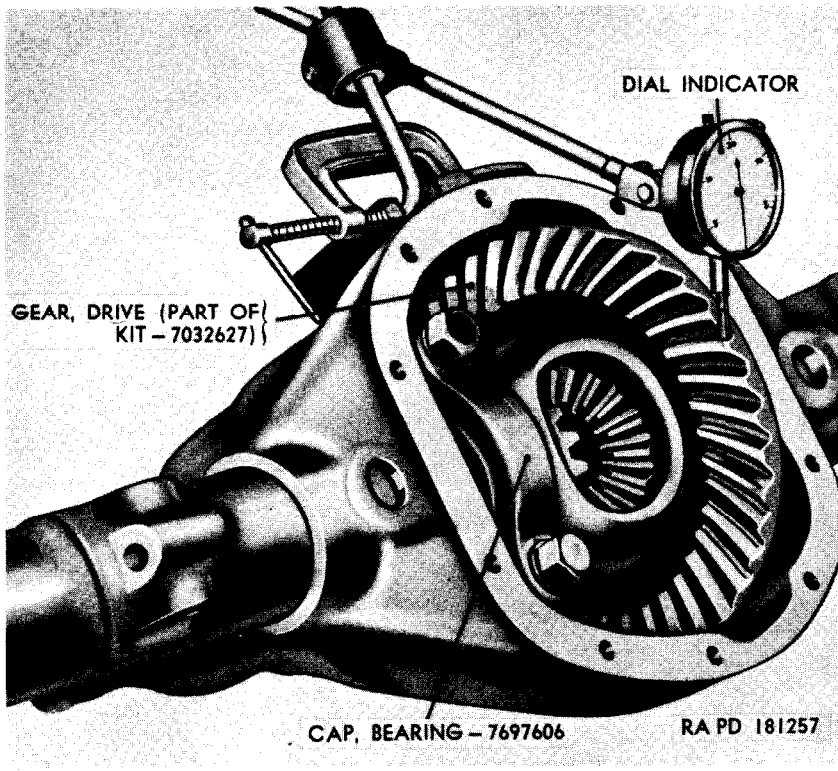


Figure 121. Checking front axle differential drive gear.

After changing position of shims, install bearing cones on differential case and install differential assembly in housing. Recheck backlash.

c. Check Drive Gear Runout. Assemble dial indicator on housing so that indicator contact point is resting on flat side of drive gear (fig. 122). Turn drive gear by hand and observe reading on dial indicator. A total indicator reading in excess of 0.003 inch indicates a warped or nicked differential case or an improperly installed drive gear. In either case, remove differential assembly from housing and check surface of differential case and drive gear for chips or nicks. Remove nicks with a fine stone. Check flange on differential case for warpage, by positioning a piece of metal, known to be true, around various points on the flange. If flange of differential case is warped, replace it. Install differential assembly in housing and recheck drive gear runout.

d. Gear Tooth Contact Pattern. Drive gear and pinion must be correctly adjusted to assure proper tooth contact in order to obtain maximum gear life and proper operation. If the foregoing checks, backlash and gear runout, were correctly made, the gear tooth contact (fig. 123) should be satisfactory. As a final check for correct adjustment, paint drive gear teeth with Prussian blue or a mixture of red

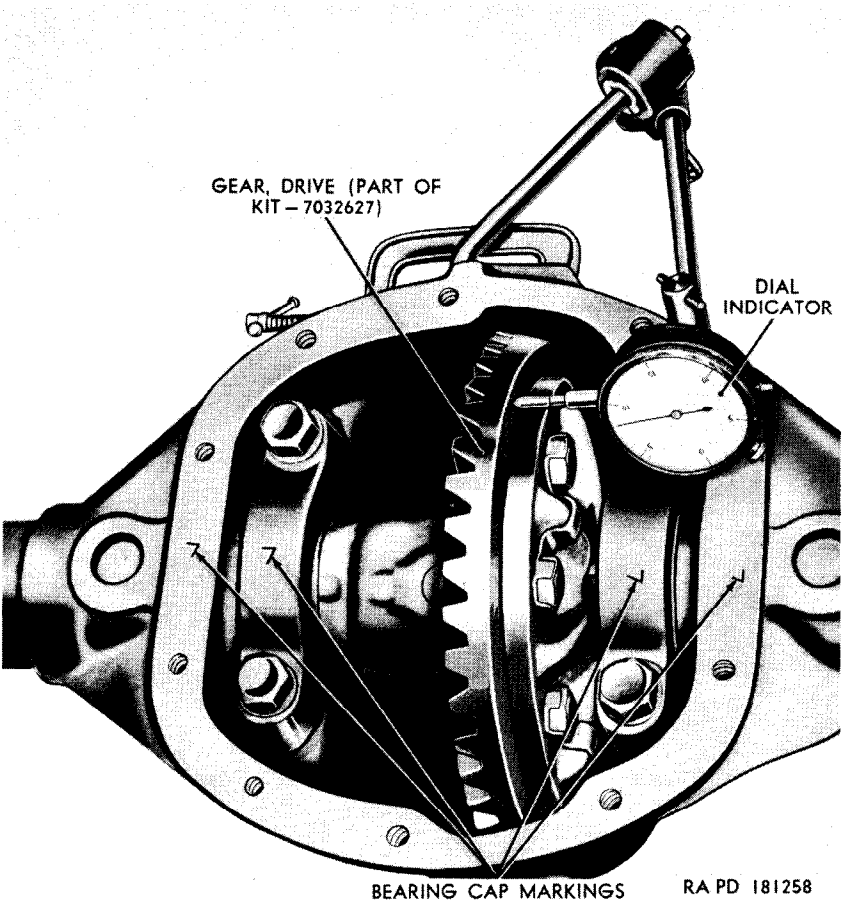


Figure 122. Checking front axle differential drive gear runout.

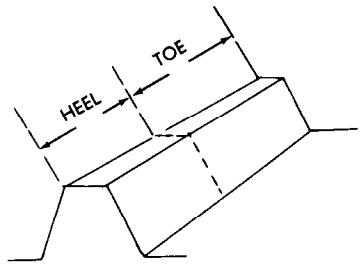
lead and oil. Move drive gear so the drive pinion will make an impression on drive gear teeth. The correct procedure to follow in the event of an unsatisfactory tooth contact is illustrated in figure 123.

165. Install Housing Cover

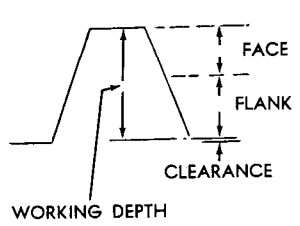
(fig. 99)

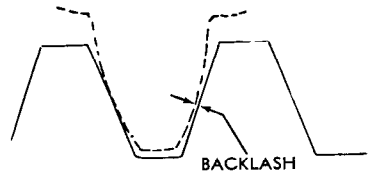
a. Coat cover gasket (E) with plastic type gasket cement and position it on housing cover. Secure housing cover to housing with ten $\frac{5}{16}$–18NC–2 x $\frac{3}{4}$ lockwasher cap screws (J).

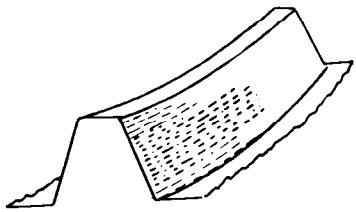
b. Be sure $\frac{3}{4}$-inch pipe plugs (H and K) are installed in housing and housing cover. Install housing cover air vent plug (F) in housing cover.



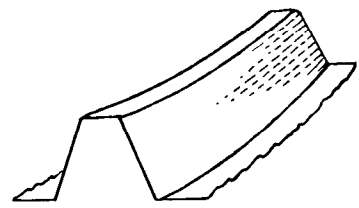
THE HEEL OF GEAR TOOTH IS THE LARGE END AND THE TOE IS THE SMALL END



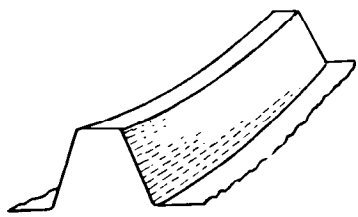




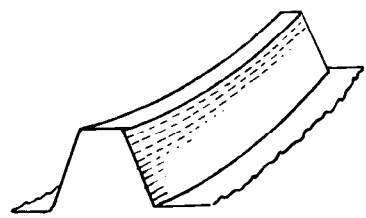
TOO MUCH BACKLASH
MOVE GEAR TOWARD PINION



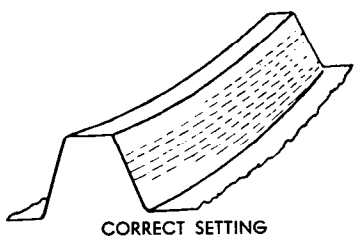
TOO LITTLE BACKLASH
MOVE GEAR AWAY FROM PINION



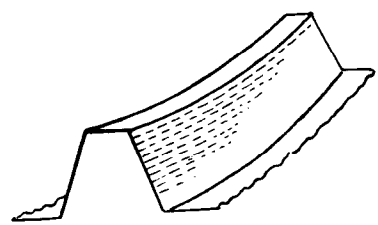
MOVE PINION OUT



MOVE PINION IN



CORRECT SETTING



COMPROMISE SETTING

RA PD 181259

Figure 123. Tooth contact of front axle differential drive gear.

166. Install Steering Knuckle Flange With Arm Assemblies

a. Install Steering Knuckle Flange. Dip the two steering knuckle flange cap bearing cones in universal gear lubricant (GO). Place bearing cones in the bearing cups on ends of tube portion of housing, and place steering knuckle flange, with pipe plug toward rear of vehicle, on tube portion of housing (fig. 98). Install the lower steering knuckle flange cap assembly and secure it with four ⅜-inch lockwashers (CC, fig. 95) and ⅜–24NF–3 x 1⅝ bolts (DD, fig. 95). Position shims of steering knuckle flange cap shim set (E, fig. 95) on top of steering knuckle flange. Install upper steering knuckle flange cap assembly (F, fig. 95). Place front brake flexible line guard on flange cap assembly and secure cap and guard with four ⅜-inch lockwashers, two ⅜–24NF–3 x 1½ bolts, and two ⅜–24NF–3 x 1⅝ bolts, as shown in figure 96.

b. Adjust Steering Knuckle Flanges. Hook a spring scale in tie-rod stud engaging hole in steering arms. Check tension of steering knuckle flange cap bearings (fig. 124). Effort to turn steering knuckle must be 6 to 9 pounds (3 to 5 lb-ft) without the steering knuckle oil seals in position. Proper tension can be obtained by adding or removing flange cap shims. Shims are supplied as set (*a* above) in 0.005, 0.010 and 0.030 inch sizes.

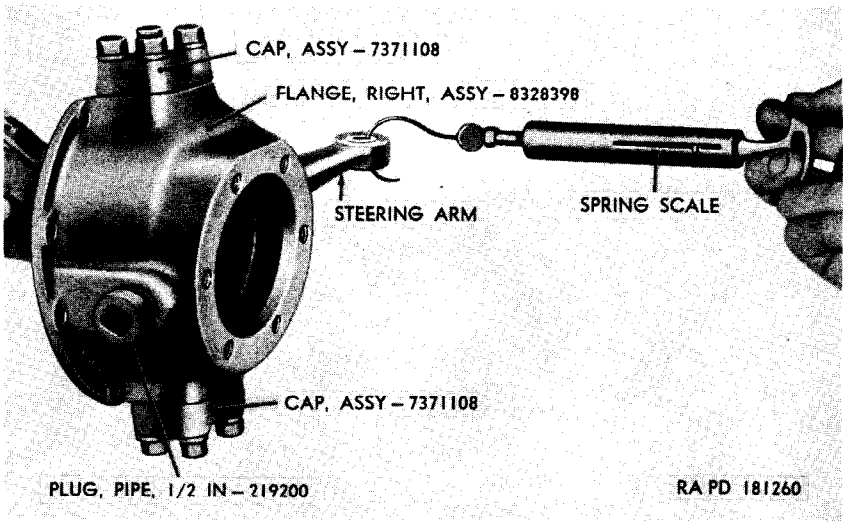


Figure 124. Checking tension of steering knuckle flange cap bearing.

c. Install Steering Knuckle Oil Seal (fig. 95). Place a steering knuckle oil seal spring (S and W) in each steering knuckle oil seal retainer (T and X). Press a new steering knuckle oil seal (R and V) in each retainer. Coat new steering knuckle flange oil seal gasket (K) with plastic type gasket cement and position gasket to steering knuckle

flange. Position the two steering knuckle oil seal retainers on steering knuckle flanges and secure with eight 5/16–24NF–3 x 1 1/16 lockwasher screws (Y).

d. Install Opposite Steering Knuckle Flange. Install opposite steering knuckle flange in the same manner as prescribed above.

167. Install Shaft Assembly

a. Install Axle Shaft. Slide axle shaft with universal joint assembly (fig. 96) into tube end of housing.

Caution: Use extreme care when installing to prevent damage to inner axle shaft oil seal and axle shaft guide. Turn axle shaft assembly until splines engage in the differential side gear.

b. Install Spindle With Bearing Assembly (fig. 94). Position spindle with bearing assembly (P) and front service brake assembly on steering knuckle flange with arm assembly. Secure these assemblies to flange with six 3/8-inch lockwashers (S) and 3/8–24NF–3 x 3/4 bolts (T).

c. Install Front Hub and Drum Assembly (fig. 94). Install front hub oil seal (M) and inner front hub bearing cone (U) in front hub. Place front hub and brake drum on spindle with bearing assembly. Install outer front hub bearing cone (W). Install front hub bearing washer (G) and 1 5/8–16 front hub bearing nut (F). Adjust bearings as instructed in TM 9–804A. Install front hub bearing nut lockwasher (E) and 1 5/8–16 front hub bearing nut (D). Tighten nut with hub nut wrench. Bend lip of lockwasher over edge of nut. Coat shaft drive flange gasket (C) with plastic type gasket cement and install gasket and shaft drive flange (B) to front hub with six 3/8-inch lockwashers (X) and 3/8–16NC–2 x 1 1/2 screws (Y). Install new front hub cap oil seal (Z). Install front hub cap (A).

d. Install Snap Ring. If axle shaft is equipped with Rzeppa joint, install snap ring in groove of axle shaft.

e. Install Wheel and Tire Assembly. Refer to paragraph 63*b*.

f. Install Opposite Axle Shaft With Universal Joint Assembly. Proceed as directed in *a* through *e* above.

g. Lubricate. Lubricate front axle in accordance with TM 9–804A.

h. Front Wheel Alinement. Caster and camber are established at time of manufacture and cannot be changed by adjustment. Refer to TM 9–804A for toe-in adjustment.

CHAPTER 9
REAR AXLE

Section I. DESCRIPTION AND DATA

168. Description

a. General. The rear axle assembly (fig. 125) is composed of the housing assembly, differential assembly, axle shaft, yoke assembly, brake assembly, and the rear hub with brake drum assembly. The rear axle is a semifloating type using hypoid gears.

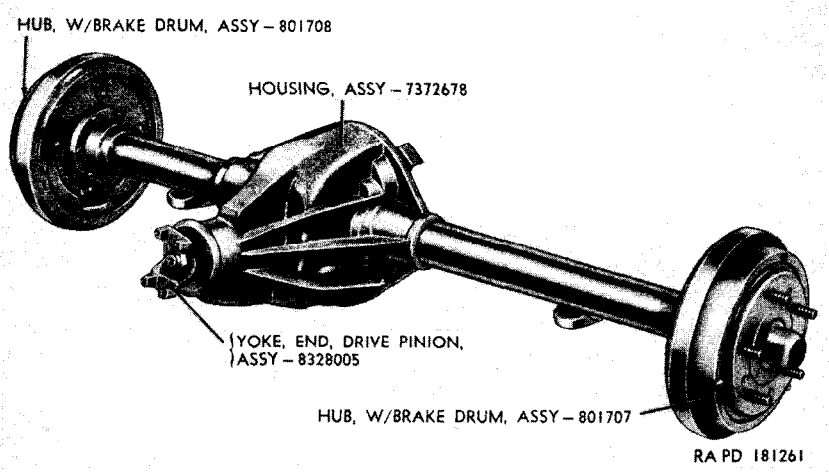


Figure 125. Rear axle assembly.

b. Housing. The housing (fig. 126) is of one piece construction. An opening near the center of the housing holds the differential. This opening is set slightly to the right so that the rear propeller shaft has a straight drive from the transfer. Flanges are provided at the outer ends of the housing for attaching the brake assemblies.

c. Differential Assembly. The differential assembly for the rear axle is the same as that used for the front axle except that a thrust block for the rear axle shafts is incorporated in the rear axle.

d. Axle Shafts. The axle shafts are splined on their inner ends to fit the splines of the differential side gears. Threads are provided on the outer ends to accommodate the shaft nuts which secure the rear hub with brake drum assemblies. Each axle shaft is provided with

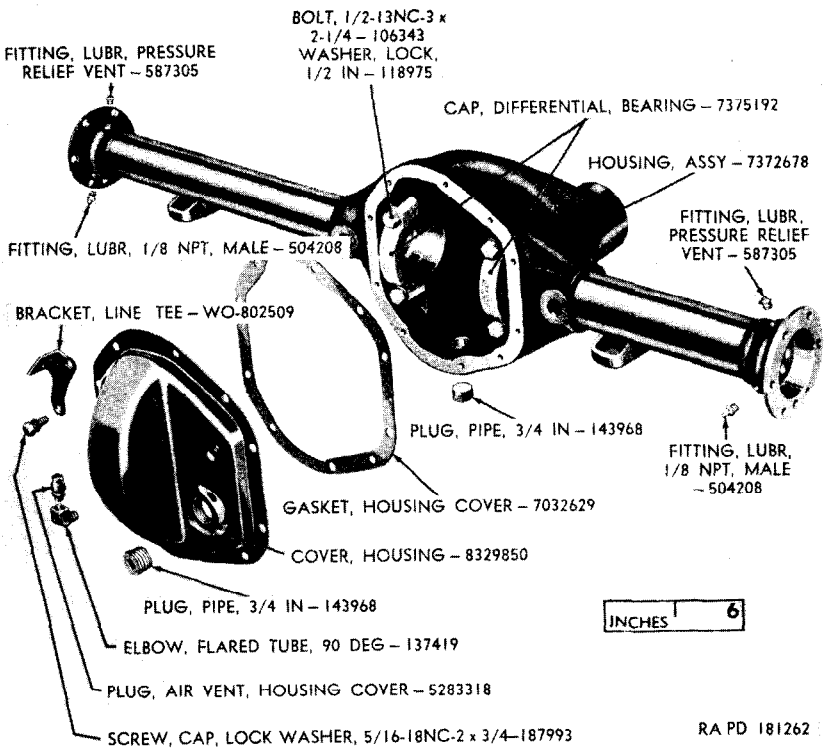


Figure 126. Rear axle housing assembly—disassembled view.

an oil seal which is housed in the end of the housing. A tapered roller bearing supports each axle shaft in the housing.

169. Data

Make	Spicer
Model	44–2
Gear ratio	5.38 to 1
Lubricant capacity	1¼ qt

Section II. DISASSEMBLY OF REAR AXLE ASSEMBLY INTO SUBASSEMBLIES

170. General

a. The following procedures are based on the assumption that the rear axle assembly has been removed as a complete component from the vehicle as shown in figure 125 (par. 58).

b. Before proceeding with the disassembly procedures, thoroughly inspect the rear axle assembly for lubricant leakage. Note all points of leakage for later reference. Thoroughly clean axle prior to disassembly to prevent foreign matter from entering housing during removal of parts.

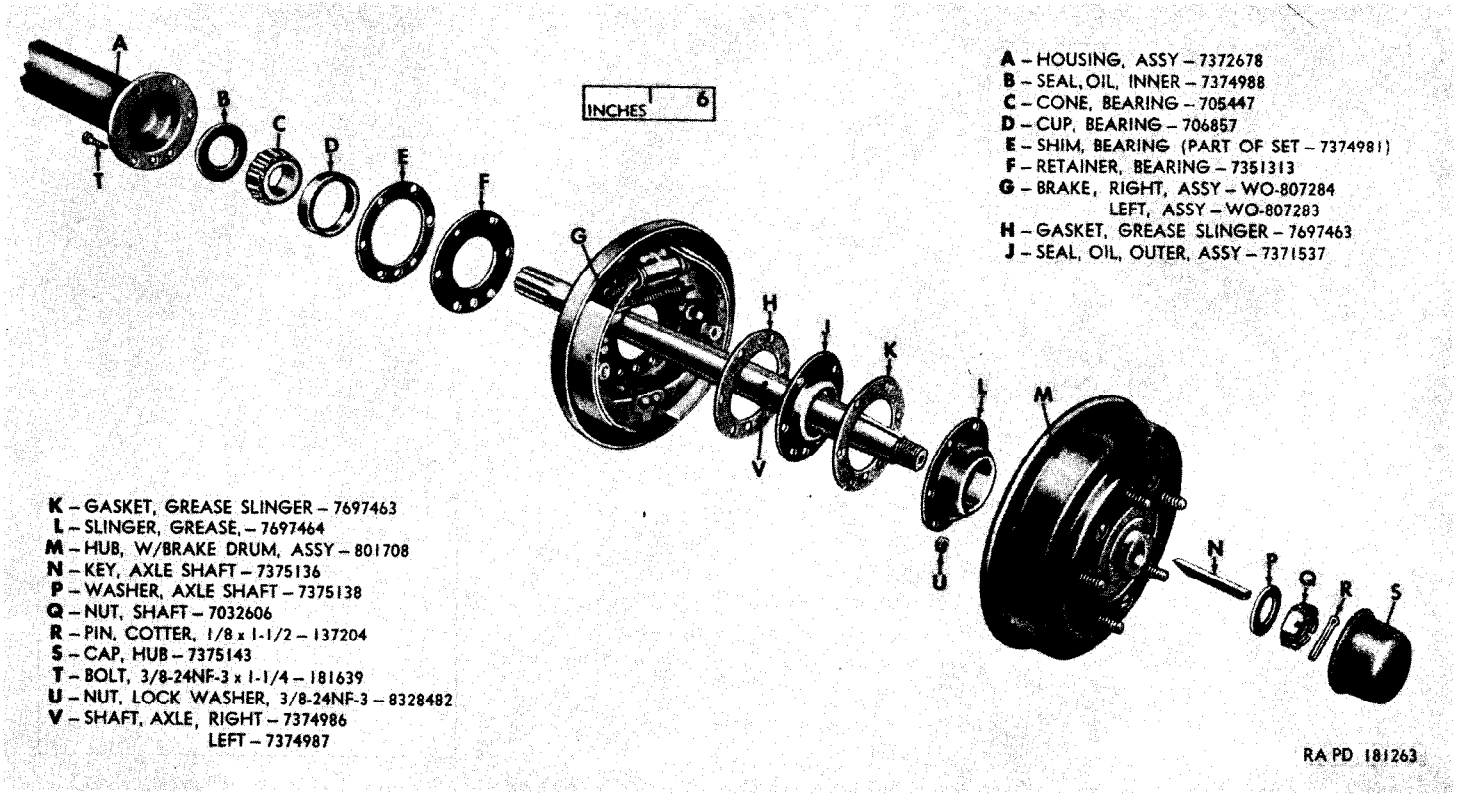


Figure 127. Rear axle assembly—disassembled view.

c. Drain the Rear Axle. Refer to TM 9–804A on procedure for draining axle.

171. Remove Axle Shafts

a. General. The following disassembly procedures are to be followed for both left and right axle shafts.

b. Remove Brake Assembly (fig. 127). Remove hub cap (S), cotter pin (R), shaft nut (Q), and axle shaft washer (P). Remove hub with brake drum assembly (M) with puller. Remove axle shaft key (N) from axle shaft. Remove six bolts (T), lockwasher nuts (U), brake assembly (G), grease slinger (L), outer oil seal assembly (J), and grease slinger gaskets (H and K). Remove bearing retainer (F) and bearing shims (E), noting thickness of shims removed.

c. Remove Axle Shaft (fig. 127). Pull axle shaft out of housing. Remove bearing cup (D) and bearing cone (C) from axle shaft. Remove inner oil seal (B) from housing assembly (A).

172. Remove Differential Assembly

a. Remove Housing Cover. With the brake lines removed (par. 56*d*), remove the housing cover (fig. 126) by removing 10 lockwasher cap screws which secure the cover to the housing assembly.

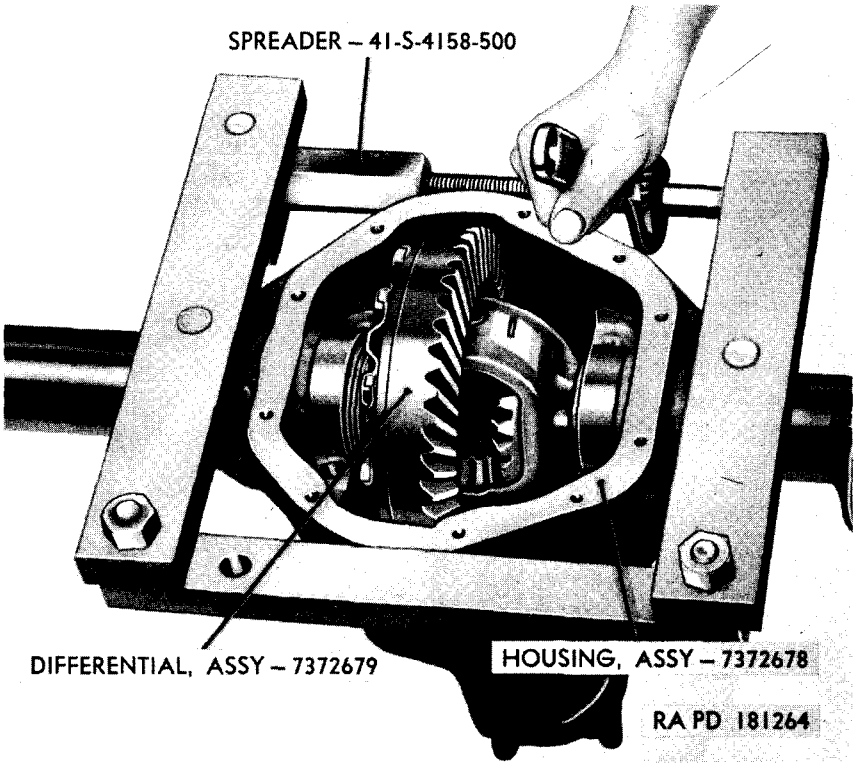


Figure 128. Spreading rear axle housing using spreader 41–S–4158–500.

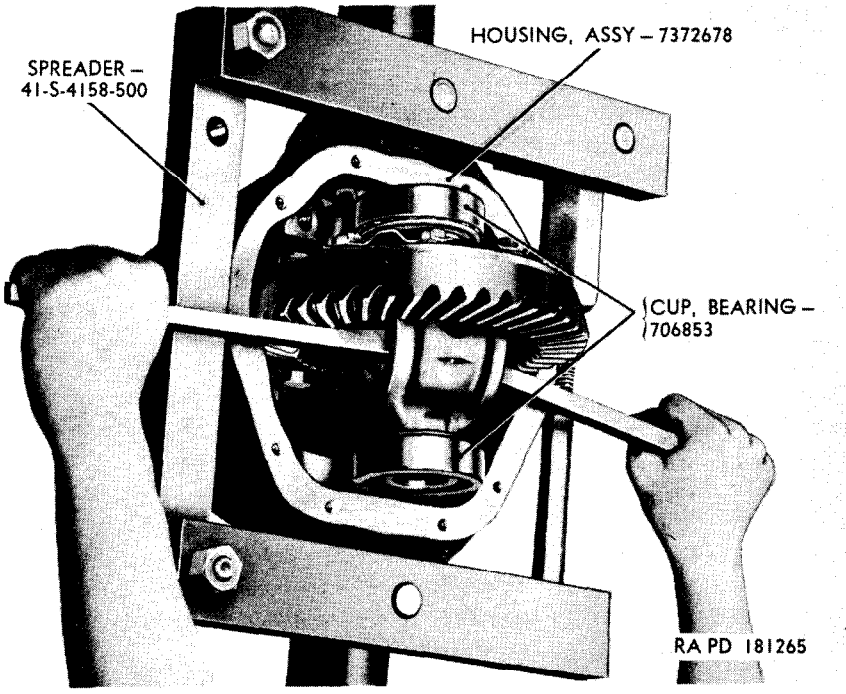


Figure 129. Removing rear axle differential assembly.

b. Remove Differential Bearing Caps. Remove two bolts and lockwashers securing each differential bearing cap (fig. 126) to housing and remove caps, noting identification marks on housing and caps.

c. Install Spreader. Position spreader 41–S–4158–500 (figs. 7 and 128) on housing assembly and spread housing sufficiently so that differential assembly can clear housing.

d. Remove Differential Assembly. If difficulty is experienced in lifting differential assembly from housing assembly, use pry bars to aid in removal (fig. 129). After removing differential assembly, remove spreader from housing. Remove two bearing cups (fig. 129) from bearing cones on differential assembly.

173. Remove Drive Pinion

(fig. 130)

a. Remove End Yoke and Shield. Remove "Huglock" nut (X) and plain washer (W) securing end yoke (V) and dust shield (U) to drive pinion (H–2). Using a suitable puller, pull end yoke from drive pinion.

Note. End yoke and dust shield are mounted together.

b. Remove Drive Pinion. Remove drive pinion oil seal (T), drive pinion oil seal gasket (S), felt seal (R), and oil slinger (Q). Using a suitable block of wood, tap the drive pinion out of housing (fig. 131). Remove the drive pinion outer bearing cone (P). The drive pinion inner bearing cone (J) will remain on drive pinion.

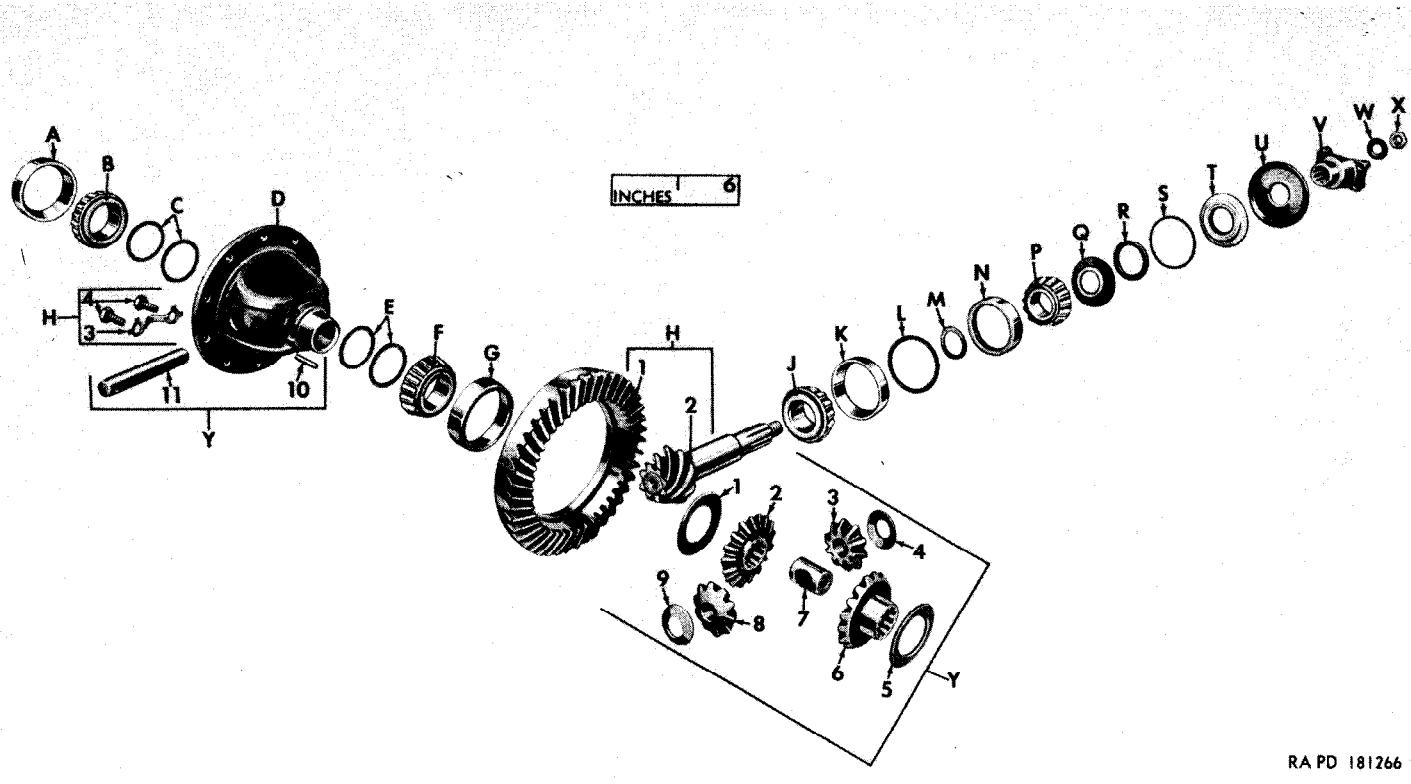


Figure 130. Rear axle differential and drive pinion assembly—disassembled view.

A—Cup, bearing—706853
B—Cone, bearing—705440
C—Shim set, bearing—7371440
D—Case, differential—7032632
E—Shim set, bearing—7371440
F—Cone, bearing—705440
G—Cup, bearing—706853
H—Kit, repair, drive gear and pinion—7348607
Composed of:
1—Gear, drive
2—Pinion, drive
3—Plate, lock, drive gear screw [1]
4—Screw, drive gear, 3/8-24NF-3 x 1 5/16 [2]
J—Cone, bearing, drive pinion, inner—705478
K—Cup, bearing, drive pinion, inner—706877
L—Shim, bearing, drive pinion, inner—7372847
M—Shim, bearing, drive pinion, inner—7372850
N—Cup, bearing, drive pinion, outer—707063
P—Cone, bearing, drive pinion, outer—705271
Q—Slinger, oil—7032633
R—Seal, felt—7032634
S—Gasket, drive pinion oil seal—7372855
T—Seal, oil, type MLS, 1 9/16 x 3.165 x 1 3/32, drive pinion—500071
U—Shield, dust—7375197
V—Yoke, end—8328005
W—Washer, plain, 3/4-in.—7372868
X—Nut, "Huglock", 3/4-16NF-2—7032635
Y—Kit, repair, differential—7375199
Composed of:
1—Washer, thrust, side gear
2—Gear, side
3—Pinion
4—Washer, thrust, pinion
5—Washer, thrust, side gear
6—Gear, side
7—Block, thrust [3]
8—Pinion
9—Washer, thrust, pinion
10—Pin, lock [4]
11—Shaft, pinion

Figure 130—Continued.

[1] Also available separately—7032631.
[2] Also available separately—7372863.
[3] Also available separately—7375195.
[4] Also available separately—7372858.

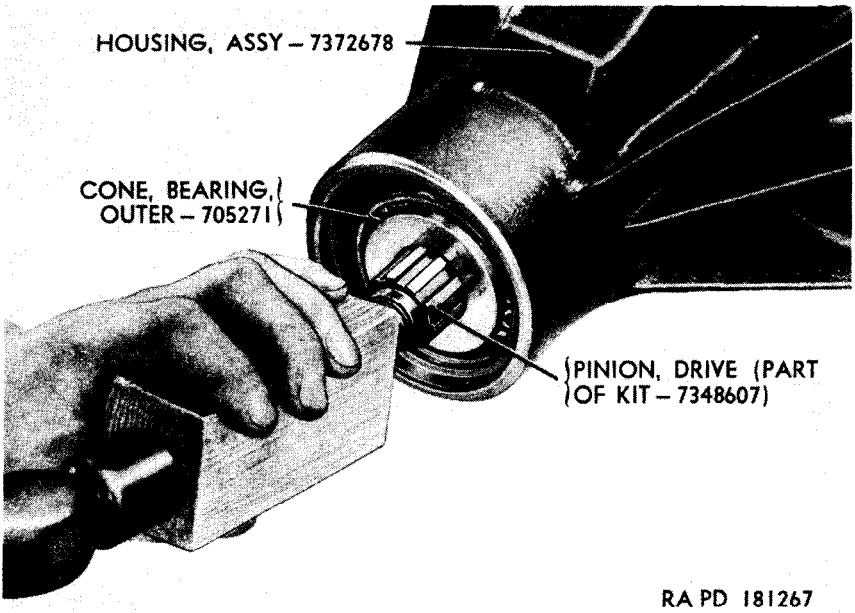


Figure 131. Removing rear axle drive pinion.

