

# TM 9-2320-218-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK, UTILITY:  
1/4-TON, 4x4, M151  
(2320-542-4783)



HEADQUARTERS, DEPARTMENT OF THE ARMY  
JULY 1960

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
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## ORGANIZATIONAL MAINTENANCE

### TRUCK, UTILITY, ¼ TON, 4X4, M151

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# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1. SCOPE

a. This technical manual contains instructions for organizational maintenance of the 1/4 ton, 4x4, utility truck, M151 as well as descriptions of major units.

b. Appendix I contains a list of current references, including supply manuals, technical manuals, forms, and other available publications applicable to the 1/4 ton, 4x4, utility truck, M151.

c. Appendix II contains the maintenance allocation chart which lists the maintenance responsibilities allocated to each echelon of maintenance.

d. TM 9-2320-218-20P (app. III) contains the repair parts and special tools list for the 1/4 ton, 4x4, utility truck, M151.

e. This first edition is being published in advance of complete technical review. Any errors or omissions will be brought to the attention of the Commanding Officer, Raritan Arsenal, Metuchen, New Jersey, ATTENTION: ORDJR-OPRA, using DA Form 2028.

#### 2. MAINTENANCE ALLOCATION

In general, the prescribed maintenance responsibilities will apply as reflected in the maintenance allocation chart (app. II). In all cases, where the nature of repair, modification, or adjustment is beyond the scope or facilities of organizational maintenance, the supporting unit should be informed in order that trained personnel with suitable tools and equipment may be provided or other instructions issued.

#### 3. FORMS, RECORDS, AND REPORTS

a. Authorized Forms. The forms generally

applicable to units maintaining this materiel are listed in appendix I. For a listing of all forms, refer to DA Pam 310-2. For instructions on use of these forms, refer to FM 9-10.

b. Field Report of Accidents. Injury to personnel or damage to materiel. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in SR 385-10-40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

c. Report of Unsatisfactory Equipment and Materiel. Any deficiencies detected in the equipment covered herein which occur under the circumstances indicated in AR 700-38 should be immediately reported in accordance with the applicable instructions in these regulations.

#### 4. CARBON MONOXIDE POISONING

Carbon monoxide gas is poisonous, colorless, and odorless, and can cause lasting damage when inhaled in percentages as low as 0.1%. Carbon monoxide is generated whenever internal combustion engines are operated, and the following precautions must be taken for the safety of all personnel in surrounding areas.  
**WARNING - CARBON MONOXIDE POISONING**

a. Do not operate vehicle when inspection plates or cover plates are removed.

b. Keep all doors wide open when performing maintenance on the vehicle.

c. Perform visual inspection of the exhaust system for possible exhaust gas leaks at least once a month.

d. Do not idle engine for extended periods without making provisions for adequate ventilation.

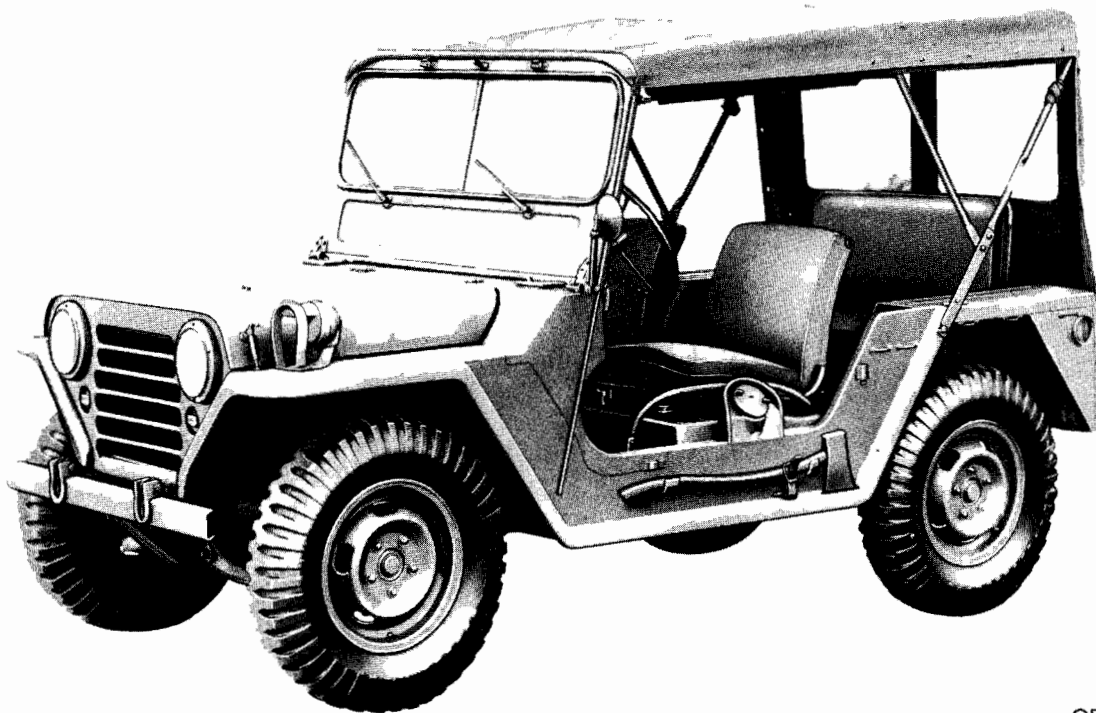
### Section II. DESCRIPTION AND DATA

#### 5. DESCRIPTION

a. The 1/4 ton, 4x4, utility truck, M151,

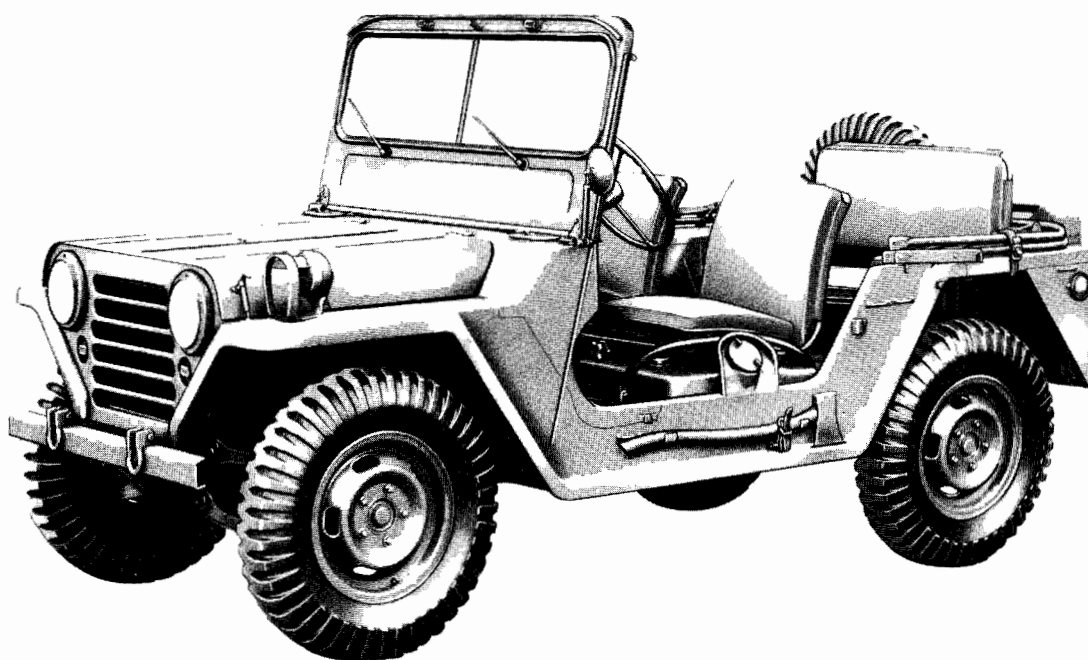
figures 1 and 2, is designed as a general purpose personnel or cargo type carrier, for use over all types of roads as well as cross-country





ORD E5071

Figure 1. 1/4 ton, 4x4, utility truck, M151



ORD E5073

Figure 2. 1/4 ton, 4x4, utility truck, M151

terrain, and in all weather conditions. It will ford hard bottom water crossings to a depth of twenty-one inches.

b. The vehicle is powered by a four-cylinder overhead valve, in line, liquid cooled, gasoline engine, located forward of the passenger compartment under the hood. A four-speed conventional type synchro-mesh transmission with transfer case transmits power to the front and rear axles. Service brakes are hydraulic. All wheels have individual suspension utilizing coil springs.

c. The body and frame are integral, all welded construction, providing space for four men and equipment including driver. The windshield can be folded forward to lie flat on the hood for a low silhouette. The body can be enclosed with removable canvas top, side curtains, and doors. Space is provided in and on the body for stowage of equipment.

d. The spare tire and wheel is mounted on the rear panel, right-hand side. A pintle hook is provided at the rear and lifting eyes at the front and rear to permit towing or lifting the vehicle.

## 6. TABULATED DATA

### a. General

Model \_\_\_\_\_ M-151  
Crew \_\_\_\_\_ 1  
Passengers (including crew) \_\_\_\_\_ 4  
Curb weight \_\_\_\_\_ 2273 lb  
Shipping weight (dry) \_\_\_\_\_ 2136 lb  
Payload (improved road) \_\_\_\_\_ 1200 lb  
Payload (cross-country) \_\_\_\_\_ 800 lb  
Towed load (improved road) \_\_\_\_\_ 2000 lb  
Towed load (cross-country) \_\_\_\_\_ 1500 lb

### b. Dimensions

Wheelbase \_\_\_\_\_ 85.0 in.  
Tread, front \_\_\_\_\_ 53.0 in.  
Tread, rear \_\_\_\_\_ 53.0 in.  
Length, overall \_\_\_\_\_ 132.0 in.  
Width, overall \_\_\_\_\_ 63.0 in.

Height, with top, overall (empty) \_\_\_\_\_ 71.0 in.  
Height, lowest operable (empty) \_\_\_\_\_ 52.5 in.  
Ground clearance, minimum (empty) \_\_\_\_\_ 10.3 in.

### c. Performance

#### Maximum Speeds

(permissible)

4th gear \_\_\_\_\_ 66 mph  
3rd gear \_\_\_\_\_ 40 mph  
2nd gear \_\_\_\_\_ 21 mph  
1st gear \_\_\_\_\_ 11 mph  
Reverse \_\_\_\_\_ 9 mph

#### Cruising range

(highway without towed load - approximate) \_\_\_\_\_ 300 miles

#### Turning radius (to

centerline of outermost wheel tread) \_\_\_\_\_ 17.9 ft

#### Fording depth (with-

out special equipment) \_\_\_\_\_ 21 in.

#### Fording depth (with

deep fording kit) \_\_\_\_\_ 5 ft

### d. Capacities

Gasoline tank \_\_\_\_\_ 17.7 gal.  
Crankcase oil (without filter) \_\_\_\_\_ 4 qt  
Crankcase oil (including filter) \_\_\_\_\_ 5 qt  
Cooling system \_\_\_\_\_ 8 qt

### e. Engine

Design \_\_\_\_\_ Ford Motor Co  
Cylinders \_\_\_\_\_ 4  
Displacement \_\_\_\_\_ 141.5 cu in.  
Compression ratio \_\_\_\_\_ 7.5 to 1  
Horsepower (at 60°F air) \_\_\_\_\_ 71 at 4000 rpm  
Torque (ft.-lb. at 60°F air) \_\_\_\_\_ 128 at 1800 rpm  
Fuel \_\_\_\_\_ Gasoline  
Firing order \_\_\_\_\_ 1-3-4-2  
Valve arrangement \_\_\_\_\_ overhead  
Carburetor  
Type \_\_\_\_\_ single barrel, side draft  
Choke \_\_\_\_\_ manual  
Fan belts  
Number \_\_\_\_\_ 2

Type \_\_\_\_\_ "V" wedge  
Width \_\_\_\_\_ 0.38 in.

f. Fuel System

Air cleaner \_\_\_\_\_ oil bath type

Fuel filter

Location \_\_\_\_\_ in fuel tank,  
around fuel  
pump

Type \_\_\_\_\_ impregnated  
paper

Fuel pump

Location \_\_\_\_\_ in fuel tank

Type \_\_\_\_\_ electric

g. Electrical system

Batteries

Location \_\_\_\_\_ under right front  
seat

Number \_\_\_\_\_ 2

Type \_\_\_\_\_ 2 HN

Ampere-hour  
capacity \_\_\_\_\_ 45 at 20 hr rate

Voltage \_\_\_\_\_ 12

Terminal ground—negative

Generator

Make \_\_\_\_\_ Autolite

Type \_\_\_\_\_ shunt wound

Rating \_\_\_\_\_ 25 amp

Voltage \_\_\_\_\_ 24

Generator Regulator

Make \_\_\_\_\_ Autolite

Current limit \_\_\_\_\_ 25 amp

Voltage limit \_\_\_\_\_ 28.3 at 70°

Ignition Distributor

Make \_\_\_\_\_ Autolite

Type of advance—centrifugal

Contact gap \_\_\_\_\_ .020 in.

Ignition Coil

Location \_\_\_\_\_ in distributor  
housing

Voltage \_\_\_\_\_ 24

Spark Plugs

Size \_\_\_\_\_ 14mm

Gap \_\_\_\_\_ .029-.032 in.

Starter Motor

Make \_\_\_\_\_ Autolite

Type \_\_\_\_\_ series wound

Voltage \_\_\_\_\_ 24

h. Cooling System

Radiator filler cap—spring pressure -  
7 psi

Thermostat

Location \_\_\_\_\_ cylinder head

Opening range \_\_\_\_\_ 180° to 202°F

Type \_\_\_\_\_ spring and  
cartridge

i. Power train

Clutch

Type \_\_\_\_\_ single dry disc

Diameter \_\_\_\_\_ 8 in.

Transmission

Type \_\_\_\_\_ selective synchro-  
mesh

Speeds \_\_\_\_\_ 4 forward -  
1 reverse

Transfer \_\_\_\_\_ single speed

Tires

Number \_\_\_\_\_ 5

Type \_\_\_\_\_ light weight,  
nylon cord

Tread \_\_\_\_\_ non-directional,  
cross-country

Size \_\_\_\_\_ 7.00 x 16

Plies \_\_\_\_\_ 4 (6 ply rating)

Inflation pressures Front Rear

Highway \_\_\_\_\_ 20 lb — 25 lb

Cross-country 18 lb — 22 lb

Mud, sand,  
snow \_\_\_\_\_ 12 lbs — 18 lbs

Wheels

Number of mount-  
ing studs \_\_\_\_\_ 5

Material \_\_\_\_\_ magnesium alloy

Type \_\_\_\_\_ drop center  
(safety) rim

j. Suspension

Type \_\_\_\_\_ independent,  
4 wheel

Springs \_\_\_\_\_ coil

Front shock absorbers

Type \_\_\_\_\_ hydraulic,  
telescopic

Action \_\_\_\_\_ two way direct  
(jounce &  
rebound control)

Stops \_\_\_\_\_ internal hydraulic  
jounce and  
rebound

Rear shock absorbers

Type \_\_\_\_\_ hydraulic,  
telescopic

Action \_\_\_\_\_ two way direct  
(jounce &  
rebound control)



Stops \_\_\_\_\_ internal hydraulic  
rebound external - jounce

Width \_\_\_\_\_ 2.00 in.

Master cylinder

Location \_\_\_\_\_ cowl, left side

Type \_\_\_\_\_ reservoir and  
cylinder

Parking brake

Type \_\_\_\_\_ mechanical,  
drum and band

Location, drum — transmission  
output shaft

k. Brakes

Service brakes

Type \_\_\_\_\_ hydraulic

Diameter \_\_\_\_\_ 9.125 in.

## CHAPTER 2

# SERVICE AND MAINTENANCE INSTRUCTIONS

### Section I. SERVICE UPON RECEIPT OF MATERIEL

#### 7. GENERAL

a. Perform a "break-in" of at least 500 miles on all new or reconditioned materiel and a sufficient number of miles on used materiel to completely check its operation, according to procedures in paragraph 8. Refer to TM 9-2320-218-10 for operating instructions, break-in operating cautions, and break-in speeds.

b. Whenever practicable, the driver will assist in the performance of these services.

#### 8. PRELIMINARY SERVICES

##### a. General Procedures

- (1) If any exterior surfaces are coated with rust preventive compound, remove it with dry-cleaning solvent or mineral spirits paint thinner.
- (2) Read Processing Record for Shipment and Storage of Vehicles and Unboxed Engines tag (DA Form 9-3) and follow all precautions checked thereon. This tag should be attached to the steering wheel, shifting levers, or ignition switch.
- (3) On materiel so equipped, crank engine by hand at least two revolutions, before turning ignition on, to test for hydrostatic lock. (This precaution is taken because there might be an excess of preservative oil in the combustion chambers, or, possibly, coolant may have leaked into them.)

NOTE: If the materiel has been driven to the using organization, most or all of the foregoing procedures should have been performed.

- (4) Follow the general procedures given in paragraph 19, section IV, Chapter 2 and TM 9-2320-218-10.

##### b. Specific Procedures

- (1) Perform the "Q" (3 month or 3,000 mile)

preventive - maintenance services as outlined on DA Form 461, with variations listed in (2) through (5) below.

- (2) Write in notation at top of Form, "New (or rebuilt) vehicle reception".
- (3) Tighten cylinder head nuts before starting engine. Refer to paragraph 34 for proper torque rating and correct tightening sequence.
- (4) Before starting road test, lubricate vehicle in accordance with lubrication chart, item 23, Table III. Check processing tag (a(2) above) for engine oil and viscosity. If tag states that oil is suitable for 500 miles of operation and is of the proper viscosity for local operation, check the level, but do not change the oil. Lubricate all points, regardless of interval.
- (5) Perform the services outlined in item 3, Table III for the ignition system. Inspect breaker points, paragraph 67.

#### 9. SERVICE AFTER 500 MILES

After 500 miles of materiel operation, perform the "Q" (3,000 mile) preventive-maintenance service, with variations listed in a and b below.

a. Write in notation at top of DA Form 461, "New (or rebuilt) vehicle 500 mile service".

b. Change the engine oil.

#### 10. SERVICE AFTER 1000 MILES

When the materiel has been driven 1,000 miles, it will be placed on the regular preventive-maintenance schedule and will be given the first regular "Q" (3,000 mile) preventive-maintenance service.

## 11. CORRECTION OF DEFICIENCIES

a. Ordinary deficiencies disclosed during preliminary inspection and servicing or during break-in period will be corrected by the using

organization or a higher echelon maintenance.

b. Serious deficiencies, which appear to involve unsatisfactory design or materiel, will be reported on DA Form 468, Unsatisfactory Equipment Report (par 3).

## Section II. PARTS, TOOLS, AND EQUIPMENT

### 12. GENERAL

Tools, equipment, and repair parts are issued to organizational-maintenance personnel

for maintaining the materiel. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored in the chest and/or roll provided for them.

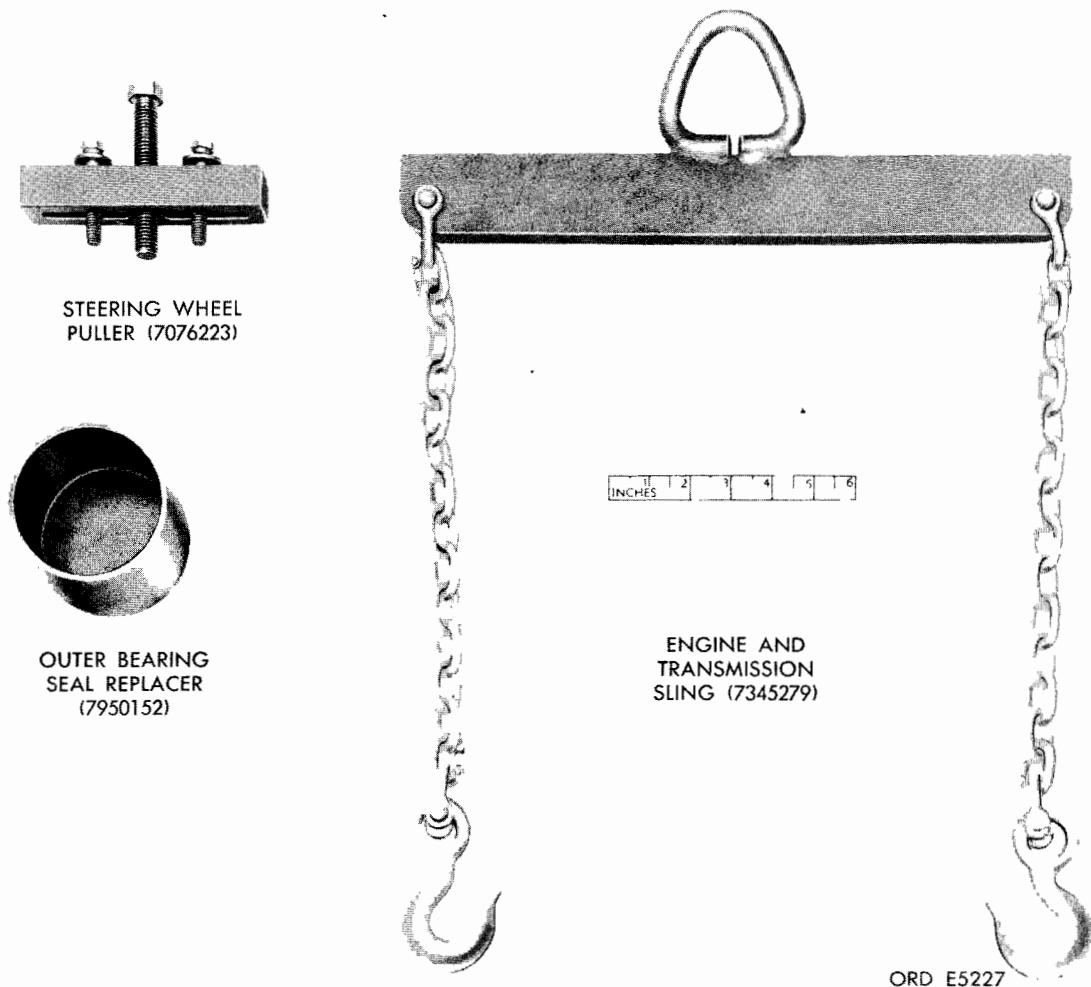


Figure 3. Special tools and equipment for organizational maintenance



Table I Special tools and equipment for organizational maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
1. Puller	7076223	126	151	Remove steering wheel
2. Replacer	7950152	108	128	Installing front and rear wheel bearing seals.
3. Sling	7345279	10	27	Lifting engine and transmission.

### 13. REPAIR PARTS

Repair parts are supplied to organizational-maintenance personnel for replacement of those parts most likely to become worn, broken, or otherwise unserviceable, providing replacement of these parts is within their scope. Repair parts supplied for the 1/4 ton, 4x4, utility truck, M151 are listed in TM 9-2320-218-20P (app. III) which is the authority for requisitioning replacements.

### 14. COMMON TOOLS AND EQUIPMENT

Standard and commonly used tools and equip-

ment having general application to this materiel are authorized for issue by tables of allowances and tables of organization and equipment.

### 15. SPECIAL TOOLS AND EQUIPMENT

Certain tools and equipment specially designed for organizational maintenance, repair, and general use with the materiel are listed in table I for information only. This list is not to be used for requisitioning replacements. Special tools for organizational maintenance are listed in TM 9-2320-218-20P (app. III) which is the authority for requisitioning replacements.

## Section III. LUBRICATION

### 16. LUBRICATION CHART

The Lubrication Chart is contained in the operator's manual and prescribes cleaning and lubricating procedures as to locations, intervals, and proper materials for this materiel. Lubrication to be performed will be in accordance with the maintenance allocation chart (app. II) and the Lubrication Chart. Whenever necessary, the operator, crew, or user will assist the organizational-maintenance personnel in lubrication of the materiel.

### 17. GENERAL LUBRICATION INSTRUCTIONS

a. General. Any special lubricating instructions required for specific mechanisms or parts are covered in the pertinent section.

b. Service Intervals. Service intervals

specified on the lubrication chart are for normal operation and where moderate temperature, humidity, and atmospheric conditions prevail.

#### c. Reports and Records.

- (1) Report unsatisfactory performance of preserving materials, using DA Form 468, Unsatisfactory Equipment Report (par 3).
- (2) Maintain a record of lubrication of the materiel on DA Form 461, Quarterly Maintenance or Spot Check for Wheeled Vehicles - Wheeled Trailers.

### 18. PAINTING

Instructions for the preparation of the materiel for painting, methods of painting, and materials to be used are contained in TM 9-2851. Instructions for camouflage painting are contained in FM 5-20B.

## Section IV. PREVENTIVE MAINTENANCE SERVICES

### 19. GENERAL

The system of preventive-maintenance services for tactically wheeled materiel is outlined in table II. The services, as outlined, are designated as second-echelon services.

Table II. Outline of Preventive-Maintenance Services for 1/4 ton, 4x4, Utility Truck, M151

Service	Interval	Accomplished by
Quarterly "Q"	Quarterly or 3,000 miles, whichever occurs first.	Regimental or battalion or separate company/battery maintenance personnel

### 20. GENERAL PROCEDURES

a. Automatically Applied. All of the general procedures given in the operator's manual will be followed. Organizational mechanics must be so thoroughly trained in these procedures that they apply them automatically at all times in the performance of their duties.

b. First-Echelon Participation. The driver or crew usually accompanies the materiel and assists the organizational mechanics in the performance of second-echelon services.

c. Unwashed Materiel. The driver or crew should present the materiel for a scheduled preventive-maintenance service in a reasonably clean condition; that is, it should be dry and not caked with mud to such an extent as to seriously hamper inspection and services. However, washing of the materiel should be avoided immediately prior to an inspection, since certain types of defect such as loose parts and oil leaks may not be evident immediately after washing.

d. Plates. Name plates, caution plates, and instruction plates made of steel rust very rapidly. When they are found to be in a rusty condition, they should be thoroughly cleaned and heavily coated with an application of lacquer. Refer to TM 9-2851.

e. Services. Second-echelon services are defined by, and restricted to, the following general procedures unless approval has been given by the supporting ordnance organization.