Section III. REBUILD OF DIFFERENTIAL ASSEMBLY

174. Disassembly

a. Remove Drive Gear. Straighten bent-over tabs of the 5 drive gear screw lock plates and remove the 10 drive gear screws (fig. 132)

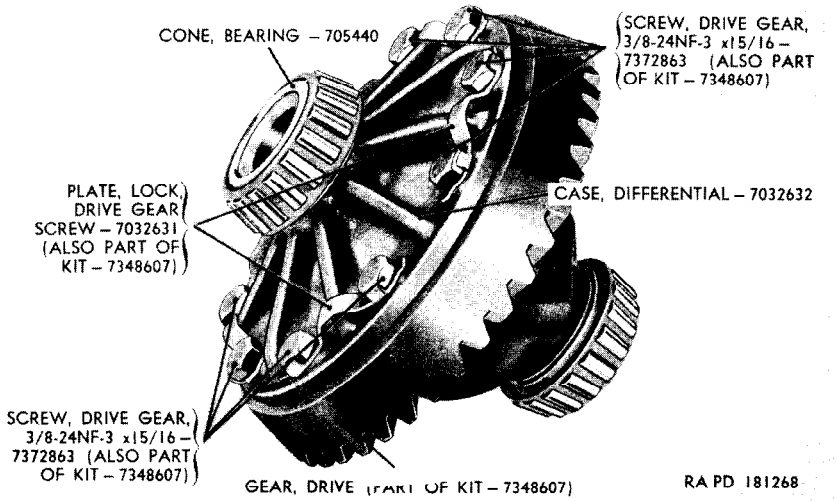


Figure 132. Differential assembly.

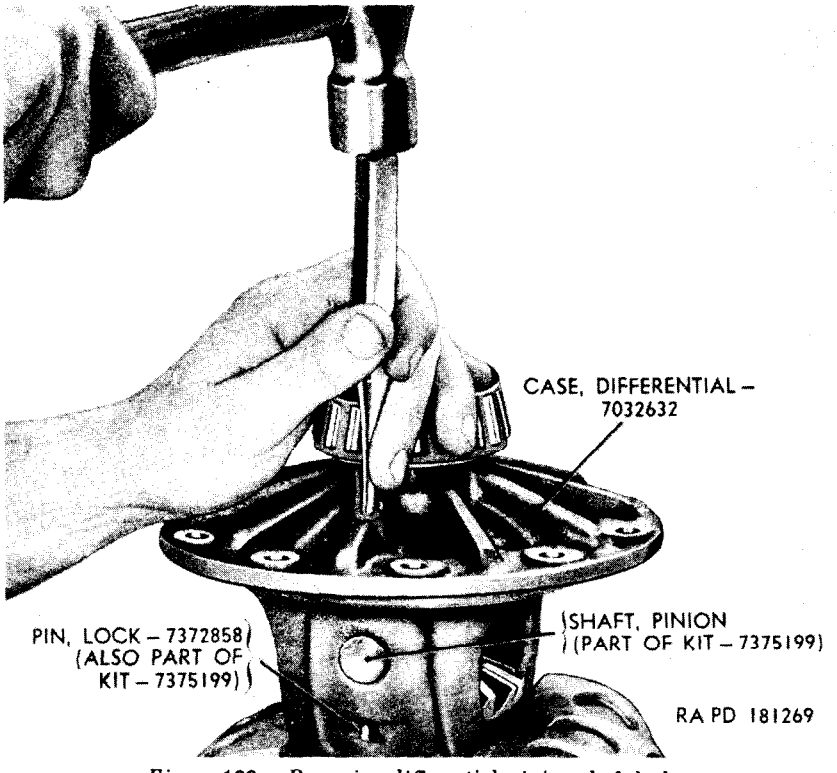


Figure 133. Removing differential pinion shaft lockpin.

which secure the drive gear to the differential case. Mark case and gear so that they can be assembled later in same position. Remove drive gear from differential case. It may be necessary to tap gear from case with brass drift and hammer.

Note. Do not use chisel in an attempt to force gear from case.

b. Remove Pinion Shaft. Using a suitable long nose drift, remove the lockpin (fig. 133) which locks the pinion shaft in place in the differential case. Tap pinion shaft out of differential case. The thrust block will fall through side gear openings in differential case once the pinion shaft is clear of the block.

c. Remove Side Gears and Pinions. Rotate the two pinions (fig. 134) until they are alined with openings in differential case. Remove the pinions and side gears. Remove pinion thrust washer from each pinion. Remove side gear thrust washer from each side gear.

d. Remove Bearing Cones. Remove the two bearing cones, from outer ends of differential case, using remover 41–R–2367–950 as shown in figure 107.

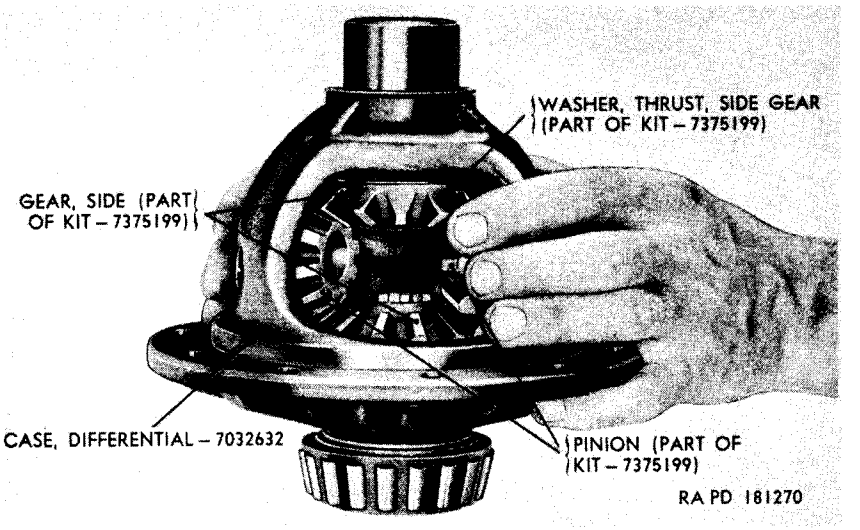


Figure 134. Removing differential pinions.

175. Inspection and Repair
(fig. 130)

a. Inspection. Inspection procedures for the rear axle differential assembly are identical to those for the front axle differential assembly (par. 159*a*) except that the thrust block (Y–7), which is incorporated in the rear axle differential only, must also be inspected for wear or damage.

b. Repair. Repair instructions for the rear axle differential assembly are same as those for the front axle differential assembly (par. 159*b*). If the thrust block (Y–7) is damaged or worn beyond limits specified in repair and rebuild standards (par. 274), it cannot be repaired and must be replaced.

176. Assembly

a. Install Side Gears and Pinions (fig. 130). Position new side gear thrust washers (Y–1 and Y–5) in bore of differential case and follow by installing side gear (fig. 135). Place new pinion thrust washers (Y–4 and Y–9) on the two pinions (Y–3 and Y–8). While supporting the upper side gear in differential case, insert the two pinions through openings in differential case until they mesh with the side gears. Rotate pinions until pinion shaft holes in pinions are alined with pinion shaft holes in differential case. Insert pinion shaft (fig. 136), in differential case, making sure that pinion shaft lockpin hole in shaft will aline with corresponding hole in differential case (fig. 136). Insert thrust block (Y–7) through side gear bore in differential case. Push pinion shaft through pinions and thrust block (fig. 137). Aline holes in differential case and pinion shaft and install the lockpin (Y–10).

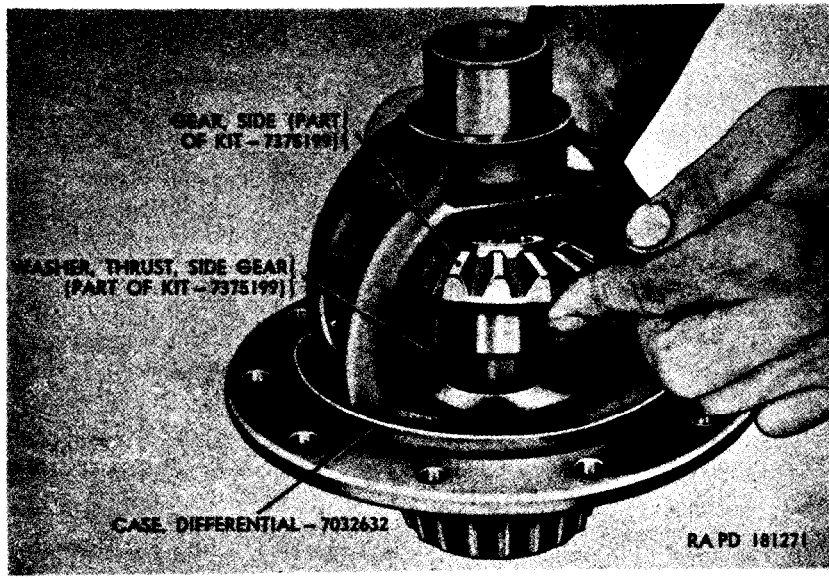


Figure 135. Installing differential side gear.

Peen lockpin on both sides to prevent it from working loose during operation.

b. Install Drive Gear (fig. 132). Position drive gear on flange of differential case. If same gear that was removed is being installed, use guide marks on case and gear to place gear in same position on case as it occupied before removal. If the drive gear is changed, replacement must be made in a set with the drive pinion (H–2, fig. 130) since the two are matched during manufacture. Position five drive

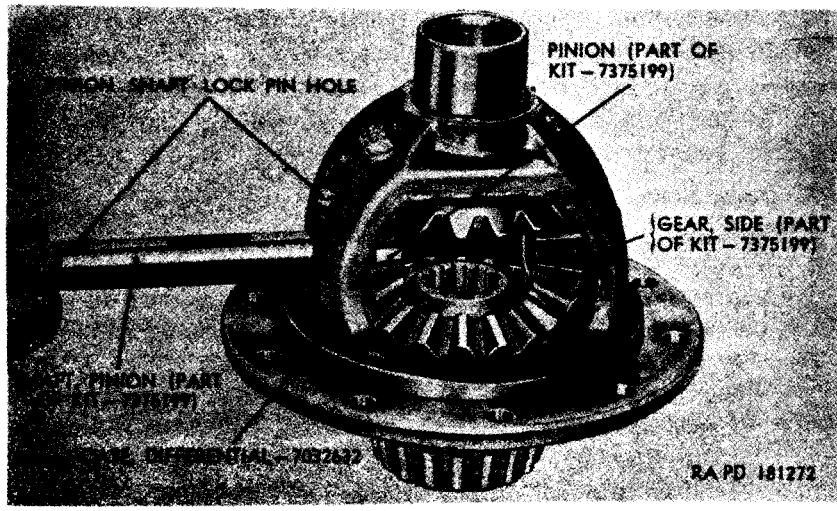


Figure 136. Inserting differential pinion shaft.

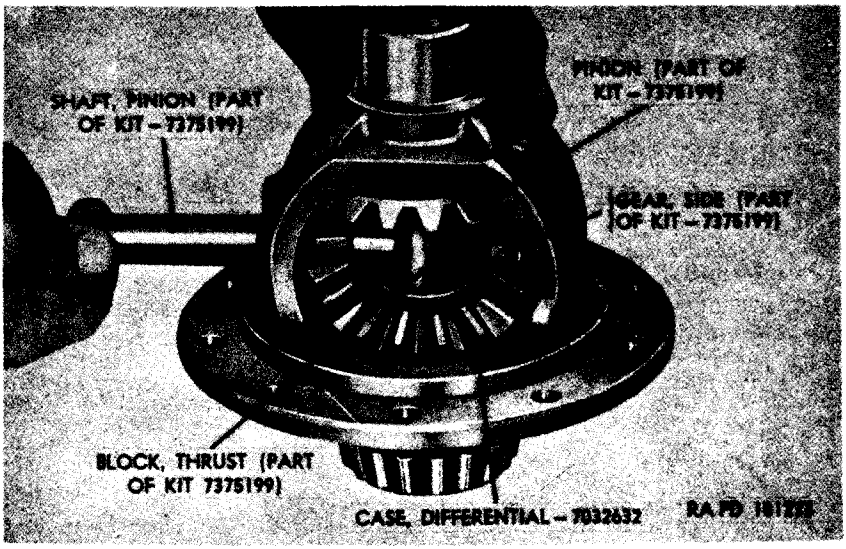


Figure 137. Installing differential thrust block.

gear screw lock plates on differential case and install ten ⅜–24NF–3 x $^{15}/_{16}$ drive gear screws. Tighten screws to torque of 38 to 42 pound-feet. Lock screws by bending tabs of the lock plates against the screws.

c. Install Bearing Cones. Refer to paragraph 160*c* for procedures for installing bearing cones.

Section IV. REBUILD OF DRIVE PINION, AXLE SHAFTS, AND HOUSING ASSEMBLY

177. Drive Pinion

. Procedures for disassembly, inspection, repair, and assembly for the drive pinion (H–2, fig. 130) of the rear axle assembly are same as those for the drive pinion of the front axle assembly (par. 161). If the drive pinion is changed, replacement must be made in a set.

178. Axle Shafts

a. Disassembly. The axle shafts require no disassembly.

b. Inspection and Repair (fig. 127).

(1) *Inspection.* Inspect axle shafts (V) for twisted or distorted condition. Replace, if necessary. Check splines and threads of axle shaft for damage. Place bearing cups (D) over bearing cones (C), apply clean engine oil to cones and turn slowly. Cones must turn smoothly and freely. Replace any cones which are scored, pitted, rough, or excessively worn. Inspect bearing cups for chipped areas, cracks, or wear caused by bearing cone rollers. Replace bearing cups if damaged or

worn. Examine axle shaft nut (Q), washer (P), and key (N) for damage. Replace, if necessary. Replace inner oil seals (B) at each rebuild.

(2) *Repair.* Small defects on axle shafts, such as burs, nicks, and scores on splines, may be corrected with a hone. Repair axle shaft threads, if possible; otherwise, replace shaft.

179. Housing Assembly

(fig. 126)

Procedure for disassembly, inspection, repair, and assembly for the housing assembly of the rear axle is essentially the same as that for the housing assembly of the front axle. Refer to paragraph 162.

Section V. ASSEMBLY OF REAR AXLE ASSEMBLY FROM SUBASSEMBLIES

180. Install Drive Pinion

Procedures for installation of drive pinion are essentially identical with those for the front axle drive pinion (pars. 162*c* (3) and (4) and 163) except that the felt seal (R, fig. 130) must be installed between the oil slinger (Q, fig. 130) and the drive pinion oil seal gasket (S, fig. 130).

Note. Felt seal (R, fig. 130) is not used in the front axle.

181. Install Differential Assembly

Installation and adjustment instructions for the rear axle differential assembly are identical with those of the front axle differential assembly (par. 163*b* and 164) with the following exception: surface E of the drive pinion setting gage checking gage 41–G–98–750 is used for rear axle whereas surface D is used for front axle.

Note. Refer to figure 116 for use of drive pinion setting gage checking gage. Surface initials "D" and "E" are stamped on checking gage for identification purposes.

182. Install Housing Cover

(fig. 126)

Refer to paragraph 165 for installation instructions.

183. Install Axle Shafts

(fig. 127)

a. Install Bearing Cone. Install new inner oil seal (B) in housing. Install bearing cup (D) and bearing cone (C) in housing. Insert axle shaft in housing, rotating shaft so that the splines will enter splines in differential side gear. Use care so that shaft will not damage inner oil seal.

b. General. The following assembly procedures are to be followed for the left and right axle shafts.

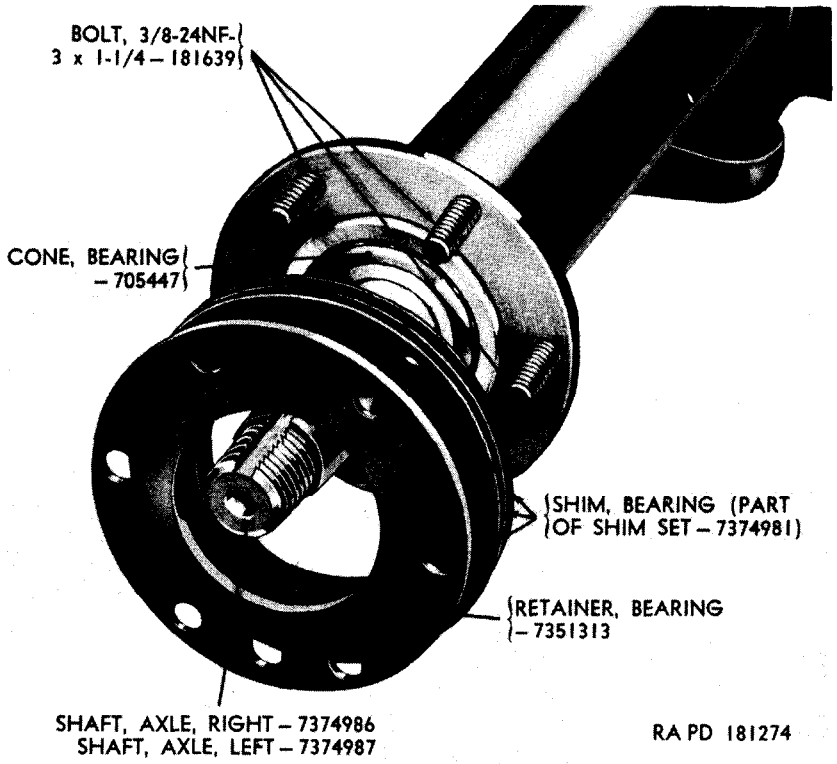


Figure 138. Bearing shims and bearing retainer in position on rear axle shaft.

c. Install Brake Assembly. Install bearing shims and bearing retainer on axle shaft (fig. 138). Install six ⅜–24NF–3 x 1¼ bolts in flange of housing tube. Install new or rebuilt brake assembly. Refer to paragraphs 184 through 193 for brake assembly rebuild instructions. Coat grease slinger gaskets with plastic type gasket cement. Install gaskets, one on each side of outer oil seal assembly. Install outer oil seal assembly and rear grease slinger (fig. 139). Install six ⅜–24NF–3 lockwasher nuts. Tighten nuts to torque of 25 to 35 pound-feet.

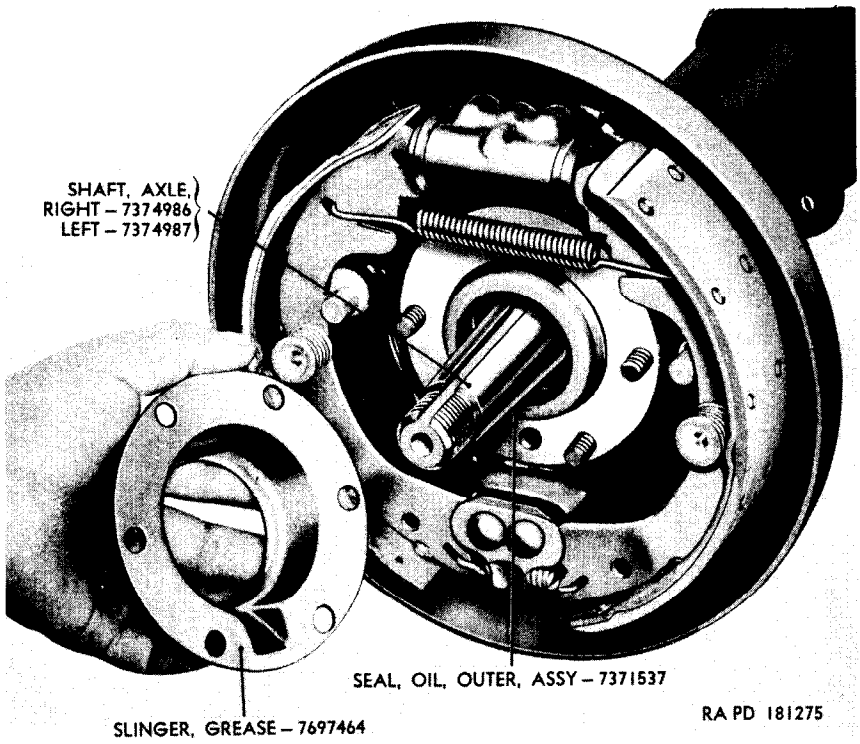


Figure 139. Installing grease slinger.

d. Check Axle Shaft End Play. Secure housing assembly in vise. Assemble a dial indicator so that its contact point bears against end of shaft. Check end play by moving axle shaft in and out (fig. 140). Correct axle shaft end play is 0.001 to 0.006 inch. If end play is not correct, remove or add bearing shims, as necessary.

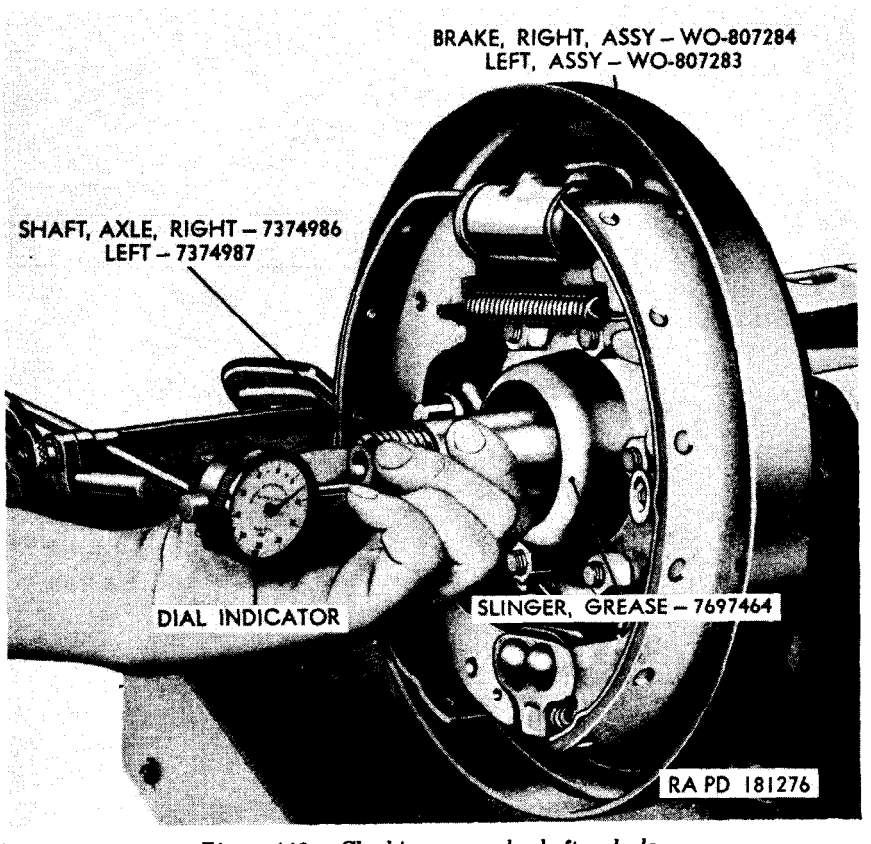


Figure 140. Checking rear axle shaft end play.

e. Install Hub With Brake Drum Assembly (fig. 127). Install hub with brake drum on axle shaft. Install axle shaft key (N). Tap hub with brake drum assembly (M) into place on axle shaft. Install axle shaft washer (P), shaft nut (Q), and ⅛ x 1½ cotter pin (R) and install hub cap (S).

CHAPTER 10
BRAKE SYSTEM

Section I. DESCRIPTION AND DATA

184. Description

a. General. The brake system comprises two independent systems: service brakes and handbrake. The brake system is illustrated in figures 37 and 38.

b. Service Brakes. The service brake system comprises brake pedal and linkage, master cylinder assembly, wheel cylinders, brakedrums, brakeshoes, and hydraulic lines and fittings to all wheels. Both metal tubing and flexible type lines are used. The flexible type lines are used to connect master cylinder metal line to front axle and to connect metal lines on both axles to the individual wheel cylinders. The service brakes are of the conventional hydraulic design. Each service brake assembly is composed of a brake backing plate assembly, one wheel cylinder, front and rear brakeshoes with riveted linings, brakeshoe retracting spring, two brakeshoe hold-down springs, brakeshoe retainer spring, and two brakeshoe adjusting eccentrics. The brake backing plate assembly of each rear service brake is secured to the tube of the rear axle housing. The brake backing plate assembly of each front service brake is secured to the spindle. The brakedrums are secured to hubs of the front and rear wheels. Refer to TM 9-1827C for data relative to the master cylinder and wheel cylinder assemblies.

c. Handbrake (figs. 142 and 143). The handbrake system is a mechanical type serving to retard or stop the rotation of the rear propeller shaft. The handbrake assembly is mounted in the driver's compartment to the right of the driver. The handbrake rod connects the handbrake assembly to the operating lever mounted on the transfer rear axle output shaft bearing retainer. The operating lever operates the inner and outer shoe assemblies which contact the brakedrum mounted on the transfer companion flange.

185. Data

Make of master cylinder assembly	Wagner
Make of wheel cylinders	Wagner

Section II. REBUILD OF SERVICE BRAKE SYSTEM

186. Disassembly

a. Remove Front Hub and Drum Assembly. Refer to paragraph 148*b* for removal procedure.

b. Remove Rear Hub and Drum Assembly. Refer to paragraph 171*b* for removal procedure.

c. Remove Service Brake Assembly. Refer to paragraph 148*c* for removal of front service brake assemblies. Refer to paragraph 171*b* for removal of rear service brake assemblies.

d. Disassemble Service Brake Assembly (fig. 141).

Note. The only difference between brake assemblies is the length of the forward and reverse linings and the assembled position of the front and rear shoes.

(1) Remove the shoe retracting spring (P).

(2) Remove anchor end shoe retainer spring (AA) from lower ends of the front and rear shoes (C and Q).

(3) Compress shoe holddown springs (E and M), turn the holddown spring shoe pins (U and Z) until flat sections of pins are alined with flat portions of shoe holddown spring seats (D, F, L and N) and remove seats and springs. Remove the holddown spring shoe pins (U and Z) by pulling out through rear of backing plate assembly (T).

(4) Disengage front and rear brakeshoe assemblies from front wheel cylinder assembly (H) at the top and the anchor at the bottom and lift out shoe assemblies.

(5) Remove two plain nuts (V and Y) and lockwashers (W and X). Remove the two shoe adjusting eccentrics (G and K).

(6) Unscrew the lockwasher bolts (BB) and remove front wheel cylinder assembly (H) from backing plate assembly (T).

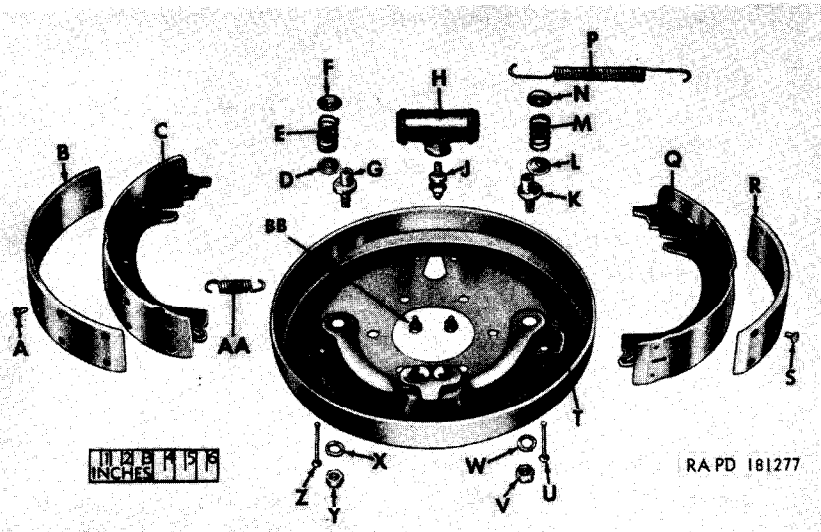
187. Inspection and Repair

a. Inspection.

(1) *Master cylinder and wheel cylinders.* Refer to TM 9-1827C for inspection procedures.

(2) *Brakedrums* (fig. 184). Inspect brake drums for scored braking surface, cracks, or warpage. Check runout of brakedrum braking surface. Runout must not exceed 0.006 inch.

(3) *Shoes and linings* (fig. 141). Inspect front and rear shoe linings (B and R) for wear, glazing, and evidence of brake fluid or grease leakage. In the event of brake fluid leakage, repair wheel cylinders (TM 9-1827C). If grease is leaking from rear axle, replace rear axle grease slinger (L, fig. 127) and rear axle shaft outer oil seal assembly (J, fig. 127). If front axle is leaking grease, replace the inner axle shaft oil



A – RIVET, SHOE LINING – 7001411
B – LINING, SHOE, FRONT – BX-1067-S-1
C – SHOE, FRONT – BX-303138
D – SEAT, SPRING, SHOE HOLD-DOWN – BX-23969
E – SPRING, HOLD-DOWN, SHOE – 8329610
F – SEAT, SPRING, SHOE HOLD-DOWN – BX-23969
G – ECCENTRIC, ADJ, SHOE – 8329607
H – CYLINDER, FRONT WHEEL, ASSY – 8328442
J – VALVE, BLEEDER, FRONT WHEEL CYLINDER – 7697462
K – ECCENTRIC, ADJ, SHOE – 8329607
L – SEAT, SPRING, SHOE HOLD-DOWN – BX-23969
M – SPRING, SHOE HOLD-DOWN – 8329610
N – SEAT, SPRING, SHOE HOLD-DOWN – BX-23969
P – SPRING, RETRACTING, SHOE – 7412179
Q – SHOE, REAR – BX-303138
R – LINING, SHOE, REAR – BX-1067-S-2
S – RIVET, SHOE LINING – 7001411
T – PLATE, BACKING, ASSY – 8329609
U – PIN, SHOE, HOLD-DOWN SPRING – 8329608
V – NUT, PLAIN, 3/8-24NF-2 – 120369
W – WASHER, LOCK, 3/8 IN – 120382
X – WASHER, LOCK, 3/8 IN – 120382
Y – NUT, PLAIN, 3/8-24NF-2 – 120369
Z – PIN, SHOE, HOLD-DOWN SPRING – 8329608
AA – SPRING, SHOE RETAINER, ANCHOR END – 8329611
BB – BOLT, LOCK WASHER, 1/4-20NC-2 x 3/8 – 423553

Figure 141. Service brake—left front assembly—disassembled view.

seals (B, fig. 108). Shoe linings that are worn near rivet heads must be replaced.

Note. Linings must be replaced in pairs and not singly. If lining is replaced in one front or one rear wheel, replace lining in the opposite wheel. Failure to equalize lining surfaces will result in erratic and unequal brake action.

Replace front and rear shoes (C and Q) if they are distorted or excessively damaged.

(4) *Backing plate assembly* (fig. 141). Inspect backing plate assembly (T) for cracks, warpage, or distortion. Replace backing plate assembly if damaged.

(5) *Shoe holddown springs, retracting spring, and retainer spring* (fig. 141). Replace the shoe holddown springs (E and M),

shoe retracting spring (P), and anchor end shoe retainer spring (AA) if they are broken, distorted, or fail to operate in their intended manner.

(6) *Shoe adjusting eccentrics* (fig. 141). Inspect shoe adjusting eccentrics (G and K) for wear and damage. Replace the eccentrics, if necessary.

b. Repair.

(1) *Master cylinder and wheel cylinders.* Refer to TM 9–1827C for repair procedures.

(2) *Brakedrums* (fig. 184). Refinish rough or scored brakedrum surface in a lathe. Do not remove more than 0.030 inch thickness of metal (0.060 inch on diameter). If refinishing requires more than dimension specified above, replace the brakedrum.

(3) *Reline front and rear shoes.*

(*a*) Remove shoe lining rivets and strip shoe lining from shoe (C and Q, fig. 141). Clean face of shoe thoroughly.

(*b*) If brakedrums have been refinished ((2) above), either install the correct oversize linings or install shims, equal in thickness to metal removed from brakedrum, between the lining and the shoe so that arc of lining will be same as that of brakedrum.

(*c*) Aline end rivet holes of shoe lining with holes in shoe. Clamp lining in place with suitable clamp or other tool. Install end shoe lining rivets, remove clamping tool, and install remaining shoe lining rivets and swage.

(*d*) Check lining and shoe contact. A 0.010-inch feeler gage must not enter between shoe and lining at any point.

(*e*) Grind shoe linings concentric with brakedrum center.

(4) *Hydraulic lines and fittings* (fig. 37). To replace damaged hydraulic line, cut tubing to required length with tubing cutter. Blow out line to remove all foreign matter.

188. Assembly

(fig. 141)

a. Position front wheel cylinder assembly (H) in backing plate assembly (T). Secure wheel cylinder with two ¼–20NC–2 x ⅜ lockwasher bolts (BB).

b. Install the anchor end shoe retainer spring (AA) on the front and rear brakeshoes. Place the front shoe (C) and the rear shoe (Q) on the backing plate assembly (T). Install shoes so that their lower ends engage slots behind plate anchor and their upper ends contact wheel cylinders.

c. Install holddown spring shoe pins (U and Z) through rear of backing plate assembly (T) and front and rear shoes. Place shoe holddown spring seats (D, F, L, and N) and shoe holddown springs

(E and M) over pins. While compressing holddown springs, turn holddown spring shoe pin until flat section of pins are perpendicular to flat portion of shoe holddown spring seats.

d. Install the two shoe adjusting eccentrics (G and K) in backing plate assembly (T), with low sides of eccentrics against brake shoes. Install ⅜-inch lockwashers (W and X) and ⅜–24NF–2 plain nuts (V and Y) on eccentrics.

e. Secure the shoe retracting spring (P) on the front and rear shoes (C and Q).

f. The front and rear service brake assemblies are installed during rebuild of front and rear axles (pars. 167 and 183). The front and rear hubs are installed in drums during rebuild of wheels and hubs (par. 268).

189. Adjustment

Refer to TM 9–804A for service brake adjustment.

Section III. REBUILD OF HAND BRAKE SYSTEM

190. Disassembly

a. Remove Brake Rod Assembly. Refer to paragraph 48*c* (10) for removal procedure.

b. Remove Brake Assembly. Remove three lockwasher cap screws (fig. 142) which secure the handbrake assembly to the body. Lift the handbrake assembly from body.

c. Remove Brakedrum, Operating Lever, and Inner and Outer Shoe

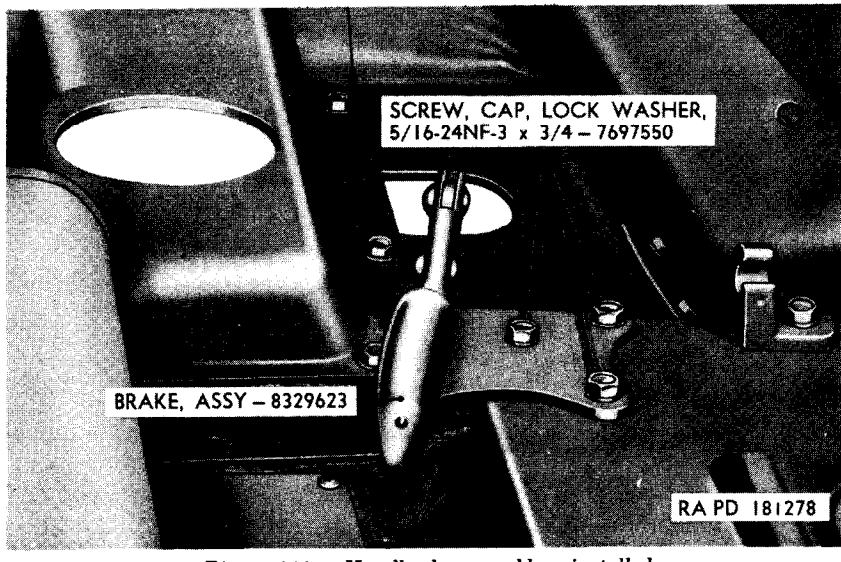
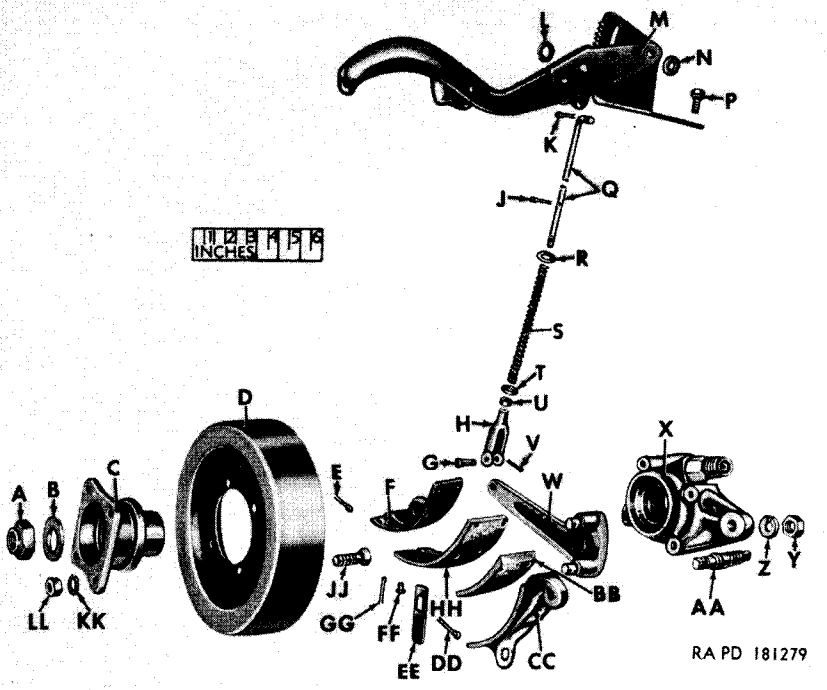


Figure 142. Handbrake assembly—installed.