- (1) Adjust. Make all necessary adjustments in accordance with instructions contained in the pertinent section of this technical manual or technical bulletins.
- (2) Clean. Clean the unit as outlined in TM 9-2320-218-10 to remove old lubricant, dirt, and other foreign material.
- (3) Special lubrication. This applies either to lubrication operations that do not appear on the materiel lubrication chart or to items that do appear but which should be performed in connection with the maintenance operations.
- (4) Service. This usually consists of performing special operations, such as replenishing battery water, draining and refilling units with oil, and changing or cleaning the oil filter, air cleaner, or cartridges.
- (5) Tighten. All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use a torque-indicating wrench where specified. Also do not overtighten, as this may strip threads or cause distortion. Tightening will always be understood to include the correct installation of lock washers, lock nuts, locking wire, or cotter pins to secure the tightened nut. For torque specifications for attaching parts refer to the pertinent paragraph.
- (6) Modification work order application. At least every 6 months, a checkup will be made to see that all modification work orders have been applied. A list of current modification work orders is published in DA PAM 310-4. If a modification has not been applied, promptly notify the local ordnance officer. No alteration or modification, which will affect moving parts, will be made by organizational personnel, except as authorized by official publications.

f. **Special Conditions.** When conditions make it difficult to perform the complete preventive-maintenance procedures at one time, they can sometimes be handled in sections. Plan to complete all operations within a week if possible. All available time at-halts and in bivouac areas must be utilized, if necessary, to assure that maintenance operations are completed. When limited by the tactical situation, items with special services in the columns of table III should be given first consideration.

g. **DA Form 461.** The numbers of the specific preventive-maintenance procedures that follow are identical with those outlined on DA Form 461, Quarterly Maintenance or Spot Check for Wheeled Vehicles - Wheeled Trailers. Certain items on the form that do not apply to this materiel are not included in the procedures in this technical manual. In general, the sequence of items on the form is followed, but in some instances there is deviation for conservation of the mechanics time and effort.

## 21. QUARTERLY "Q" PREVENTIVE-MAINTENANCE SERVICES

a. **Intervals.** The quarterly "Q" preventive-maintenance services are performed by the organizational mechanics every three months or at every 3,000 miles of vehicle operation, whichever occurs first.

b. **Purpose.** The "Q" preventive-maintenance services insure the correct adjustment, securing, and assembly of all components of the materiel. Necessary replacements, cleaning, lubrication, and protection of parts and/or assemblies will be accomplished as required, to give reasonable assurance of trouble-free operation until the next "Q" preventive-maintenance service is performed.

## 22. SPECIFIC PROCEDURES FOR SECOND ECHELON

Specific procedures for performing each item in the quarterly "Q" preventive-maintenance services on materiel are given in table III.

Table III. Organizational Maintenance or Maintenance Crews  
Quarterly ("Q") Preventive Maintenance Service

PART I. ITEMS WHICH SHOULD BE CHECKED BY ROAD TEST AND CORRECTIONS MADE DURING MAINTENANCE SERVICE (Perform Before-Operation Service and Check Current Work File)	
Note: <u>Item numbers listed below are identical with numbers shown on DA Form 461</u>	
No.	Detailed Procedure For Item
1.	<u>Dash Instruments.</u> Check fuel gage, battery-generator indicator, speedometer, oil pressure gage, temperature gage, ignition switch, and other controls. Observe all for normal readings. Notice if ignition switch operates freely. Check other controls for normal operation.
2.	<u>Safety Devices.</u> Depress horn button to sound horn and determine if signal is normal (if tactical situation permits). Test windshield wipers for satisfactory operation. Examine rear view mirror and reflectors.
3.	<u>Engine.</u> a. <u>Performance.</u> In starting and warming engine, observe if it starts easily and if action of throttle and choke control assemblies are satisfactory. Notice if idling speed is correct. Listen for any unusual noises at idle and higher speeds. When operating vehicle, notice if it has normal power and acceleration in each speed range. Listen for any unusual noises when engine is under load.



No.	Detailed Procedure For Item (continued)
	<p>b. <u>Linkage and Lines.</u> Inspect carburetor, choke, and throttle linkage and lines. Notice if linkage operates freely and is not excessively worn. Observe if choke valve opens fully when choke control is released and if throttle valve opens fully when the accelerator is fully depressed. Make an engine vacuum test (par. 41) and adjust carburetor mixture (par. 51). Test fuel pump pressure (par. 56). Examine fuel lines and connections for evidence of leaks. Examine vent lines for loose connections.</p> <p>c. <u>Belts.</u> Check engine cooling fan, drive belts, and groove pulleys. Inspect pulleys and fan for alinement. Check belts for proper tension. Notice if water pump is leaking.</p> <p>d. <u>Ignition.</u> If engine performance is satisfactory and shows no excessive loss of power, skip, or exhaust smoke, only a visual inspection of the ignition system will be made. If loss of power, skip, or excessive exhaust smoke is noted, isolate the difficulty by troubleshooting (pars. 24 and 25).</p> <p>e. <u>Cooling System.</u> Inspect radiator core, shell, hoses, cap, and gaskets. Notice if radiator core is clogged with foreign matter or if fins are bent. Observe coolant level and examine coolant for dirt or other foreign matter. If required, drain radiator and cylinder block, flush and refill cooling system and add rust inhibitor, unless antifreeze containing rust inhibitor is used. Tighten radiator mounting and hose clamps.</p> <p>f. <u>Antifreeze Protection.</u> In cold weather, test coolant with a hydrometer to determine if cooling system contains sufficient antifreeze. Add as required.</p> <p>g. <u>Exhaust System.</u> Listen for loud or unusual noises and look for exhaust leaks. Tighten exhaust manifold mountings if required.</p> <p>h. <u>Filters.</u> Check condition of oil. If oil change is necessary change oil and replace oil filter.</p>
4.	<p><u>Steering.</u> Check steering for free play, bind, wander, shimmy, or side pull while moving forward. Turn steering wheel through its entire range to check for binding. Examine steering column and wheel.</p>
5.	<p><u>Clutch.</u> Check if action of pedal return spring is satisfactory. Note if clutch disengages completely or if it has a tendency to drag. Note if clutch engages smoothly or if it chatters, grabs, or slips. With transmission in neutral, depress clutch and listen for unusual noise which may indicate a defective release bearing.</p>
7.	<p><u>Brakes.</u></p> <p>a. <u>Service Brakes.</u> Make several stops and check for braking effect, side pull, noise, chatter, or other unusual conditions. Check brake pedal for specified free travel (par. 157). Remove one wheel and tire assembly and the hub (spindle) from each side of the vehicle and inspect brake drum, brake shoes (w/lining), brake shoe anchor, hold-down springs, retracting springs, adjusting socket (brake shoe adjusting screw), and wheel cylinder. If any part is defective inspect all service brake assemblies and correct any deficiencies found or notify ordnance maintenance personnel if the repair is not within the scope of organizational maintenance. If brake lining thickness from the outer surface to the rivet head is less than 3/64-inch, replace brake shoe assemblies (par. 159). If evidence of oil or grease is found on brake shoe assemblies, replace.</p>

No.	Detailed Procedure For Item (continued)
<p>b. <u>Parking Brakes</u>. Check if ratchet on parking brake control lever holds and if the lever requires more than three quarters travel for full application. Stop vehicle on an incline and apply parking brake to see if it holds the vehicle.</p> <p>8. <u>Generator and Wiring</u>. Check for proper tension on belts. Adjust as required. Check wiring for loose connections or worn insulation.</p> <p>9. <u>Starter and Starter Controls</u>. Notice if starter switch requires only normal pressure. Notice if starting motor engages smoothly and turns engine with normal cranking speed.</p> <p>10. <u>Power Train</u>.</p> <p>a. <u>Propeller Shafts and U-Joints</u>. Inspect and tighten as required.</p> <p>b. <u>Front Axle</u>. Inspect seals for damage. If damaged, inspect outer spindle bearing grease for dirt. Clean or replace as necessary (par. 128).</p> <p>c. <u>Rear Axle</u>. Inspect seals for damage. If damaged, inspect outer spindle bearing grease for dirt. Clean or replace as necessary (par. 128).</p> <p>d. <u>Springs</u>. Inspect for damaged springs.</p> <p>e. <u>Shock Absorbers</u>. Inspect for damaged shock absorbers or brackets. Check rubber insulators for excessive wear.</p> <p>11. <u>Lights and Clearance Indicating Reflectors</u>. During stops in the road test, check operation of lights and light switches. Note if headlights appear to be properly aimed. Check for damaged reflectors.</p>	
<p align="center"><b>PART II. ITEMS NOT REQUIRING OPERATION OF THE VEHICLE ON WHICH NECESSARY CORRECTION WILL BE MADE DURING MAINTENANCE SERVICE</b></p>	
No.	Detailed Procedure For Item
<p>12.</p> <p>13.</p> <p>14.</p> <p>15.</p>	<p><u>Batteries</u>. Test batteries only after engine has been stopped for five minutes or more. Check specific gravity of each cell and record specific gravity. Check electrolyte level. Inspect cables and clamps for tightness and condition. After test, clean tops of batteries, coat terminals lightly with grease, and repaint carrier if necessary.</p> <p><u>Fuel System</u>. Inspect in engine compartment and under vehicle for leaks. Check lines and connections for damage.</p> <p><u>Body and Body Accessories</u>. Make general inspection of body including glass, panels, top, fenders, bows, paulins, curtains, brush guards, hinges, brackets, and fasteners. Inspect seat frames and upholstery. Examine condition of paint and check markings and name, caution, and identification plates for legibility.</p> <p><u>Towing Hitches</u>. Check operation of pintle hook. Check mounting bolt for tightness.</p>

No.	Detailed Procedure For Item (continued)
16.	<u>Frame and Bumpers.</u> Inspect front and rear bumpers for looseness or damage.
23.	<u>Lubrication.</u> Lubricate vehicle in accordance with lubrication chart. Coordinate with inspection and disassembly operations to avoid duplication.
24.	<u>Final Road Check.</u> Perform final road test as outlined in Part I at the beginning of this table. Pay special attention to items which have just been repaired or adjusted.

## Section V. TROUBLESHOOTING

### 23. SCOPE

a. This section contains troubleshooting information and tests for locating and correcting some of the troubles which may develop in the materiel. Each symptom of trouble or malfunction given for an individual unit or system is followed by a list of probable causes of the trouble and corrective actions necessary to remedy the malfunction.

b. This technical manual cannot cover all possible troubles and deficiencies that may occur under the many conditions of operation. If a specific malfunction, probable cause, and corrective action therefore are not covered herein, proceed to isolate the system in which the trouble occurs and then locate the defective component. Use all the senses to observe and locate troubles. Do not neglect use of any test instruments such as an ohmmeter, voltmeter, ammeter, test lamp, hydrometer, and pressure

and vacuum gages that are available. Standard automotive theories and principles of operation apply in troubleshooting this vehicle. Question the driver to obtain maximum number of observed malfunctions. The greater the number of malfunctions that can be evaluated, the easier will be the isolation of the defect.

c. The tests and remedies provided in this section are governed by the scope of the organizational level of maintenance.

### 24. PROCEDURES

Table IV, lists possible malfunctions that may occur in the vehicle or in individual units or systems of the vehicle. Each malfunction is followed by a list of probable causes that must be considered in determining corrective action necessary to correct the malfunction. Probable causes are listed in their order of probability, and should be considered in that manner during troubleshooting.

Table IV. Troubleshooting

Malfunction	Probable Cause	Corrective Action
	ENGINE	
1. Engine will not turn when starting motor is actuated.	a. Defective starter.  b. Mechanical seizure of parts.  c. Incorrect oil viscosity.	a. Troubleshoot starting system (items 23 through 25).  b. Notify ordnance maintenance personnel.  c. Inspect engine oil. Drain and fill with correct grade as specified in lubrication chart



Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	ENGINE (continued)	
2. Engine turns over but will not start.	a. Combustion chambers flooded with fuel.	a. If choke has been used excessively, fuel may flood the combustion chamber causing engine not to start. Push choke all the way in, open throttle and crank engine to clean out excessive fuel. If flooding continues, check fuel system (item 17).
	b. Faulty batteries or cables.	b. Test batteries for charge and voltage (fig. 4). Replace or charge battery as required (par. 78). Check for loose cables and corroded battery terminals. Clean and tighten terminals.
	c. Current not reaching spark plug.	c. Troubleshoot ignition system (items 21 and 22).
	d. Inoperative fuel system.	d. Test fuel pump pressure (par. 55).
	e. Incorrect ignition timing.	e. Check the ignition timing and adjust if necessary (par. 68).
	f. Inoperative oil pressure safety switch or low oil level in crankcase.	f. Check engine oil level. Add oil if necessary. Check oil pressure safety switch circuit (par. 35).
3. Engine starts but fails to keep running.	a. Engine idle speed set too low.	a. Adjust carburetor (par. 51).
	b. Choke not operating properly.	b. Check choke linkage and correct any binding condition or replace damaged linkage (par. 53).
	c. Incorrect float setting.	c. Notify ordnance maintenance personnel.
	d. Defective fuel pump.	d. Check fuel pump pressure (par. 55). If fuel pump pressure is not within specified limits, replace fuel pump.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	ENGINE (continued)	
3. Engine starts but fails to keep running. (continued)	e. Breaker points not properly adjusted.  f. Defective spark plugs.  g. Leakage in primary wiring (ignition coil).	e. Check breaker point gap and tension of moveable contact arm (par. 66).  f. Check spark plugs (par. 69) and replace if defective.  g. Make continuity check, Table V. Replace ignition coil if defective. If ignition coil is not defective, notify ordnance maintenance personnel.
4. Engine runs, but misses.	a. Improper breaker point adjustment.  b. Defective ignition distributor.  c. Improper choke operation.  d. Incorrect float setting.  e. Low or erratic fuel pump pressure.	a. Adjust breaker points (par. 66).  b. Troubleshoot ignition distributor (items 21 and 22).  c. Check choke linkage and correct any binding condition, or replace damaged linkage, (par. 53).  d. Notify ordnance maintenance personnel.  e. Check fuel pump pressure, (par. 55). If fuel pump pressure is not within specified limits, replace fuel pump.
5. Poor acceleration.	a. Incorrect ignition timing.  b. Fouled or improperly adjusted spark plugs.  c. Defective or improperly adjusted breaker points.  d. Ignition distributor not advancing properly.	a. Adjust ignition timing (par. 68).  b. Inspect spark plugs (par. 69).  c. Inspect breaker points (par. 66).  d. Notify ordnance maintenance personnel.
6. Lack of power.	a. Engine overheating.	a. Troubleshoot cooling system (items 12-13).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	ENGINE (continued)	
6. Lack of power. (continued)	b. Choke not fully open. c. Fuel system restricted. d. Improper valve adjustment. e. Valves sticking.	b. Push choke control rod all the way in. Adjust cable if necessary. c. Troubleshoot fuel system (items 15 and 16). d. Check and adjust valve clearance (par. 39). e. Notify ordnance maintenance personnel.
7. Engine will not idle.	a. Carburetor out of adjustment. b. Air leaking into intake manifold. c. Faulty ignition system. d. Loose or corroded wiring.	a. Adjust carburetor (par. 51). b. Apply a small amount of oil at carburetor and intake manifold flanges. If oil is sucked into manifold air leak is present. Tighten flange nuts or replace gasket (par. 36). c. Troubleshoot ignition system (items 21 and 22). d. Remove wiring and inspect wire terminals for corrosion. Remove corrosion, and install. Tighten all connections.
8. Excessive oil consumption.	a. External leaks. b. Crankcase overfilled. c. Piston rings worn, stuck, or broken. d. Vacuum pump diaphragm failure. e. Improper grade of oil in engine.	a. Inspect oil pan and oil filter for leaks. If oil pan leaks notify ordnance maintenance personnel. b. Maintain oil at correct oil level. c. Test compression (par. 40). d. Replace vacuum pump (par. 167). e. Check engine oil viscosity.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	ENGINE (continued)	
8. Excessive oil consumption. (continued)	f. Crankcase vents not operating properly.	f. Notify ordnance maintenance personnel.
	g. Oil leaking into vacuum pump.	g. Notify ordnance maintenance personnel.
9. Spark knock or ping (a sharp metallic knock occurring on acceleration or when operating under heavy load).	a. Ignition timing too early for fuel used.	a. Check with timing light and correct timing (par. 68).
	b. Engine overheating.	b. Troubleshoot cooling system (items 12-14).
	c. Ignition distributor automatic advance functioning improperly.	c. If the causes listed in a and b above are not evident, replace distributor (par. 67). If replacing distributor does not correct condition, notify ordnance maintenance personnel.
	d. Improper spark plugs.	d. Install correct spark plugs.
10. Valve noise.	a. Valve clearance improperly adjusted.	a. Check valve clearance adjustment (par. 39).
	b. Valve spring(s) broken.	b. Notify ordnance maintenance personnel.
	c. Valve stems or tappets worn.	c. Notify ordnance maintenance personnel.
	d. No oil at tappet.	d. Notify ordnance maintenance personnel.
11. Low or no oil pressure.	Oil low in crankcase.	Check engine oil level and grade. Refer to lubrication chart. Crankcase should be properly filled with oil of correct grade. If correct level and grade of oil is found, low oil pressure may be caused by worn engine parts. Notify ordnance maintenance personnel.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
12. Engine overheats.	<b>COOLING SYSTEM</b>	
	a. Cooling system has low coolant level.	a. Replenish coolant. Fill to a level slightly below the bottom of the radiator filler neck. Add anti-freeze solution as required.
	b. Clogged cooling system.	b. Clean cooling system.
	c. Loose or worn drive belts.	c. Adjust or replace belts (par. 46).
	d. Faulty thermostat.	d. Remove and test thermostat. Replace if faulty (par. 45).
	e. Leaks in cooling system.	e. Inspect cooling system for leaks, paying particular attention to hose or radiator connections. Replace hose or leaking radiator (par. 44).
	f. Incorrect ignition timing.	f. Check ignition timing (par. 68).
	g. Incorrect carburetor adjustment.	g. Adjust carburetor (par. 51).
	h. Clogged muffler or exhaust outlet pipes.	h. Replace muffler, or exhaust outlet pipe(s) (pars. 60-63).
	i. Improper valve timing.	i. Notify ordnance maintenance personnel.
	j. Excessive carbon condition within engine.	j. Notify ordnance maintenance personnel.
	k. Insufficient oil circulation.	k. Notify ordnance maintenance personnel.
	l. Inoperative water pump.	l. Replace water pump (par. 46).
13. Loss of coolant.	m. Fuel mixture too lean.	m. Troubleshoot fuel system.
	a. Hose leaks.	a. Tighten clamps or replace hose.
	b. Drain cock leak.	b. Tighten or replace.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
13. Loss of coolant. (continued)	<b>COOLING SYSTEM (continued)</b> c. Cylinder head gasket leaks. d. Radiator cap inoperative. e. Water pump or radiator core leaks. f. Cracked cylinder head or block.	c. Replace cylinder head gasket (par. 38). d. Replace cap. e. Replace water pump (par. 46) or radiator (par. 43). f. Replace defective cylinder head (par. 38). If block is cracked, notify ordnance maintenance personnel.
14. Engine fails to reach normal operating temperature.	a. Defective or incorrect thermostat installed in vehicle. b. Temperature sending unit defective. c. Temperature indicator defective.	a. Inspect and test thermostat (par. 45). Replace if defective or if it is of incorrect heat range (par. 45). b. Replace defective sending unit (fig. 18). c. Replace defective temperature indicator (par. 97).
15. Fuel does not reach carburetor.	<b>FUEL SYSTEM</b> a. Fuel tank empty. b. Oil pressure low. Oil pressure safety switch is cutting circuit to fuel pump. c. Fuel line leak. d. Fuel filter clogged. e. Fuel pump pressure low.	a. Fill with proper grade fuel. b. Check oil level, fill with proper grade to full mark. Refer to lubrication chart. c. Tighten connector at leak, if line still leaks replace defective parts (par. 58). d. Remove fuel filter element (par. 56) and clean. e. Check fuel pump pressure (par. 55). If pressure is in correct replace fuel pump (par. 55). Check pressure of new pump (par. 55).



Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	<b>FUEL SYSTEM (continued)</b>	
15. Fuel does not reach carburetor. (continued)	f. Fuel lines clogged.	f. Disconnect fuel lines and blow out with compressed air.
	g. Defective oil pressure safety switch.	g. Replace oil pressure safety switch (par. 35).
16. Fuel does not reach cylinders.	a. Choke does not close.	a. Remove air cleaner hose. Pull out choke control rod and note whether choke valve closes at carburetor. If not, connect or adjust linkage (par. 53).
	b. Carburetor fuel passages clogged.	b. If fuel reaches carburetor and choke closes properly (a above) replace carburetor (par. 51).
17. Engine floods.	a. Air cleaner restricted or dirty.	a. Service air cleaner (par. 50).
	b. Carburetor choke control not fully open.	b. Remove air intake hose at carburetor. Push choke control all the way in. Look into carburetor to make certain choke control valve is fully open. If not fully open, adjust (par. 53).
	c. Fuel pump pressure incorrect.	c. Check fuel pump pressure (par. 55).
	d. Carburetor adjustment incorrect.	d. Adjust carburetor (par. 51).
	e. Worn carburetor or float valve stuck.	e. If engine continues to flood after above procedures (items 17a through d) have been performed, replace carburetor (par. 51).
18. Excessive fuel consumption.	a. Leaks.	a. Carefully inspect all fuel lines and fittings for leaks. Tighten or replace damaged lines or fittings (par. 58).
	b. Carburetor choke control not fully open.	b. Refer to item 17b above.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
18. Excessive fuel consumption. (continued)	<b>FUEL SYSTEM (continued)</b>	
	c. Carburetor adjustment incorrect.	c. Adjust carburetor (par. 51).
	d. Air cleaner restricted or dirty.	d. Service air cleaner (par. 50).
	e. Weak spark.	e. Troubleshoot ignition system (item 22).
	f. Spark plugs dirty or incorrectly adjusted.	f. Remove spark plugs (par. 69). Clean and set plug gap at .028 to .032 in. Replace worn plugs.
	g. Fuel pump pressure incorrect.	g. Check fuel pump pressure (par. 55).
	h. Incorrect ignition timing.	h. Check ignition timing (par. 68).
	i. Incorrect valve adjustment.	i. Perform manifold vacuum test (par. 41). Adjust valve clearance.
19. Unusual noise.	j. Brakes drag.	j. Adjust brakes (par. 157).
	k. Cylinder compression poor or uneven.	k. Perform cylinder compression test (par. 40). If compression is poor or uneven, notify ordnance maintenance personnel.
20. Exhaust system restricted.	<b>EXHAUST SYSTEM</b>	
	a. Break or crack in exhaust muffler.	a. Inspect muffler for breaks or cracks. If muffler is unserviceable, replace (par. 61).
	b. Loose connections or damaged gaskets.	b. Inspect exhaust system for broken brackets or leaking gaskets. Replace damaged parts as required (pars. 60-63).
	Muffler outlet pipe or pipes plugged.	Repair or replace pipe (par. 62).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
IGNITION SYSTEM (Refer to table V)		
General. To isolate the ignition system as a source of trouble, attempt to start the engine. If the starter is inoperative or the cranking speed is excessively slow, refer to items 23 and 24. If this does not isolate the trouble, remove one spark plug cable and hold the cable terminal 3/8 inch from the cylinder head while cranking the engine with the starter. If there is no spark, refer to 21 below. If the spark is weak, refer to 22.		
21. No spark.	<p>a. Battery cables loose.</p> <p>b. Ignition switch inoperative.</p> <p>c. Primary capacitor open or shorted.</p> <p>d. Ignition coil inoperative.</p> <p>e. Breaker point capacitor inoperative.</p>	<p>a. Clean terminals and make certain all connections are tight.</p> <p>b. Make continuity check of ignition switch. If suitable equipment for checking continuity is not available, check by replacing ignition switch (par. 89) with one known to be operating.</p> <p>c. Remove the ignition distributor cover and cap assembly (par. 66). Disconnect the ignition coil primary cable from the coil. With the ignition switch on, momentarily ground the cable terminal. If no spark results, a break in the line from the switch to the capacitor or a faulty capacitor is indicated. Remove the primary capacitor. Check the capacitor with suitable equipment, or replace with one known to be working. If a break in the line is indicated, notify ordnance maintenance personnel.</p> <p>d. Remove the ignition coil (par. 66). Check the coil with suitable test equipment or replace with one known to be operating.</p> <p>e. Remove the breaker point capacitor (par. 66). Check the capacitor with suitable test equipment, or replace with one known to be operating.</p>