A – NUT, COMPANION FLANGE, 3/4-16NF-2 – 7032635
B – WASHER, COMPANION FLANGE NUT, 3/4 IN – 7372868
C – FLANGE, COMPANION, W/SLINGER, ASSY – 7371035
D – DRUM, BRAKE – 8329632
E – PIN, COTTER, 1/8 x 3/4 – 177923
F – SHOE, INNER, W/LINING, ASSY – WO-806028
G – PIN, CLEVIS – 121471
H – YOKE, ADJ, ROD – GM-144242
J – PIN, COTTER, 3/32 x 1/2 – 119117
K – PIN, COTTER, 3/32 x 1/2 – 119117
L – WASHER, PLAIN – 144363
M – BRAKE, ASSY – 8329623
N – WASHER, PLAIN – 144363
P – SCREW, CAP, LOCK WASHER, 5/16-24NF-3 x 3/4 – 7697550
Q – ROD, BRAKE – 8329626
R – WASHER, PLAIN – 144363
S – SPRING, RETRACTING – 8329625
T – WASHER, PLAIN – 144363
U – NUT, PLAIN, 5/16-24NF-2 – 120368
V – PIN, COTTER, 1/8 x 3/4 – 177923
W – LEVER, OPERATING – 8329633
X – RETAINER, REAR AXLE OUTPUT SHAFT, W/BEARING, ASSY – 8328478
Y – NUT, PLAIN, 5/8-18NF-2 – 124944
Z – WASHER, LOCK, 5/8 IN – 131205
AA – PIN, ANCHOR – 8329629
BB – LINING, OUTER – WO-119475
CC – SHOE, OUTER, W/LINING, ASSY – WO-806027
DD – PIN, COTTER, 1/8 x 3/4 – 177923
EE – STOP, BRAKE – 8329630
FF – RIVET, LINING – WO-119477
GG – PIN, COTTER, 1/8 x 3/4 – 177923
HH – LINING, INNER – WO-119476
JJ – BOLT, DRUM, 3/8-24NF-3 – 7324918
KK – WASHER, LOCK, 3/8 IN – 120382
LL – NUT, PLAIN, 3/8-24NF-3 – 121932

Figure 143. Handbrake assembly, drum and shoes—disassembled view.

Assemblies (fig. 143). Refer to paragraphs 111 and 117 for removal procedures.

d. Disassembly. It is not necessary to disassemble the brake and brake rod assemblies unless inspection (par. 191*a*) reveals them to be unserviceable.

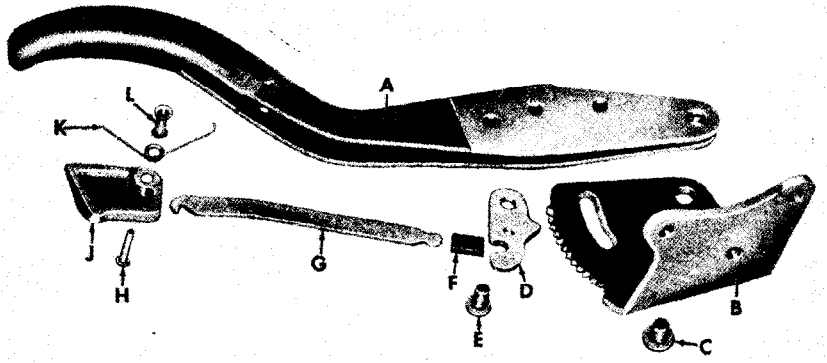


Figure 144. Handbrake assembly—disassembled view.

(1) *Brake rod assembly* (fig. 143). Unscrew the rod adjusting yoke (H), plain nut (U), and plain washer (T) from brake rod (Q). Remove cotter pin (J) and slide the retracting spring (S) and two plain washers (R and T) off brake rod.

(2) *Hand brake assembly* (fig. 144). Drive out the sector rivet (C) and withdraw brake sector (B) from brake handle (A). Drive out release lever rivet (H). Withdraw release lever (J) and pawl rod (G) from within brake handle (A). Pull the pawl rod antirattle (F) off pawl rod. Drive pawl rivet (E) and withdraw brake pawl (D) from within brake handle. To remove release lever return spring (K), remove the release lever rivet grommet (L) which secures spring to release lever (J).

e. Disassemble Brakedrum, Operating Lever, and Inner and Outer Shoe Assemblies (fig. 143). The brakedrum (D), operating lever (W), and the inner and outer shoe with lining assemblies (F and CC) require no disassembly except the removal of inner and outer linings (HH and BB). Do not remove linings unless inspection (par. 191*a*) reveals them to be unsatisfactory. Refer to paragraph 191 for removal and installation of linings.

191. Inspection and Repair

a. Inspection.

(1) *Brake sector* (fig. 144). Inspect brake sector (B) for damage and worn teeth. Replace sector, if necessary.

(2) *Brake pawl* (fig. 144). Examine brake pawl (D) for worn projection and for oversized hole which offers engagement to the pawl rod (G). Replace brake pawl, if necessary.

(3) *Pawl rod and release lever* (fig. 144). Replace the pawl rod (G) if its projections are so worn or damaged that they do not properly engage the release lever (J) and brake pawl (D). Replace damaged or worn release lever.

(4) *Brake handle* (fig. 144). Inspect the brake handle (A) for distortion, damage, and wear. Replace handle, if necessary.

(5) *Release lever return spring* (fig. 144). Replace a broken or distorted release lever return spring (K).

(6) *Brake rod and retracting spring* (fig. 143). Replace a broken or twisted brake rod (Q). Replace the retracting spring (S) if it is distorted, broken, or if it fails to operate in its intended manner.

(7) *Rod adjusting yoke* (fig. 143). Replace a broken or otherwise damaged rod adjusting yoke (H).

(8) *Operating lever, brake stop, and anchor pin* (fig. 143). Replace the operating lever (W) if it is distorted, broken, or excessively worn. Replace a broken or twisted brake stop (EE). Inspect the anchor pin (AA) for damaged threads. Replace anchor pin, if necessary.

(9) *Brakedrum* (fig. 143). Brakedrum braking surfaces must be smooth and concentric within 0.006-inch total indicator reading. Inspect brakedrum (D) for cracking, scoring, or warpage. Replace drum, if cracked or warped. Repair scored or grooved drum (*b* (1) below).

(10) *Inner and outer shoe assemblies* (fig. 143). Inspect outer lining (BB) and inner lining (HH) for glazing, burning, or excessive wear. Replace linings, if outer surface is near head of lining rivets (FF).

b. Repair.

(1) *Brakedrum* (fig. 143). Refinish rough or scored brakedrum (D) in a lathe. Do not remove more than 0.030 inch thickness of metal (0.060 inch on diameter). If refinishing requires more than dimension specified above, replace brakedrum.

(2) *Reline inner and outer shoes* (fig. 143). Remove lining rivets (FF) and strip inner and outer linings (HH and BB) from inner and outer shoes. Clean faces of shoes thoroughly. Secure new linings to shoes with rivets. Check contact of linings with shoes after riveting. A 0.010-inch feeler gage must not enter between shoe and lining at any point.

192. Assembly

a. Assemble Handbrake Assembly (fig. 144). Secure brake sector (B) to brake handle (A) with sector rivet (C). Swage rivet tight. Slip pawl rod antirattle (F) on pawl rod (G). Position release lever return spring (K) in release lever (J) and secure spring to lever with the release lever rivet grommet (L). Engage pawl rod in release lever and brake pawl, and insert rod, lever, and pawl in the brake handle. Secure brake pawl to handle with pawl rivet (E). Swage rivet tight. Secure release lever (J) to handle with the release lever rivet (H). Peen over end of lever rivet.

b. Assemble Brake Rod Assembly. (fig. 143) Install $\frac{3}{32}$ x $\frac{1}{2}$ cotter pin (J) in brake rod (Q). Slip plain washer (R), retracting spring (S), and plain washer (T) onto brake rod. Install $\frac{5}{16}$–24NF–2 plain nut (U) and rod adjusting yoke (H) on brake rod.

c. Install Brake Assembly (fig. 142). Secure brake assembly to body with three $\frac{5}{16}$–24NF–3 x $\frac{3}{4}$ lockwasher cap screws.

d. Install Brake Rod Assembly. Refer to paragraph 72*e* (9) for installation procedures.

e. Install Brakedrum, Operating Lever, and Inner and Outer Shoe Assemblies. Refer to paragraphs 119*b* and 137 for installation procedures.

193. Adjustment

Refer to TM 9–804A for adjustment instructions.

CHAPTER 11

SPRINGS AND SHOCK ABSORBERS

Section I. DESCRIPTION AND DATA

194. Description

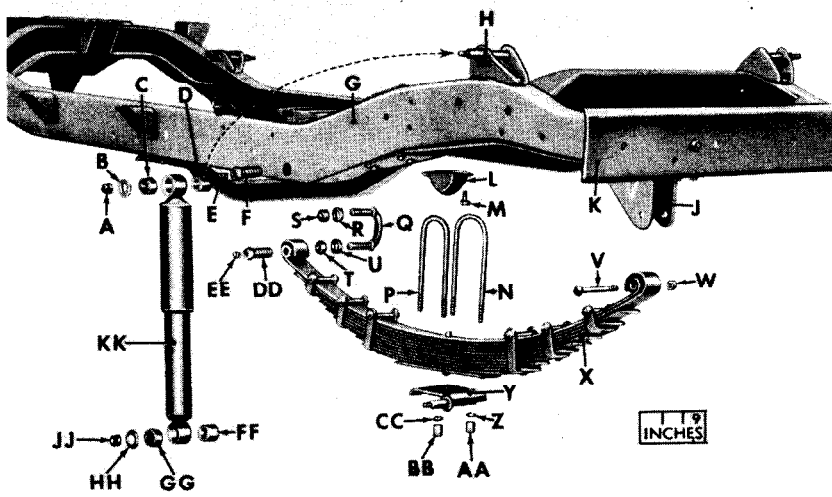
a. Springs. The front and rear springs are of the semielliptic type constructed of alloy steel. The front springs (figs. 145 and 146) are comprised of 12 leaves, while the rear springs have 13 leaves. The spring leaves of both spring assemblies are held together by a center bolt and nut and six rebound clips. These rebound clips are riveted at both ends of the fourth, seventh, and tenth leaves. A bolt, spacer, and nut are used to secure each rebound clip. Each spring is suspended from the frame by a shackel at the rear and a bolt at the front. The shackles ride in internally and externally threaded bushing type bearings while the bolts are mounted in bushing type eye bearings. To prevent the shackle bearings from screwing out, due to spring action, left-hand thread shackle bearings are used on the lower ends of the right rear spring shackle and left front spring shackle. The shackles are identified by bosses forged at the bases of the threads. The bearings are identified by a groove cut around their hexagon heads. The spring assemblies are secured to their respective axles by U-bolts. Spring saddles, which are welded to the undersides of both the front and rear axle housings at each end, and the spring center bolt heads are used to prevent shifting of the axle during operation of the vehicle.

b. Shock Absorbers (fig. 145). The shock absorbers are, hydraulic, double-action type, mounted on rubber bushings at their top and bottom attachment points. Each shock absorber is comprised basically of a dust tube, an inner tube, a piston and rod assembly, a compression valve, and a reservoir tube. The shock absorbers are nonadjustable and nonrefillable.

195. Data

a. Front Springs.

Manufacturer	Mather Spring Co.
Number of leaves	12
Length (center of spring eyes, arched)	38⅝ in. (apprx)
Rebound clips	6



A – NUT, LOCK, 7/16-20NF-2B – 442830
B – WASHER, PLAIN – 120389
C – BUSHING, MOUNTING PIN – 7343032
D – BUSHING, MOUNTING PIN – 7343032
E – FITTING, LUBR, 1/8 IN – 504208
F – BEARING, BUSHING TYPE, SHACKLE, UPPER RIGHT – 7697598
G – FRAME, ASSY-WO – 805715
H – BRACKET, SHOCK ABSORBER, FRONT WO – 805635
J – BRACKET, SPRING PIVOT – WO-806910
K – BUMPER, BAR – WO-801386
L – BUMPER, FRONT AXLE – 8329600
M – BOLT, 5/16 – 24NF – 3 x 3/4 – 181595
N – BOLT, "U", RIGHT SPRING – 7371059
P – BOLT, "U", RIGHT SPRING – 7371081
Q – SHACKLE, RIGHT FRONT AND LEFT REAR, RH-THD-7735833 SHACKLE, LEFT FRONT AND RIGHT REAR, LH-THD – 7371090
R – RETAINER, SHACKLE GREASE SHIELD – 7735843
S – SEAL, GREASE, SHACKLE – 7697602
T – SEAL, GREASE, SHACKLE – 7697602
U – RETAINER, SHACKLE GREASE SHIELD – 7735843
V – BOLT, PIVOT, 7/16-20NF-3 x 3 – 124155
W – NUT, ELASTIC STOP, 7/16-20NF-3 – 442830
X – SPRING, FRONT, ASSY – WO 808458
Y – PLATE, SPRING CLIP, FRONT RIGHT, ASSY – WO-800823
Z – WASHER, LOCK, 7/16 IN – 131100
AA – NUT, "U" BOLT, 7/16-20 – 7371061
BB – NUT, "U" BOLT, 7/16-20 – 7371061
CC – WASHER, LOCK, 7/16 IN – 131100
DD – BEARING, BUSHING TYPE, SHACKLE, RIGHT FRONT, LEFT REAR, UPPER LEFT FRONT, UPPER RIGHT REAR, RH-THD – 7697598
BEARING, BUSHING TYPE, SHACKLE, LOWER LEFT FRONT, LOWER RIGHT REAR – LH – THD 7697596
EE – FITTING, LUBR, 1/8 IN – 504208
FF – BUSHING, MOUNTING PIN – 7343032
GG – BUSHING, MOUNTING PIN – 7343032
HH – WASHER, PLAIN – 120389
JJ – NUT, LOCK, 7/16-20NF-2B – 442830
KK – ABSORBER, SHOCK, FRONT, ASSY – 8329681

RA PD 181281

Figure 145. Front spring and shock absorber.

b. Rear Springs.

Manufacturer	Mather Spring Co.
Number of leaves	13
Length (center of spring eyes, arched)	44¾ in. (apprx)
Rebound clips	6

c. Shock Absorbers.

Manufacturer	Monroe
Type	Double action, hydraulic
Collapsed length:	
Front	11⅜ in.
Rear	12 in.
Extended length:	
Front	16⅜ in.
Rear	19½ in.

Section II. REBUILD OF SPRING AND SHOCK ABSORBER ASSEMBLIES

196. Disassembly

a. Springs (figs. 145 and 146). The front and rear spring assemblies require no repair except the replacement of broken spring leaves and bushing type eye bearings. To disassemble either front or rear spring assembly, proceed as follows:

(1) *Remove center bolt.* Remove nut from the center bolt, and remove the bolt.

(2) *Remove rebound clips.* Remove rebound clip nut, spacer, and bolt securing each of the six rebound clips. Remove the spring leaves.

(3) *Remove rebound clip from spring leaf.* If a rebound clip must be removed from spring leaf, break the rebound clip rivet securing the rebound clip to the spring leaf with a chisel and lift rebound clip from spring leaf.

b. Shock Absorbers (fig. 145). No disassembly of shock absorbers is permitted. To remove axle bumper from underside of frame, remove 2 lockwasher bolts securing each of the 4 axle bumpers to frame.

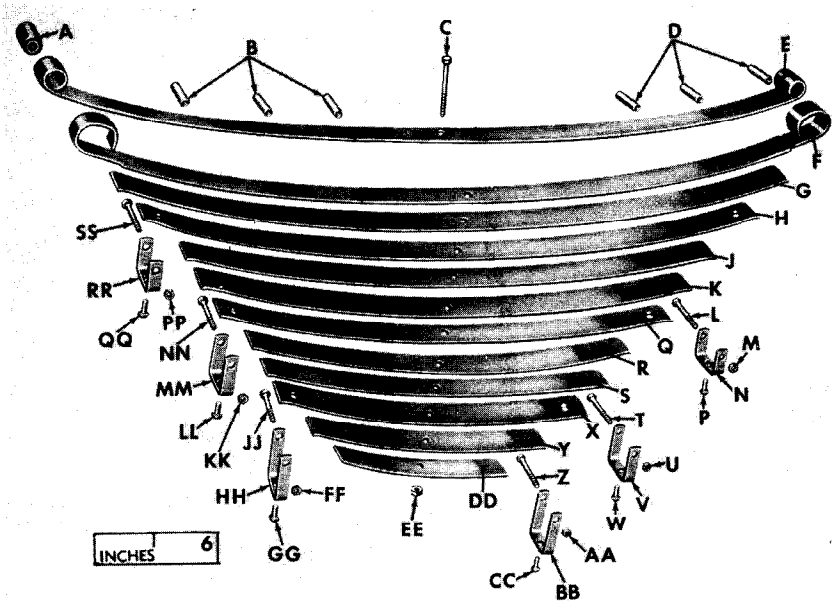
197. Inspection and Repair

a. Inspection.

(1) *Spring leaves.* Inspect all spring leaves for cracks and breaks. A faulty spring leaf must be replaced. Replace rebound clips if they are broken, cracked, or otherwise damaged.

(2) *Shackles and shackle bearings.* Inspect shackles for damage and wear. Replace, if faulty. Check the threads of the shackle bushing type bearings, for damage and wear. Replace, if necessary. Inspect the lubrication fittings in the end of the bushing type bearings for damage and proper operation. Replace, if necessary.

(3) *Bushing type eye bearings and pivot bolts.* Inspect the bushing type eye bearings for wear and damage. Replace them if they exceed the wear limits established in the repair and rebuild standards (par. 275). Replace pivot bolts if not in accordance with repair and rebuild standards.



A – BEARING, BUSHING TYPE, EYE – 8329602
B – SPACER, REBOUND CLIP
C – BOLT, CENTER, 5/16-24NF-2 x 2-3/4 WO– 116715
D – SPACER, REBOUND CLIP
E – LEAF, SPRING, NO 1 – 1198898-N
F – LEAF, SPRING, NO 2 – 1198899-N
G – LEAF, SPRING, NO 3 – 1198900-N
H – LEAF, SPRING, NO 4 – 1198901-N
J – LEAF, SPRING, NO 5 – 1198902-N
K – LEAF, SPRING, NO 6 – 1198903-N
L – BOLT, 5/16-24NF-2 x 2-1/2 – 223664
M – NUT, 5/16-24NF-2 – 103025
N – CLIP, REBOUND, OUTER
P – RIVET
Q – LEAF, SPRING, NO 7 – 1198904-N
R – LEAF, SPRING, NO 8 – 1198905-N
S – LEAF, SPRING, NO 9 – 1198906-N
T – BOLT, 5/16-24NF-2 x 2-1/2 – 223664
U – NUT, 5/16-24NF-2 – 103025
V – CLIP, REBOUND, INTERMEDIATE
W – RIVET
X – LEAF, SPRING, NO 10 – 1198907-N
Y – LEAF, SPRING, NO 11 – 1198908-N
Z – BOLT, 5/16-24NF-2 x 2-1/2 – 223664
AA – NUT, 5/16-24NF-2 – 103025
BB – CLIP, REBOUND, INNER
CC – RIVET
DD – LEAF, SPRING, NO 12 – 1198909-N
EE – NUT, 5/16-24NF-2 – 103025
FF – NUT, 5/16-24NF-2 – 103025
GG – RIVET
HH – CLIP, REBOUND, INNER
JJ – BOLT, 5/16-24NF-2 x 2-1/2 – 223664
KK – NUT, 5/16-24NF-2 – 103025
LL – RIVET
MM – CLIP, REBOUND, INTERMEDIATE
NN – BOLT, 5/16-24NF-2 x 2-1/2 – 223664
PP – NUT, 5/16-24NF-2 – 103025
QQ – RIVET
RR – CLIP, REBOUND, OUTER
SS – BOLT, 5/16-24NF-2 x 2-1/2 – 223664

RA PD 181282

Figure 146. Front spring assembly—disassembled view.

(4) *Spring clip plates, axle bumpers, and U-bolts.* Check the spring clip plate assemblies and U-bolts for wear, cracks, and breaks. Inspect the axle bumpers for deterioration and loss of rebound qualities. Replace all faulty parts.

(5) *Shock absorbers.* Test and inspect shock absorbers according to directions in paragraph 199*b*.

b. Repair.

(1) *Faulty threads.* Clean all fouled or damaged screw threads with standard thread chasers. If damaged threads are beyond repair, replace affected part.

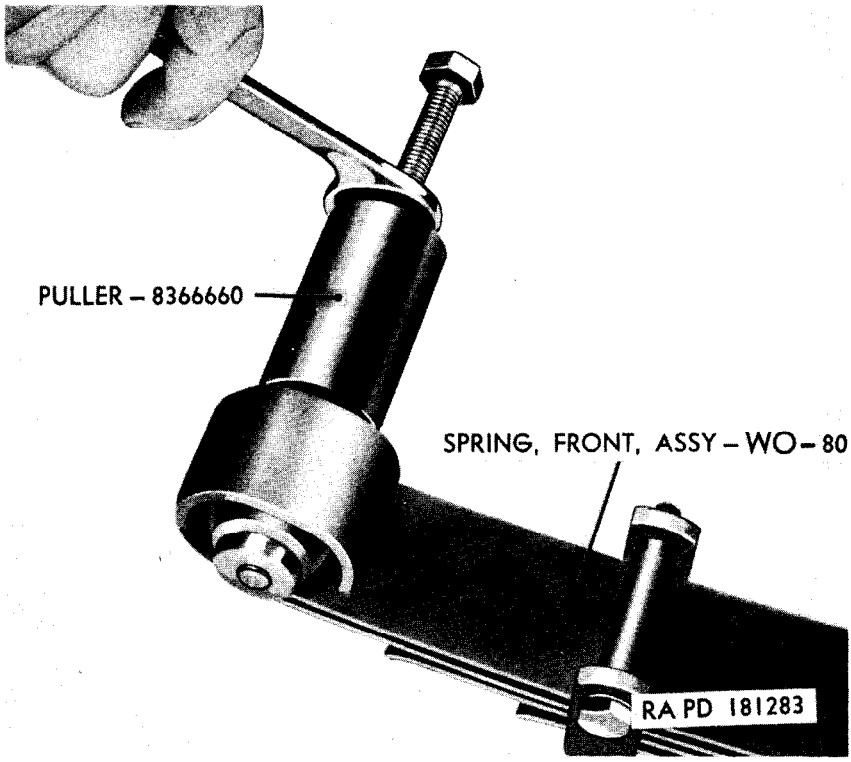


Figure 147. Removing bushing type eye bearing.

(2) *Bushing type eye bearings.* If it is necessary to replace a bushing type eye bearing, remove it from the spring eye with puller 8366660 (fig. 147). Install a new bearing with the same tool (fig. 148).

(3) *Shackle grease seals and mounting pin bushings.* Replace all shackle grease seals and mounting pin bushings at each overhaul.

(4) *Rebound clips.* Place new rebound clips (outer, intermediate, or inner) in place on spring leaf, install new rebound clip, rivet, and swage tight.

198. Assembly

a. Springs (figs. 145 and 146). Assembly operations for front and rear springs are similar.

(1) *Install center bolt.* Be sure all rust and corrosion have been removed from spring leaves. Beginning with the longest spring leaf, No. 1, and placing powdered graphite between spring leaves, assemble all spring leaves in their proper order and aline holes in spring leaves for center bolt. Insert the $\frac{5}{16}$–24NF–2 x $2\frac{3}{4}$ center bolt for front spring and $\frac{5}{16}$–24NF–2 x $3\frac{1}{4}$ center bolt for rear spring. With a suitable clamp,

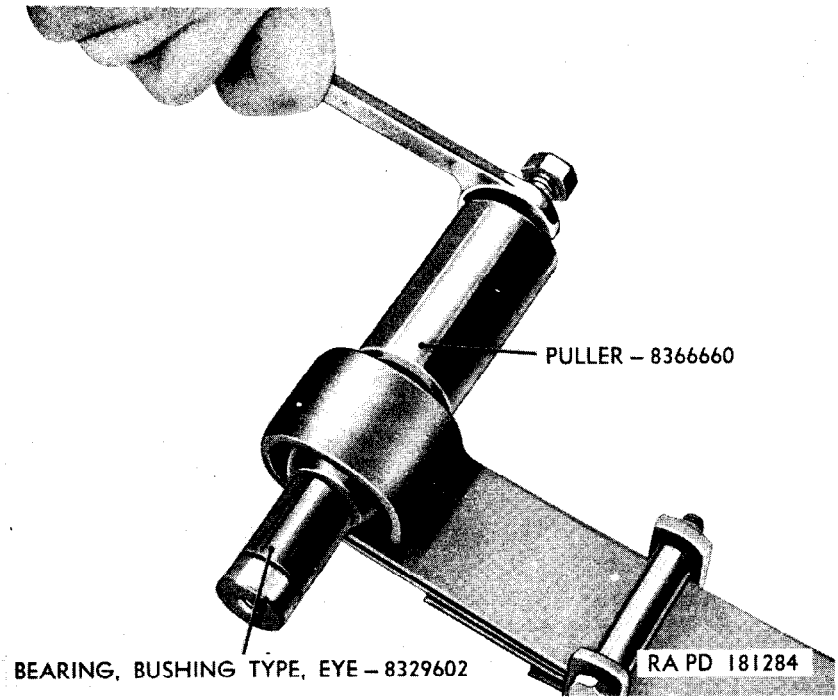


Figure 148. Installing bushing type eye bearing.

vise, or arbor press, compress the spring leaves together sufficiently to install 5/16–24NF–2 nut on center bolt. Peen end of center bolt at nut end.

(2) *Secure rebound clips.* Secure each of the six rebound clips with a rebound clip spacer, 5/16–24NF–2 x 2½ bolt, and nut. Peen ends of rebound clip bolts.

b. Axle Bumpers. To install axle bumpers, place each one in position on underside of frame and secure with two 5/16–24NF–3 x ¾ bolts, lockwashers, and nuts.

199. Test and Adjustment

a. Springs. Test spring for correct arch by comparing with a new spring. Rebound clips should not permit excessive side play of spring leaves. Minimum clearance between spring leaf and rebound clip must be less than 0.03 inch at each side.

b. Shock Absorbers. Inspect shock absorbers for leakage. If leakage is evident, replace the shock absorber. Pull shock absorber to its extended length and then collapse. There should be continuous resistance to movement in both directions for complete length of travel. Resistance on the compression (collapsing) stroke should be much less than that on the rebound (pulling) stroke. Shock absorber should not flop or fade away on any stroke.

CHAPTER 12
STEERING SYSTEM

Section I. DESCRIPTION AND DATA

200. Description and Operation

a. General (fig. 149). The steering system, which is of the conventional design, is composed of the steering gear assembly (H), drag link (F), bellcrank with bearing and oil seal assembly (E), tie rods (B) and (D), and steering knuckle flanges (A) and (J). Functionally, angular movement of the steering wheel (N, fig. 150) motivates the shaft with integral worm (L, fig. 150) whose screw effect causes the pitman shaft with integral cam (JJ, fig. 150) to rotate. This in turn causes the pitman arm (G) to swing angularly. The drag link (F), which is connected to both the pitman arm (G) and bellcrank, is caused to move laterally thereby pivoting the bellcrank which, in turn, moves the tie rods (B) and (D) and steering knuckle flanges (A) and (J).

A – FLANGE, STEERING KNUCKLE, RIGHT, ASSY – 8328398
B – ROD, TIE, RIGHT, W/ENDS, ASSY – 8329747
C – END, ASSEMBLY – 8329744
D – ROD, TIE, LEFT, W/ENDS, ASSY – 8329746
E – BELLCRANK, W/BEARING AND OIL SEAL, ASSY – 7375183
F – LINK, DRAG, ASSY – 7375182
G – ARM, PITMAN – 7412445
H – GEAR, STEERING, W/O STEERING WHEEL AND PITMAN ARM, ASSY – 8329724
J – FLANGE, STEERING KNUCKLE, LEFT, ASSY – 8328397

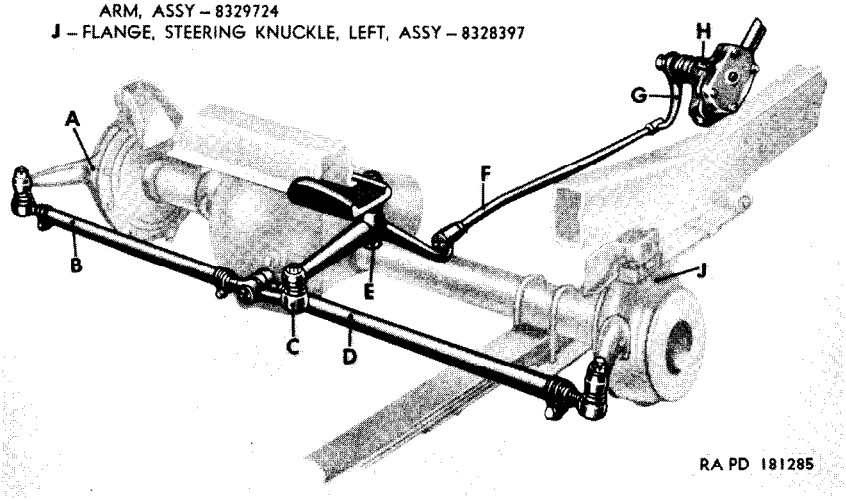


Figure 149. Steering system.

b. Steering Gear Assembly (fig. 150). The steering gear assembly is a cam and twin fixed stud lever, variable ratio design. The cam, which is integral with the pitman shaft (JJ), is mounted between two ball type worm bearings (K–3) and (K–4) which are adjustable by means of housing upper cover shims (K–7) located between the steering gear housing (G) and the upper housing cover (M). Two studs mounted in the cam end of the pitman shaft engage the worm threads of the shaft (L) in sliding contact. Clearance adjustment between the studs installed in the cam end of the pitman shaft and worm shaft is provided by a pitman shaft adjusting screw (LL) and jam nut (MM) mounted in the housing side cover (KK). The pitman shaft rides in two pitman shaft bushing type bearings (E) and (F) mounted in the steering gear housing (G). The pitman arm (C) is serrated for attachment to the pitman shaft (JJ). A jacket bearing ball (V) and jacket bearing cup (U and W) are used at the upper end of the jacket (Z) to center the shaft with integral worm (L). During normal straight ahead driving, both pitman shaft studs engage the thread of the worm shaft. Turning the steering wheel causes one of the pitman shaft studs to move downward and out of the worm thread. Meanwhile, the other stud is caused to move toward central portion of worm thread. The steering wheel (N) is a three spoke type and is serrated for attachment to the worm shaft. The horn mechanism, consisting of a horn button cap (AA), horn switch push rod (DD), and horn switch (RR), is incorporated in the steering gear assembly.

201. Data

a. Steering Gear.

Make	Ross
Model	T12
Ratios:	
Full left	19. 1
Center	17. 1
Full right	19. 1

b. Dimensions.

Length from outside rim of steering wheel to center of pitman arm shaft.	39.72 to 39.84 in.
Length of worm shaft (overall)	42⅜ in.
Length jacket (overall)	34⅝ in.

c. Steering Geometry.

Kingpin inclination	7½ deg
Toe-in	3/64–3/32-in.
Camber	1½ deg
Caster	3 deg
Turning radius	18 ft.

d. Pitman Arm Shaft.

Clearance to bushing type bearings	0.0005 .00025 in.
End play	0.000

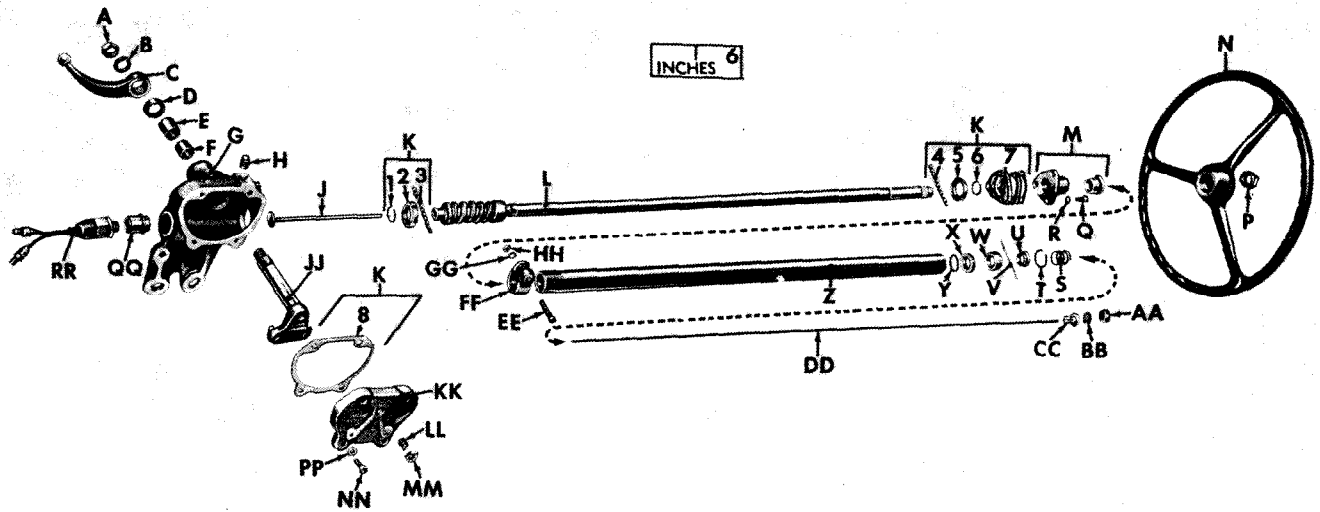


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Figure 150. Steering gear assembly—disassembled view.

A—Nut, ¾-16NF-2—124949
B—Washer, lock, ¾-in.—103326
C—Arm, pitman—7412445
D—Seal, oil, pitman shaft—7375341
E—Bearing, bushing type, pitman shaft—7375348
F—Bearing, bushing type, pitman shaft—7375349
G—Housing, steering gear—8329726
H—Plug, pipe, ¼-in.—219190
J—Tube, oil seal—7375337
K—Kit, repair, worm shaft bearing—7351410
Composed of:
1—Ring, snap, worm bearing
2—Cup, worm bearing ball
3—Ball, 5/16-in., worm bearing [1]
4—Ball, 5/16-in., worm bearing [1]
5—Cup, worm bearing ball
6—Ring, snap, worm bearing
7—Shim set, housing upper cover [2]
8—Gasket, housing side cover [3]
L—Shaft, w/integral worm—8329730
M—Cover, housing, upper, w/seal, assy—7412446
N—Wheel, steering—7375336
P—Nut, 13/16-20NC-2—7412579
Q—Bolt, 5/16-18NC-2 x ¾—214644
R—Washer, lock, 5/16-in.—120638
S—Spring, jacket bearing—WO-639191
T—Seat, jacket bearing spring—WO-801423
U—Cup, inner, jacket bearing
V—Ball, jacket bearing
W—Cup, outer, jacket bearing
X—Seal, oil, jacket—WO-804392
Y—Washer, oil seal
Z—Jacket—WO-801078
AA—Cap, horn button—WO-804623
BB—Button, horn (disk)
CC—Retainer, horn switch push rod—WO-806393
DD—Rod, push, horn switch—WO-806394
EE—Bolt, 5/16-24NF-3 x 1¾—123798
FF—Clamp, jacket—WO-A635
GG—Washer, lock, 5/16-in.—138538
HH—Nut, 5/16-24NF-2—120368
JJ—Shaft, pitman, w/integral cam—8329729
KK—Cover, housing side—8329723
LL—Screw, adj, pitman shaft, 7/16-20NF-2—8329728
MM—Nut, jam, 7/16-20NF-2—5175255
NN—Screw, cap, 5/16-18NC-2 x 1—RG-020041
PP—Washer, lock, 5/16-in.—120638
QQ—Adapter, horn switch—WO-806917
RR—Switch, horn, w/harness, assy—8329689

Figure 150—Continued.

[1] Also available separately—104919.

[2] Also available separately—7371431.

[3] Also available separately—8329725.