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
21. No spark. (continued)	IGNITION SYSTEM (continued)	
	f. Breaker point set improperly adjusted or damaged.	f. Check and adjust the breaker point set (par. 66). Check point set for signs of unusual burning or pitting. Replace if necessary.
	g. Ignition distributor cap damaged.	g. Remove the ignition distributor cover and cap assembly (par. 66). Inspect cap for damage or unusual oxidation. Replace cap if necessary.
	h. Ignition distributor rotor damaged.	h. Remove the ignition distributor cover and cap assembly (par. 66). Inspect rotor for damage. Replace if necessary.
22. Weak spark.	i. Broken cables.	i. If there is no spark after a through h above have been checked, notify ordnance maintenance personnel.
	a. Loose connections.	a. Check all connections in ignition system and tighten if necessary.
	b. Ignition distributor worn.	b. Remove cover and cap (par. 66). Check rotor and cam for side play or wear. If parts are sufficiently worn to cause uneven breaker point opening, replace ignition distributor (par. 67).
	c. Ignition coil inoperative.	c. Refer to item 21d above.
	d. Breaker point capacitor faulty.	d. Refer to item 21e above.
	e. Breaker point set improperly adjusted or damaged.	e. Refer to item 21f above.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
STARTING SYSTEM (Refer to table V)		
23. Starter will not crank engine.	a. Battery discharged. b. Loose or corroded connections. c. Engine seizure. d. Switch or starter inoperative. e. Low battery charge.	a. Test batteries (Table V). b. Clean and tighten battery-cable connections at battery and ground (engine or chassis). Examine cables for damaged terminal connections. Replace cables or terminals as required (par. 79). c. Notify ordnance maintenance personnel. d. Disconnect battery positive cable. Disconnect cable at starter switch. Remove switch and hold battery cable tightly against starting motor terminal post. Touch other end of battery cable to battery post. If starter does not run, replace starter (par. 71). If starter does run, replace starter switch (par. 72). e. Test battery (fig. 4).
24. Slow cranking speed.	a. Engine oil too heavy. b. Loose or corroded connections. c. Starting switch contacts burned or dirty.	a. Use oil of correct viscosity. Refer to lubrication chart. b. Clean and tighten battery-cable connections at battery and ground (engine or chassis). Examine cables for damaged terminal connections. Replace cables or terminals as required (par. 79). c. Disconnect battery ground cable; remove starting switch (par. 72) and examine contacts. If burned or dirty, replace switch (par. 72) or clean contacts.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
STARTING SYSTEM (continued)		
25. Starter operates and engages flywheel but will not turn engine.	d. Internal friction or voltage drop in starting motor.	d. If the causes listed in a through c above are not evident, replace starting motor or notify ordnance maintenance personnel.
	a. Engine seizure.	a. Notify ordnance maintenance personnel.
	b. Battery run down.	b. Test batteries (fig. 4).
	c. Starter clutch or spring broken or stuck.	c. If the causes listed in a or b above are not evident, replace starter (par. 71).
GENERATING SYSTEM		
<p><u>NOTE: Before assuming either the charging system or the associated charge indicator to be faulty, run the engine at a speed slightly above idle for a period of about 15 minutes, and observe battery generator indicator. The reason is that under certain severe battery discharge conditions, the battery will accept only a very slight charge when the engine is first run, the charging rate increasing during the 15 minutes run. This initial slight charge may be small enough so as not to be noticeable on the indicator, and thus lead to the conclusion that the gage or the charge system is faulty.</u></p>		
26. Battery not being charged.	a. Loose or corroded battery terminals or cables.	a. Clean and tighten battery terminals at battery and ground. Replace cables or terminals as required. Refer to TM 9-2857.
	b. Faulty generator regulator.	b. Test generator regulator, (table V). If defective, replace generator regulator (par. 75).
	c. Faulty battery-generator indicator.	c. Replace battery-generator indicator (par. 98).
	d. Generator not charging (no output or unsteady or low output).	d. Test generator (table V). If defective, replace generator (par. 74).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
GENERATING SYSTEM (continued)		
27. Battery voltage too high (indicated by consistent loss of electrolyte).	a. Corroded or loose cable connections.  b. Faulty generator regulator.	a. Clean and tighten all cable connections in the generating system.  b. Replace generator regulator (par. 75).
28. Noisy generator.	a. Loose generator mounting.  b. Excessively tight drive belts.  c. Worn or faulty generator.	a. Tighten generator mounting bolts.  b. Adjust drive belts (par. 46).  c. Replace generator (par. 74).
LIGHTING SYSTEM (Refer to table V)		
<u>NOTE: If the engine cranks and starts, there will be current in the lighting circuit and light failure will be caused by some difficulty in the lighting circuit, lights, lamps, or switches.</u>		
29. All lights inoperative (with main light switch on).	a. Main lighting switch inoperative.  b. All lamps burned out.  c. Light switch feed cable, circuit no. 15, loose or broken	a. Replace the main lighting switch (par. 90).  b. Replace lamps, but first correct cause of malfunction. Check generator voltage (item 26).  c. Tighten if loose. If not loose, notify ordnance maintenance personnel.
30. One light inoperative.	a. Lamp burned out.  b. Poor ground between light assembly and ground.	a. Replace lamp (par. 80).  b. Check ground cable and tighten ground cable mounting nut.



Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
30. One light inoperative. (continued)	LIGHTING SYSTEM (continued)	
	c. Feed cable loose, broken, or disconnected.	c. Inspect connections at light, and main lighting switch. If connections are clean and tight, test feed cable from switch to light for current and, if broken, repair defective harness assembly. If harness cannot be repaired notify ordnance maintenance personnel.
	d. Lights or accessory operating intermittently.	d. Note each light or accessory that is operating intermittently. This indicates circuit in which a short circuit exists. Inspect connection at inoperative light or accessory for feed cable contacting light body or ground. If head light is inoperative, clean and inspect connector and cable. If trouble cannot be corrected at light end of feed cable, disconnect the same number cable from harness. If other lights then burn steadily, feed cable in harness assembly is grounded. Repair wiring harness assembly. Temporary repairs can be made by leaving both ends of the grounded wire disconnected and running another wire from junction block to light connection.
	e. Lamps or sealed-beam units fail repeatedly.	e. Generator regulator inadequately grounded. Tighten regulator base and generator mounting bolts. Check generator voltage, if it cannot be adjusted properly, replace generator regulator (par. 75).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	LIGHTING SYSTEM (continued)	
	f. Sealed-beam unit or lamp burns out immediately after being installed with light switch on.	f. Generator regulator not controlling charging rate. Check regulator and replace if defective (par. 75).
	g. Headlights dim.	g. Low voltage at headlight. Lighting-system voltage may be checked with low-voltage circuit tester. Change tester controls so instrument can be used as a voltmeter. Remove headlight door and partially pull out sealed beam unit from connector. With sealed beam unit mounted in its correct position, top prong supplies current for low beam. Right prong supplies current for high beam and left prong is ground. Connect negative lead of voltmeter to ground in headlight body and positive voltmeter lead to right prong (which supplies current for high beam). Check voltage available at headlight. If voltage is sufficient (24V) replace sealed beam unit (par. 80).
INSTRUMENTS, GAGES, AND HORN (Refer to Table V)		
CAUTION. <u>Ignition switch must be turned off when removing instrument cluster. If it is necessary to test instruments with cluster out of the dash panel, install a jumper wire to serve as ground before turning ignition switch on. Failure to install ground will result in the polarity of all instruments being reversed.</u>		
31. Fuel gage inoperative.	a. Instrument panel unit inoperative.	a. (1) Disconnect the cable from unit and connect a temporary jumper cable to the terminal. If the gage shows full, with the ignition switch on and the loose end of the jumper cable grounded, the wiring or the tank sending unit is at fault.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
INSTRUMENTS, GAGES, AND HORN (continued)		
		(2) If the instrument-panel unit does not register full when test in a above is made, connect another temporary cable between right side of gage and right post of ignition switch. If gage does not register full with ignition switch on, and temporary cable from left side of gage unit grounded, replace fuel gage instrument panel unit (par. 96).
	b. Tank sending unit inoperative.	b. If test in a (1) above proved that the instrument panel unit is operating, disconnect cable from the tank unit and ground the wire to bare metal of the chassis. If the gage does not show full, with the ignition switch on and the tank unit wire grounded, the wire is broken. If the gage does show full, replace the fuel level sending unit (par. 93).
32. Speedometer does not register speed or mileage.	a. Speedometer cable broken.	a. Replace cable and or housing (par. 101).
	b. Speedometer inoperative.	b. Replace speedometer assembly (par. 100).
33. Speedometer registers either speed or mileage (odometer) but not the other.	Speedometer inoperative.	Replace speedometer assembly (par. 100).
34. Horn does not operate.	a. Cable connector between horn and steering column pulled apart.	a. Assemble connector.
	b. Horn cable disconnected from horn button.	b. Remove horn button and solder wire.
	c. Horn feed cable loose or disconnected.	c. Tighten or connect cable connector.
	d. Horn out of adjustment.	d. Adjust (refer to TM 9-8627).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
INSTRUMENTS, GAGES, AND HORN (continued)		
35. Horn operates continually.	a. Horn button stuck or grounded. b. Horn cable grounded in steering column.	a. Remove button and repair or replace. b. Replace horn button and cable.
NOTE. To temporarily stop continuous horn operation, pull connector apart at bottom of steering gear or at horn. Leave rubber insulator on cable leading to horn.		
CLUTCH		
36. Clutch chatter.	a. Grease on clutch driven disk, flywheel, or pressure plate. b. Binding of clutch release linkage. c. Disk facings loose on disk. d. Broken pressure plate. e. Loose engine mounts.	a. Replace disk (par. 110) and thoroughly clean other parts. b. Clean and free linkage. Adjust linkage (par. 109). c. Replace disk and pressure plate (par. 110). d. Replace disk and pressure plate assembly (par. 110). e. Tighten.
37. Clutch grabbing.	a. Grease on disk, flywheel or pressure plate. b. Clutch disk or pressure plate broken. c. Hub of disk not sliding freely on splined shaft. d. Release linkage binding.	a. Replace disk (par. 110) and thoroughly clean other parts. b. Replace damaged parts (par. 110). c. Remove and free. d. Free linkage and adjust (par. 109).
38. Clutch slippage.	a. Lack of pedal free play. b. Release linkage binding. c. Pressure plate spring weak or broken. d. Disk facing worn.	a. Adjust pedal free play (par. 109). b. Free linkage and adjust (par. 109). c. Replace disk and pressure plate assembly (par. 110). d. Replace disk and pressure plate (par. 110).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	<b>CLUTCH (continued)</b>	
39. Clutch dragging.	e. Pressure plate warped. f. Oil on disk facing. a. Excessive pedal free play. b. Clutch disk bent or dished. c. Clutch disk facings loose or broken. d. Friction in crankshaft pilot bushings.	e. Replace disk and pressure plate (par. 110). f. Notify ordnance maintenance personnel. a. Adjust pedal free play (par. 109). b. Replace disk and pressure plate (par. 110). c. Replace disk and pressure plate (par. 110). d. Notify ordnance maintenance personnel.
40. Gear clash.		
<p><u>NOTE: Gear clash caused by spinning of clutch is frequently confused with clutch dragging. A clutch disk which releases perfectly will naturally spin under its own weight and momentum immediately after being released, if transmission gears are in neutral position. When shifting from neutral to first speed, or to reverse, wait for clutch to stop to avoid gear clash. If symptom is definitely gear clash, troubleshoot transmission and transfer.</u></p>		
<b>TRANSMISSION AND TRANSFER</b>		
41. Hard gear shifting.	a. Too much clutch pedal free play. b. Clutch disk or other clutch parts damaged.	a. Adjust pedal free play (par. 109). b. Replace disk and clutch pressure plate assembly (par. 110).
42. Slips out of gear.	Transmission parts worn or damaged.	Replace transmission and transfer assembly (par. 112), coordinate with ordnance maintenance personnel.
43. Engagement of two speeds.	Transmission parts worn or damaged.	Replace transmission and transfer assembly (par. 112), coordinate with ordnance maintenance personnel.
44. Lubricant leakage.	a. Lubricant level too high in transmission.	a. Drain to proper level. Refer to lubrication chart.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
TRANSMISSION AND TRANSFER (continued)		
45. Transmission noisy.	b. Leak at bearing retainer cap screw.	b. Remove screw, dip in white lead or paint, and install.
	c. Drain plug loose or damaged.	c. Tighten or replace drain plug.
	d. Transmission input shaft seal leaking.	d. Notify ordnance maintenance personnel.
	e. Transmission expansion plugs loose.	e. Tighten
	f. Transmission cover gasket leaking.	f. Tighten cover mounting bolts.
	a. Loose mounting bolts.	a. Tighten loose bolts.
46. Transfer will not shift into gear.	b. Flywheel housing alignment incorrect.	b. Remove flywheel housing and check alignment (par. 29).
	c. Insufficient lubricant.	c. Fill with proper lubricant.
	d. Worn or damaged parts.	d. Replace transmission and transfer assembly (par. 112). Coordinate with ordnance maintenance personnel.
	a. Incorrect lubricant.	a. Refer to lubrication chart.
47. Transfer slips out of gear.	b. Transfer worn or damaged.	b. Replace transmission and transfer assembly (par. 112), coordinate with ordnance maintenance personnel.
	c. Transfer will not disengage.	c. If transfer will not disengage while in front wheel drive position, stop the vehicle. Depress the clutch pedal and shift the transmission into reverse gear. Release the clutch and back the vehicle a few feet. Depress the clutch pedal and release the transfer from front wheel drive.
47. Transfer slips out of gear.	Damaged or worn parts.	Replace transmission and transfer assembly (par. 112), coordinate with ordnance maintenance personnel.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
TRANSMISSION AND TRANSFER (continued)		
48. Transfer noisy in operation.	a. Insufficient lubrication. b. Incorrect lubricant c. Transfer parts worn or damaged.	a. Check the transmission lubricant level, refer to lubrication chart. b. Refer to lubrication chart. c. Replace transmission and transfer assembly (par. 112). Coordinate with ordnance maintenance personnel.
49. Transfer leaks lubricant.	a. Drain plug loose or damaged. b. Damaged transfer input, output, or shifter shaft oil seal. c. Case cracked. d. Speedometer cable loose or damaged.	a. Tighten or replace drain plug. b. Replace damaged oil seal or notify ordnance maintenance personnel. c. Notify ordnance maintenance personnel. d. Tighten or replace.
50. Hard shifting out of front axle drive.	Torsional windup between front and rear propeller shafts.	Drive a short distance in a straight line, preferably on dirt or gravel.
PROPELLER SHAFTS		
51. Backlash or noise in joint.	Damaged or worn bearings.	Repair universal joint (par. 118).
52. Vibration in propeller shaft.	Worn or damaged universal joint or propeller shaft sprung.	Repair universal joint (par. 118), and or replace propeller shaft (par. 117).
DIFFERENTIAL AND DRIVE COMPONENTS		
53. Front axle assembly unusual noise.	a. Insufficient lubricant. b. Front wheel bearings worn or incorrectly adjusted.	a. Lubricate in accordance with lubrication chart. b. Notify ordnance maintenance personnel.



Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
DIFFERENTIAL AND DRIVE COMPONENTS (continued)		
54. Rear axle assembly - unusual noise.	c. Wheel drive shaft universal joint worn, loose, or damaged.	c. Replace or repair universal joint (par. 118).
	d. Worn or damaged differential.	d. Replace differential (par. 122).
55. Axle leaks lubricant.	Same as front axle, item 53 above.	Same as front axle, item 53 above.
	a. Drain plug loose or damaged.	a. Tighten or replace drain plug.
56. Excessive backlash (play).	b. Oil seal damaged.	b. Replace seal (par. 125). Check breather valve (par. 126).
	c. Differential housing damaged or cover gasket leaking.	c. Replace differential (par. 122), coordinate with ordnance maintenance personnel.
	a. Worn or defective differential.	a. Replace differential (par. 122).
	b. Differential bearings out of adjustment.	b. Notify ordnance maintenance personnel.
	c. Loose universal joint flanges.	c. Notify ordnance maintenance personnel.
SERVICE BRAKES		
57. One brake drags.	a. Distorted or improperly adjusted brake shoe.	a. Inspect brake shoe and adjust or replace as necessary (par. 159).
	b. Faulty retracting spring.	b. Replace retracting spring (par. 159).
	c. Brake drum out of round.	c. Replace brake drum (par. 159).
	d. Faulty wheel cylinder.	d. Replace wheel cylinder (par. 160).
	e. Improperly adjusted or damaged wheel bearing.	e. Notify ordnance maintenance personnel.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	SERVICE BRAKES (continued)	
58. All brakes drag.	f. Brake line restricted.	f. Replace or clean affected brake line.
	g. Dirt in brake fluid.	g. Bleed brake system (par. 158).
	h. Air in hydraulic system.	h. Bleed brake system (par. 158).
	a. Pedal improperly adjusted.	a. Adjust brake pedal (par. 157).
	b. Distorted or improperly adjusted brake shoes.	b. See 57a above.
	c. Brake line restricted.	c. See 57f above.
59. Hard pedal.	d. Faulty master cylinder.	d. Replace master cylinder (par. 161).
	e. Dirt in brake fluid.	e. See 57g above.
	a. Damaged brake linkage.	a. Replace or repair damaged portion of brake linkage.
	b. Glazed or worn brake linings.	b. Replace brake shoe assemblies (par. 159).
60. Spongy pedal	c. Brake line restricted.	c. See 57f above.
	d. Distorted or improperly adjusted brake shoes.	d. See 57a above.
	a. Insufficient hydraulic fluid.	a. Fill with proper fluid.
	b. Leaks in hydraulic system.	b. Inspect hydraulic system and replace faulty parts (par. 162).
61. Vehicle pulls to one side. When brakes are applied.	c. Air in hydraulic system.	c. Bleed hydraulic system, (par. 158).
	a. Improper tire pressure.	a. See TM 9-2320-218-10 for proper tire pressure.
	b. Distorted or improperly adjusted brake shoes.	b. See 57a above.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	SERVICE BRAKES (continued)	
	c. Glazed or worn brake linings.	c. See 59b above.
	d. Brake drum out of round.	d. See 57c above.
	e. Oil or grease on brake linings.	e. Inspect brake linings (par. 159), and replace if necessary.
	f. Faulty retracting spring.	f. See 57b above.
	g. Faulty wheel cylinder.	g. See 57d above.
	h. Improperly adjusted or worn wheel bearings.	h. Notify ordnance maintenance personnel.
	i. Brake line restricted.	i. See 57f above.
	j. Loose suspension arm.	j. Check suspension parts.
62. One wheel locks.	a. Distorted or improperly adjusted wheel bearing.	a. See 57a above.
	b. Oil or grease on lining.	b. See 61e above.
	c. Faulty wheel cylinder.	c. See 57d above.
63. Brake chatter.	a. Brake drum out of round.	a. See 57c above.
	b. Glazed or worn brake linings.	b. See 59b above.
	c. Oil or grease on brake linings.	c. See 61e above.
	d. Loose brake linings.	d. Inspect brake linings (par. 159), and replace brake shoe assemblies if necessary.
64. Excessive pedal travel.	a. Damaged brake linkage.	a. See 59a above.
	b. Insufficient hydraulic fluid.	b. See 60a above.
	c. Leaks in hydraulic system.	c. See 60b above.
	d. Glazed or worn brake linings.	d. See 59b above.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	SERVICE BRAKES (continued)	
65. Pedal gradually goes to floor.	a. Insufficient hydraulic fluid. b. Leaks in hydraulic system. c. Faulty master cylinder.	a. See 60a above. b. See 60b above. c. Replace master cylinder (par. 161).
66. Brakes uneven.	a. Improper tire pressure. b. Oil or grease on brake lining. c. Scored brake drum. d. Dirt in hydraulic fluid.	a. See 61a above. b. See 61e above. c. Replace brake drum (par. 161). d. See 57g above.
67. Noisy or grabbing brakes.	a. Distorted or improperly adjusted brake shoe. b. Glazed or worn brake lining. c. Oil or grease on brake lining. d. Scored brake drum. e. Dirt on drum or lining surface. f. Faulty wheel cylinder.	a. See 57a above. b. See 59b above. c. See 61e above. d. See 66c above. e. Inspect brake drums and shoe assemblies (par. 161) and clean as necessary. f. See 57d above.
68. Brakes fail completely.	a. Mechanical linkage disconnected or broken. b. Insufficient hydraulic fluid. c. Glazed or worn brake linings. d. Leaks in hydraulic system. e. Faulty master cylinder. f. Air in hydraulic system. g. Dirt in hydraulic fluid.	a. Connect or replace linkage. b. See 60a above. c. See 59b above. d. See 60b above. e. See 58d above. f. See 57h above. g. See 57g above.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	<b>PARKING BRAKE</b>	
69. Parking brake does not hold.	a. Brake band improperly adjusted.	a. Adjust (par. 153).
	b. Brake lining worn or damaged.	b. Replace band and lining (par. 154).
	c. Brake drum scored.	c. Replace brake drum (par. 155).
	d. Brake linkage damaged.	d. Replace damaged linkage.
70. Parking brake drags and overheats.	a. Brake partially applied.	a. Release lever fully.
	b. Band improperly adjusted.	b. Adjust (par. 153).
	c. Lining loose and damaged.	c. Replace band and lining (par. 154).
	<b>WHEELS AND TIRES</b>	
71. Abnormal tire wear.	a. Continual use of four wheel drive on hard surfaced roads and at speeds in excess of 25 mph.	a. Use four wheel drive only when maximum traction is needed at speeds below 25 mph.
	b. Tire pressure low.	b. Correct tire pressure (par. 164).
	c. Improper toe-in.	c. If wear is in front tires, adjust toe-in (par. 136). If wear is in rear tires check rear suspension arms for damage or notify ordnance maintenance personnel.
	d. Wheel and tire assemblies out of balance.	d. Notify ordnance maintenance personnel.
72. Wheel wobbles.	a. Loose on hub.	a. Tighten wheel nuts.
	b. Bent wheel.	b. Replace wheel.
	c. Wheel bearings out of adjustment or damaged.	c. Adjust bearings or replace if necessary (par. 129). Notify ordnance maintenance personnel.
	d. Loose wheel nuts.	d. Tighten wheel nuts.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	<b>STEERING</b>	
73. Backlash in steering.	a. Pitman arm loose.	a. Tighten Pitman arm nut.
	b. Steering gear adjusted too loosely.	b. Notify ordnance maintenance personnel.
	c. Worn or damaged parts in steering gear.	c. Notify ordnance maintenance personnel.
74. Erratic steering	a. Incorrect front wheel alinement.	a. Adjust toe-in (par. 136). If condition persists, notify ordnance maintenance personnel.
	b. Incorrect steering gear adjustment.	b. Notify ordnance maintenance personnel.
	c. Loose steering linkage.	c. Tighten all connections
	d. Incorrect front wheel bearing adjustment.	d. Notify ordnance maintenance personnel.
75. Loose steering	a. Loose steering linkage.	a. Tighten all connections.
	b. Incorrect steering gear adjustment.	b. Notify ordnance maintenance personnel.
	c. Loose steering gear mounting bolts.	c. Tighten steering gear mounting bolts
	d. Incorrect front wheel bearing adjustment.	d. Notify ordnance maintenance personnel.
76. Hard steering.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Tires not of uniform size.	b. Install tires of uniform size.
	c. Lack of lubrication.	c. Lubricate in accordance with lubrication chart.
	d. Incorrect steering gear adjustment.	d. Notify ordnance maintenance personnel.
	e. Incorrect front wheel alinement.	e. Adjust toe-in (par. 136). If condition persists, notify ordnance maintenance personnel.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
	STEERING (continued)	
77. Hard turning when stationary.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Tires not of uniform size	b. Install tires of uniform size.
	c. Lack of lubrication.	c. Lubricate in accordance with lubrication chart.
	d. Incorrect steering gear adjustment.	d. Notify ordnance maintenance personnel.
78. Rattles.	a. Loose steering linkage.	a. Tighten all connections.
	b. Loose steering gear mounting bolts.	b. Tighten mounting bolts.
	c. Weak or broken suspension spring.	c. Replace suspension spring (par. 131).
	d. Broken shock absorber.	d. Replace shock absorber (par. 130).
	e. Lack of lubrication.	e. Lubricate in accordance with lubrication chart.
	f. Loose or worn spindle support.	f. Notify ordnance maintenance personnel.
	g. Loose suspension arm mounting bolts.	g. Tighten suspension arm mounting bolts.
	h. Loose crossmember mounting bolts.	h. Tighten crossmember mounting bolts.
79. Shimmy.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Incorrect front wheel alignment.	b. Notify ordnance maintenance personnel.
	c. Incorrect steering gear adjustment.	c. Notify ordnance maintenance personnel.
	d. Tires not of uniform size	d. Install tires of uniform size.
	e. Loose steering linkage.	e. Tighten steering linkage.



Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
80. Pull to one side.	STEERING (continued)	
	f. Incorrect front wheel bearing adjustment.	f. Notify ordnance maintenance personnel.
	g. Weak shock absorber.	g. Replace shock absorber (par. 130).
	h. Loose or worn spindle support.	h. Notify ordnance maintenance personnel.
	i. Loose suspension arm mounting bolts.	i. Tighten suspension arm mounting bolts.
	j. Loose crossmember mounting bolts.	j. Tighten crossmember mounting bolts.
	k. Bent wheel.	k. Replace wheel.
	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Incorrect front wheel alignment.	b. Adjust toe-in (par. 136). If condition persists, notify ordnance maintenance personnel.
	c. Tires not of uniform size.	c. Install tires of uniform size.
	d. Unequal brake adjustment.	d. Adjust service brakes (par. 157).
	e. Incorrect front wheel bearing adjustment.	e. Notify ordnance maintenance personnel.
	f. Bent spindle arm.	f. Replace spindle arm (par. 150).
	g. Sagging or broken suspension spring.	g. Replace suspension spring (par. 131).
	h. Frame out of alignment.	h. Notify ordnance maintenance personnel.
81. Wander.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Tires not of uniform size.	b. Install tires of uniform size.
	c. Loose steering linkage.	c. Tighten steering linkage.

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
82. Body sway or roll.	STEERING (continued)	
	d. Incorrect steering gear adjustment.	d. Notify ordnance maintenance personnel.
	e. Loose steering gear mounting bolts.	e. Tighten steering gear mounting bolts.
	f. Incorrect front wheel alinement.	f. Adjust toe-in (par. 136). If condition persists, notify ordnance maintenance personnel.
	g. Bent spindle arm.	g. Replace spindle arm (par. 150).
	h. Sagging or broken suspension arm.	h. Replace suspension arm (par. 132 or 133).
	i. Loose or worn spindle support.	i. Notify ordnance maintenance personnel.
	j. Loose suspension arm mounting bolts.	j. Tighten suspension arm mounting bolts.
	k. Loose crossmember mounting bolts.	k. Tighten crossmember mounting bolts.
	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Incorrect steering gear adjustment.	b. Notify ordnance maintenance personnel.
	c. Loose steering gear mounting bolts.	c. Tighten steering gear mounting bolts.
	d. Incorrect front wheel bearing adjustment.	d. Notify ordnance maintenance personnel.
	e. Sagging or broken suspension spring.	e. Replace suspension spring (par. 131).
83. Tires squeal on turns.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure.
	b. Incorrect front wheel alinement.	b. Adjust toe-in (par. 136). If condition persists, notify ordnance maintenance personnel.
	c. Bent spindle arm.	c. Replace spindle arm (par. 150).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
<b>SPRING AND SHOCK ABSORBERS</b>		
84. Spring breakage.	a. Extremely rough handling of vehicle over rough terrain.	a. Reduce vehicle speed over rough terrain when possible.
	b. Lack of shock absorber control.	b. Replace shock absorbers (par. 130).
85. Noise in shock absorbers.	a. Shock absorber bushing worn or damaged.	a. Replace bushings (par. 130).
	b. No fluid in shock absorbers.	b. Replace shock absorbers (par. 130).
	c. Loose mountings.	c. Check insulators. If serviceable, tighten shock absorber mounting nuts.
86. Lack of spring control.	a. No fluid in shock absorbers.	a. Replace shock absorber (par. 130).
	b. Shock absorber inoperative.	b. Replace shock absorber (par. 130).
<b>RADIO INTERFERENCE SUPPRESSION</b>		
General. Radio interference may arise from one or more sources on the vehicle. If no testing equipment is available for checking such sources, perform the checks described below progressively until interference has been eliminated, or notify ordnance maintenance personnel.		
87. Radio interference.	a. Faulty spark plugs.	a. Replace spark plugs (par. 69).
	b. Faulty spark plug cables.	b. Replace spark plug cables (par. 69).
	c. Ground strap loose.	c. Tighten ground strap.
	d. Faulty starting motor.	d. If interference occurs only when starting motor is operating, replace (par. 71).
	e. Faulty generator and/or generator regulator.	e. Temporarily disengage fan and generator drive belt from generator pulley and start engine. If interference is eliminated when generator is not operating, replace generator (par. 74) and/or generator regulator (par. 75).