Section II. REBUILD OF STEERING GEAR ASSEMBLY

202. Disassembly

(fig. 150)

a. Remove Steering Wheel. Refer to paragraph 48*c* (11) for removal instructions.

b. Remove Jacket. Remove bolt (EE), nut (HH), and lockwasher (GG) which secure jacket clamp (FF), and follow by pulling jacket (Z) off housing upper cover with seal assembly (M). Remove jacket bearing assembly; composed of jacket bearing spring seat (T), inner cup (U), balls (V); and outer cup (W); from upper end of jacket. To dissassemble jacket bearing assembly, remove bearing spring seat, inner cup, and balls from outer cup. Withdraw jacket oil seal (X) and oil seal washer (Y) from within upper end of jacket.

c. Remove Housing Side Cover. Remove four cap screws (NN), lockwashers (PP) and lift housing side cover (KK) and side cover gasket (K–8) from steering gear housing (G). Discard housing side cover gasket.

d. Remove Pitman Arm. Unscrew the nut (A) from pitman shaft with integral cam (JJ) and remove lockwasher (B). Pull pitman arm (C) from end of pitman shaft. It may be necessary to tap pitman arm to free it from serrations on pitman shaft. If so, check pitman shaft for burs and raised metal or nicks. Smooth as necessary. Rough surface on pitman shaft can damage pitman shaft bearings during removal of shaft from housing. Pull shaft (JJ) from housing.

e. Remove Shaft With Integral Worm. Remove three bolts, (Q), and lockwashers (R), upper housing cover with seal assembly (M) and cover shims (K–7). Pull the shaft with integral worm (L) from housing. Withdraw steering gear oil seal tube (J) from end of shaft. Remove the two worm bearing snap rings (K–1) and (K–6) and remove the worm bearing balls (K–3) and (K–4) from the worm bearing ball cups (K–2) and (K–5). Remove worm bearing ball cups from shaft.

Note. Once the worm bearing snap rings are removed, the balls will readily fall out of cups unless pressure is exerted.

f. Remove Pitman Shaft Bearing. Do not remove the pitman shaft bushing type bearing (E) and (F) from housing unless inspection (par. 203*a* (6)) reveals them unserviceable.

g. Remove Horn Switch. Unscrew the horn switch with harness assembly (RR) from the horn switch adapter (QQ).

h. Remove Horn Switch Adapter. It is not necessary to remove the horn switch adapter (QQ) from the steering gear housing unless inspection (par. 203*a*) indicates it must be replaced.

203. Inspection and Repair

(fig. 150)

a. Inspection.

(1) *Steering gear assembly jacket.* Inspect jacket (Z) for bent or dented condition. Check to see that shoulder inside jacket is satisfactory for retaining oil seal washer.

(2) *Steering gear housing and covers.* Inspect steering gear housing (G), upper housing cover with seal assembly (M), and housing side cover (KK) for cracks or other damage. Replace, if damaged. Inspect condition of threads in horn switch adapter (QQ). Repair or replace, if necessary. Replace pipe plug (H), if threads are fou ed or distorted.

(3) *Pitman arm.* Inspect pitman arm (C) for damage. Check condition of integral ball in end of arm. Replace pitman arm if ball is so worn or damaged that it fails to offer proper engagement to the drag link. Inspect condition of serrations. Replace pitman arm if serrations are worn flat enough to prevent proper locking to the pitman shaft.

(4) *Pitman shaft.* Inspect bearing surfaces and serrations of pitman shaft with integral cam (JJ) for wear. Check tapered studs for flat spots or chipped condition. Repair or replace the shaft, if necessary.

(5) *Worm shaft.* Inspect the steering gear assembly shaft worm threads for wear, cracking, chipping, pitting, or brinelling. Inspect serrations on upper end of shaft for wear. Replace faulty shaft, if necessary.

(6) *Bearings.* Inspect the pitman shaft bushing type bearings (E) and (F) for damage and wear. Remove these bearings if the inside diameter is more than 0.938 inch. Check the worm bearing balls (K–3 and K–4) and the jacket bearing balls (V) for chips and flat spots. Examine worm bearing ball cups (K–2 and K–5) and the jacket bearing inner and outer cups (U and W) for wear or brinelling. Replace damaged parts. Replace worm bearing snap rings (K–1 and K–6) if damaged.

(7) *Miscellaneous parts.* Examine oil seal washer (Y) and jacket bearing spring seat (T) for damage. Replace, if necessary. Replace jacket bearing spring (S) if distorted, weakened, or broken. Discard jacket oil seal (X) at each rebuild. Replace oil seal tube (J), horn switch push rod (DD), and horn switch push rod retainer (CC), if they are damaged beyond repair.

b. Repair.

(1) *Pitman shaft bearings.* To remove pitman shaft bushing type bearings (E and F), remove pitman shaft oil seal (D). Drive a suitable drift between steering gear housing and

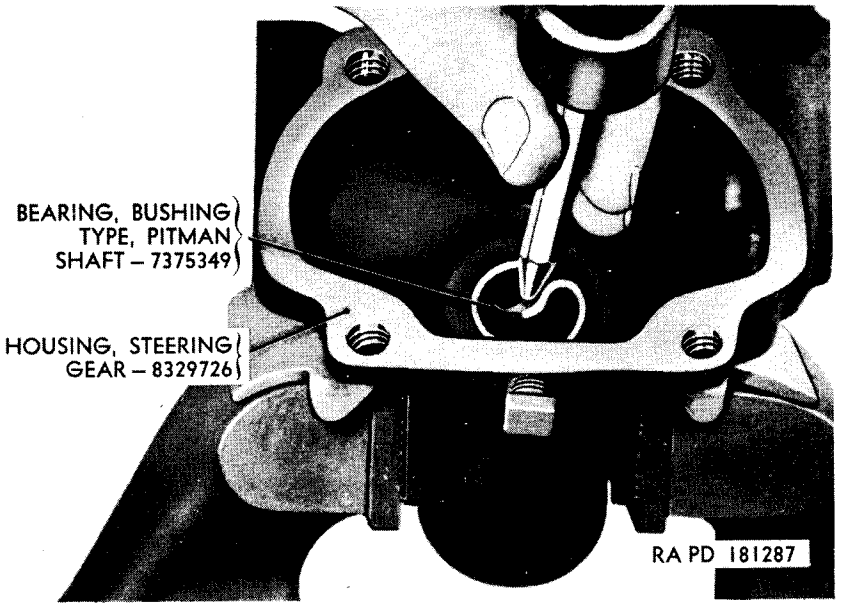


Figure 151. Removing pitman shaft bearings.

pitman shaft bearing joints as shown in figure 151 until ends of bearings overlap. Tap pitman shaft bearings out of steering gear housing. Install a new pitman shaft oil seal, with long lip toward interior of housing. Press (outer) pitman shaft bushing type bearing (E) into steering gear housing until it is flush with pitman shaft oil seal. Press (inner) pitman shaft bushing type bearing (F) into steering gear housing until the edge nearer the interior of housing is flush with edge of countersunk surface of steering gear housing.

(2) *Upper cover seal.* If necessary, drive seal from housing upper cover (M) with a suitable drift. Install a new seal by driving it into proper position.

204. Assembly

a. Install Steering Gear Shaft. Install worm bearing ball cups (fig. 152) on shaft. Coat 5/16-inch worm bearing balls with universal gear lubricant (GO) to aid in their assembly. Assemble 11 balls into each cup and lock worm bearing ball cups in position with the worm bearing snap rings. Install shaft with integral worm in steering gear housing.

b. Install Upper Cover With Seal Assembly (fig. 150). Place shim set (K–7) in position on steering gear housing and aline holes. Position upper housing cover with seal assembly (M) and install three 5/16-inch

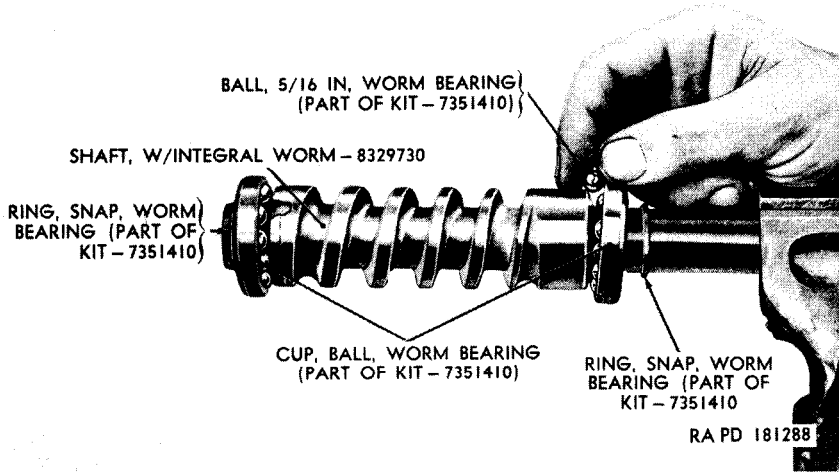


Figure 152. Installing worm bearing balls in steering assembly shaft.

lockwashers (R) and three $\frac{5}{16}$–18NC–2 x $\frac{3}{4}$ bolts (Q), and tighten them until just snug.

c. Install Jacket (fig. 150). Dip lower end of jacket in SAE No. 10 lubricating oil to facilitate assembly of jacket over seal in housing upper cover (M). Install jacket over seal so that slot in lower end of jacket is parallel to side opening of steering gear housing. Slip jacket clamp (FF) in position on jacket and secure clamp with $\frac{5}{16}$–24NF–3 x $1\frac{3}{4}$ bolt (EE), $\frac{5}{16}$-inch lockwasher (GG), and $\frac{5}{16}$–24NF–2 nut (HH). Slip oil seal washer (Y) over shaft with integral worm (L)

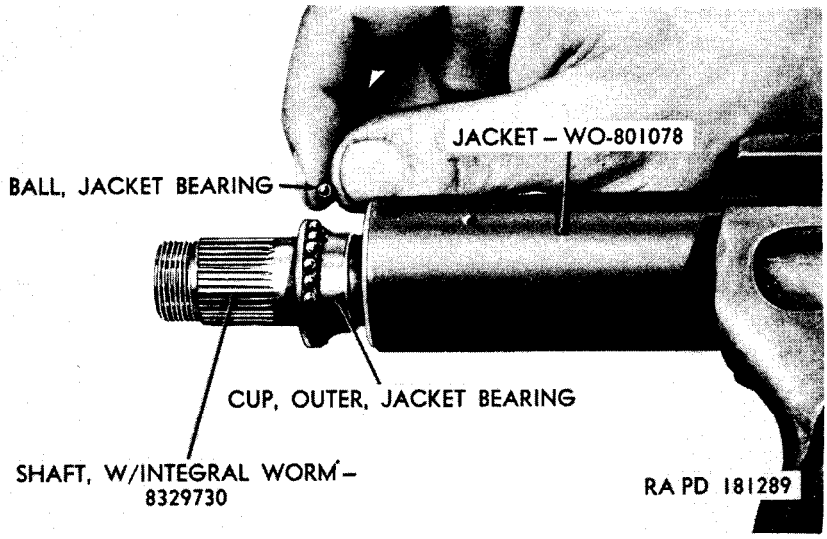


Figure 153. Installing jacket bearing balls.

and into interior of jacket (Z) until it rests on shoulder provided in jacket. Soak jacket oil seal (X) in SAE No. 10 motor oil to facilitate installation, and insert oil seal (X) (long lip outward) in jacket. Install jacket bearing outer cup (W) on outer edge of jacket. Position jacket bearing inner cup (U) on shaft (L). Coat 22 jacket bearing balls (fig. 153) with universal gear lubricant (GO) to aid in their assembly. Install balls on outer circumference of jacket bearing inner cup. Slide cup and balls into jacket bearing outer cup. Install jacket bearing spring seat (T), in interior of outer cup.

d. Install Pitman Shaft (fig. 150). Insert pitman shaft with integral cam (JJ) through side opening in steering gear housing (G).

e. Install Pitman Arm (fig. 150). Aline match marks on pitman arm (C) and pitman shaft (JJ). If arm and shaft do not have match marks, set shaft (L) in midposition. With pitman arm straight up and down, tap pitman arm into position on shaft. Install ¾-inch lockwasher (B) and ¾–16NF–2 nut (A).

Note. To place shaft (L) in midposition, turn shaft to right as far as possible and then turn in opposite direction as far as possible, noting total number of turns. Turn shaft back one-half the number of total turns.

f. Install Housing Side Cover (fig. 150). Install 7/16–20NF–2 jam nut (MM) and 7/16–20NF–2 pitman shaft adjusting screw (LL) in housing side cover (KK). Leave adjusting screw out enough so it will not bear against pitman shaft. Coat new housing side cover gasket (K–8) with plastic type gasket cement. Position gasket and side cover on steering gear housing (G) and secure with four 5/16–18NC–2 x 1 cap screws (NN) and 5/16-inch lockwashers (PP).

g. Install Horn Switch Adapter (fig. 150). Insert oil seal tube (J) in end of shaft (L). Screw horn switch adapter (QQ) into end of steering gear housing (G). Screw horn switch with harness assembly (RR) into end of horn switch adapter.

h. Install Steering Wheel. Refer to paragraph 72*e* (7) for installation instructions.

205. Test and Adjustment

a. Lubricate Steering Gear Assembly. Remove pipe plug (H, fig 150) from top of steering gear housing and fill with lubricant. Refer to TM 9–804A for proper type and grade of lubricant.

b. Endplay Adjustment of Shaft With Integral Worm (fig. 150). If end play (up and down play of shaft with integral worm) is correct, a slight drag will be felt when shaft is rotated. Test end play by rotating shaft with integral worm (L). If shaft is too tight, shims (K–7) must be added; if too loose, shims must be removed. Before adding or removing shims, loosen pitman shaft adjusting screw (fig. 154). Remove three bolts (Q) and lockwashers securing housing upper cover with seal assembly (M) to steering gear housing and pull upper cover away from housing. If shims are to be added, make a

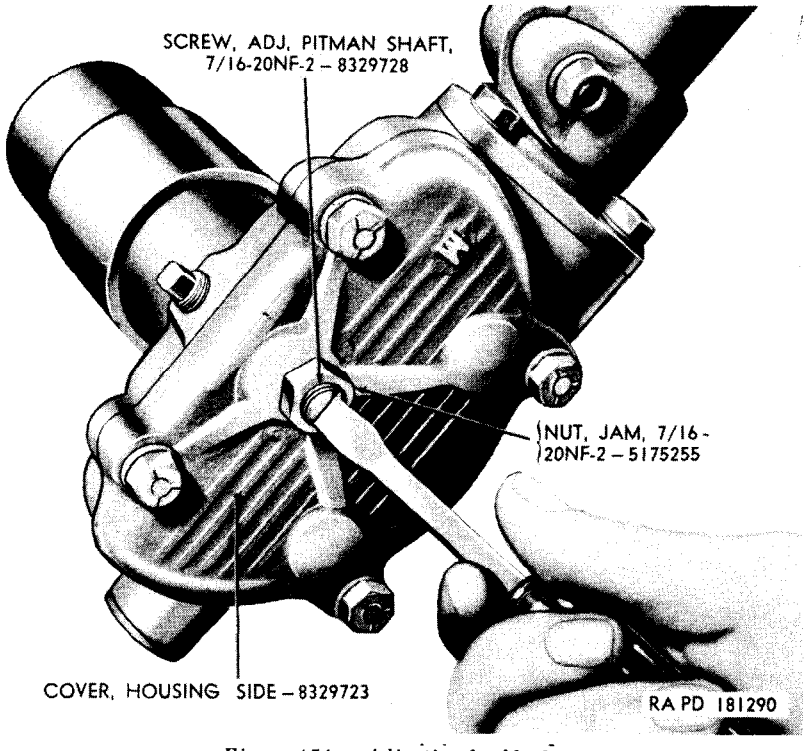


Figure 154. Adjusting backlash.

clean sharp cut across one side of the shims and install the shims, bending the edges of the cutback just far enough to permit the shim to slide past the shaft (L). If shims are to be removed, cut across one side of shim and pull to remove. Shims are supplied in 0.002, 0.003, and 0.010 inch thickness.

Note. Bolts must be drawn up evenly to insure proper testing of end play. Correct end play, with steering gear installed on vehicle, is such that a very slight drag is felt but permits the steering wheel to turn freely with thumb and forefinger lightly gripping steering wheel at the rim.

c. Backlash Adjustment (fig. 154). Place shaft (L, fig. 150) in straight ahead driving position.

Note. Do not adjust when off straight ahead driving position.

Be sure end play is correct (*b* above). Turn Pitman shaft adjusting screw in housing side cover until side play is removed from pitman shaft. Unscrew adjusting screw until a barely perceptible drag is felt at pitman shaft. Tighten jam nut securely. Test steering gear assembly for binding by rotating steering gear assembly shaft. A shaft worm groove for pitman shaft tapered studs is cut narrow in straight ahead driving position. This design permits close adjustment for normal straight ahead driving and provides for takeup of

backlash at this point after wear occurs without causing a bind elsewhere.

Section III. REBUILD OF DRAG LINK ASSEMBLY

206. Disassembly

(fig. 155)

Remove the two dust cover shields (A–8) and dust covers (A–7) from both ends of drag link (B). Remove cotter pins (A–1) and unscrew the ball seat adjusting plugs (A–2 and A–6) from the axle and gear ends of the drag link. Withdraw ball seat (A–3), ball seat spring (A–4), and ball seat spring seat (A–5) from within axle end of drag link. Withdraw ball seat spring seat (A–5), ball seat spring (A–4), and two ball seats (A–3) from within gear end of drag link. Unscrew the two lubricating fittings (C and D) from ends of drag link.

207. Inspection and Repair

(fig. 155)

Inspect ball seats (A–3) for wear, cracks, or chipping. Examine ball seat springs (A–4) for failure or weakness. Inspect ball seat spring seats (A–5) and lubricating fittings (C and D) for damage. Replace all worn or damaged parts. Check drag link (B), dust covers (A–7), and dust cover shields (A–8) for wear and damage. Replace, if necessary.

208. Assembly

(fig. 155)

a. Assemble Tie Rod End. Note that ball opening at tie rod or axle end is nearer to end of drag link than at pitman arm end. Slide ball seat spring seat (A–5), ball seat spring (A–4), and ball seat (A–3) into tie rod end of drag link. Turn ball seat adjusting plug (A–2) (the longer one of the two adjusting plugs) three or four turns into into tie rod end of drag link.

Note. The cotter pin (A–1) is not installed until drag link is secured to vehicle and adjusted. Instructions for installation and adjustment of drag link assembly are contained in TM 9–804A.

b. Assemble Pitman Arm End. Slide two ball seats (A–3), ball seat spring (A–4), and ball seat spring seat (A–5) into pitman arm end of drag link. Start ball seat adjusting plug (A–6) into pitman arm end of drag link. The cotter pin (A–1) is not installed until drag link is installed on vehicle. See *Note* in *a* above.

c. Install Lubricating Fittings. Screw two ⅛-inch lubricating fittings (C and D) into drag link. Dust covers (A–7) and dust cover shields (A–8) will be installed when drag link is installed on vehicle and adjusted. See *Note* in *a* above.

A – KIT, REPAIR – 7375186
COMPOSED OF:
1 – PIN, COTTER, 1/8 x 1-3/4
2 – PLUG, ADJ, BALL SEAT (AXLE END)
3 – SEAT, BALL
4 – SPRING, BALL SEAT
5 – SEAT, BALL SEAT SPRING
6 – PLUG, ADJ, BALL SEAT GEAR END
7 – COVER, DUST
8 – SHIELD, DUST COVER

B – LINK, DRAG – 73751852
C – FITTING, LUBR, 1/8 IN – 504208
D – FITTING, LUBR, 1/8 IN – 504208

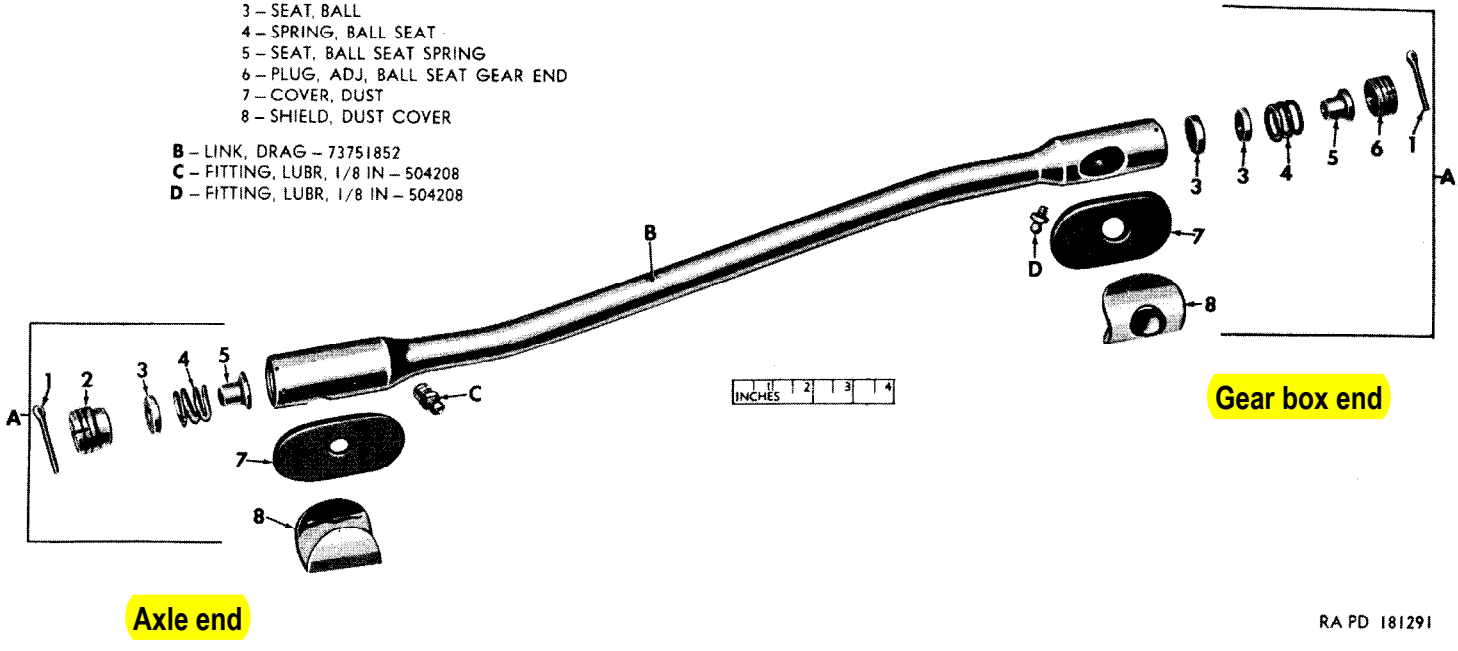


Figure 155. Drag link—disassembled view.

d. Adjustment. Proper adjustment (*a* above) of the drag link ball joints provides proper ball seat spring tension and prevents any tightness when swinging wheels from maximum left to right turn.

Section IV. REBUILD OF STEERING BELLCRANK ASSEMBLY

209. Disassembly

(fig. 156).

a. Do not remove the needle bearing assemblies from the interior of the steering bellcrank unless inspection (par. 210) reveals them to be unserviceable. To remove needle bearing assemblies, remove the two bellcrank seals from ends of bellcrank bore, and press bearings out of bore with a suitable remover.

b. Unscrew the lubricating fitting from the steering bellcrank

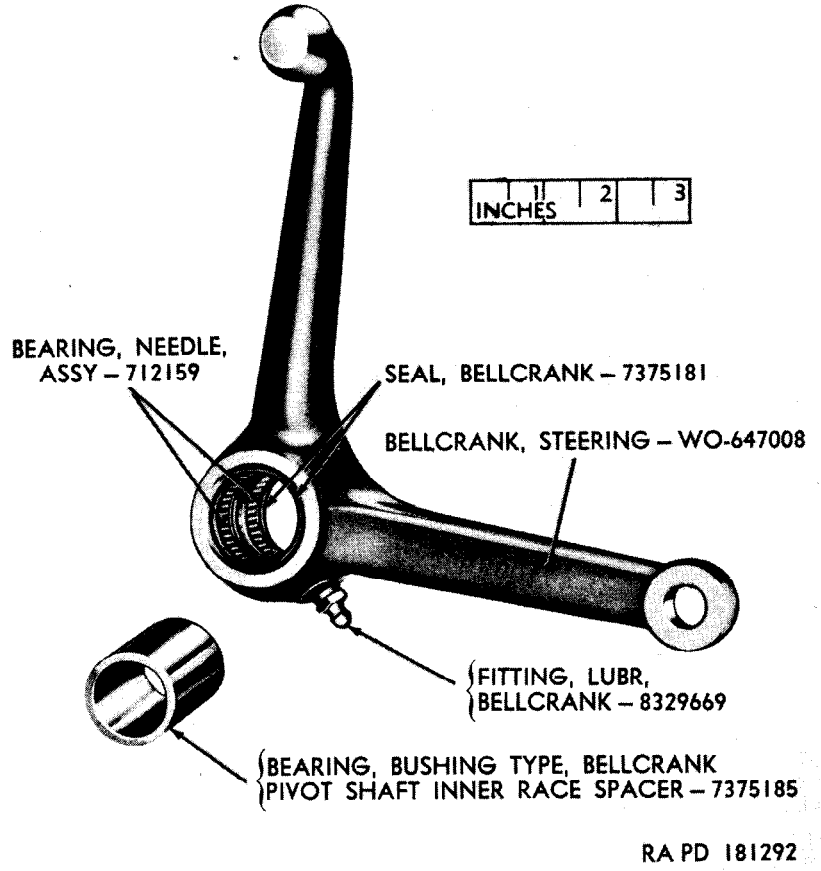


Figure 156. Steering bellcrank assembly.

210. Inspection and Repair

Examine integral ball on arm of steering bellcrank for out-of-round condition, chips, and cracks. Replace bellcrank if ball is excessively damaged. Check tie rod end assembly (M, fig. 157) in arm hole of bellcrank. If hole does not offer proper fit to tie rod end, replace bellcrank. Inspect bellcrank for cracks and other damage. Replace bellcrank, if necessary. Check needle bearing assemblies in bore of bellcrank for freedom of rotation, rough spots, and missing or damaged bearing rollers. Replace needle bearing assemblies, if necessary. Check bellcrank pivot shaft inner race spacer bushing type bearing for brinelling, wear, cracking, chipping, or pitting. Replace, if necessary. See that lubricating fitting is not damaged or clogged.

211. Assembly

(fig. 156)

a. To replace needle bearing assemblies, place steering bellcrank in vise with soft metal or wood protected jaws. Using a suitable pressing or driving tool, press or drive needle bearing assembly into bore of bellcrank approximately nine sixty-fourths of an inch from shoulder of bellcrank. Turn bellcrank over in vise and repeat operation for other needle bearing assembly. Install new bellcrank seals in interior of bellcrank bore. Insert bellcrank pivot shaft inner race spacer bearing in bellcrank bore.

b. Screw ⅛-inch lubricating fitting into steering bellcrank.

Section V. REBUILT OF TIE ROD ASSEMBLIES

212. Disassembly

(fig. 157)

a. Separate Left and Right Tie Rods. Remove cotter pin (S) and slotted nut (T) that secure end assembly (MM) to end assembly (M). Tap stud on end assembly (MM) with soft hammer to free it from hole in end assembly (M). Lift end stud spring (KK) and end stud dust cover (LL) from end assembly. Discard end stud dust cover.

b. Loosen End Clamps. Remove four bolts (G), (HH), (JJ), and (SS), lockwashers, and nuts which secure four end clamps (H), (W), (AA), and (RR) to tie rods and end assemblies.

c. Remove End Assemblies. Unscrew end assemblies (B) and (MM) from the left tie rod, and end assemblies (M) and (FF) from the right tie rod. Slide end clamps from ends of tie rods.

d. Remove Lubricating Fittings. Unscrew lubricating fittings (A), (GG), (NN), and (PP) from end assemblies.

A – FITTING, LUBR, 90 DEG, 1/8 IN – 8329748
B – END, ASSY, RH-THD – 8329743
C – COVER, DUST, END STUD – A333908
D – SPRING, END STUD – 7373111
E – NUT, SLTD, 1/2-20NF-2 – 125250
F – PIN, COTTER, 3/32 x 7/8 – 137169
G – BOLT, 5/16-24NF-2 x 1-1/2 – 214063
H – CLAMP, END – 8329741
J – WASHER, LOCK, 5/16 IN – 120638
K – NUT, 5/16-24NF-2 – 120368
L – ROD, TIE, LEFT – WO-642058
M – END, ASSY, LH-THD – 8329744
N – COVER, DUST, END STUD – A333908
P – SPRING, END STUD – 7373111
Q – NUT, SLTD, 1/2-20NF-2 – 125250
R – PIN, COTTER, 3/32 x 7/8 – 137169
S – PIN, COTTER, 3/32 x 7/8 – 137169
T – NUT, SLTD, 1/2-20NF-2 – 125250
U – NUT, 5/16-24NF-2 – 120368
V – WASHER, LOCK, 5/16 IN – 120638
W – CLAMP, END – 8329741
X – ROD, TIE, RIGHT – WO-642059
Y – NUT, 5/16-24NF-2 – 120368
Z – WASHER, LOCK, 5/16 IN – 120638
AA – CLAMP, END – 8329741
BB – PIN, COTTER, 3/32 x 7/8 – 137169
CC – NUT, SLTD, 1/2-20NF-2 – 125250
DD – SPRING, END STUD – 7373111
EE – COVER, DUST, END STUD – A333908
FF – END, ASSY, RH-THD – 8329743
GG – FITTING, LUBR, 90 DEG, 1/8 IN – 8329748
HH – BOLT, 5/16-24NF-2 x 1-1/2 – 214063
JJ – BOLT, 5/16-24NF-2 x 1-1/2 –214063
KK – SPRING, END STUD – 7373111
LL – COVER, DUST, END STUD – A333908
MM – END, ASSY, LH-THD – 8329742
NN – FITTING, LUBR, 90 DEG, 1/8 IN – 8329748
PP – FITTING, LUBR, 90 DEG, 1/8 IN – 8329748
QQ – WASHER, LOCK, 5/16 IN – 120638
RR – CLAMP, END – 8329741
SS – BOLT, 5/16-24NF-2 x 1-1/2 – 214063
TT – NUT, 5/16-24NF-2 –120368

NOTE: ITEMS B, M, FF, AND MM ALSO AVAILABLE AS A REPAIR KIT – 8329745

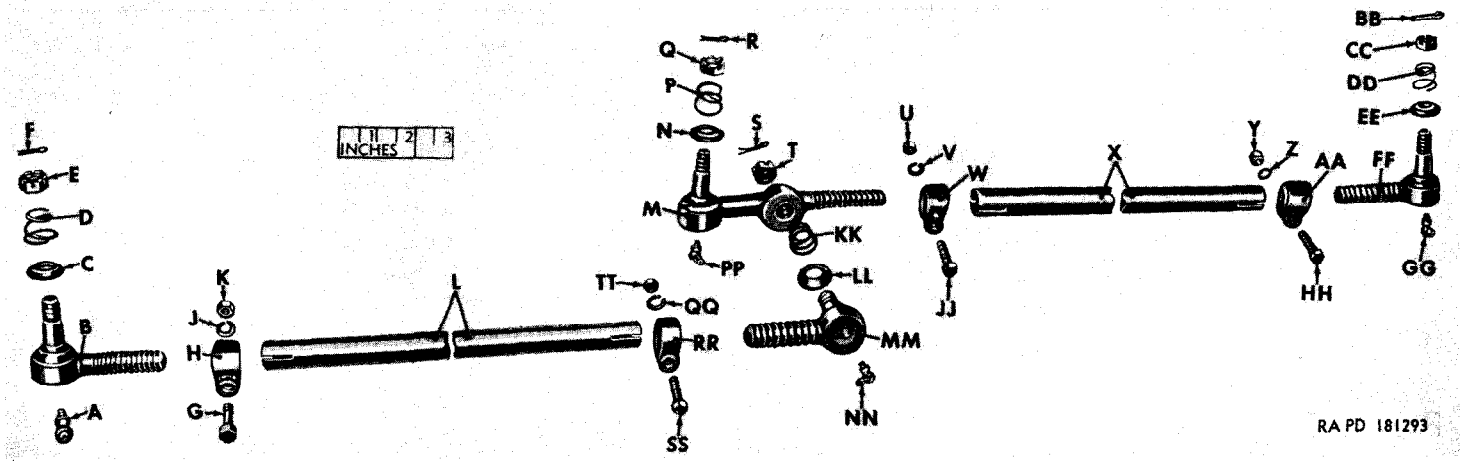


Figure 157. Tie rod assemblies—disassembled view.

213. Inspection and Repair

(fig. 157)

a. Inspection. Inspect left and right tie rods (L) and (X) for twisted or bent condition. Inspect tie rod threads for damage. Replace tie rod if it cannot be repaired. Check end assemblies (B), (M), (FF) and (MM) for damaged threads. Inspect the studs on the end assemblies for out-of-round, twisted, or bent condition. Replace end assemblies if they cannot be repaired. Examine end stud spring (D), (P), (DD) and (KK) for distortion, weak condition, or breaks. Replace end stud springs, if necessary. Inspect end clamps (H), (W), (AA) and (RR) and their bolts, washers and nuts for damage. Replace all damaged or worn parts. See that end lubricating fittings (A), (GG), (NN) and (PP) are not damaged or clogged. Replace and clean fittings, if necessary.

b. Repair. Repair all fouled or distorted threads of tie rods (L) and (X) and end assemblies (B), (M), (FF) and (MM) with appropriate standard taps and thread chasers.

214. Assembly

(fig. 157)

a. Install End Assemblies. Slip end clamps (H), (W), (AA) and (RR) over tie rods. Screw end assemblies (B) and (MM) in ends of tie rod (L) and end assemblies (M) and (FF) in tie rod (X). Install one $\frac{5}{16}$–24NF–2 x 1½ bolt, $\frac{5}{16}$-inch lockwasher, and $\frac{5}{16}$-24NF–2 nut in each end clamp. Temporarily tighten bolts as toe-in adjustment is made when tie rods are installed on vehicle.

b. Connect Left and Right Tie Rods. Place new end stud dust cover (LL) and end stud spring (KK) (large end first) on stud of end assembly (MM). Push or tap stud of end assembly into hole of end assembly (M). Secure tie rods together with ½–20NF–2 slotted nut (T) and $\frac{3}{32}$ x ⅞ cotter pin (S).

c. Install Lubricating Fittings. Screw ⅛-inch, 90-degree lubricating fittings in each end assembly.

d. Tie Rod Adjustment. After tie rods are installed on vehicle, correct tie rod adjustment must be maintained. Refer to TM 9–804A for toe-in adjustment.

CHAPTER 13
BODY

Section I. DESCRIPTION AND DATA

215. Description
(fig. 158)

a. General. The all steel, open type body is of seamed and welded construction. All open edges or panels are turned under, reinforced, and flanged to provide added strength. The body is insulated from the frame by body mounting shims and cushions between body and frame. The body is equipped with three passenger seats, tool compartment, battery stowage box, bows for installation of canvas top, spare wheel support bracket, and spare fuel can bracket. The body mounts the fuel tank and instrument panel. Two front floor pan covers are provided for access to rear of engine compartment, transmission, transfer, master cylinder, and steering gear. Drain plugs on front floor are also provided for draining purposes. Reflex reflectors are bolted to the rear and sides of the body. Half hinges are provided for attachment of the windshield assembly. A built-in chamber is incorporated, between instrument panel and dash panel, for circulating heat to the windshield assembly for defrosting purposes.

b. Windshield Assembly. The windshield is of the two-piece type equipped with safety glass and dual windshield wipers. Windshield can be folded forward and secured to top of hood by the windshield lock catch. A footman loop is provided for securing the hood in open position when windshield is upright. The vacuum motor driven windshield wipers can be operated manually by means of handles attached to the shaft of the vacuum motor. Windshield glass is mounted in a rubber weatherstrip and is locked in place with rubber weatherstrip fillers.

c. Seat Assemblies. The driver and front passenger seat assemblies are virtually identical constructions. The driver's seat, however, is bolted to the floor of body directly above fuel tank. The front passenger seat assembly is provided with swivel pins so that it can be folded forward and thereby provide access to space in the rear of the body. The rear passenger seat can be folded vertically when more stowage space is desired.

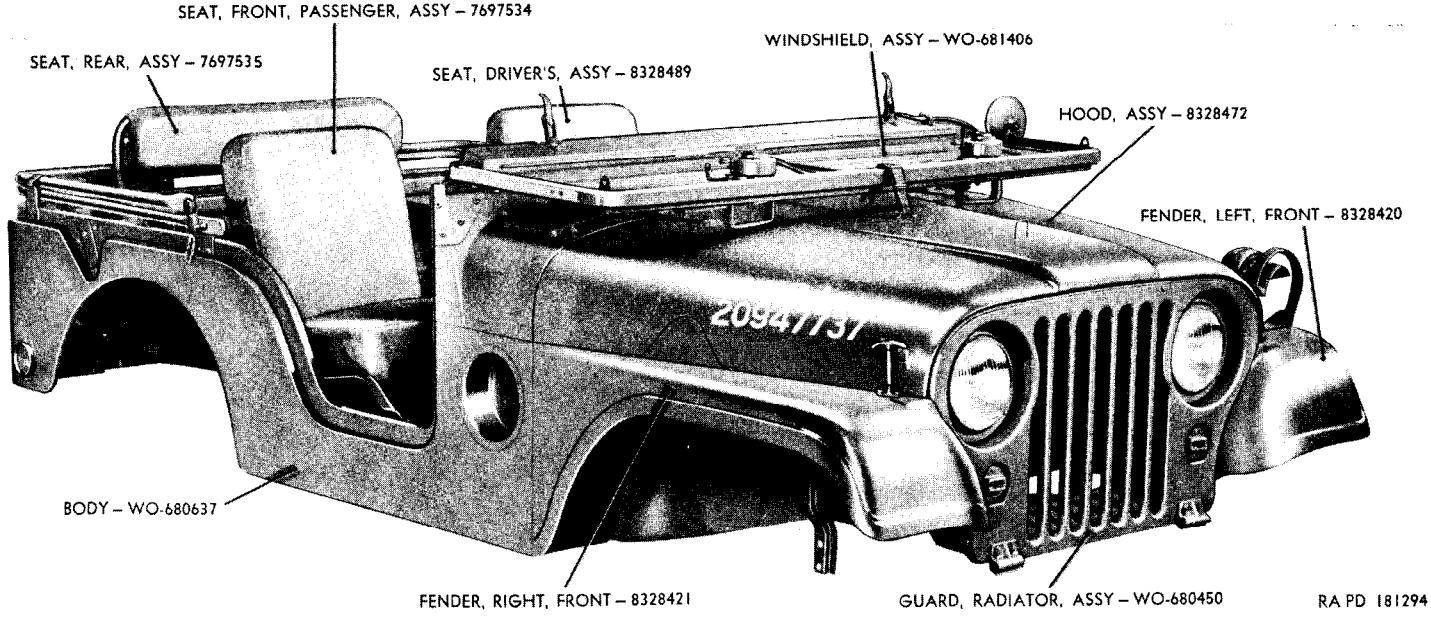


Figure 158. Body of ¼-ton 4 x 4 utility truck M38A1.

216. Data

Type	All steel, open
Construction	Welded
Type of steel	No. 18 gage
Width (edge of reflex reflectors)	60.38 in.
Length (to inside of dash panel)	80.13 in.

Section II. REMOVAL OF RELATED PARTS

217. General

a. Disassembly of Body Is Progressive. It is not necessary to remove related parts unless they are found to be faulty through inspection.

b. Preliminary Instructions. Disassembly instructions included in this chapter cover major items. Removal instructions for seat and fuel tank assemblies are covered in TM 9–804A. Refer to paragraph 48 for instructions relative to removal of body from vehicle. Paragraph 72 prescribes body installation instructions.

218. Remove Instrument and Glove Compartment Panels

a. Instrument Panel. To remove instrument panel (fig. 159) from body, proceed as follows:

(1) Remove seven lockwasher screws securing instrument panel to top of body cowl.

(2) Remove six lockwasher cap screws which secure right bottom side of instrument panel to the battery box brackets.

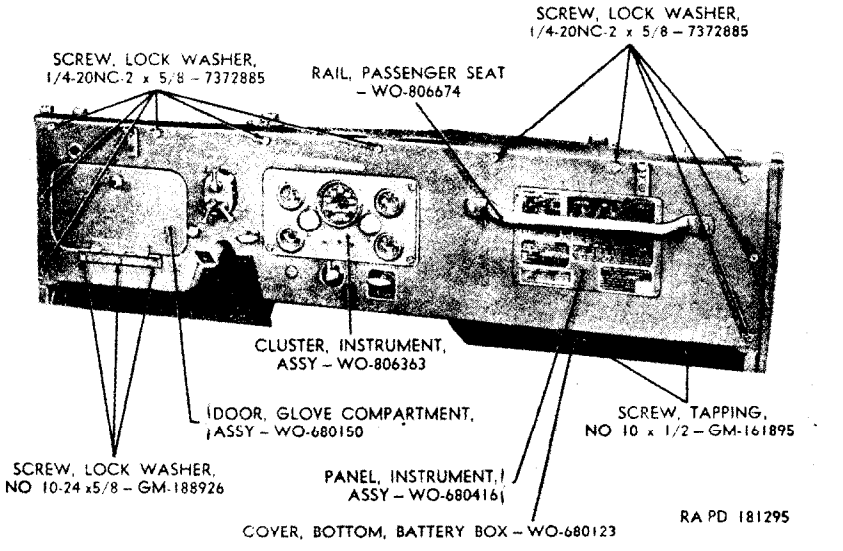


Figure 159. Instrument panel installed.

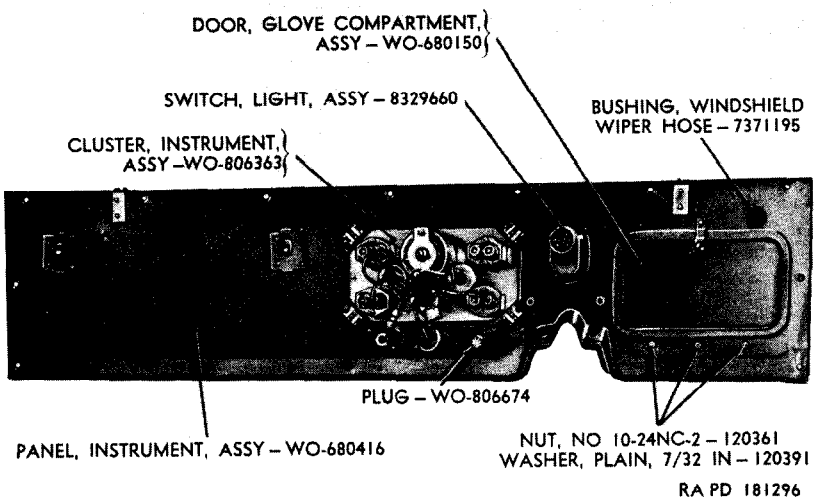


Figure 160. Rear of instrument panel.

(3) Remove two lockwasher cap screws which secure left bottom side of instrument panel to the glove compartment panel.
(4) Remove the four lockwasher cap screws (two on each side) securing right and left sides of instrument panel to body cowl.
(5) Open glove compartment door and remove the two lockwasher

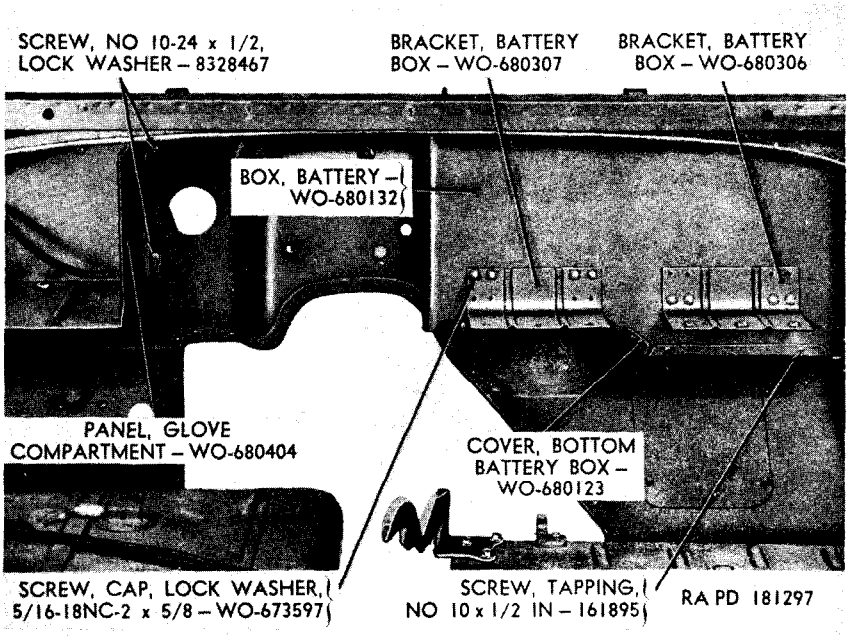


Figure 161. Body with instrument panel removed.

cap screws securing instrument panel to the glove compartment panel.

(6) Pull instrument panel from body cowl. Remove glove compartment door assembly (fig. 160), instrument cluster, and other parts, if necessary.

(7) Remove four lockwasher cap screws (fig. 161) (accessible from inside of battery box), securing each battery box bracket to battery box, and remove brackets. These attaching screws also secure bottom battery box tray.

b. Glove Compartment Panel (fig. 161). Remove two lockwasher screws securing right side of glove compartment panel to fire wall. Remove three lockwasher screws securing bottom of glove compartment panel to dash panel. Remove glove compartment panel from fire wall.

219. Remove Spare Wheel Support and Fuel Can Bracket Assemblies

a. Spare Wheel Support Bracket (fig. 162). Remove spare wheel and tire assembly (par. 45). Remove two lockwashers, nuts, carriage bolts and support spacers securing top of support bracket to top of

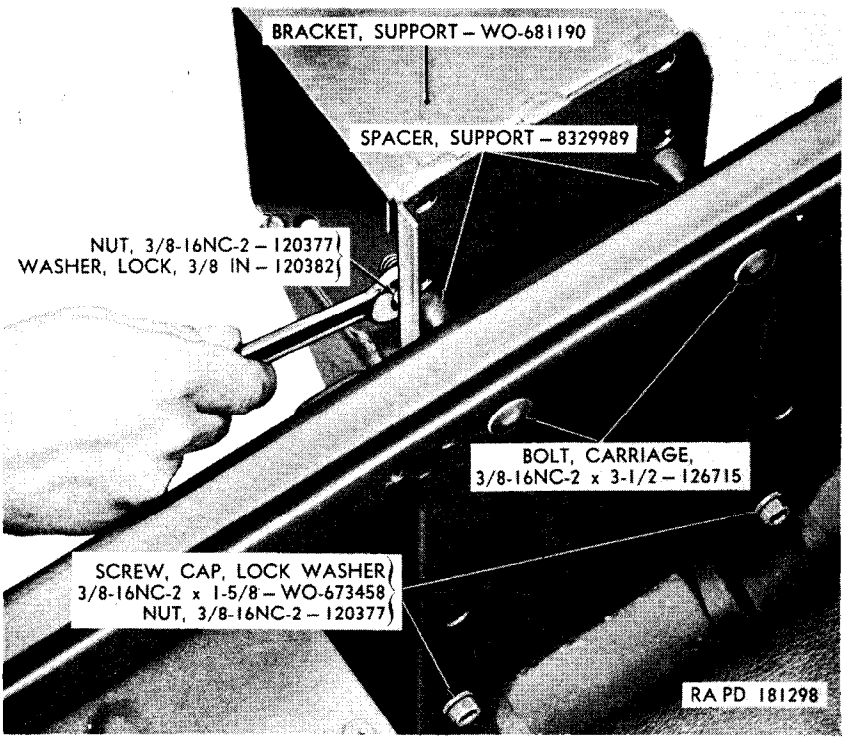


Figure 162. Removing spare wheel support bracket.

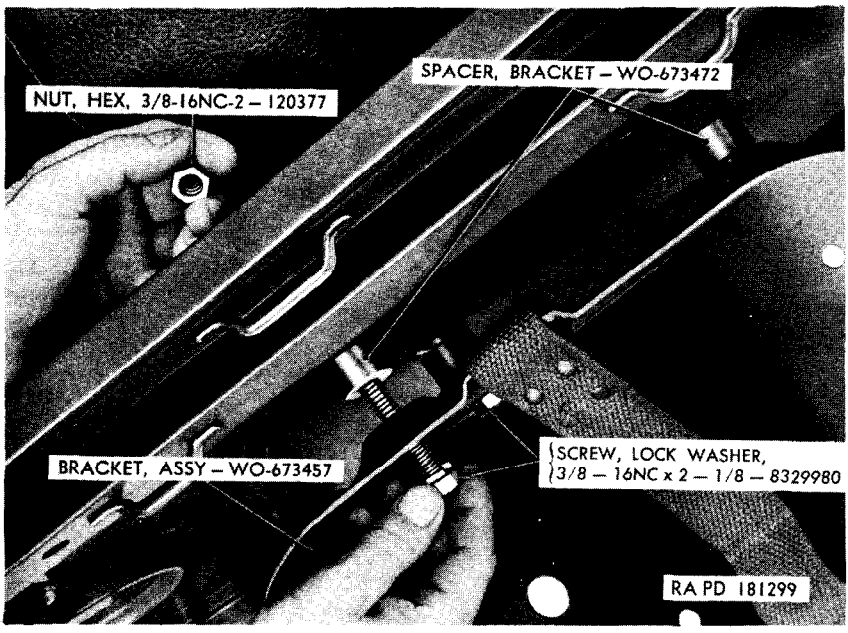


Figure 163. Removing spare fuel can bracket.

body rear panel. Remove two lockwasher cap screws and nuts securing bottom of support bracket to body rear panel. Remove support bracket from body rear panel.

b. Spare Fuel Can Bracket (fig. 163). Remove the four lockwasher cap screws, bracket spacers, and nuts which secure the bracket assembly to body rear panel and remove bracket assembly from body panel.

220. Remove Battery Box Trays

a. Remove four lockwasher cap screws which secure each battery box tray to dash panel: Remove four lockwasher cap screws securing each tray to rear of battery box.

Note. The latter screws also attach the battery box brackets.

b. Remove four tapping screws (fig. 161) which secure rear of the bottom battery box cover to battery box. Remove four tapping screws which secure rear of cover to fire wall and remove the cover.

Section III. REBUILD OF BODY

221. Body

a. Disassembly. It is not necessary to remove any brackets, hinges, or any other parts unless inspection reveals them unserviceable. If it is necessary to remove the female half-hinges (fig. 164), remove two knurled screws securing female half-hinge to side of body cowl.

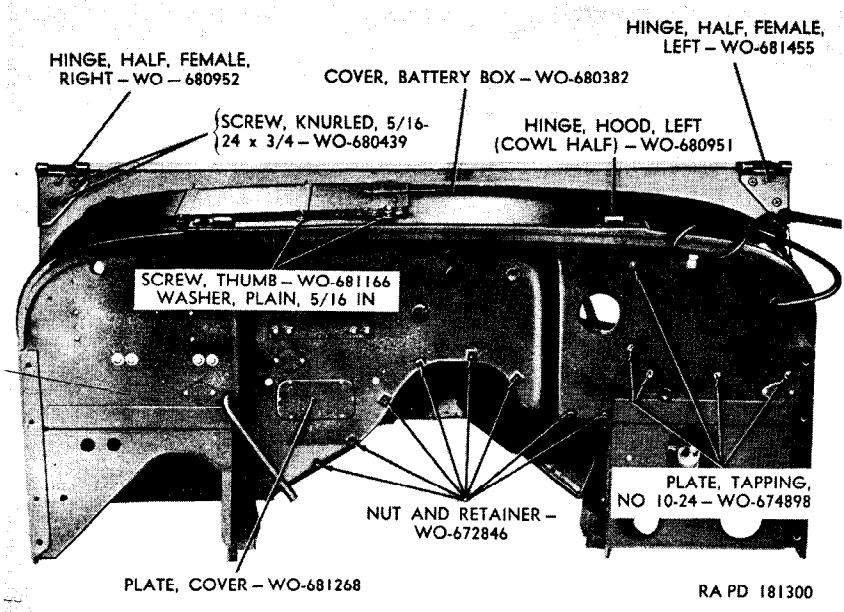


Figure 164. Front of body.

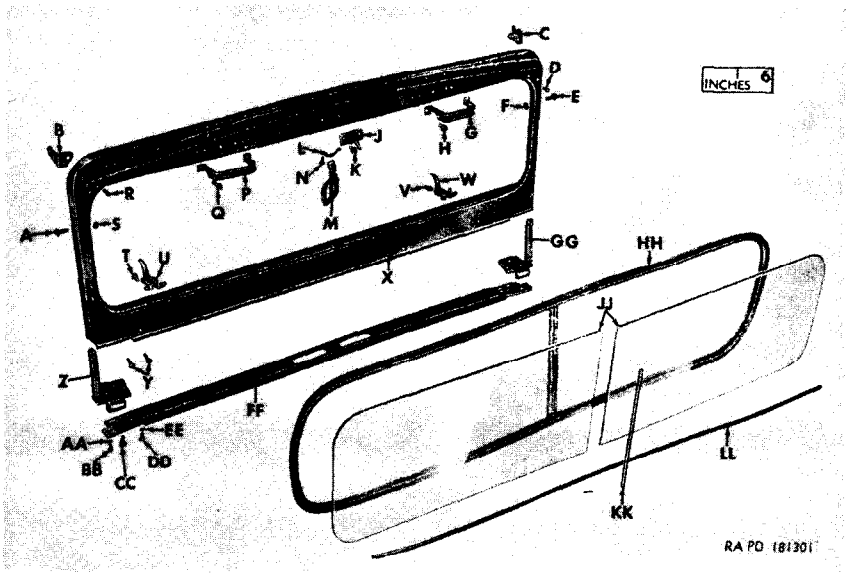
Remove two knurled screws securing front portion of female half-hinge to front of body cowl. Lift female half-hinge from body cowl.

b. Inspection and Repair.

(1) *Inspection.* Inspect body for bent or dented sections. Inspect brackets, footman loops, reflectors, instrument panel, spare wheel support bracket, spare fuel can bracket, battery box, and tool compartment for damage. Repair or replace damaged parts. See that all tapping plates, access plates, and nuts and retainers (fig. 164) are secure. Inspect the front floor pan upper and lower covers for bent or broken condition. Inspect left and right female half-hinges for damaged or bent condition.

(2) *Repair.* Straighten all dented or sprung sections. Repair cracks or breaks by welding. Sandpaper and paint all repaired sections. Weld all tapping plates and retainer nuts in place if they are loose or missing. Replace all damaged screws and bolts. Straighten dents on female half-hinges of windshield assembly.

c. Assembly. To install female half-hinges (fig. 164) place each one in position on body cowl and secure it with four $\frac{5}{16}$–24 x $\frac{3}{4}$ knurled screws.



A—Screw, cap, lockwasher, ¼–20NC–2 x 1¼—WO–680580
B—Bracket, top side rail support, right—WO–680822
C—Bracket, top side rail support, left—WO680821
D—Screw, cap, lockwasher, No. 10–24 x ½—WO680400
E—Screw, cap, lockwasher, ¼–20NC–2 x 1¼—WO–680580
F—Nut, ¼–20NC–2—120375
G—Bumper, left, assy—8328464.
H—Screw, cap, lockwasher, ¼–20NC–2 x ½—8328466
J—Catch, lock—7375312
K—Bolt, ¼–20NC–2 x ¾—120697
L—Loop, footman—7697591
M—Strap, holddown—8329655
N—Screw, tapping, No. 10–16 x ⅝—162688
P—Bumper, right, assy—8328465
Q—Screw, cap, lockwasher, ¼–20NC–2 x ½—8328466
R—Screw, cap, lockwasher, No. 10–24 x ½—WO–680400
S—Nut, ¼–20NC–2—120375
T—Bolt, lockwasher, ¼–20NC–2 x ⅝—7418145
U—Lock, assy—8329653
V—Bolt, lockwasher, ¼–20NC–2 x ⅝—7418145
W—Lock, assy—8329653
X—Frame, assy—8329652
Y—Bolt, lockwasher, 5/16–18NC–2 x 1—WO–680440
Z—Hinge, half, male, right—WO–681458
AA—Washer, plain, No. 10–120391
BB—Screw, No. 8–32NC–2 x ⅜—159582
CC—Screw, cap, lockwasher, 5/16–18NC–2 x ¾—443775
DD—Screw, tapping, No. 8–15 x ½—161860
EE—Washer, plain, No. 10—120391
FF—Weatherstrip—WO–680505
GG—Hinge, half, male, left—WO–681457
HH—Weatherstrip, glass—8329659
JJ—Glass—WO–680412
KK—Filler, weatherstrip, center bar—WO–680993
LL—Filler, weatherstrip, outer—8329651

Figure 165. Windshield assembly—disassembled view.

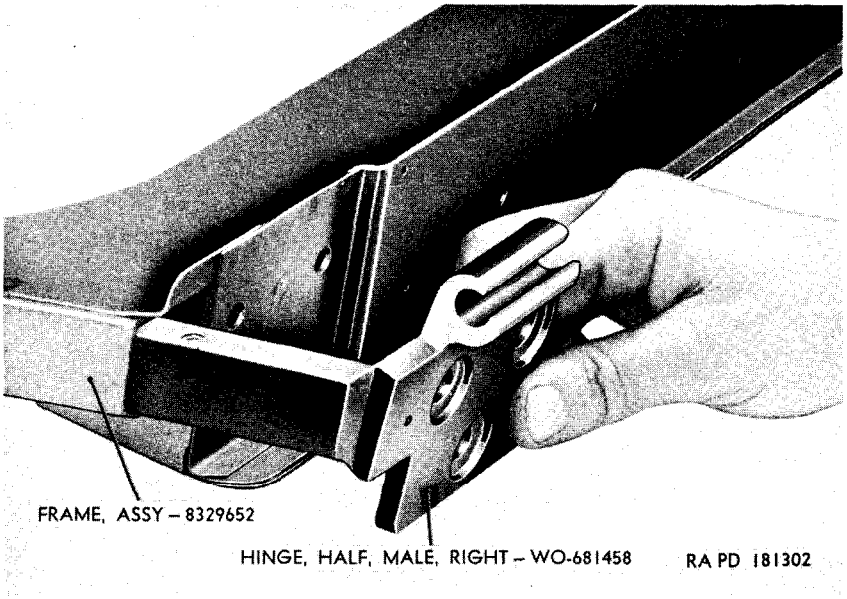


Figure 166. Removing windshield hinge.

222. Windshield Assembly

a. Disassembly. It is not necessary to disassemble the windshield assembly unless inspection reveals unserviceable parts.

(1) *Remove windshield weatherstrip* (fig. 165). Remove two screws (BB). Remove 11 tapping screws (DD) and 13 plain washers (AA). Remove weatherstrip (FF) from bottom of frame assembly (X).

(2) *Remove male half-hinges* (fig. 165). Remove two lockwasher bolts (Y), securing left and right male half-hinges to side of frame assembly. Remove three lockwasher cap screws (CC) securing each male half-hinge (Z and GG) to bottom of frame assembly (X). Pull male half-hinges from windshield frame (fig. 166).

(3) *Remove lock assembly* (fig. 165). Remove three lockwasher bolts (V) securing each lock assembly (U and W) to frame (X) and remove lock assembly from frame.

(4) *Remove lock catch* (fig. 165). Remove two bolts (K) securing lock catch (J) to frame and remove catch.

(5) *Remove bumper assemblies* (fig. 165). Remove four lockwasher cap screws (H) and (Q) securing the left and right bumper assemblies (G and P) to frame and remove bumpers.

(6) *Remove footman loop* (fig. 165). Remove two tapping screws (N) which secure footman loop (L) to frame. Remove footman loop. Pull holddown strap (M) from footman loop.

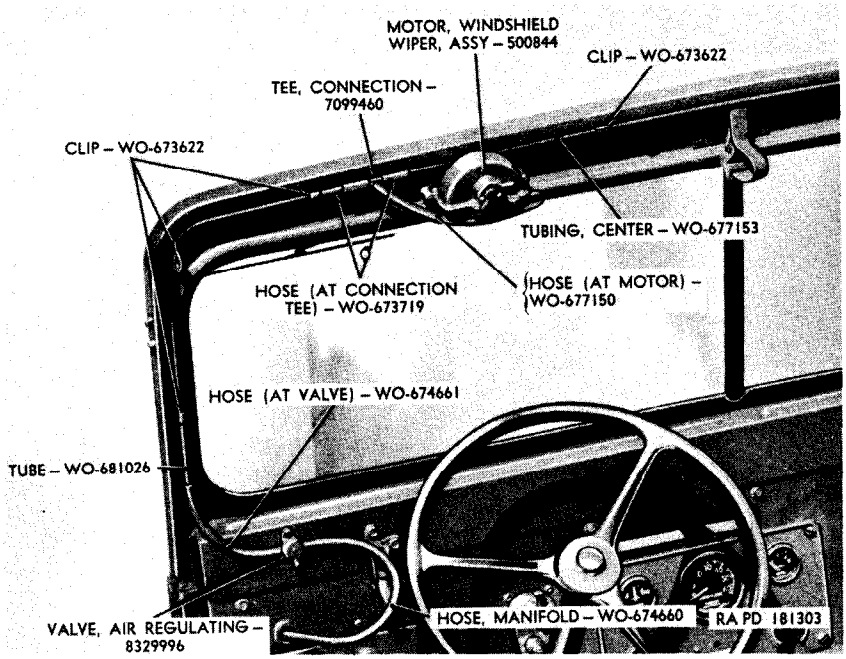
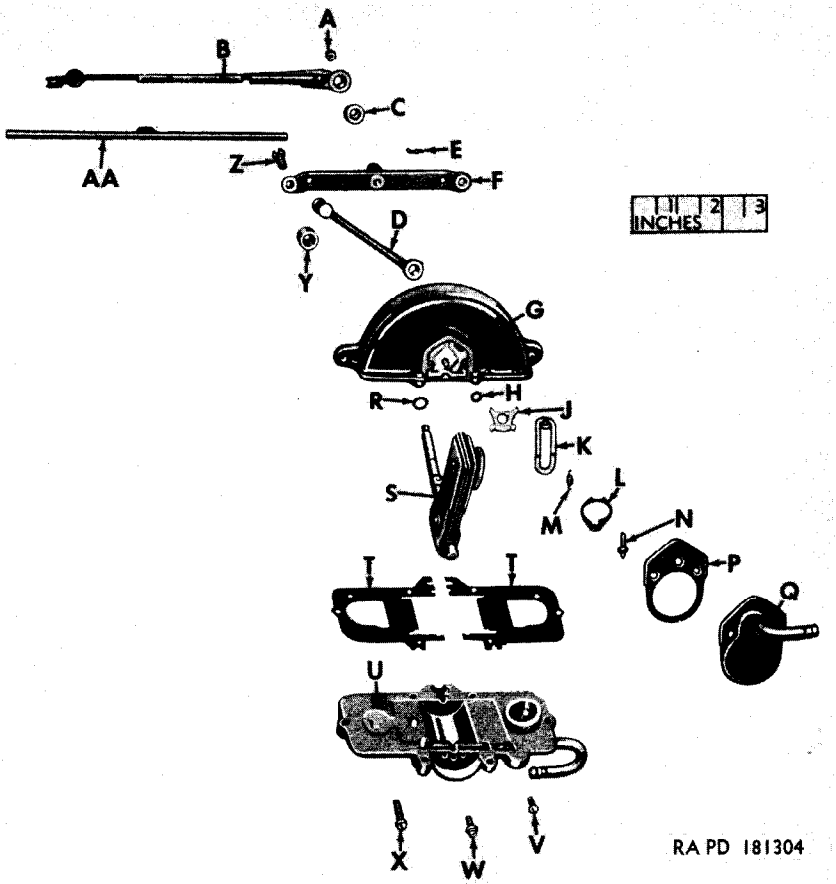


Figure 167. Windshield wiper hoses and tubing.

(7) *Remove windshield glass* (fig. 165). Remove the center bar weatherstrip filler (KK) and outer weatherstrip filler (LL) from glass weatherstrip (HH). Remove the glass (JJ) from the glass weatherstrip.

(8) *Remove windshield wiper tubes and hoses* (fig. 167). Remove two lockwasher screws which secure air regulating valve assembly to windshield frame and remove valve. Remove the hose (at valve) from between the air regulating valve and tube. Remove 3 tapping screws which secure the 3 clips, and pull the tube free of the hose (at connection tee). Remove the hose from the left windshield wiper motor assembly. Remove 2 lockwasher screws securing 2 clips and pull the center tubing free of the connection tee and hose connected to right windshield wiper motor. Pull windshield wiper hoses (at connection tee) from the connection tee.

(9) *Remove windshield wiper motor assembly* (fig. 168). Remove blind nut (A) and pull windshield wiper adjustable arm (B) and knurled driver (C) off shaft of the paddle assembly (S). Remove two screws (Z), which secure windshield wiper motor



A—Nut, blind, No. 10-32NF-2—7058965
B—Arm, adjustable, windshield wiper, assy—500810
C—Driver, knurled—7372262
D—Handle, assy—WO-118568
E—Pin, set, handle—TRI-87453
F—Plate, assy—TRI-82812-41
G—Housing—WO-118550
H—Washer, felt—TRI-8741-3
J—Valve, slide—WO-118558
K—Retainer, valve—A327338
L—Yoke, valve kicker—TRI-2617
M—Spring—TRI-2620
N—Kicker, valve—TRI-2618-17
P—Gasket, valve cover—TRI-8894-3
Q—Cover, valve—TRI-8896-1
R—Seal—WO-118552
S—Paddle, assy—TRI-P86631-I-J
T—Gasket, top cover—TRI-87652
U—Cover, top—TRI-86521-3
V—Screw, top cover—TRI-1900-IR
W—Screw, top cover—TRI-1900
X—Screw, valve cover—TRI-1863-8
Y—Spacer, mounting, windshield wiper—8329997
Z—Screw, lockwasher, No. 10-32 x ⅞ (mounting)—TRI-1727-28
AA—Blade, windshield wiper, assy—500813

Figure 168. Windshield wiper motor assembly—disassembled view.

to windshield frame, and remove windshield wiper motor and two mounting spacers (Y).

Note. Procedures for removing the left and right windshield wiper motors are identical.

(10) *Disassemble windshield wiper motor* (fig. 168).

Note. Do not disassemble windshield wiper motor unless it is faulty.

Remove handle set pin (E) and pull handle assembly (D) from paddle assembly (S). Remove two top cover screws (V) and four top cover screws (W) and follow by removing top cover (U) and top cover gasket (T) from housing (G). Remove two valve cover screws (X) and remove valve cover (Q) and valve cover gasket (P). Remove valve kicker yoke (L), spring (M), valve kicker (N), and valve retainer (K). Pull slide valve (J) and felt washer (H) from paddle assembly (S). Lift paddle assembly from within housing (G). Remove seal (R) from paddle assembly.

b. Inspection and Repair.

(1) *Inspection.*

(*a*) *Windshield assembly* (fig. 165). Inspect the windshield frame assembly (X) for dents, distortion, and broken condition. Check left and right male half-hinges (Z and GG) for damage and excessive wear. See that the lock catch (J) and lock assemblies (U and W) operate properly. Replace the weatherstrip assembly (FF), glass weatherstrip (HH), outer weatherstrip filler (LL), and center bar weatherstrip filler (KK) if they are deteriorated, hardened, or excessively damaged. Replace all damaged screws, nuts, and bolts. Replace cracked or broken glass (JJ).

(*b*) *Windshield wiper motor* (fig. 168). Inspect the housing (G), valve cover (Q), and top cover (U) for cracks, damaged mating surfaces, and distortion. Replace housing, valve cover, and top cover, if necessary. Check the paddle assembly (S) for wear and damage to shaft and for hardening and deterioration of the paddle. Replace paddle assembly, if necessary. Replace slide valve (J), valve retainer (K), valve kicker yoke (L), and valve kicker (N), if they are worn or damaged. Replace the spring (M), if it is broken or distorted. Replace felt washer (H), valve cover gasket (P), seal (R), and top cover gasket (T) at each rebuild. Replace all other worn or damaged parts.

(2) *Repair.*

(*a*) *Windshield assembly* (fig. 165). Repair bent or dented frame assembly (X) by straightening. To remove worn or damaged left and right bumper liners from left and right

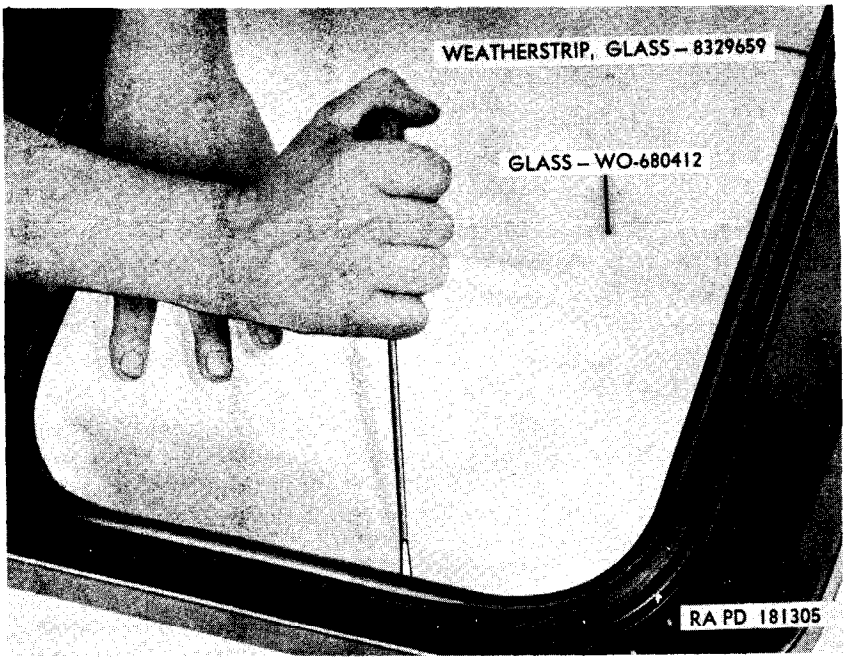


Figure 169. Installing windshield glass weatherstrip.

bumpers (G and P), remove four split rivets securing each liner to bumper. Install new liner on bumper and secure with four 9/64 x 7/16 split rivets.

(*b*) *Windshield wiper motor* (fig. 168). Remove all burs, abrasions, and scratches from mating surfaces of housing (G), valve cover (Q), and top cover (U) with a fine mill file.

c. Assembly.

(1) *Assemble windshield assembly* (fig. 165).

(*a*) *Install male half-hinges.* Coat the left and right male half-hinges (Z and GG) with glass cement and install hinges in windshield frame. Secure each hinge with three 5/16–18NC–2 x 3/4 lockwasher cap screws (CC) and two 5/16–18NC–2 x 1 lockwasher bolts (Y).

(*b*) *Install windshield weatherstrip.* Place weatherstrip assembly (FF) at bottom of frame assembly (X) so that lipped portion of weatherstrip slips over rim on lower front of frame. Secure weatherstrip with 13 No. 10 plain washers (AA), 11 No. 8–15 x 1/2 tapping screws (DD), and 2 No. 8–32NC–2 x 3/8 screws (BB).

(*c*) *Install lock assembly.* Secure each lock assembly (U and W) to windshield frame with three 1/4–20NC–2 x 5/8 lockwasher bolts (T).

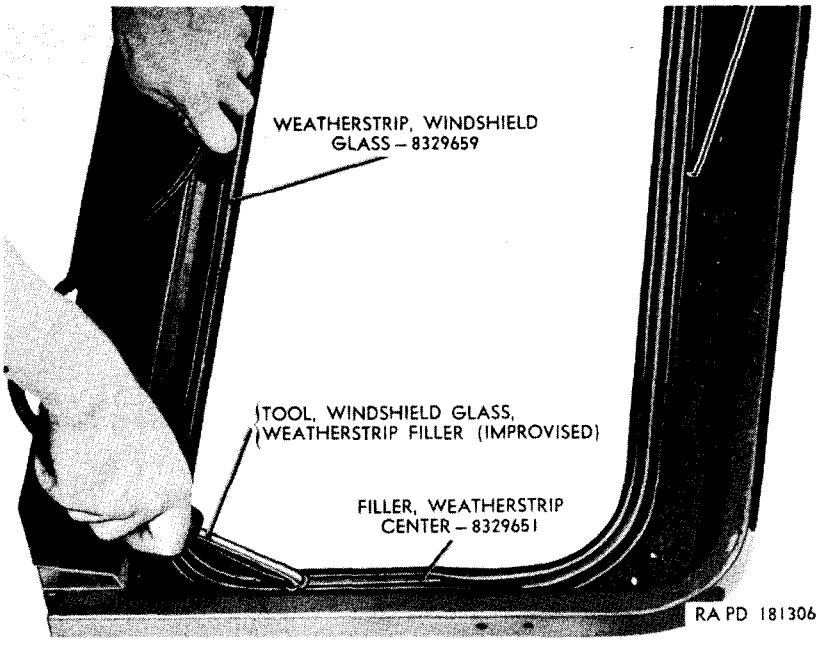


Figure 170. Installing outer windshield glass weatherstrip filler.

(*d*) *Install lock catch.* Secure lock catch (J) to frame with two ¼–20NC–2 x ¾ bolts (K).

(*e*) *Install footman loop.* Place hold-down strap (M) on footman loop (L). Secure footman loop and strap to frame with two No. 10–16 x ⅝ tapping screws (N).