Table IV Troubleshooting (continued)

Malfunction	Probable Cause	Corrective Action
RADIO INTERFERENCE SUPPRESSION (continued)		
	f. Faulty ignition filter.	f. Notify ordnance maintenance personnel.
	g. Faulty ignition distributor rotor or cap.	g. Replace ignition distributor rotor or cap if contacts show evidence of burning.
CRANKCASE VENTILATION SYSTEM		
88. Oil leak at tappet cover.	Restricted metering valve.	Replace metering valve (par. 106).
89. Oil leak at rocker arm cover.	Restricted metering valve.	Replace metering valve (par. 106).
90. Erratic idling.	a. Defective metering valve.	a. Replace metering valve (par. 106).
	b. Leak or hole in line or fitting.	b. Replace defective line or fitting.

## 25. TROUBLESHOOTING WITH ELECTRICAL TEST EQUIPMENT

The test procedures in table V are not written for a specific type of test equipment. The instructions apply to any good equipment that may be available. Only minimum operating knowledge of such equipment is required if the test

procedures are carefully followed. The quickest way to locate a malfunction is to perform the tests in the order shown. Individual instruments are shown in the corresponding figures to clearly illustrate basic usage. The instruments are often combined in testers by equipment manufacturers. The use of testers with combined instruments is the same as illustrated.

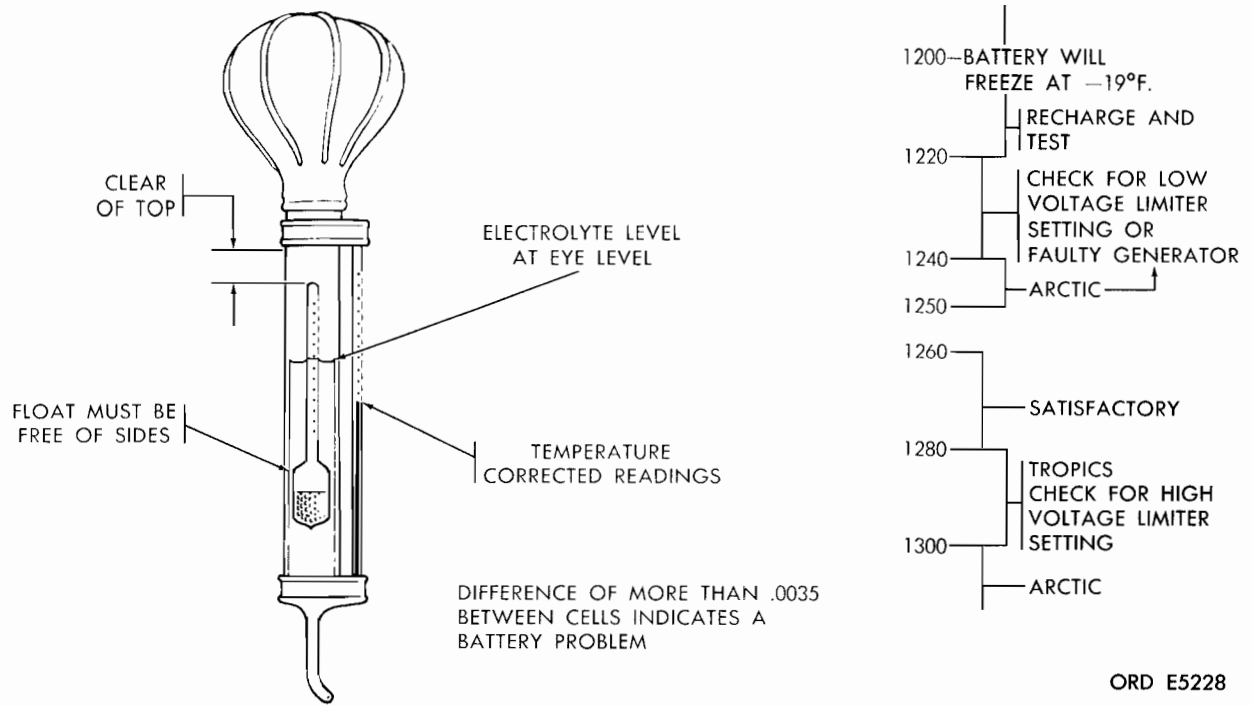
Table V - Troubleshooting with Electrical Test Equipment

TEST	METHOD	RESULTS
<b>BATTERIES AND STARTING SYSTEM (fig. 4)</b>		
1. <u>Battery Charge Condition.</u> Check specific gravity (state of charge) to determine battery and charging system condition. Battery state of charge is good indicator of a generator or wiring fault, or an improper generator regulator adjustment.	Remove all cell filler caps. Insert hydrometer hose into cell and draw enough electrolyte into hydrometer to suspend float. Read float scale with electrolyte surface at eye level. Do not allow float to touch top or side of hydrometer. Refer to view A, figure 4. Return electrolyte to the cell from which it was removed. Repeat this procedure for each of the remaining cells. Before returning electrolyte to the last cell observe thermometer in base of hydrometer; add or subtract the correction number indicated on the thermometer to obtain temperature corrected specific gravity reading for each cell (view A, fig. 4).	<p><u>Varying Readings.</u> A difference of .0035 or more between the cells of a battery indicates a battery fault. Discard battery.</p> <p><u>Low and Equal Readings</u> Discharged battery caused by a low generator regulator setting, faulty generator, poor electrical connections, defective companion battery, or water recently added to the cells. Refer to charging system tests (items 7-14).</p> <p><u>High and Equal Readings.</u> Overcharged battery caused by a high generator regulator setting, discharged companion battery, or poor regulator ground connections. Refer to charging system test (items 7-14).</p> <p><u>Reading above 9.5 volts.</u> Battery is not the cause of slow cranking.</p> <p><u>Specific Gravity more than 1250.</u> Replace battery if voltmeter indicates less than 9.5 volts.</p> <p><u>Specific Gravity less than 1250.</u> If voltmeter indicates less than 9.5 volts, battery is discharged or faulty. Charge battery and repeat test.</p>
2. <u>Battery Under Load.</u> Test each battery under load to determine its ability to crank engine under all conditions.	Select ammeter scale; use lowest range that includes 140 amp. Select voltmeter scale; use lowest range that includes 13 volts. Connect meters and carbon pile load as shown in view b, figure 4. Adjust load control so ammeter indicates 135 amp. Slowly count to fifteen (fifteen seconds) and observe voltmeter. Adjust load control until ammeter indicates 0 amp. Repeat test on companion battery.	

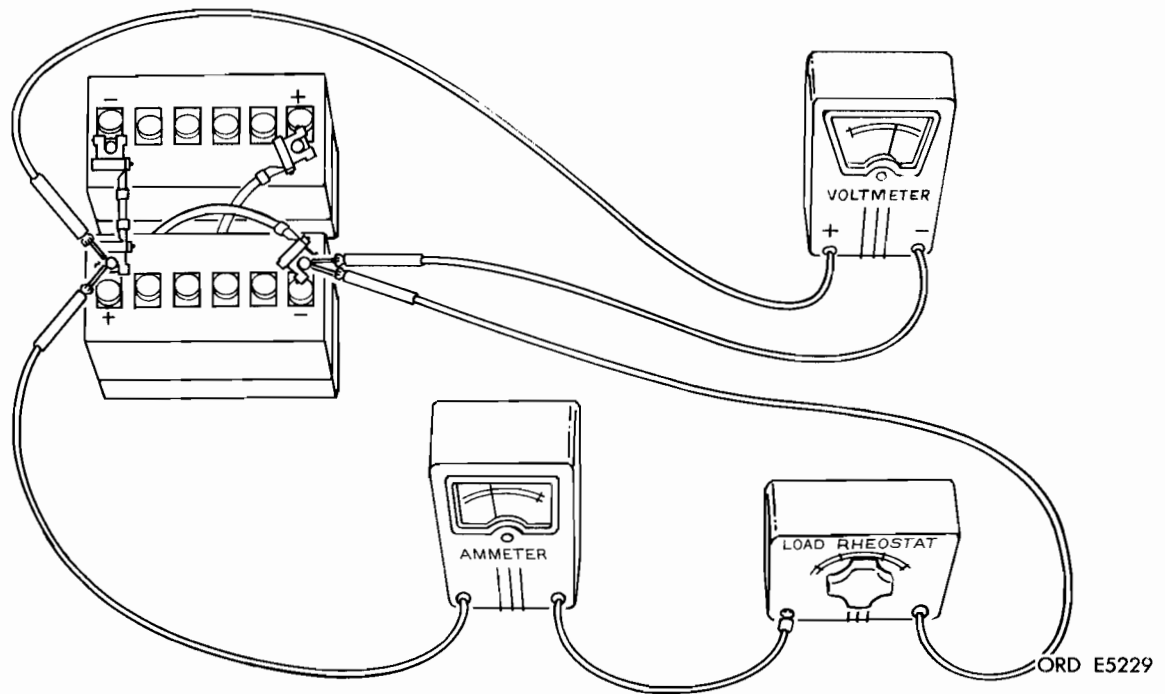
Table V - Troubleshooting with Electrical Test Equipment

TEST	METHOD	RESULTS
<b>BATTERIES AND STARTING SYSTEM (fig. 4) (continued)</b>		
3. <u>Voltage at the Starter.</u> Test voltage at starter while cranking engine to determine quickly if battery cables, starter switch, or ground connections are the cause of slow cranking.	Start and operate engine until temperature is normal. Select voltmeter scale; use lowest range that includes 25 volts. Connect voltmeter as shown in view C, figure 4. Crank engine with starter and at the same time observe voltmeter.	<p><u>Reading more than 18.5 volts.</u> Cables, starter switch, and connections are not the cause of slow cranking. Replace starter.</p> <p><u>Reading less than 18.5 volts.</u> If batteries are functioning within specifications, refer to insulated circuit tests (item 4) to find faulty cable, switch or connection.</p>
4. <u>Insulated Circuit.</u> Test voltage drop across starter insulated circuit to find cause of slow cranking.	Start and operate engine until temperature is normal. Select voltmeter scale; use range that includes 25 volts. Connect voltmeter as shown for meter (1) in view D, figure 4. Crank engine with starter and select voltmeter scale that will most accurately indicate tenths of a volt. Observe voltmeter.	<p><u>Reading more than .3 volt.</u> Check for loose connections, corroded cables, or a defective starter switch.</p> <p><u>Reading less than .3 volt</u> Cables and switch are functioning normally. Refer to battery cable test (item 5).</p>
5. <u>Battery to Battery Cable.</u> Test voltage drop across starter ground circuit to find cause of slow cranking.	Select voltmeter scale that will most accurately indicate tenths of a volt. Connect voltmeter as shown for meter (2) in view D, figure 4. Crank engine with starter and at the same time observe voltmeter.	<p><u>Reading more than .1 volt.</u> Check for loose connections or corroded cable. Replace cable if corroded.</p> <p><u>Reading less than .1 volt.</u> Cables are serviceable. Make ground circuit test (item 6).</p>
6. <u>Ground Circuit.</u> Test voltage drop across starter ground circuit to find cause of slow cranking.	Connect voltmeter as shown for meter (3) in view D, figure 4. Voltmeter negative lead must be connected to starter housing. Crank engine with starter and at the same time observe voltmeter.	<p><u>Reading more than .2 volt.</u> Check for corroded or loose battery ground cable loose starting motor, and missing or loose engine ground cable.</p> <p><u>Reading less than .2 volts.</u> Ground cable and connections are serviceable.</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