(*f*) *Install windshield glass.* Soap flange of frame with liquid soap. Install glass weatherstrip (HH) over flange of windshield frame. Position windshield glass in upper left corner of weatherstrip at center bar of weatherstrip. Continue guiding glass in place in the weatherstrip using a screwdriver to slip upper portion of weatherstrip over glass (fig. 169).

Note. Position windshield glass so trade name reads right side up.

Install other windshield glass in same manner. Soap interior of improvised windshield glass weatherstrip filler tool (figs. 9 and 170) and insert end of outer weatherstrip filler (LL) through loop end of tool and handle. Soap interior slot of windshield glass weatherstrip. Using a screwdriver, insert end of filler into weatherstrip at upper right side. Install outer weatherstrip filler into weatherstrip by guiding filler into weatherstrip with improvised weatherstrip filler tool. Install center bar weatherstrip filler (fig. 171) with filler tool in same manner.

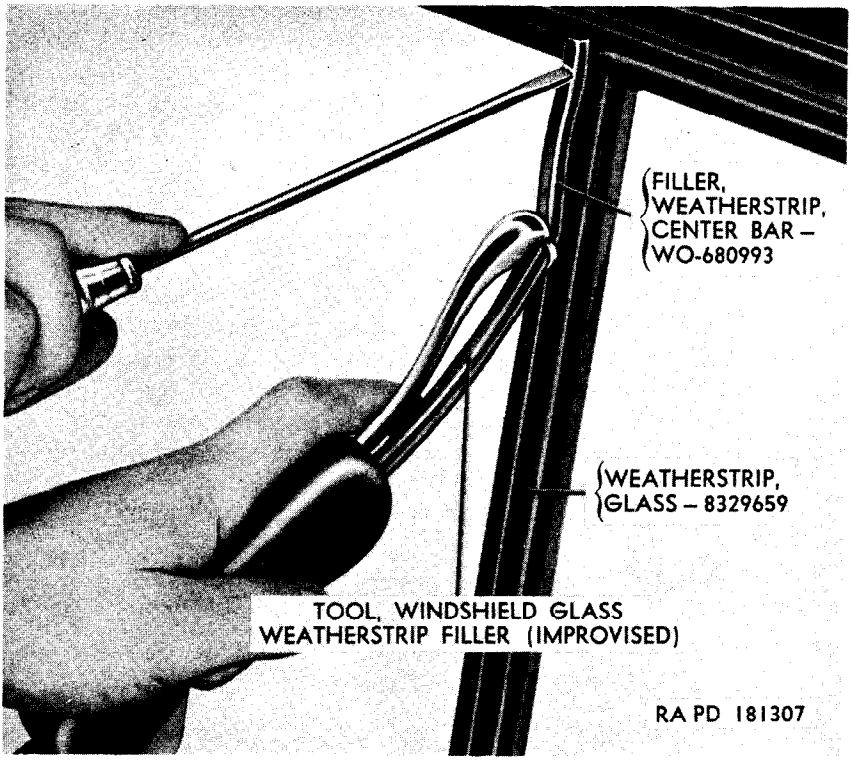


Figure 171. Installing windshield glass center bar weatherstrip filler.

(*g*) *Install bumper assemblies.* Secure left and right bumper assemblies (G and P) to windshield frame (X) with four ¼–20NC–2 x ½ lockwasher cap screws (H and Q).

(2) *Assemble windshield wiper motor* (fig. 168). Install seal (R) on paddle assembly (S) and position paddle assembly in housing (G). Coat paddle assembly with general purpose lubricating grease. Install top cover gasket (T) on top cover (U). Secure top cover and top cover gasket to housing (G) with two top cover screws (V) and four top cover screws (W). Position felt washer (H) and slide valve (J) on paddle assembly (S). Assemble valve retainer (K), valve kicker yoke (L), spring (M), and valve kicker (N) together and insert them by the paddle assembly (S). Secure valve cover gasket (P) and valve cover (Q) to housing (G) with two valve cover screws (X). Secure plate assembly (F) to housing (G) with two windshield wiper mounting spacers (Y) and mounting screws (Z). Secure handle assembly (D) to plate by pressing handle set pin (E) in place.

Note. Cement valve cover gasket (P) and top cover gasket (T) to valve cover, top cover, and windshield wiper motor housing with plastic type gasket cement.

(3) *Install windshield wiper motor assembly* (fig. 168). Insert shaft of plate assembly (F) in hole at top of windshield frame. Secure windshield wiper motor with two mounting spacers (Y) and No. 10–32 x ⅞ lockwasher screws (Z). Position knurled driver (C) and adjustable arm (B) on shaft of paddle assembly (S) parallel to handle assembly (D) and secure with No. 10–32NF–2 blind nut (A).

(4) *Install windshield wiper tubes and hoses* (fig. 167). Secure center tubing to top of windshield frame with two clips. Secure clips with two No. 10 x ½ tapping screws. Position tube on left of windshield frame and secure its three clips with No. 10 x ½ tapping screws. Secure air regulating valve to windshield frame with two No. 10–24 x ½ lockwasher screws. Install two hoses (at connection tee) to connection tee and connect hoses to center tubing and tube at left of windshield frame. Connect windshield wiper motor assemblies to tubing with the hoses. Connect air regulating valve to tube with the hose (at valve).

223. Seat Assemblies

a. Disassembly. It is not necessary to disassemble seat assemblies unless inspection (*b* below) reveals them unserviceable.

(1) *Front seats.* Remove 12 screws and washers securing back cover to seat frame and remove back cover, back pad, and spring assembly. Remove two lockwasher screws which which secure seat cushion assembly to seat frame. Slip seat cushion assembly to clear two clips on rear of seat frame and remove seat cushion from seat frame. Straighten 18 clips and remove bottom cover and bottom pad. Straighten four clips securing bottom springs to seat bottom and remove springs.

(2) *Rear passenger seat.* Remove 5 screws and washers securing back rear seat cover to top of frame and 5 screws and washers securing it to the bottom of frame. Remove back rear seat cover, padding, and springs. Remove bottom seat cover, padding, and springs in same manner.

b. Inspection and Repair.

(1) *Inspection.* Inspect covers for ripped or torn condition. Inspect seat frames for cracks, breaks, and bent condition. Replace excessively damaged covers and padding.

(2) *Repair.* Straighten bent seat frames, if necessary. Weld all broken parts of seat frames. Sew damaged seams of cover.

c. Assembly.

(1) *Front seats.* Place springs in position on seat bottom and secure them to seat frame by bending over four clips.

Install pad and cover. Tighten cover loops and secure them by bending over a clip on seat frame. Secure cover by bending over the remaining 17 clips. Slip seat cushion in seat frame and secure seat cushion with two 5/16–24 x 5/8 lockwasher screws. Install seat back springs, pad, and cover. Secure cover with 12 No. 10 washers and No. 10 x 1/2 screws.

(2) *Rear passenger seat.* Put springs, padding, and cover in place on bottom of seat and secure cover in place with 10 No. 10 x 1/2 screws and washers. Put springs, padding, and cover in place on back of seat. Secure cover to frame with 10 No. 10 x 1/2 screws and washers, 5 in top of frame and 5 in bottom.

224. Fuel Tank Assembly

(fig. 172)

a. Disassembly. It is not necessary to disassemble fuel tank unless inspection (*b* below) reveals damage. Refer to TM 9–804A for removal of fuel tank from body.

(1) *Remove fuel gage sending unit assembly from fuel tank.* Refer to TM 9–804A.

(2) *Remove fuel filter assembly from fuel tank.* Refer to TM 9–804A.

(3) *Disassemble fuel filter assembly.* Remove nut (K), lockwasher (L), and screw (P). Remove end plate (N) and fuel filter element (M). Disconnect the upper end plate assembly (J) from cover plate assembly (E) by unscrewing the upper end plate connection. Remove six bolts (A) and then remove the air vent assembly (B) and air vent gasket (C) from top of cover plate assembly (E).

b. Inspection and Repair.

(1) *Inspection.*

(*a*) *Fuel tank.* Check fuel tank (CC) for cracks or damage. Test fuel tank for leaks. Tank must withstand 3 psi air pressure without showing leaks at seams or fittings. Replace filler cap assembly (GG), filler tube strainer (EE), drain plug (AA), and mounting strap (V) if damaged or worn. Replace the filler neck grommet (DD) and cap gasket (FF) at each rebuild.

(*b*) *Fuel filter assembly.* Inspect air vent assembly (B), cover plate assembly (E), upper end plate assembly (J), end plate (N), and screw (P) for damage. Replace all faulty parts. Replacement of fuel filter element (M) is covered in TM 9–804A. Replace air vent gasket (C) and cover plate gasket (Q) at each rebuild.

(*c*) *Fuel gage sending unit.* Replace an improperly operating fuel gage sending unit (S). Replace the fuel gage sending unit gasket (T) at each rebuild.

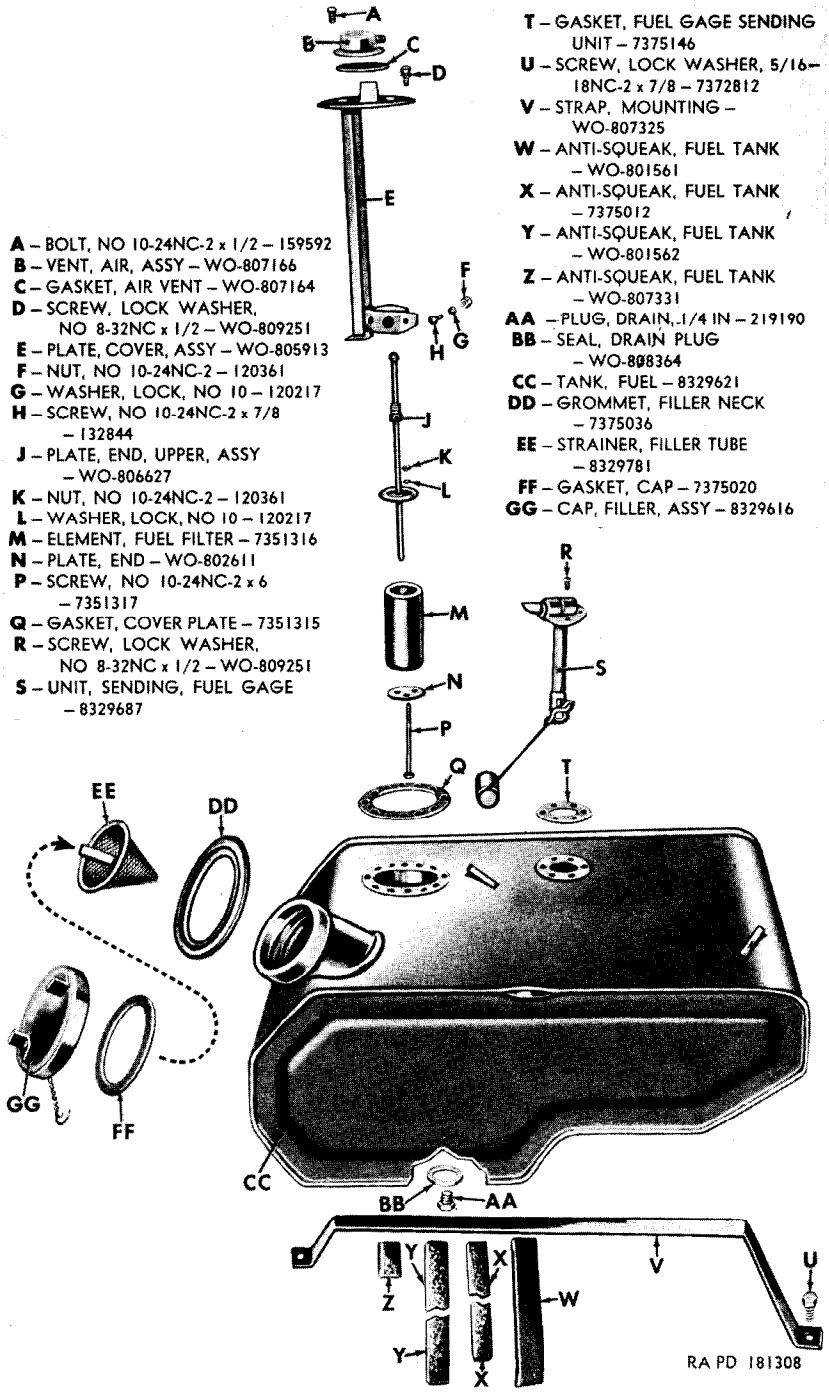


Figure 172. Fuel tank assembly—disassembled view.

(2) *Repair.* Small leaks at seams and joints of fuel tank (CC) may be repaired by soldering. Use paste flux to eliminate spattering.

Warning: Do not attempt fuel tank repair unless tank has been cleaned and properly treated to be free of all explosive or inflammable fumes. Thoroughly steam tank (or use other approved method) to completely remove all fumes.

c. *Assembly.*

(1) *Assemble fuel filter assembly.* Secure air vent assembly (B) and air vent gasket (C) to top of cover plate assembly (E) with six No. 10–24NC–2 x ½ bolts (A). Place end plate (N) at bottom of fuel filter element (M) and insert upper end plate (J) in top of element. Install No. 10–24NC–2 x 6 screw (P), and secure end plate, element, and upper end plate together with No. 10 lockwasher (L) and No. 10–24NC–2 nut (K). Slide fuel filter element through bracket of cover plate assembly (E) and connect vent line to bracket of cover plate assembly and to line connector of cover plate assembly. Secure fuel filter element to cover plate bracket with No. 10–24NC–2 x ⅞ screw (H), No. 10 lockwasher (G), and No. 10–24NC–2 nut (F).

(2) *Install fuel filter assembly in fuel tank.* Refer to TM 9–804A.

(3) *Install fuel gage sending unit (S) in fuel tank.* Refer to TM–9–804A.

(4) *Install fuel tank in vehicle.* Refer to TM 9–804A.

Section IV. INSTALLATION OF RELATED PARTS

225. Install Instrument and Glove Compartment Panels

a. Glove Compartment Panel. Place glove compartment panel (fig. 161) in position on fire wall. Secure panel with five No. 10–24 x ½ lockwasher screws (two securing right side of panel and three securing bottom of panel).

b. Instrument Panel. Position instrument panel on body cowl. Install eleven ¼–20NC–2 x ⅝ lockwasher screws at front of panel as shown in figure 159. Install eight ¼–20NC–2 x ⅝ lockwasher screws to secure panel to battery box brackets and glove compartment panel. Open glove compartment door and install two No. 10–24 x ½ lockwasher screws which secure instrument panel to glove compartment panel.

226. Install Spare Wheel Support and Fuel Can Bracket Assemblies

a. Spare Wheel Support Bracket (fig. 162). Position support bracket at rear of body rear panel. Secure top of bracket with two

⅜–16NC–2 x 3½ carriage bolts, support spacers, ⅜-inch lock washers, and ⅜–16NC–2 nuts. Secure bottom of bracket with two ⅜–16NC–2 x 1⅝ lockwasher cap screws and ⅜–16NC–2 nuts.

b. Spare Fuel Can Bracket (fig. 163). Secure bracket to body rear panel with four ⅜–16NC x 2⅛ lockwasher screws, bracket spacers, and ⅜–16NC–2 hex nuts.

227. Install Battery Box Trays

a. Secure each battery box tray to fire wall with four $\frac{5}{16}$–18 x ¾ lockwasher cap screws. Secure each tray to rear of battery box with $\frac{5}{16}$–18 x ¾ lockwasher screws.

b. Secure bottom battery box cover (fig. 161) to battery box with eight No. 10 x ½ tapping screws.

CHAPTER 14
HOOD AND FENDERS

Section I. DESCRIPTION AND DATA

228. Description

a. Hood (fig. 173). The hood is a formed and reinforced metal panel which covers the engine compartment. It is locked to the fenders during vehicle operation by spring-loaded hood catches mounted on the tops of the fenders. Two quick disconnect type hood hinges on hood and hood hinge pins on body cowl are provided for securing hood to vehicle. A shovel blade retainer and stowage shovel

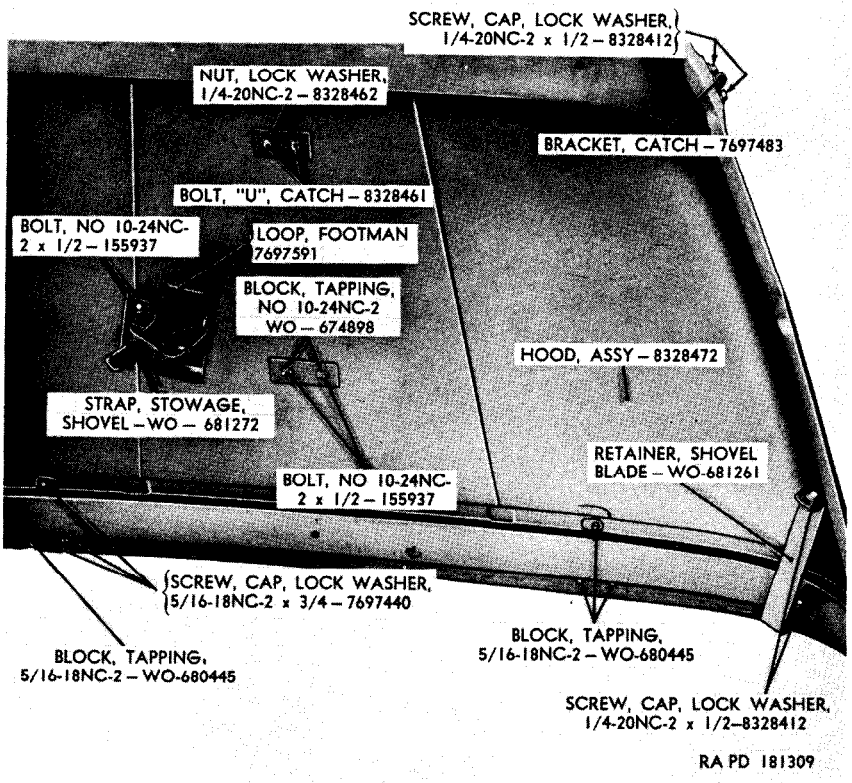


Figure 173. Underside of hood and rleated parts.

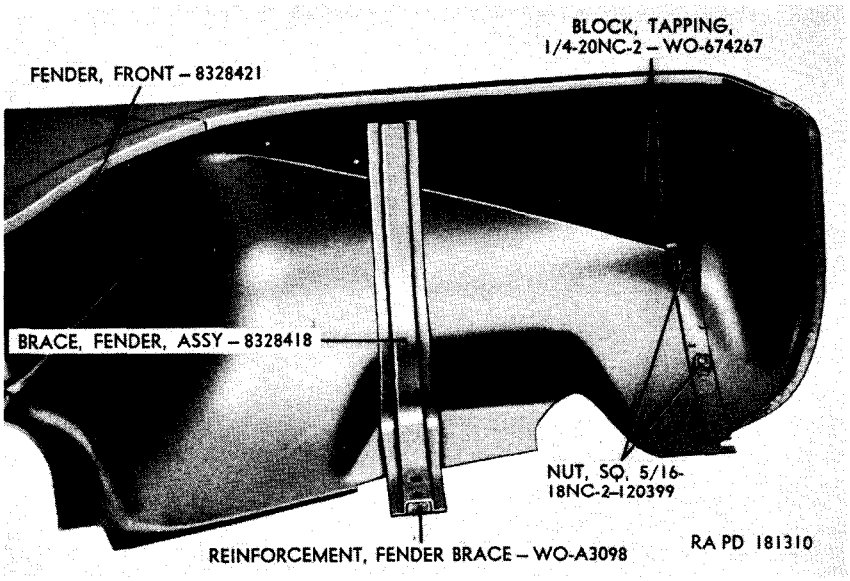


Figure 174. Underside of right front fender.

strap are provided on the underside of the hood for storage of the vehicle spare shovel.

b. Fenders (figs. 174 and 175). Both front fenders are similar in design and construction. They are secured to the body, radiator guard assembly, and frame in an identical manner. The left front fender, however, mounts the blackout driving light and guard, horn, and clips for securing the vehicle wiring harness and fuel line.

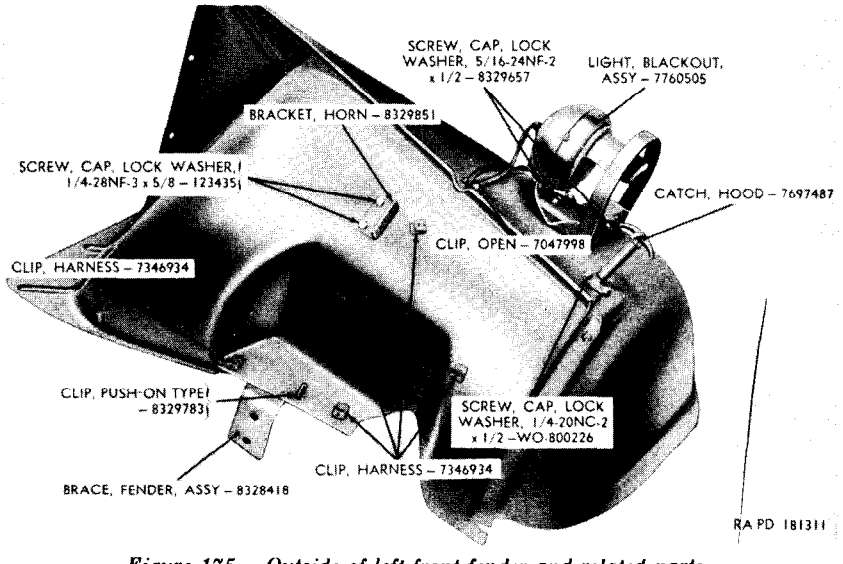


Figure 175. Outside of left front fender and related parts.

229. Data

a. Hood Assembly.

Length	34¾ in.
Width	59½ in.

b. Fenders.

Height	17¾ in.
Length	38¾ in.

Section II. REBUILD OF HOOD ASSEMBLY

230. Disassembly

(fig. 173)

It is not necessary to remove associated parts from the hood assembly unless inspection (par. 231*a*) reveals them to be faulty.

a. Remove Shovel Blade Retainer. Remove two lockwasher cap screws and remove shovel blade retainer assembly from hood.

b. Remove Shovel Stowage Strap. Remove the two bolts which secure footman loop. Unbuckle shovel stowage strap assembly from welded footman loop. Remove strap assembly from hood.

c. Remove Catch Brackets. Remove two lockwasher cap screws and nuts which secure each catch bracket to top of hood. Remove catch bracket.

d. Remove Hood Hinge Assemblies. Remove three lockwasher cap screws securing each hood hinge assembly to top of hood and remove hinges.

e. Remove Hood Breather Tube Hole Cover. Remove two lockwasher cap screws securing hood breather tube hole cover to side of hood and remove the cover.

f. Remove Catch U-bolt. Remove two lockwasher nuts on underside of hood. Remove catch U-bolt from top of hood.

g. Remove Footman Loop. Remove two bolts which secure footman loop to top of hood and remove the loop.

231. Inspection and Repair

(fig. 173)

a. Inspection.

(1) *Hood.* Inspect hood for cracks, dents, or fractures. Check all tapping blocks at underside of hood for looseness, damage, or wear. Check hood for fit on body, and straighten or replace if sprung or distorted.

(2) *Shovel blade retainer and shovel stowage strap.* Inspect these parts for damage and wear. Replace shovel blade retainer and shovel stowage strap, if necessary.

(3) *Catch brackets.* Replace the catch brackets if they are damaged or worn.

(4) *Hood hinge assemblies.* Inspect hood hinge assemblies for cracks, damage, and wear, and replace, if necessary.

(5) *Hood breather tube hole cover.* Inspect hood breather tube hole cover for dents, distortion, or other damage. Replace cover if it cannot be repaired by straightening.

(6) *Catch U-bolt and footman loops.* Replace broken or distorted catch U-bolt and footman loops.

(7) *Bolts, cap screws, and nuts.* Replace all damaged bolts, screws, and nuts.

b. Repair.

(1) *General.* No established procedures are set forth for repair of components in this paragraph since there can be considerable variation to damage of sheet metal parts.

(2) *Hood.* Tack weld any loose tapping blocks to underside of hood. Clean all tapped holes in tapping blocks with standard taps. Straighten bent or sprung hood, if necessary. Remove dents and repair cracks by welding.

232. Assembly

(fig. 173)

a. Install Shovel Blade Retainer. Secure shovel blade retainer to underside of hood with two ¼–20NC–2 x ½ lockwasher cap screws.

b. Install Shovel Stowage Strap. Slip shovel stowage strap assembly over footman loop. Secure footman loop and shovel stowage strap assembly to underside of hood with two No. 10–24NC–2 x ½ bolts.

c. Install Catch Brackets. Secure each catch bracket to top of hood with two ¼–20NC–2 x ½ lockwasher cap screws.

d. Install Hood Hinge Assemblies. Position each hood hinge assembly on top of hood. Install three 5/16–18NC–2 x ¾ lockwasher cap screws in each hinge assembly.

e. Install Hood Breather Tube Hole Cover. Place hood breather tube hole cover in position on right side of hood and secure cover with two No. 10–24NC–2 x ½ internal-teeth lockwasher cap screws.

f. Install Catch U-Bolt. Insert catch U-bolt through top of hood. Secure catch U-bolt with two ¼–20NC–2 lockwasher nuts at underside of hood.

g. Install Footman Loop. Secure footman loop to top of hood with two No. 10–24NC–2 x ½ bolts.

Section III. REBUILD OF FENDERS

233. Disassembly

a. Right Front Fender. The right front fender (fig. 174) requires no disassembly except for removal of the hood catch. Do not remove hood catch unless inspection (par. 234*a*) reveals it to be unserviceable. To remove hood catch (fig. 175), remove two lockwasher cap screws.

b. Left Front Fender (fig. 175 and 176). Do not remove the horn

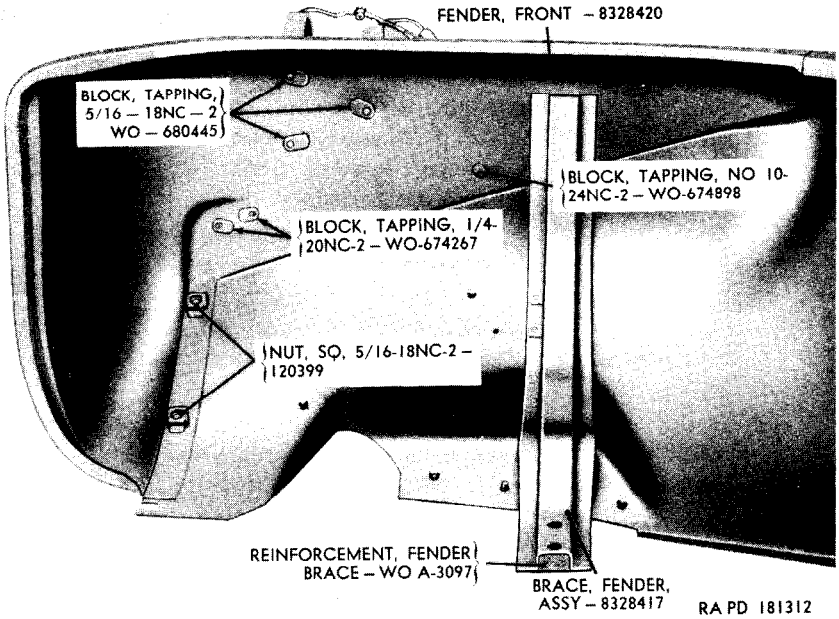


Figure 176. Underside of left front fender.

bracket, blackout driving light assembly, hood catch, push-on type clip, and wiring harness clips unless inspection (par. 234*a*) reveals them unserviceable.

(1) *Remove horn bracket.* Remove two lockwasher cap screws securing horn bracket to side of fender and remove horn bracket.

(2) *Remove blackout light assembly.* Remove cap screw securing open clip to fender and remove clip. Remove three lockwasher cap screws and remove blackout light assembly.

(3) *Remove hood catch.* Refer to *a* above.

(4) *Remove wiring harness and push-on type clip.* Pull the six wiring harness clips and the one push-on type clip (secures fuel line) from their retaining holes in left front fender.

234. Inspection and Repair

(figs. 174, 175, and 176)

a. Inspection. Inspect front fenders for dents, cracks, and sprung condition. Inspect the fender brace reinforcements and replace them, if necessary. Replace hood catches if they operate improperly. Check all tapping blocks on underside of fenders for damage and looseness. See that square nuts are in good condition and securely held by their retainers. Replace all damaged wiring harness and

push-on type clips. Replace horn bracket, if damaged. Replace a faulty blackout driving light assembly (TM 9–804A).

b. Repair. No repair procedures can be established for repair of fenders since damage to sheet metal parts varies considerably. Straighten bent or sprung fenders. Remove dents. Tack weld all loose tapping blocks. Clean faulty threads in tapping blocks with standard taps. Repair cracks and fractures by welding.

235. Assembly

a. Right Front Fender. Secure hood catch (fig. 175) with two ¼–20NC–2 x ½ lockwasher cap screws.

b. Left Front Fender (figs. 175 and 176).

(1) *Install horn bracket.* Secure horn bracket to left front fender with two ¼–28NF–3 x ⅝ lockwasher cap screws.

(2) *Install blackout light assembly.* Position blackout light assembly on top of left front fender and secure with two 5/16–24NF–2 x ½ lockwasher cap screws and one 5/16–24NF–2 x ¾ lockwasher cap screw. Secure open clip to top of left front fender with a No. ¼–24NC–2 x ½ cap screw.

(3) *Install hood catch.* Refer to *a* above.

(4) *Install wiring harness and push-on type clips.* Install the six wiring harness clips and one push-on type clip by inserting them in their retaining holes in the left front fender.

CHAPTER 15

RADIATOR AND RADIATOR GUARD WITH HINGES AND HOOD LINER

Section I. DESCRIPTION AND DATA

236. Description

(fig. 177)

a. Radiator. The radiator (F) is a fin tube core type permanently assembled between top and bottom tanks. The radiator filler neck, with pressure filler neck cap (D) and gasket (E), is mounted on the top of top tank. Water inlet connection, from engine, is at rear center of top tank. Water outlet connection, to engine, is at left of bottom tank. A drain cock (P) is mounted on rear of bottom tank. This drain cock is located at different points on different radiators. The radiator mounts a radiator shroud box (L). The left and right radiator to engine support rods (S and V) secure radiator assembly to engine.

b. Radiator Guard With Hinges and Hood Liner. The radiator guard (Y) is of stamped and welded construction. It is provided with recess type housings for mounting the service head lights and blackout marker lights. Two radiator guard hinges (Z and FF) on the radiator guard and two radiator guard hinge pins (DD and GG) on the frame side rails provide for quick disconnection of the guard assembly from the vehicle. The hood liner (A) is attached to the upper edge of the guard with split rivets (B).

237. Data

a. Radiator

Make	Harrison or Blackstone
Type	fin and tube core
Fin spacing	10 per in.
Pressure	4½ psi
Number of tubes	96
Frontal area	272 sq in.
Width of core	16½ in.
Height of core	16½ in.
Thickness of core	3 in.

b. Radiator Guard With Hinges And Hood Liner.

Width (across service head light recesses)	39 in.
Height	19⅞ in.
Depth	8 in.

Section II. REBUILD OF RADIATOR ASSEMBLY

238. Disassembly

(fig. 177)

a. Remove Radiator Assembly From Power Plant. Remove the radiator filler neck cap (D) and gasket (E) and open drain cock (P) to drain cooling system. Disconnect radiator hose clamps (G and J) which secure radiator water inlet hose (H), to radiator and to engine. Disconnect radiator hose clamps (M and R) which secure water outlet hose (N) to radiator and to engine. Pull radiator assembly free of hoses and lift it free of the left and right radiator to engine support rods (S and V).

b. Remove Radiator Shroud Box. Remove six tapping screws (K) which secure the radiator shroud box (L) to radiator (F). Pull radiator shroud box from radiator.

c. Remove Radiator to Engine Support Rods. Remove two cotter pins (U) and plain washers (T) which secure both the left and right radiator to engine support rods (S and V) to the engine front mounting support cushions. Pull the rods from the support cushions.

d. Remove Drain Cock. Unscrew the drain cock (P) from the radiator (F).

239. Inspection and Repair

(fig. 177)

a. Inspection.

(1) Check to see that all radiator fins are parallel and that the tubes are not bent. Check all soldered seams.

(2) Inspect the radiator (F) for leakage. Examine the drain cock (P) for leakage.

(3) Install filler neck cap gasket (E) and filler neck cap (D). Close free end of radiator overflow tube. Close either radiator water outlet or water inlet tube with suitable cap. Attach an air hose to outlet or inlet tube (not capped). Submerge radiator assembly in water and admit air. Observe radiator assembly for leakage. Mark any leaks for repair.

Caution: Air pressure must be below 10 psi.

(4) Inspect filler neck cap (D) for proper operation. Replace filler cap if it indicates improper operation.

Note. Vacuum in radiator is relieved by valve built into the cap which opens at one-half to one pound vacuum. Replace cap if valve fails to open.

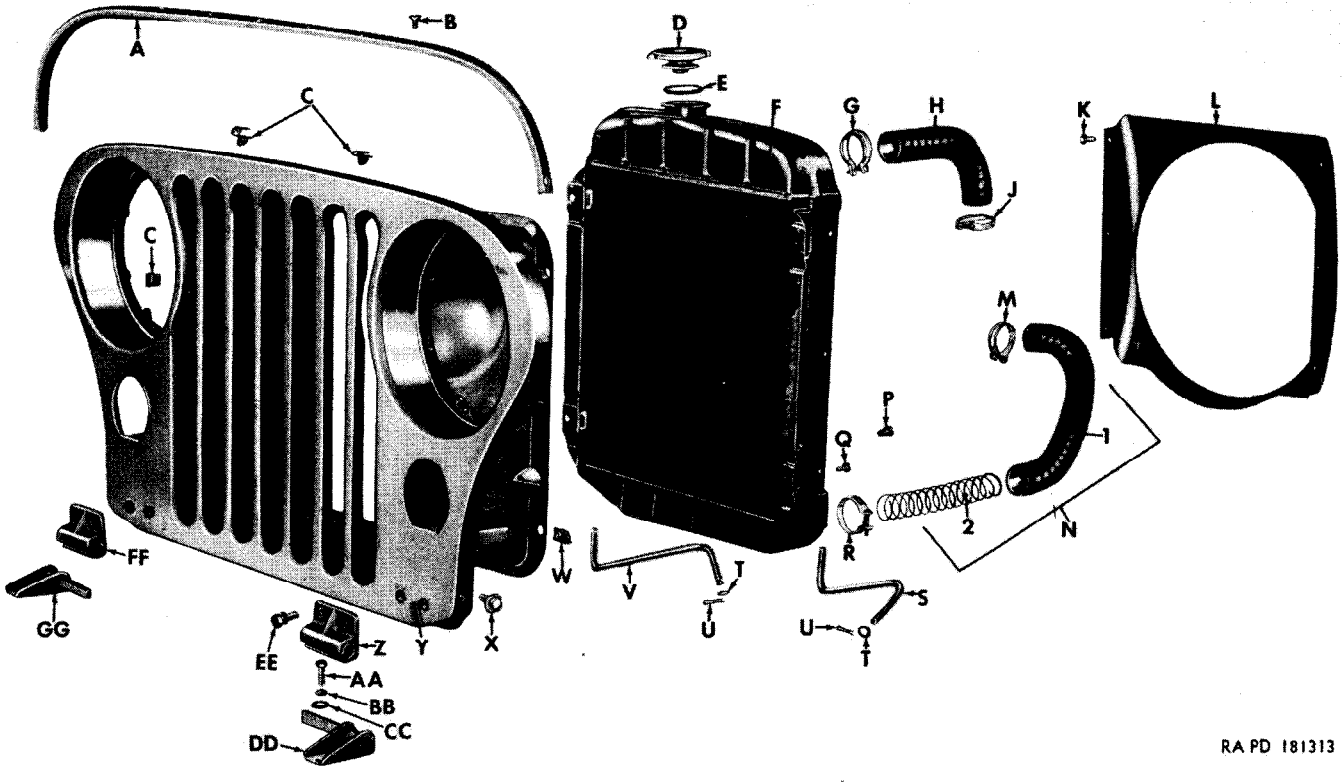


Figure 177. Radiator and radiator guard with hinges and hood liner—disassembled view.

A—Liner, hood—WO–680420
B—Rivet, split, 9/64 x 7/16—113454
C—Clip, wiring, harness—7346934
D—Cap, filler neck—7375030
E—Gasket, filler neck cap—A262210
F—Radiator—WO–805825
G—Clamp, hose, radiator—8328455
H—Hose, water inlet, radiator—WO–805820
J—Clamp, hose, radiator—8328455
K—Screw, tapping, pan-hd No. 8 (0.165) x 3/8—128270
L—Box, shroud, radiator—WO–806322
M—Clamp, hose, radiator—8328455
N—Hose, water outlet, radiator—8328458
1—Hose, water outlet radiator—WO–805821
2—Reinforcement, hose water outlet—WO–645905
P—Cock, drain, 1/4-in.—103647
Q—Bolt, 5/16–10 x 5/8—7369880
R—Clamp, hose, radiator—8328455
S—Rod, support, radiator to engine, left—8328492
T—Washer, plain, 15/32 ID, 59/64 OD, 0.065 thk—120395
U—Pin, cotter, 3/32 x 3/4—121222
V—Rod, support, radiator to engine, right—8328491
W—Clip, 5/16–10, radiator to guard panel—8328493
X—Screw, cap, lockwasher, 5/16–18NC–2 x 7/8—WO–673468
Y—Guard, radiator, assy—WO–680450
Z—Hinge, radiator guard—WO–673621
AA—Screw, cap, 5/16–24NF–3 x 7/8—120213
BB—Washer, lock, 5/16-in.—120214
CC—Washer, plain, 3/8 ID, 7/8 OD, 0.083 thk—446363
DD—Pin, hinge, radiator guard, left—WO–680395
EE—Screw, cap, lockwasher, 3/8–16NF–3 x 1—WO–673501
FF—Hinge, radiator guard—WO–673621
GG—Pin, hinge, radiator guard right—WO–680396

Figuae 177—Continued.

Test filler neck cap as follows: Attach air hose to radiator assembly as described in (3) above. Secure a suitable rubber hose to free end of radiator overflow tube and insert hose in a container of water. Force air under low pressure into radiator assembly. Bubbles in water will indicate leakage of air past filler neck cap. Filler neck cap must hold a minimum pressure of 3½ psi and a maximum pressure of 4½ psi.

(5) Inspect radiator shroud box (L) for dents, damage, and sprung condition.

(6) Check the radiator to engine support rods (S and V) for twists, breaks, and other damage.

(7) Replace radiator water outlet and inlet hoses if they are collapsed, cracked, or deteriorated.

b. Repair.

(1) Solder all loose connections.

(2) Close all leaks by soldering.

(3) Straighten bent tubes and misalined fins.

(4) Repair leaks in flat parts of top and lower tanks of radiator (F) by sweating sheet metal over damaged areas.

(5) Straighten bent or distorted radiator to engine support rods (S and V).

(6) Straighten bent radiator shroud box (L). Remove dents from box.

240. Assembly

(fig. 177)

a. Install Drain Cock. Screw the ¼-inch drain cock (P) in the lower tank of the radiator (F).

b. Install Radiator to Engine Support Rods. Place the left radiator to engine support rod (S) and the right radiator to engine support rod (V) in the engine front mounting support cushions. Secure support rods with two $^{15}/_{32}$ ID, $^{59}/_{64}$ OD, 0.065 thick plain washers (T) and $^{3}/_{32}$ x ¾ cotter pins (U).

c. Install Radiator Shroud Box. Secure the radiator shroud box (L) to the radiator (F) with six No. 8 (0.165) x ⅜ pan-head tapping screws (K).

d. Install Radiator Assembly on Power Plant. Position radiator assembly (F) on the radiator to engine support rods (S and V). Connect the radiator water inlet hose (H) and secure in place with hose clamps (G and J). Connect radiator water outlet hose with reinforcement assembly (N) to radiator and secure hoses with the hose clamps (M and R). Fill cooling system with proper coolant as directed in TM 9–804A.

e. Install Filler Neck Cap. Install new filler neck cap gasket (E) in filler neck cap (D) and install the cap on the radiator.

Section III. REBUILD OF RADIATOR GUARD WITH HINGES AND HOOD LINER ASSEMBLY

241. Disassembly

(fig. 177)

Disassembly of the radiator guard assembly with hinges and hood liner is not required unless component parts are proved faulty by inspection (par. 242*a*).

a. Remove Headlights and Signal Blackout Marker and Service Parking Lights. Refer to TM 9-804A for removal instructions.

b. Remove Radiator Guard Hinges. Remove four lockwasher cap screws (EE) and remove each radiator guard hinge (Z and FF).

c. Remove Radiator Guard Hood Liner. Remove 13 split rivets (B) which secure radiator guard hood liner (A) to top of radiator guard (Y). Lift hood liner from top of radiator guard.

d. Remove Wiring Harness Clips. Pull the three wiring harness clips (C) from their retaining holes in radiator guard assembly (Y).

e. Radiator Guard Hinge Pins. Remove four cap screws (AA), lockwashers (BB), and plain washers (CC) which secure both the left and the right radiator guard hinge pins (DD and GG) to the frame side rails, and remove the hinge pins.

242. Inspection and Repair

a. Inspection.

(1) *Radiator guard.* Inspect the radiator guard (Y) for sprung condition, dents, and breaks. Replace radiator guard if it can not be straightened sufficiently to provide proper assembly on vehicle.

(2) *Hood liner.* Check the hood liner (A) for wear, breaks, damage, and missing rivets. Replace liner, if necessary.

(3) *Radiator guard hinges.* Examine the radiator guard hinges (FF and Z) for wear and damage. See that slots in hinges are not worn excessively. Replace hinges, if necessary.

(4) *Radiator guard hinge pins.* Replace the left and right radiator guard hinge pins (DD and GG) if pins are broken or cracked.

(5) *Miscellaneous parts.* Replace the harness wiring clips (C) if they are damaged. Replace the radiator to guard panel clips (W) if they are damaged. Replace all screws and washers that are damaged.

b. Repair. No system of repair procedures can be established for the repair of the radiator guard assembly since damage to sheet metal parts can vary considerably.

(1) *Radiator guard.* Straighten bent or sprung radiator guard (Y). Remove dents if necessary. Repair cracks or fractures by welding.

(2) *Radiator guard hinges and hinge pins.* Remove any raised

metal at nicks on the radiator guard hinge pins (DD and GG) and in the slots of the radiator guard hinges (Z and FF) to assure their proper engagement.

243. Assembly

(fig. 177)

a. Install Wiring Harness Clips. Insert the three wiring harness clips (C) in their retaining holes in the radiator guard (Y).

b. Install Radiator Guard Hood Liner. Secure new hood liner (A) to top of radiator guard (Y) with thirteen $\frac{9}{64}$ x $\frac{7}{16}$ split rivets (B).

c. Install Radiator Guard Hinges. Position radiator guard hinges (Z and FF) on radiator guard (Y). Secure each hinge with two $\frac{3}{8}$–16NF–3 x 1 lockwasher cap screws (EE).

d. Radiator Guard Hinge Pins. Secure the left radiator guard hinge pin (DD) and the right radiator guard hinge pin (GG) to the frame side rails with four $\frac{3}{8}$ ID, $\frac{7}{8}$ OD, 0.083 thick plain washers (CC). $\frac{5}{16}$-inch lockwashers (BB), and $\frac{5}{16}$–24NF–3 x $\frac{7}{8}$ cap screws (AA).

e. Install Headlights and Signal Blackout Marker and Service Parking Lights. Refer to TM 9-804A for installation instructions.

CHAPTER 16
FRAME

Section I. DESCRIPTION AND DATA

244. Description

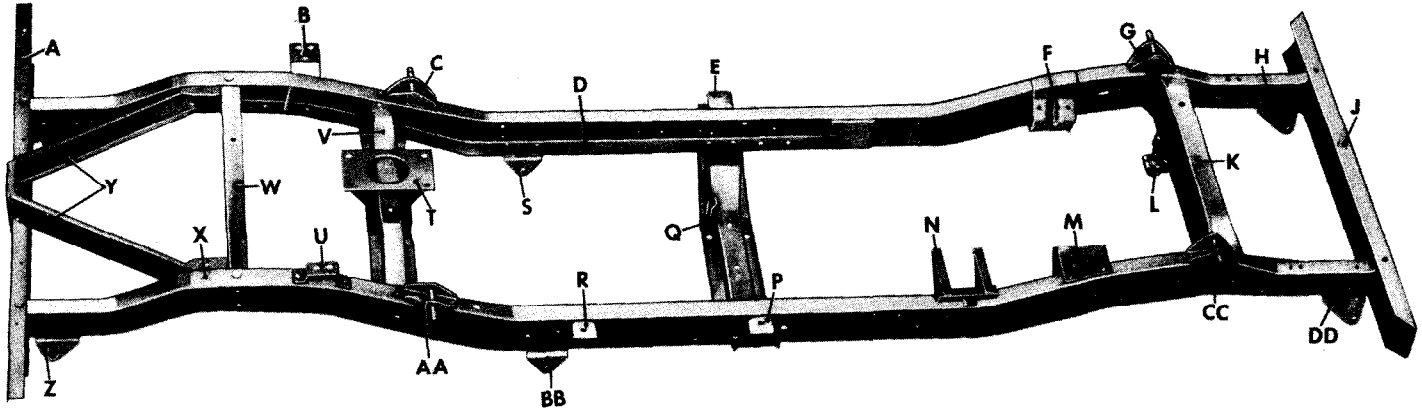
a. Frame (fig. 178). The frame, which is the structural center of the vehicle, is constructed of two heavy channel steel side rails (d and x) and five cross members (A, W, V, Q, and K). All crossmembers, except the engine rear support crossmember (Q), are welded to the two side rails. The engine rear support cross member (Q) is bolted to the two side rails. A bumper bar (J) is bolted to the front ends of the side rails. Two rear reinforcements (Y) are welded to the side rails and rear crossmember. Four shock absorber brackets (C, G, AA, and CC) are riveted and welded to the top portions of the side rails. Two rear spring shackle brackets (Z) and four spring pivot brackets (S, H, DD, and BB) are riveted and welded to the underside of the side rails. Holddown brackets (E, P, and R) for securing the body to the frame are riveted and welded to the sides of the side rails.

b. Towing Pintle (fig. 179). The towing pintle is mounted on the rear crossmember and secured in place with four bolts and lockwasher nuts. A rotating type towing pintle, somewhat different from the one illustrated, is used on a few vehicles.

c. Lifting Shackles (figs. 179 and 180). Two lifting shackles are bolted to the front of the frame. Two lifting shackles are bolted to the rear of the frame. Two bumperettes are also bolted to the rear of the frame.

245. Data

Material	Steel, SAE 950
Length (overall)	128.44 in.
Width (outside edges of side rails)	29.25 in.
Number of cross members	5
Weight	140 lb. (aprx.)
Distance between right and left front holddown brackets	31.50 in.
Distance from center line of frame to center line of hold-down bracket	16.063 in.



A – CROSS MEMBER, REAR – WO-800605
B – BRACKET, MACHINE GUN, LEFT – WO-806217
C – BRACKET, SHOCK ABSORBER, REAR, LEFT – WO-800825
D – RAIL, SIDE, LEFT – WO-805717
E – BRACKET, NO 2 HOLD-DOWN, LEFT – WO-645071
F – BRACKET, SUPPORT, ENGINE, LEFT – WO-805519
G – BRACKET, SHOCK ABSORBER, FRONT, LEFT – WO-805635
H – BRACKET, SPRING PIVOT, FRONT, LEFT – WO-805514
J – BAR, BUMPER – WO-801386
K – CROSS MEMBER, FRONT – WO-805643
L – BRACKET, STEERING BELLCRANK – WO-804453
M – BRACKET, SUPPORT, ENGINE, RIGHT – WO-805552
N – SUPPORT, GENERATOR REGULATOR, ASSY – WO-805719
P – BRACKET, NO 2 HOLD-DOWN, RIGHT – WO-645072

RA PD 181314

Q – CROSS MEMBER, ENGINE REAR SUPPORT – WO-649705
R – BRACKET, NO 4 HOLD-DOWN – WO-645072
S – BRACKET, SPRING PIVOT, REAR, LEFT – WO-806910
T – SUPPORT, MACHINE GUN – WO-806219
U – BRACKET, MACHINE GUN, RIGHT – WO-806218
V – CROSS MEMBER, CENTER – WO-A-1150
W – CROSS MEMBER, INTERMEDIATE, REAR – WO-646942
X – RAIL, SIDE, RIGHT – WO-805718
Y – REINFORCEMENT, REAR – WO-805518
Z – BRACKET, SPRING SHACKLE – WO-A-544
AA – BRACKET, SHOCK ABSORBER, REAR, RIGHT – WO-800825
BB – BRACKET, SPRING PIVOT, REAR, RIGHT – WO-806910
CC – BRACKET, SHOCK ABSORBER, FRONT, RIGHT – WO-805635
DD – BRACKET, SPRING PIVOT, FRONT, RIGHT – WO-805514

Figure 178. Frame.

Section II. REMOVAL OF ASSOCIATED PARTS FROM FRAME

246. Remove Towing Pintle

(fig. 179)

Remove four bolts and lockwasher nuts which secure towing pintle to rear of frame. Remove towing pintle from frame.

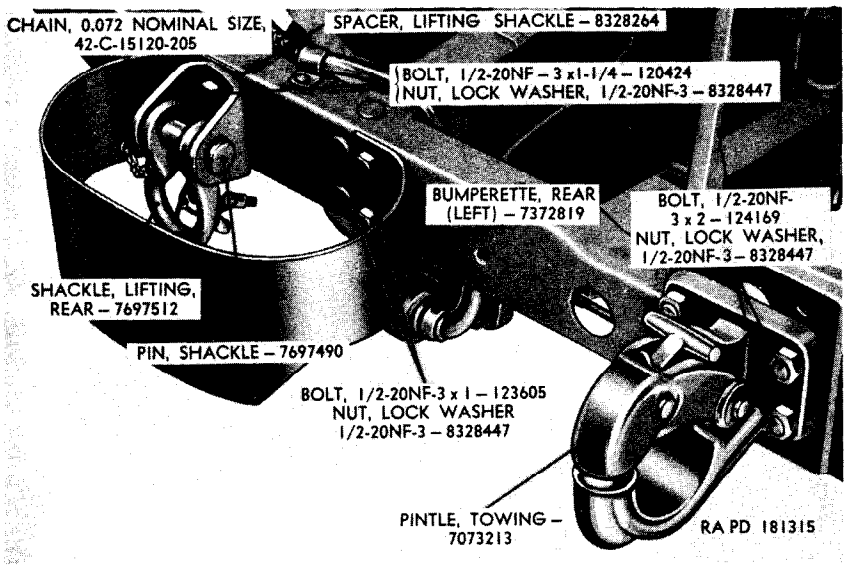


Figure 179. Towing pintle and rear lifting shackle installed.

247. Remove Rear Lifting Shackles and Rear Bumperettes

(fig. 179)

Remove two bolts and lockwasher nuts which secure inner end of each rear bumperette to frame. Remove two bolts, plain washers, and lockwasher nuts which secure lifting shackle bracket and the outer end of each bumperette to frame. Remove bumperettes and lifting shackles. Remove lifting shackle spacer which is installed between each lifting shackle and bumperette.

248. Remove Front Lifting Shackles

(fig. 180)

Remove bolt, nut, and lockwasher which secure front of each lifting shackle bracket to top of bumper bar. Remove bolt and lockwasher which secure rear of each front lifting shackle bracket to the side rail. Remove shackle bracket and shackle spacer.

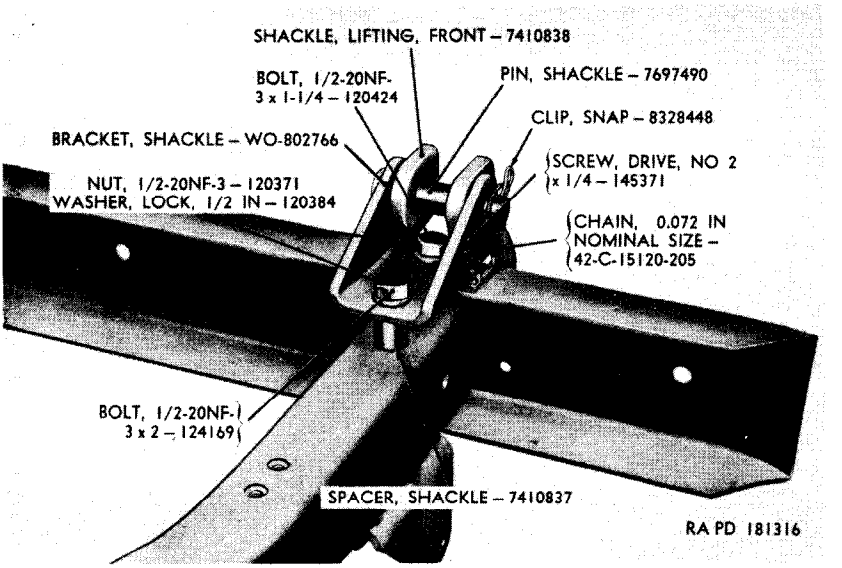


Figure 180. Front lifting shackle installed.

Section III. REBUILD OF FRAME

249. Disassembly

(fig. 178)

a. General. The extent of frame disassembly can only be determined by inspection. It is not necessary to remove the bumper bar (J) and engine rear support crossmember (Q) unless inspection (par. 250*a*) proves these components faulty.

b. Remove Engine Rear Support Crossmember. Remove two bolts, lockwashers, and lockwasher nuts which secure each side of the engine rear support crossmember (Q) to side rails and remove crossmember from frame.

c. Bumper Bar. Remove bolt, lockwasher, and nut which secure front of bumper bar (J) to each side rail of frame. Remove two bolts, lockwashers, and nuts securing bottom of bumper bar to bottom portion of each side rail and remove bumper bar.

250. Inspection and Repair

a. Inspection (fig. 181).

(1) *General.* Inspection of the frame should be made before removal from the vehicle and after removal. Since improper steering geometry or axle alinement may offer similar symptoms of improper vehicle operation as those caused by a distorted frame (due to accident), it is recommended that

frame inspection be performed prior to disassembly of vehicle in order to prevent unnecessary labor.

Note. Reference should be made to a good frame (if one is available) for comparative purposes during procedures described in this paragraph.

(2) *Inspection of frame prior to removal.* Check frame for misalinement. If a frame alining fixture is not available, use the "X" or diagonal method (fig. 181) of checking frame alinement. The most convenient method of checking alinement while the frame is still installed on the vehicle is by marking on the floor all points from which measurements should be taken. Figure 181 illustrates check points that should be used for making plumb bob marks.

(*a*) Position vehicle on a clean level floor or other suitable place. Hang a plumb bob from each point (A through H) as indicated in figure 181. Mark spots on floor beneath plumb bob points.

Note Practice utmost care to mark plumb bob points accurately in relation to frame in order to obtain a satisfactory alinement check.

Move vehicle off markings.

(*b*) Measure frame width at front and rear. Draw a center line through the full length of the frame using the mid-points of the frame widths if they are equal. However, if frame widths vary, use mid-points of any two pair of equal diagonals. Measure distance from center line to opposite sides of frame over entire frame length. Measurements should not vary if frame is in proper alinement.

(*c*) To locate point at which frame is sprung, measure diagonal distance between points A and G, G and C, C and E, D and F, F and B, and B and H. The comparative diagonal distance on opposite sides of frame must not vary by more than one-eighth of an inch. If any pair of diagonal lines vary by more than one-eighth of an inch, part of frame included between measurement points is sprung. Diagonals should also intersect at center line. If measurements do not agree within one-eighth of an inch, corrective action, (*b* below) must be applied to those points that are not equal. Approximate comparable diagonal measurements are as follows: 46⅜ inches (A to G) and (B to H), 47⅛ inches (B to F) and (C to G), and 51⅜ inches (C to E) and (D to F).

(*d*) Due to the kick-up of the frame at both ends, the center of the front spring pivot bracket hole should be 0.51 inch (distance E) higher than center of front spring shackle bushing hole. The center of the rear spring shackle

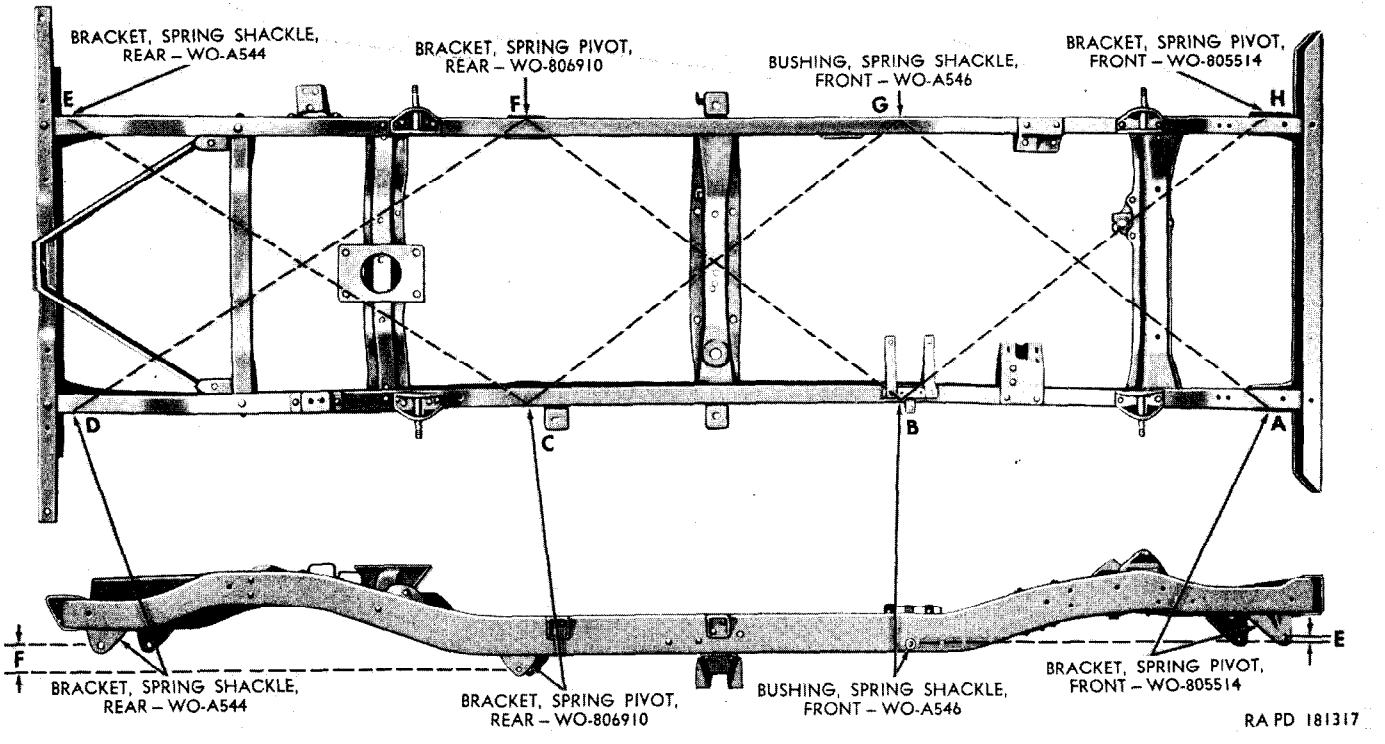


Figure 181. Frame alinement points.

bracket hole should be 3.218 inches (distance F) higher than the rear spring pivot bracket hole.

(3) *Inspection of frame after removal.* Inspect the two side rails for cracks, bends, or misalinement. Inspect crossmembers for cracks or damage. Inspect all welded and riveted joints for cracks or broken welds. Inspect all nuts, which are used as tapping blocks or plates, for looseness or damaged threads. Check frame for misalinement in accordance with instructions (2)(*a*) above.

(4) *Bumper bar and engine rear support crossmember.* Inspect these parts for cracks, bends, or other damage. Repair (*b* below) or replace, if necessary.

b. Repair (fig. 178)

(1) *Frame.* If bending or twisting of frame is not excessive, it can be straightened. This should be done cold, as excessive heat applied to frame will weaken it. If frame is out of alinement and cannot be repaired by straightening, it must be replaced.

(2) *Shock absorber brackets.* Clean all faulty mounting pin threads with a standard die. Swage all loose rivets tight and weld places where weld has broken. If shock absorber brackets (C, G, CC, and AA) must be replaced, break welds and cut off and drive out two rivets securing bracket to top of side rail. Position new shock absorber bracket in place, install two new ⅜-inch round-head rivets and swage tight, and weld bracket to frame, where necessary.

(3) *Spring pivot brackets.* If spring pivot brackets (H, S, BB, and DD) must be replaced, break welds, and cut off and drive out two round-head rivets securing brackets to underside of side rails. Place new spring pivot brackets in position, install two new ⅜-inch round-head rivets and swage tight, and weld bracket to frame.

(4) *Spring shackle brackets.* If spring shackle bushing, either in spring shackle bracket, or in frame side rail must be replaced, drive it out with a suitable remover and install new bushing with same remover. To remove spring shackle bracket, break welds, and cut off and drive out two round-head rivets securing brackets to underside of side rail. Place new spring shackle bracket in position, install two new ⅜-inch round-head rivets and swage tight, and weld bracket to frame.

(5) *Holddown brackets.* Swage tight all loose rivets which secure number 2 and 3 holddown brackets (E, P, and R) to side rails. If brackets must be replaced, cut off and drive out two round-head rivets securing bracket to side rail. Position new bracket in place on side rail, install two new ⅜-inch round-head rivets, and swage rivets tight.

251. Assembly

(fig. 178)

a. Install Engine Rear Support Crossmember. Secure engine rear support crossmember (Q) to each frame side rail (D and X) with two ⅜–24NF–3 x ⅞ bolts, ⅜-inch lockwashers, and ⅜–24NF–3 hex nuts.

b. Install Bumper Bar. Position bumper bar (J) at front of frame. Secure front of bumper bar to each side rail with one ⅜–24NF–3 x ⅞ bolt, ⅜-inch lockwasher, and ⅜–24NF–3 hex nut. Secure bottom of bumper bar to bottom portion of each side rail with two ⅜–24NF–3 x ⅞ bolts, ⅜-inch lockwashers, and ⅜–24NF–3 hex nuts.

Section IV. REBUILD OF TOWING PINTLE ASSEMBLY

252. Disassembly

(fig 182)

a. Remove Lock. Remove two snap rings from ends of latch pin. Drive out latch pin and lift lock from towing pintle.

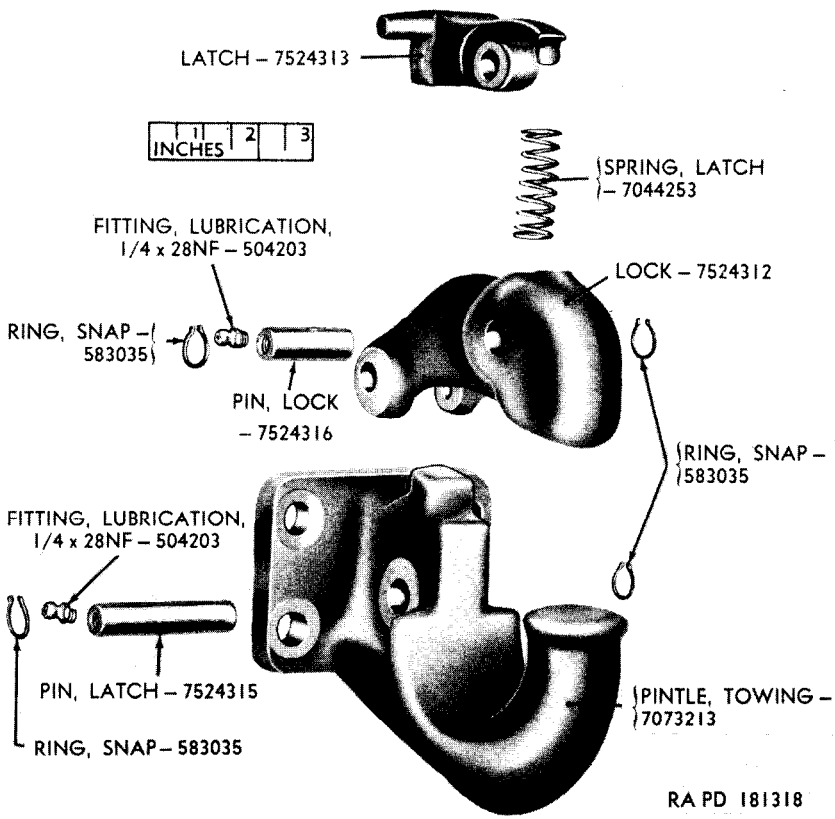


Figure 182. Towing pintle assembly—disassembled view.

b. Disassemble Lock. Remove two snap rings from ends of lockpin. Drive out lockpin and remove latch from lock. Withdraw latch spring from within lock.

c. Remove Lubrication Fittings. Unscrew lubrication fittings from ends of lock and latch pins, if necessary.

253. Inspection and Repair

(fig. 182)

a. Inspection.

(1) *Towing pintle, lock, and latch.* Inspect towing pintle, lock, and latch for cracks, wear, and damage. Check projections on latch to see that they are not broken. Replace a faulty towing pintle, lock, or latch, if necessary.

(2) *Latch and lockpins.* Inspect the latch and lockpins for wear, damage, and out-of-round condition. Replace a faulty latch pin or lockpin.

(3) *Latch spring.* Replace the latch spring if it is broken, distorted, or if it fails to operate in its intended manner.

(4) *Snap rings.* Replace all distorted or broken snap rings.

(5) *Lubrication fittings.* Replace lubrication fittings if they are damaged or if they do not open.

(6) *Bolts.* Replace bolts and lockwasher nut if they are damaged.

b. Repair. Repair of towing pintle assembly is limited to removing burs, abrasions, and raised metal at nicks from lockpin and latch pin. Use a fine mill file.

254. Assembly

(fig. 182)

a. Assemble Latch. Place the latch spring in the lock. Place latch in position over latch spring and secure latch to lock with the lockpin. Secure lockpin with two snap rings.

b. Install Lock. Position lock (with latch assembled) on towing pintle and secure lock to towing pintle with the latch pin. Secure latch pin in place with two snap rings.

c. Install Lubrication Fittings. Install a ¼–28NF lubrication fitting in end of lockpin and latch pin.

Section V. REBUILD OF LIFTING SHACKLE ASSEMBLIES

255. Disassembly

a. Front Lifting Shackles (fig. 180). Remove lifting shackle snap clip from hole in lifting shackle pin. Remove pin and lift shackle from bracket. Remove chain to towing shackle bracket drive screw and remove chain from lifting shackle bracket.

b. Rear Lifting Shackles (fig. 179). Proceed as directed in *a* above.

256. Inspection and Repair

a. Inspection. Inspect all front and rear lifting shackle parts for damage and wear. Inspect the lifting shackle pin for out-of-round condition. Replace all faulty parts.

b. Repair. Remove all burs, abrasions, and raised metal at nicks from lifting shackle pins with a fine mill file.

257. Assembly

a. Front Lifting Shackles (fig. 180). Position lifting shackle within lifting shackle bracket and secure shackle to bracket with the lifting shackle pin. Secure 0.072-inch lifting shackle clip chain to bracket with a No. 2 x ¼ lifting shackle bracket drive screw. Lock shackle pin with the lifting shackle snap clip.

b. Rear Lifting Shackles (fig. 179). Proceed as directed in *a* above.

Section VI. REBUILD OF BUMPERETTES

258. Disassembly

(fig. 179)

The rear bumperettes require no disassembly.

259. Inspection and Repair

a. Inspection. Inspect rear bumperettes for cracks and distortion.

b. Repair. Straighten a bent or sprung bumperette. Repair all breaks or fractures by welding.

260. Assembly

The rear bumperettes require no assembly.

Section VII. INSTALLATION OF ASSOCIATED PARTS ON FRAME

261. Install Towing Pintle

(fig. 179)

Position towing pintle at rear of frame. Secure towing pintle to frame with four ½–20NF–3 x 2 bolts and ½–20NF–3 lockwasher nuts.

262. Install Rear Lifting Shackles and Bumperettes

(fig. 179)

Position rear lifting shackle spacer between bumperette and rear lifting shackle. Secure outer end of bumperette and rear lifting shackle to rear of frame with two ½–20NF–3 x 1¼ bolts and ½–20NF–3

lockwasher nuts. Secure inner end of each bumperette to frame with two ½–20NF–3 x 1 bolts and ½–20NF–3 lockwasher nuts.

263. Install Front Lifting Shackles

(fig. 180)

Secure each front lifting shackle bracket to top of bumper bar with one ½–20NF–3 x 1¼ bolt, ½-inch lockwasher, and ½–20NF–3 nut. Secure each front lifting shackle to frame side rail with ½–20NF–3 x 2 bolt, front lifting shackle spacer, and ½-inch lockwasher.

CHAPTER 17

WHEELS AND HUBS

Section I. DESCRIPTION AND DATA

264. Description

The wheel assemblies (fig. 183) are of the offset type disk with five mounting stud holes. Wheels are interchangeable on front and rear axles, but hub nuts for the right and left wheels are not interchangeable. Left-hand thread hub studs and nuts are used on the left-side of the vehicle, while right-hand thread studs and nuts are used on the right-side of the vehicle. The hub nuts for the left-side of the vehicle are notched for identification. The serrated hub studs of all four wheels are pressed into the front and rear hubs. The front and rear hubs are secured to their respective brake drums by three bolts. The front hubs are mounted on opposed bearings. Each front hub is equipped with an oil seal. Each rear hub fits directly on a rear axle shaft and is locked to the shaft by a rear axle shaft key, rear axle shaft washer, rear axle shaft nut, and a cotter pin.

Figure 183. Wheel assembly.

265. Data

a. Wheels.

Rim size	4.50-16 in.
Stud circle diam	5.496 to 5.504 in.

b. Hub Studs.

Thread types:	
Left-side of vehicle	lh thd
Right-side of vehicle	rh thd

Section II. REBUILD OF WHEELS AND HUB ASSEMBLIES

266. Disassembly

a. Wheel Assemblies (fig. 183). Remove tire and tube from each wheel assembly as directed in TM 9–804A.

b. Hub and Brakedrum Assemblies. Remove the front hub and drum assembly as instructed in paragraph 148*b*. Remove the rear hub and drum assembly as instructed in paragraph 171.

c. Front and Rear Hubs.

(1) *Front hubs* (fig. 184). Remove three bolts which secure the brakedrums to the front hubs. Pull the brakedrums from front hubs. Remove the two inner and outer bearing cones and the oil seal from within each front hub. Do not remove the two inner and outer bearing cups from within each front hub unless inspection (par. 267*a*) reveals them unserviceable. To remove bearing cups, use remover and replacer 41–R–2374–845 with screw 41–S–1047–330 (fig. 187).

Note. It is not necessary to remove the brakedrum from the front hub in order to remove the inner and outer bearing cups.

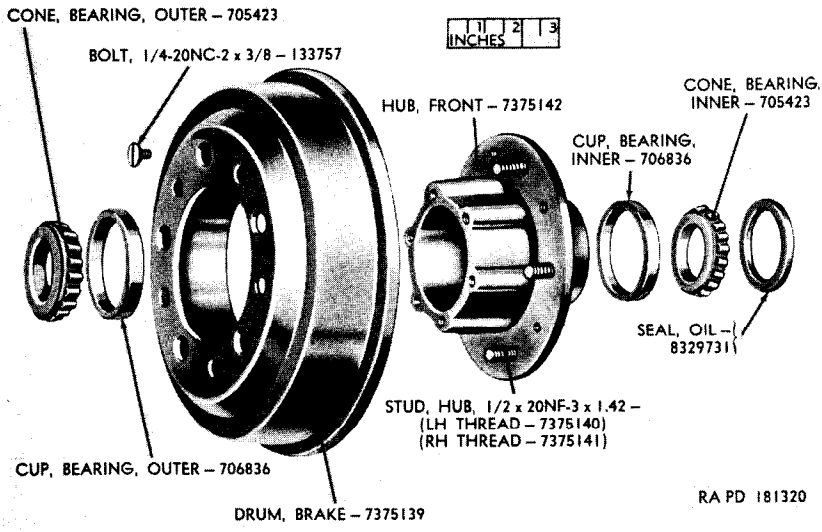


Figure 184. Front wheel hub and brakedrum—disassembled view.

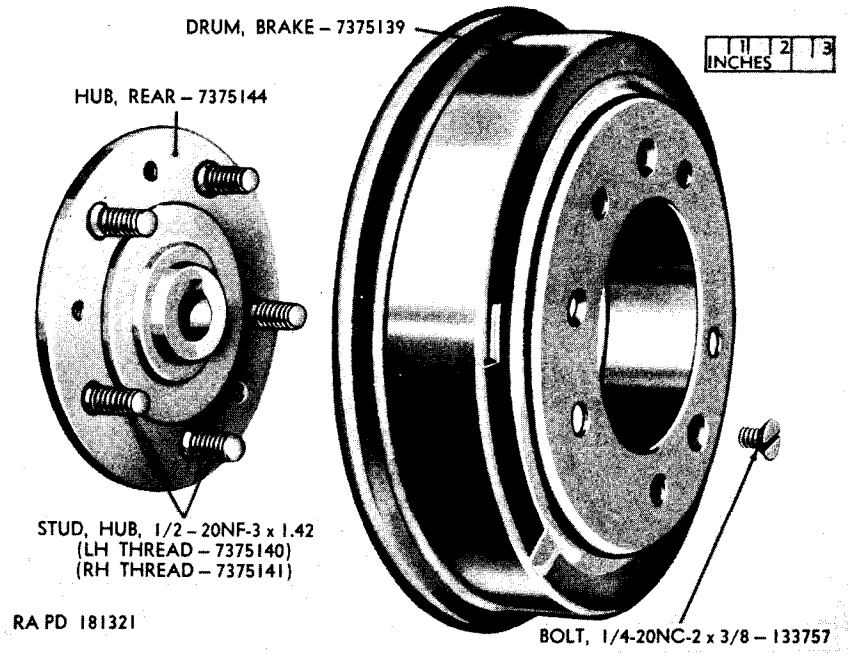


Figure 185. Rear wheel hub and brakedrum—disassembled view.

(2) *Rear hubs* (fig. 185). Remove three bolts which secure each to its respective rear hub brakedrum and pull from rear hub brakedrum.

(3) *Hub studs* (figs. 184 and 185). Do not remove the hub studs from the front and rear hubs unless inspection (par. 267*a*) reveals that they must be replaced. To remove a hub stud, drive it out of hub.

267. Inspection and Repair

a. Inspection.

(1) *Wheel assemblies* (fig. 183). Carefully inspect wheel assemblies for distortion. Replace wheels, if necessary. Inspect wheels for good paint condition (chips, cracks, or bare metal). Inspect holes in wheel, which provide for mounting wheel on hub studs, for excessive wear due to loose wheel mounting. Replace wheel if hub stud hole wear is excessive. Replace all faulty hub nuts.

(2) *Front and rear hubs* (figs. 184 and 185). Carefully inspect the front and rear hubs for cracks, wear, and damage. Replace hub, if damaged. Examine the front hub inner and outer bearing cups for chipped spots, cracks, or wear due to contact with inner and outer bearing cones. Replace worn or damaged bearing cups. Bearing cups must have a tight

fit in front hub. Test front hub bearing cones for tightness and freedom of rotation. Replace bearing cones if scoring, pitting, wear, or other damage is evident.

Note. The rear hubs do not have bearings.

Inspect hub studs for damaged threads, wear, or looseness. Replace hub studs, if necessary.

(3) *Tubes and tires.* Refer to TM 9–804A for tube and tire inspection procedures.

b. Repair.

(1) *Wheel assemblies* (fig. 183). Paint wheel assemblies, if necessary.

(2) *Front and rear hubs* (figs. 184 and 185). Remove all raised metal at nicks with a fine mill file. Replace front hub oil seals at each rebuild.

Note. The rear hubs do not have oil seals.

268. Assembly

a. Hub Studs. If hub studs were removed from rear hub, drive new ½–20NF–3 x 1.42 hub studs into place in hub (fig. 186).

Note. Install left-hand thread hub studs in hubs to be used on left-side of vehicle. Install right-hand thread hub studs in hubs to be used on right-side of vehicle. The front hub studs are installed in the same manner as the rear hub studs.

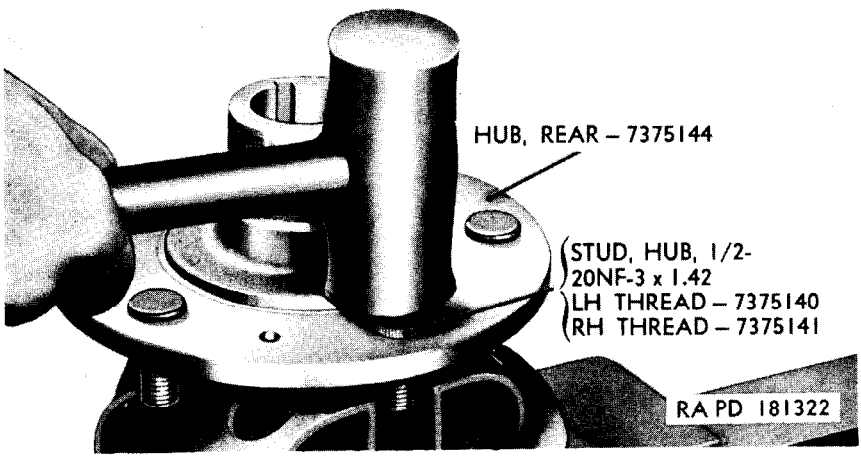


Figure 186. Installing rear wheel hub stud.

b. Front Hubs (fig. 184). If the inner and outer bearing cups were removed from front hub, use remover and replacer 41–R–2374–845 with screw 41–S–1047–330 to drive the two bearing cups into proper position in hub (fig. 187). Lubricate interior of front hub with layer of proper lubricant. Lubricate the inner roller bearing cones with

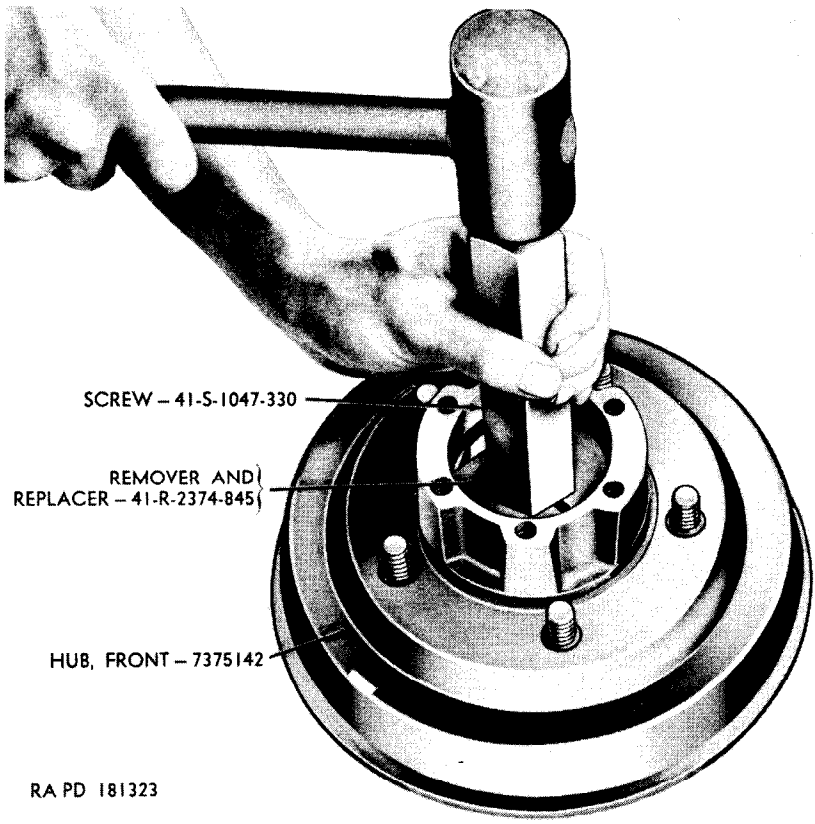


Figure 187. Installing front wheel hub bearing cup.

proper lubricant, as directed in TM 9–804A, and place it in position against the inner bearing cup.

Note. The outer bearing cone is not installed until the brakedrum and hub assembly is installed on vehicle.

Install new oil seal (lip toward bearing cone) in the front hub. Seal must be flush with surface of front hub. Position front hub in brakedrum and secure with three ¼–20NC–2 x ⅜ bolts.

c. Rear Hubs (fig. 185). Position rear hub in brakedrum and secure hub to drum with three ¼–20NC–2 x ⅜ bolts.

d. Wheel Assemblies (fig. 183). Install tire and tube assemblies on each wheel assembly as instructed in TM 9–804A.

CHAPTER 18

REPAIR AND REBUILD STANDARDS

269. General

The repair and rebuild standards included herein give the minimum, maximum and key clearances of new or rebuilt parts. They also give wear limits which indicate that point to which a part or parts may be worn before replacement, in order to receive maximum service with minimum replacement. Normally, all parts, which have not been worn beyond the dimensions shown in the wear limits column, or damaged from corrosion, will be approved for service. An asterisk (*) in the wear limits column indicates that the part or parts should be replaced when worn beyond the limits given in the sizes and fits of new parts column.

270. Transmission

(ch. 5)

a. Transmission Countershaft and Countershaft Cluster Gear (par. 92).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
188	E	Diameter of countershaft cluster gear bearing rollers.	0.1248–0.1250	(*)
	G	Countershaft cluster gear end play	0.012–0.018	0. 022
	D	Thickness of countershaft cluster gear thrust washers.	0.0535–0.0595	(*)

b. Main Shaft Assembly (par. 95).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
188	A	Diameter of pilot end of main shaft	0.7627–0.7632	(*)
	C	Backlash between first and reverse speed sliding gear and main shaft.	0.003–0.016	0. 018
	B	Inside diameter bushing type bearing second speed gear.	1.4925–1.4935	1. 4955

c. Input Shaft Assembly (par. 98).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
188	K	Diameter of pilot end of input shaft	0.627–0.628	0. 622
	J	Inside diameter of ball bearing	1.5743–1.5748	(*)
	H	Diameter of input shaft front bearing rollers.	0.2180–0.2182	(*)

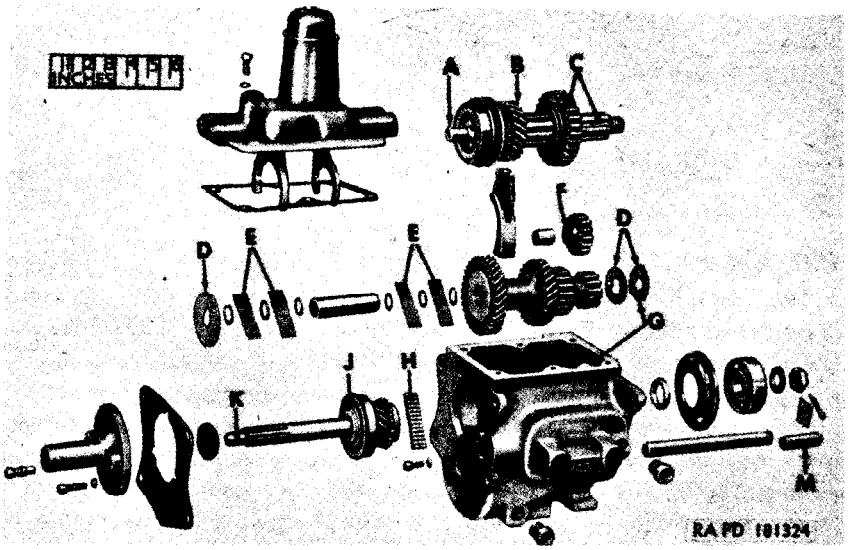


Figure 188. Transmission repair and rebuild measuring points.

d. Reverse Idler Shaft and Shaft Gear (par. 100).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
188	F	Inside diameter of idler shaft gear bushing type bearing.	0.742–0.744	(*)
	F	Ream size of idler shaft gear bushing type bearing.	0.7563–0.7570	0. 760
	M	Diameter of reverse idler shaft	0.7545–0.7550	(*)

271. Transfer

(ch. 6)

a. Rear Axle Output Shaft Retainer (par. 118).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
189	B	Outside diameter of pilot end of speedometer driven gear.	0.246 0.248	0. 244
	A	Inside diameter of speedometer drive gear bearing.	0.2530–0.2550	0. 2580

b. Front Axle Output Shaft Bearing Retainer (par. 121).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
190	C	Outside diameter of pilot end of front axle output shaft.	0.752–0.753	(*)
	D	Front axle output shaft yoke with shield assembly splines:		
		Width	0.111–0.1125	0. 096
		OD	1.2475–1.2480	1. 2455
	A	Clearance between front axle output shaft clutch gear and output shaft.	0.001–0.002	0. 005
	B	Outside diameter of gearshift high and low range and front wheel drive lever pivot pin.	0.497–0.500	(*)

An asterisk (*) in the wear limits column indicates that the part or parts should be replaced when worn beyond the limits given in the sizes and fits of new parts column.

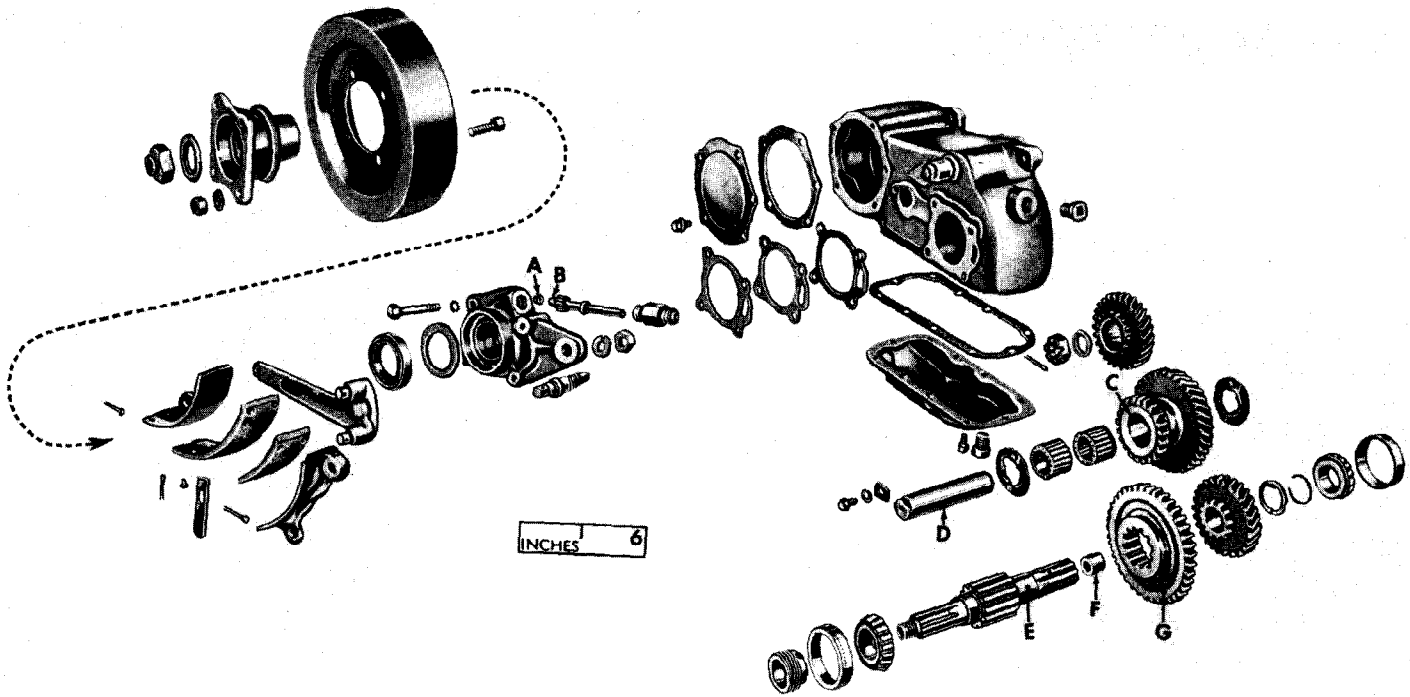


Figure 189. Transfer repair and rebuild measuring points—shafts.

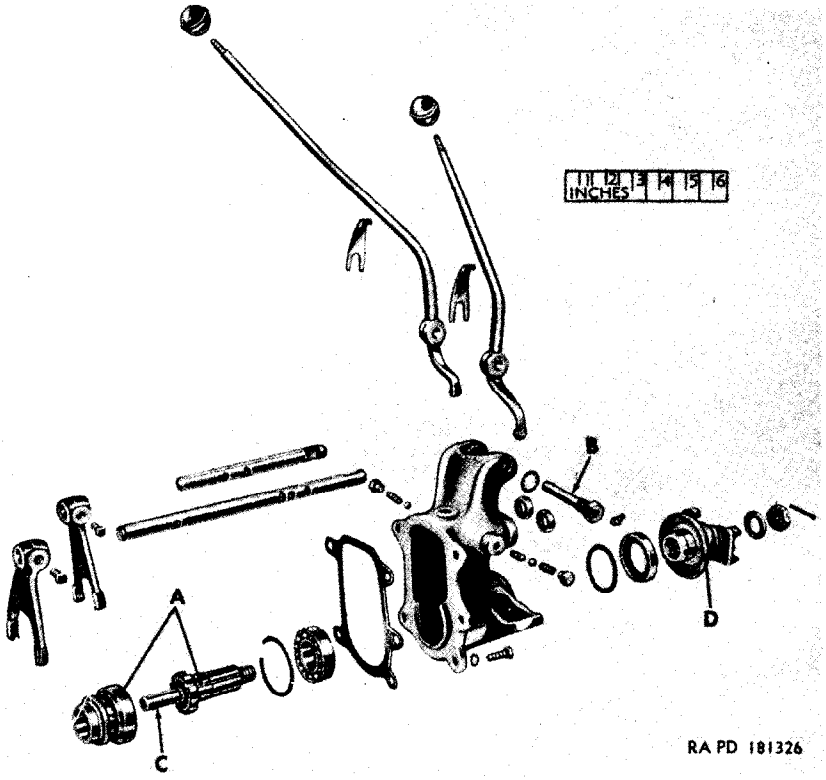


Figure 190. Transfer repair and rebuild measuring points—bearing retainer.

c. Transfer Countershaft and Countershaft Gear (par. 124).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
189	D	Diameter of transfer countershaft	1.1255–1.1260	1. 1235
	C	Inside diameter of countershaft gear	1.6255–1.6265	1. 6275

d. Rear Axle Output Shaft (par. 127).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
189	F	Inside diameter of front axle output shaft bushing type pilot bearing.	0.626–0.627	(*)
	E and G	Clearance between sliding gear and front axle output shaft.	0.001–0.002	0. 005
	E	Rear axle output shaft end play	0.004–0.008	(*)

272. Propeller Shafts

(ch. 7)

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
191	A	Clearance between slip yoke splines and propeller shaft splines.	0.002–0.004	0. 010
	B	Clearance between bearing and slip yoke hole.	0.001–0.002	0. 005
	C	Outside diameter of bearing cap	1.0630–1.0633	(*)

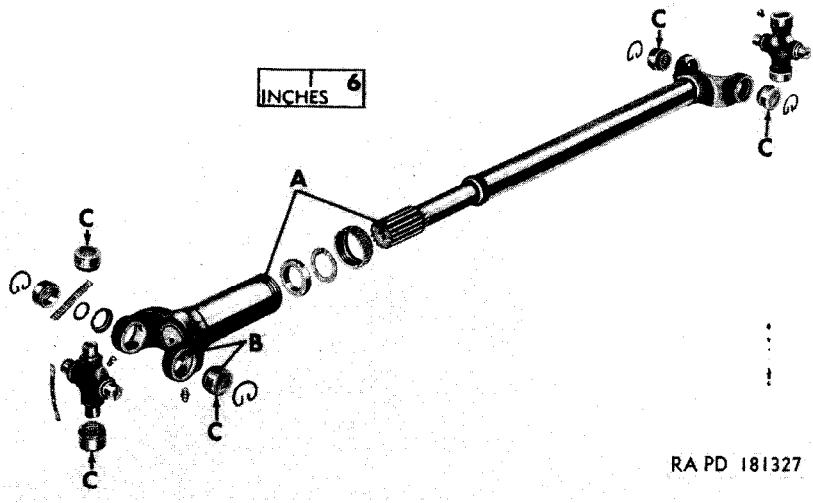


Figure 191. Propeller shaft repair and rebuild measuring points.

273. Front Axle

(ch. 8)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
192	C and D	Clearance between pinion and pinion shaft.	0.0024–0.0039	0. 0069
	A	Clearance between bearing cups and housing.	0.008	(*)
	B	Drive gear and drive pinion backlash	0.005–0.007	(*)
	E	Drive gear runout	Excess of 0.003	(*)

274. Rear Axle

(ch. 9)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
193	C and D	Clearance between pinion and pinion shaft.	0.0024–0.0039	0. 0069
	A	Clearance between bearing cups and housing.	0.008	(*)
	B	Drive gear and drive pinion lash	0.005–0.007	(*)
	F	Drive gear runout	Excess of 0.003	(*)
	E	Diameter of differential thrust block	1.066–1.071	(*)

275. Springs

(ch. 11)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
194	A	Diameter of shackle bushing type bearing.	0.845–0.855	(*)
	C	Diameter of bushing type eye bearing	0.860–0.875	(*)
	B	Diameter of pivot bolts	0.4355–0.4375	(*)
	A	Spring shackle bushing type bearing to shackle (threaded type).	0.015	

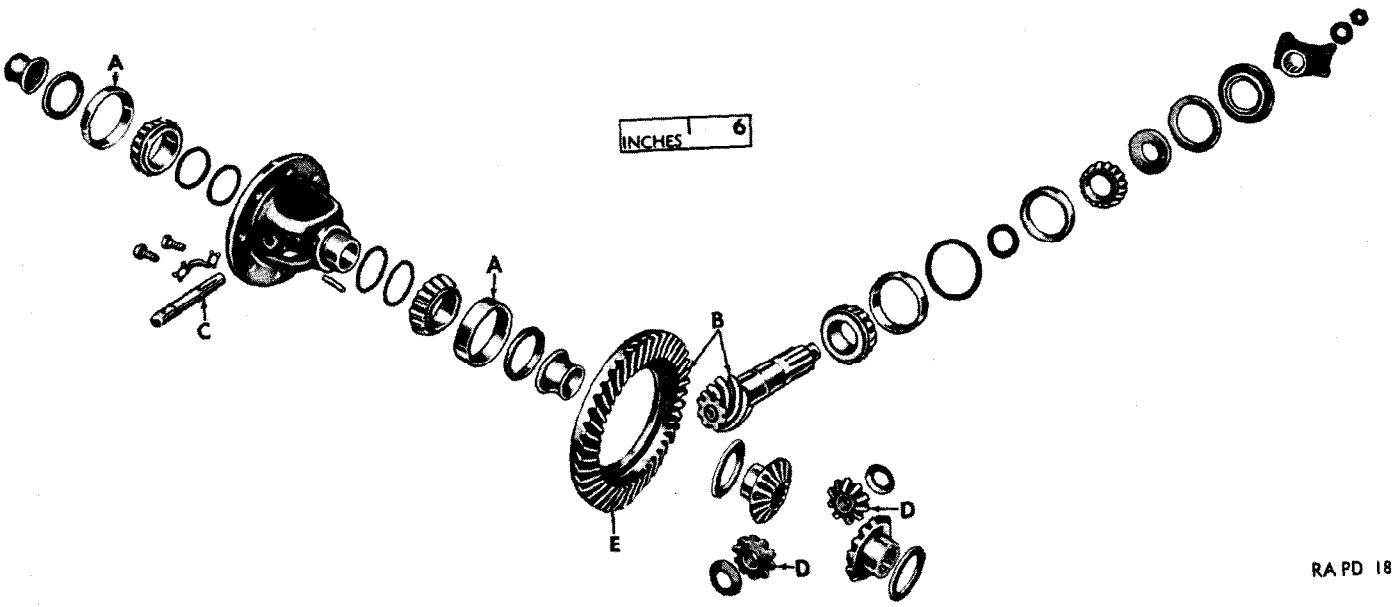


Figure 192. Front axle repair and rebuild measuring points.

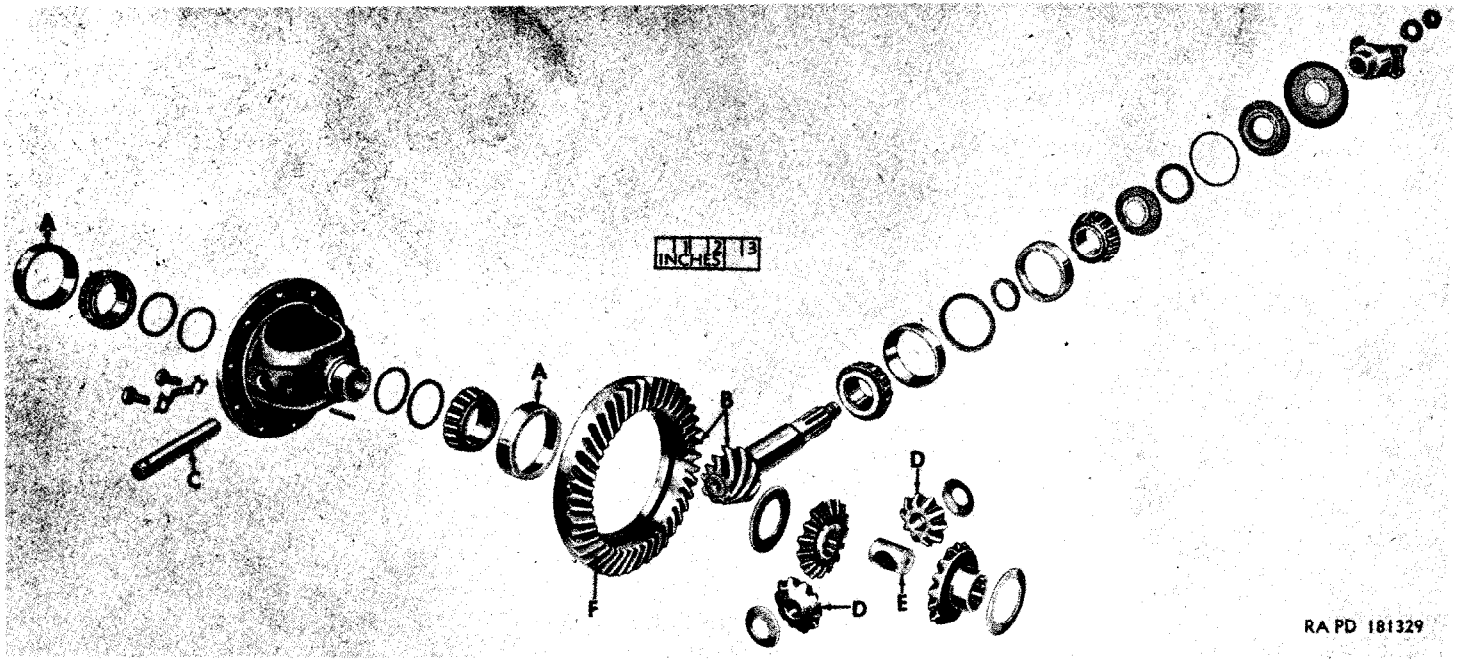


Figure 193. Rear axle repair and rebuild measuring points.

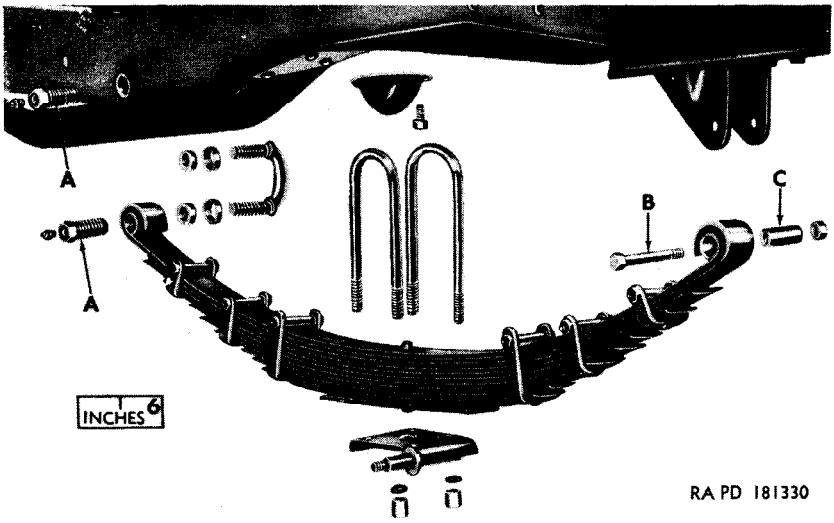


Figure 194. Spring repair and rebuild measuring points.

276. Steering System

(ch. 12)

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
195	A	Inside diameter of pitman shaft bushing type bearings.	0.937–0.938____	(*)

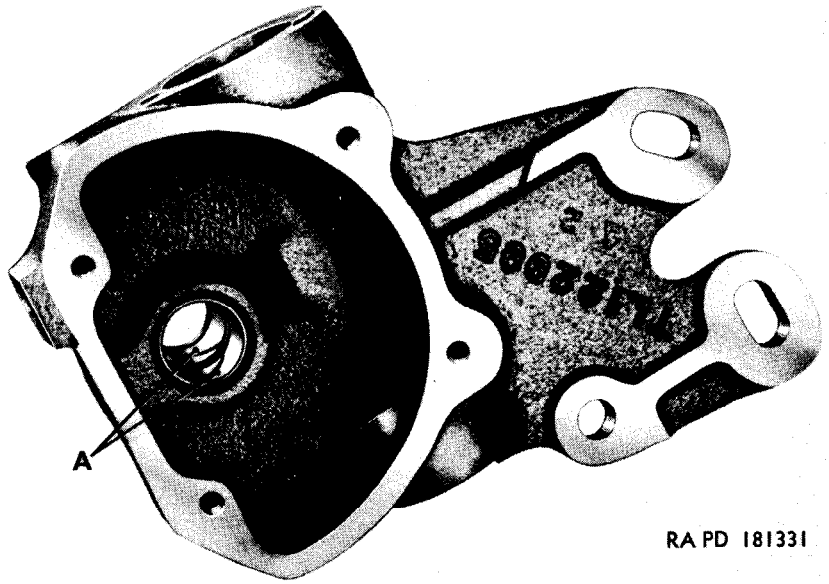


Figure 195. Steering mechanism repair and rebuild measuring points.

277. Torque Wrench Specifications

Location	*Torque in lb-ft*
Brake backing plate bolts	25–35
Differential bearing cap bolts	39–42
Drive gear screws	38–42
Hand brakedrum bolts	20–30
Pitman arm plain nut	150–175
Propeller shaft universal joint journal bearing U-bolts	15–20
Spring front and rear U-bolts	50–55
Spring pivot bolts	27–30
Steering gear to frame bolts	36–40
Steering tie rod bolts	10–15
Wheel spindle bolt	45–55

APPENDIX
REFERENCES

1. Publication Indexes

Special Regulations in the 310–20 series; SR 110–1–1; ORD 1; SR 310–20–29; and FM 21–8 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

The following Department of the Army Supply Manuals pertain to this materiel:

a. Destruction To Prevent Enemy Use.	
Land Mines and Components, Demolition Explosives and Related Items; and Ammunition for Simulated Artillery Booby Trap, Hand Granade, and Land Mine Fire.	ORD 3 SNL R–7
b. Repair and Rebuild.	
Antifriction Bearings and Related Items	ORD 5 SNL H–12
Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNL K–1
Electrical Fittings	ORD 5 SNL H–4
Items of Soldering, Metallizing, Brazing and Welding Materials: Gases and Related Items.	ORD 3 SNL K–2
Lubricating Equipment, Accessories and Related Dispensers.	ORD [1] SNL K–3
Lubricating Fittings, Oil Filters, and Oil Filter Elements.	ORD 5 SNL H–16
Major Items and Major Combinations of Group G.	ORD 3 SNL G–1
Miscellaneous Hardware	ORD 5 SNL H–2
Oil Seals	ORD 5 SNL H–13
Pipe and Hose Fittings	ORD 5 SNL H–6
Standard Hardware	ORD 5 SNL H–1
c. Vehicle.	
Truck, ¼-ton, 4 x 4, Utility, M38A1	ORD [1] SNL G–758

[1] See SR 310–20–29 for published Manuals of the Ordnance section of the Department of the Army Supply Manual.

3. Forms

The following forms pertain to this materiel:

DA Form 9–1, Materiel Inspection Tag.
DA Form 9–3, Processing Record for Shipment and Storage of Vehicles and Boxed Engines.
DA Form 9–4, Vehicular Storage and Servicing Record.
DA Form 9–68, Spot Check Inspection Report for Wheeled and Half-Track Vehicles.
DA Form 9–71, Locator and Inventory Control Card.
DA Form 9–72, Ordnance Stock Record.
DA Form 9–76, Request for Work Order.
DA Form 9–77, Job Order Register.
DA Form 9–78, Job Order.
DA Form 9–79, Parts Requisition.
DA Form 9–80, Job Order File.
DA Form 9–81, Exchange Part or Unit Identification Tag.
DA Form 446, Issue Slip.
DA Form 447, Turn-In Slip.
DA Form 460, Preventive Maintenance Roster.
DA Form 461, Preventive Maintenance Service and Inspection for Wheel and Half-Track Vehicles.
DA Form 461–5, Limited Technical Inspection.
DA Form 462, Preventive Maintenance Service and Inspection for Full-Track Vehicles.
DA Form 468, Unsatisfactory Equipment Report.
DA Form 478, MWO and Major Unit Assembly Replacement Record and Organizational Equipment File.
DA Form 811 and 811–1, Work Request and Job Order and Hand Receipt.
DA Form 865, Work Order.
DA Form 866, Condolidation of Parts.
DA Form 867, Status of Modification Work Order.
DD Form 6, Report of Damaged or Improper Shipment.
DD Form 313, U. S. Government Operator's Permit.
DD Form 317, Preventive Maintenance Service Due.

4. Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

a. Camouflage.

Camouflage, Basic Principles	FM 5–20
Camouflage of Vehicles	FM 5–20B

b. Decontamination.

Decontamination	TM 3–220
Defense Against Chemical Attack	FM 21–40

c. Destruction To Prevent Enemy Use.

Explosives and Demolitions	FM 5–25
Ordnance Service in the Field	FM 9–5

d. General.

Cooling Systems: Vehicles and Powered Ground Equipment.	TM 9–2858
Inspection of Ordnance Materiel in the Hands of Troops.	TM 9–1100
Military Vehicles	TM 9–2800
Precautions in Handling Gasoline	AR 850–20
Safety: Prevention of Motor Vehicle Accidents.	SR 385–155–1
Principles of Automotive Vehicles	TM 9–2700
Safety: Reports of Accident Experience	SR 385–10–40
Storage Batteries, Lead-Acid Type	TM 9–2857

e. Repair and Rebuild.

Abrasives, Cleaning, Preserving, Sealing, Adhesive and Related Materials Issued for Ordnance Materiel.	TM 9–850
Disposal of Supplies and Equipment: Uneconomically Repairable Ordnance Vehicles.	SR 755–105–5
Hand, Measuring, and Power Tools	TM 10–590
Instruction Guide: Care and Maintenance of Ball and Roller Bearings.	TM 37–265
Lubrication	TM 9–2835
Maintenance and Care of Hand Tools	TM 9–867
Maintenance and Care of Pneumatic Tires and Rubber Treads.	TM 31–200
Maintenance of Supplies and Equipment: Maintenance Responsibilities and Shop Operation.	AR 750–5
Maintenance of Supplies and Equipment: Ordnance Expenditure Limits for Repair of Transport Vehicles.	SR 750-130–5
Modification of Ordnance Materiel	SB 9–38
Ordnance Field Maintenance	FM 9–10
Ordnance Maintenance: Hydraulic Brakes (Wagner-Lockheed).	TM 9–8653 (TM 9–1827C)
Ordnance Maintenance: Carburetors (Carter).	TM 9–8641 (TM 9–1826A)
Ordnance Maintenance: Electrical Equipment (Auto-lite).	TM 9-8629 (TM 9–1825B)
Ordnance Maintenance: Electrical Equipment (Delco-Remy).	TM 9–8627 (TM 9–1825A)
Ordnance Maintenance: Fuel Pumps	TM 9–8655 (TM 9–1828A)

Painting Instructions for Field Use	TM 9–2851
Preparation of Ordnance Materiel for Deep Water Fording.	TM 9–2853
Preventive Maintenance of Electric Motors and Generators.	TM 55–405
Supplies and Equipment: Unsatisfactory Equipment Report.	SR 700–45–5
Wheeled and Half-Track Vehicles, Trailers, and Towed Artillery: Lubrication of Wheel Bearings.	TB 9–2835–12
f. Operation	
¼-ton 4 x 4 Utility Truck M38A1	TM 9–804A
g. Shipment and Stand-by or Long-Term Storage.	
Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Packaging and Shipping (Posts, Camps, and Stations).	TM 9–2854
Marking and Packaging of Supplies and Equipment: Marking of Oversea Supply.	SR 746–30–5
Military Standard—Marking of Shipments.	MIL–STD–129 [2]
Ordnance Storage and Shipment Chart—Group G.	TB 9–OSSC–G
Preparation of Supplies and Equipment: Processing of Unboxed and Uncrated Equipment for Oversea Shipment.	AR 747–30
Preservation, Packaging, and Packing of Military Supplies and Equipment.	TM 38–230
Processing of Motor Vehicles and Related Unboxed Materiel for Shipment and Storage.	SB 9–4
Protection of Ordnance General Supplies in Open Storage.	TB ORD 379
Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment.	SR 745–45–5 Navy Shipping Guide Article 1850–4 AFR 71–4.
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel Other than Ammunition and Army Aircraft.	TB ORD 385

[2] Copies may be obtained from Aberdeen Proving Ground, Aberdeen, Maryland.

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[AG 451.2 (30 Mar 54)]

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