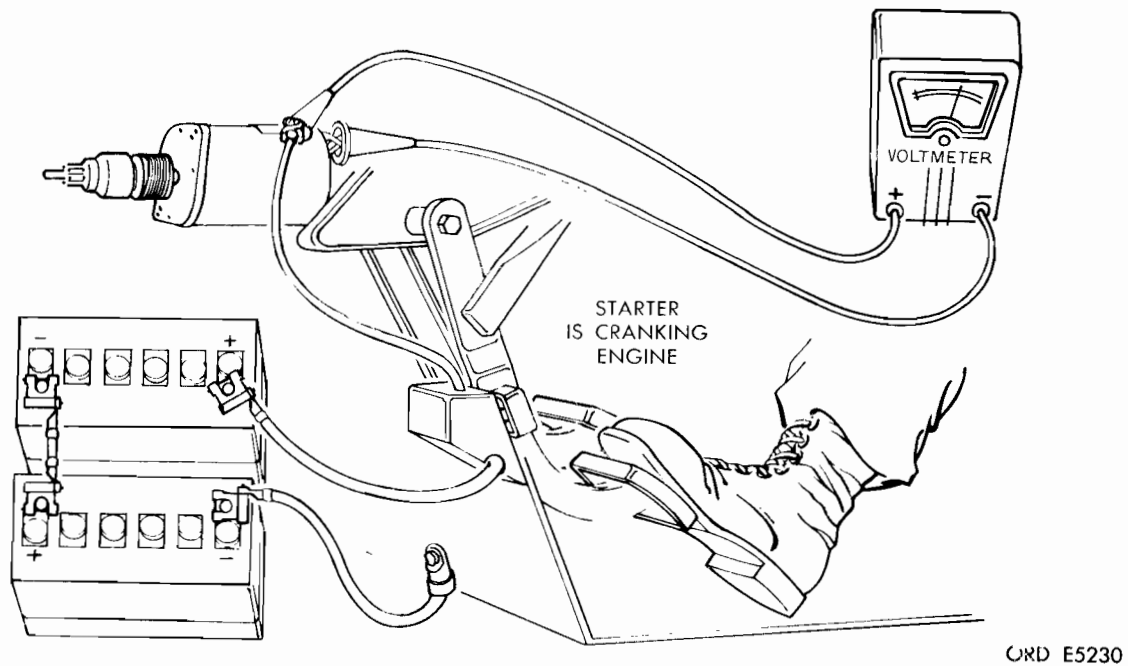


VIEW A. Specific gravity

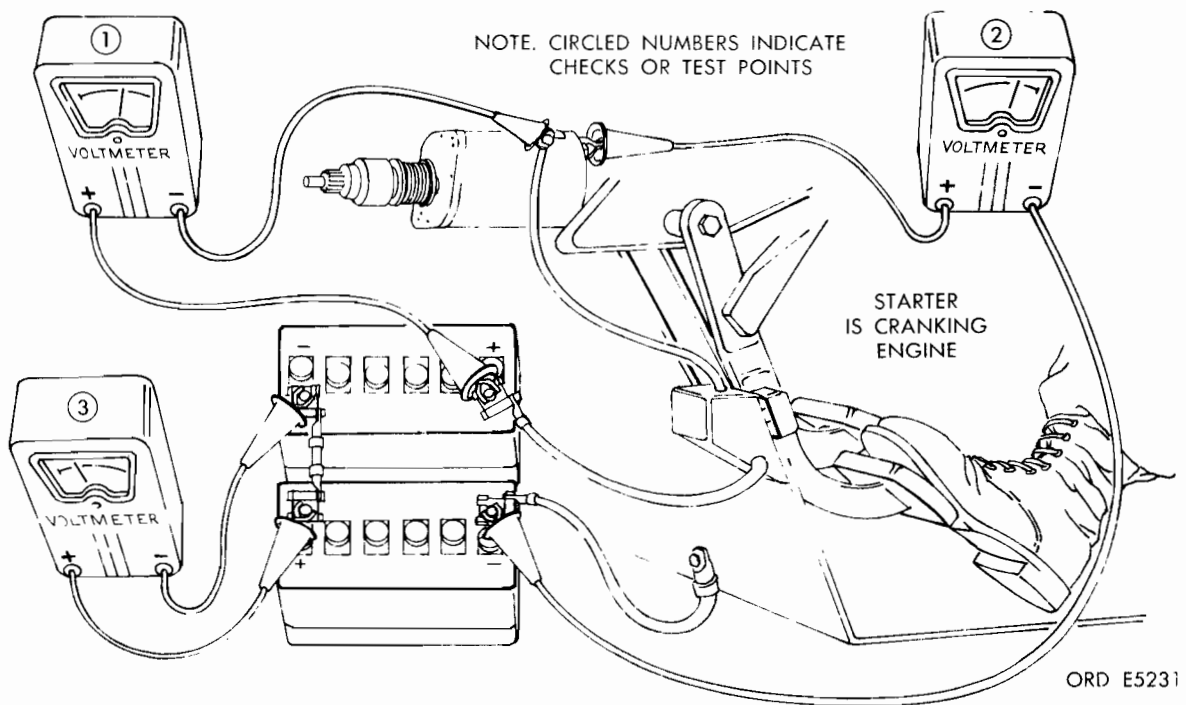


VIEW B. Battery under load

Figure 4. Hook-up for batteries and starting system tests (continued)



VIEW C. Voltage at starter



VIEW D. Circuit resistance

Figure 4. Hook-up for batteries and starting system tests



Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<p><u>CHARGING SYSTEM (fig. 5)</u></p> <p>NOTE. When it is necessary to test any part of the charging system, test the entire system. When a test is completed, do not disconnect test equipment until the connections required for the next test have been determined.</p>		
7. <u>Generator Output.</u> Test generator output to determine if the generator can produce its rated amperage.	<p>Select ammeter scale; use lowest range that includes 30 amp. Connect adapters, ammeter and generator field controller as shown in view A, figure 5. Turn field control knob to resistance "in" position. Start engine and set hand throttle so engine speed is approximately 30 mph (1700 engine rpm). Observe ammeter and slowly turn field control knob toward resistance "out" position until ammeter indicates 25 amp. NOTE. Do not turn knob any further.</p> <p>Turn field control knob back to resistance "in" position - stop engine.</p>	<p><u>Reading 25 amperes.</u> Generator functioning normally.</p> <p><u>Reading less than 25 amperes.</u> If field control knob has been rotated to full resistance, "out" position, check for loose generator drive belt. If drive belt is slipping, tighten or replace and repeat test. If drive belt is not slipping, replace generator.</p>
8. <u>Circuit Breaker Relay Closing voltage.</u> Test the circuit breaker relay closing voltage to find improper spring adjustment or reason for no charge condition. Test opening amps to find improper mechanical clearance in relay. Wrong clearances will result in eventual generator regulator failure.	<p>Select voltmeter scale; use lowest range that includes 30 volts. Select ammeter scale; use lowest range that includes 30 amps. Connect adapters, voltmeter, ammeter, and generator field controller as shown in view B, figure 5. Turn field control knob to resistance "in" position. Start engine. Set hand throttle to engine speed of approximately 20 mph (1150 rpm). Observe ammeter and voltmeter. Slowly turn field control knob toward resistance "out" position until ammeter indicates 10 amp. Turn field control knob to resistance "in" position.</p>	<p><u>Reading 24.5-25.5 volts.</u> Closing volt adjustment is normal.</p> <p><u>Reading less than 24.5 or more than 25.5 volts.</u> Circuit breaker improperly adjusted. Replace generator regulator.</p> <p><u>Reading more than 28 volts.</u> If ammeter indicates no amperes, circuit breaker relay is not closing. Replace generator regulator.</p>

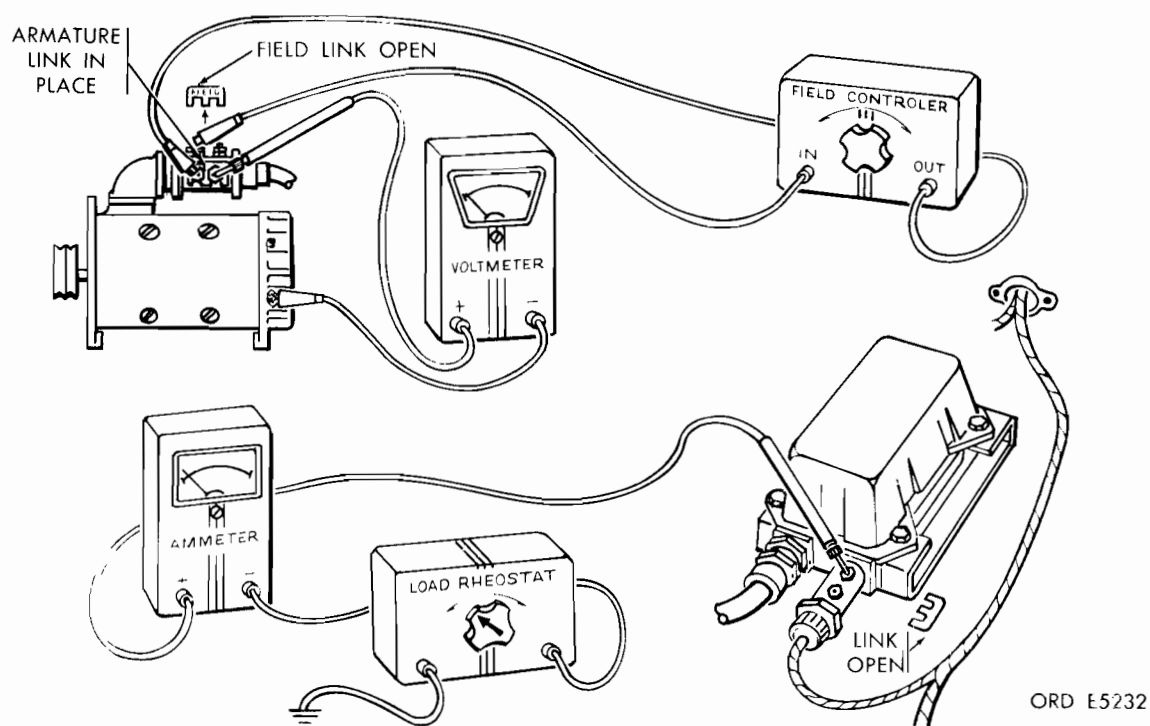
Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<b>CHARGING SYSTEM (fig. 5) (continued)</b>		
8. <u>Circuit Breaker Relay Closing Voltage (cont'd.)</u>	Repeat these checks several times. Turn field control knob to "in" position. Do not disconnect test equipment.	
9. <u>Opening Amperes.</u>	Leave test equipment connected as for closing voltage test. Turn field control knob toward resistance "out" position until ammeter indicates 10 amp. Slowly turn field control knob toward resistance "in" position until ammeter pointer is fixed at zero.	<p><u>Reading 4-8 amp before fixing on zero.</u> Opening ampere adjustment is normal.</p> <p><u>Reading past 8 amperes.</u> Replace generator regulator.</p> <p><u>Reading less than 4 amp before fixing on zero.</u> Replace generator regulator.</p> <p><u>Reading less than .5 volts</u> Circuit functioning normally.</p> <p><u>Reading more than .5 volts.</u> Low battery charge caused by poor connections. Disconnect and inspect all charging circuit cable connections.</p>
10. <u>Circuit Resistance (Insulated Circuit).</u> Test voltage drop across generator insulator to find the cause of high or low charging rate.	Select voltmeter scale; use range that includes 30 volts. Select ammeter scale; use lowest range that will include 30 amps. Connect adapters, ammeter, voltmeter and generator field controller as shown for "meter (1)", view C, figure 5. Turn field control knob to resistance "in" position. Start engine and set hand throttle so engine speed is approximately 20 mph (1150 engine rpm). Observe ammeter and slowly turn field control knob toward "out" position until ammeter indicates exactly 10 amp. Select voltmeter scale that will most accurately indicate tenths of a volt. Observe voltmeter. Do not disconnect test equipment.	
11. <u>Circuit Resistance (Regulator Ground Circuit)</u>	Change voltmeter connections to those shown for "meter (2)" in view C, figure 5. Observe ammeter and turn field control knob to obtain exactly 10 amp. Observe voltmeter. Do not disconnect test equipment.	<p><u>Reading less than .1 volt.</u> Circuit functioning normally.</p> <p><u>Reading more than .1 volt.</u> Generator regulator not properly grounded, causing excessively high and erratic system voltage. Remove one regulator mounting bolt and scrape away all dirt, paint, and</p>

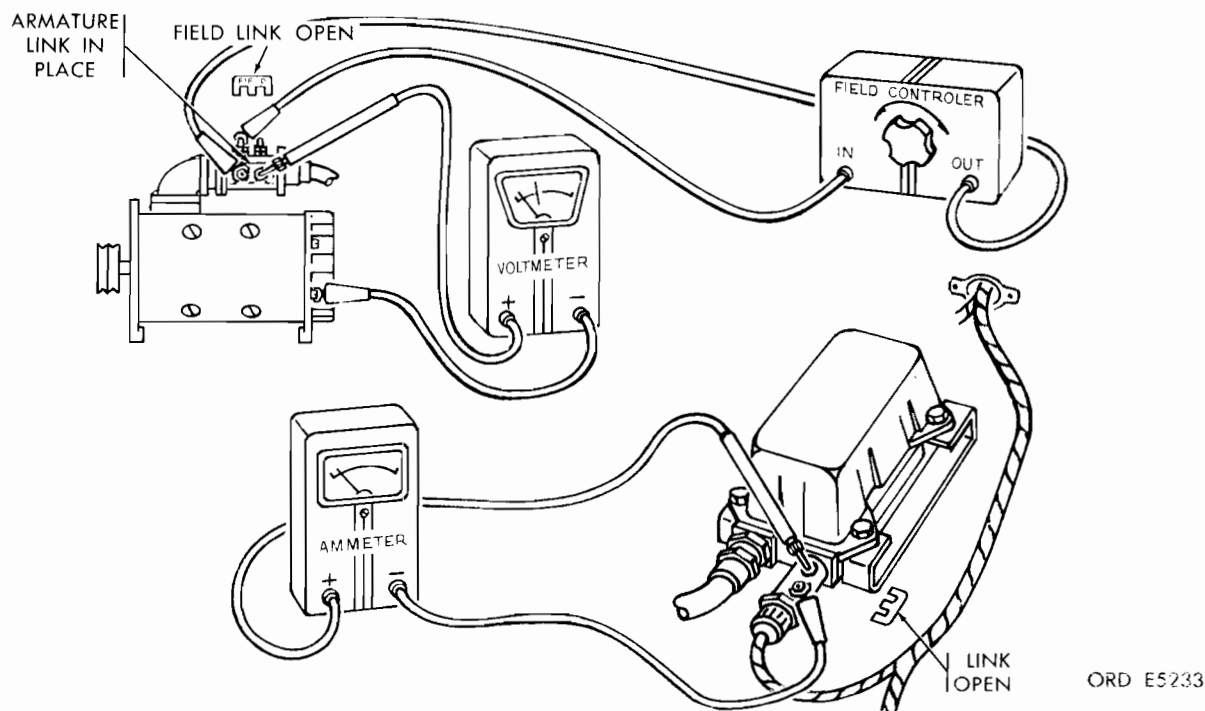
Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
CHARGING SYSTEM (fig. 5) (continued)		
11. <u>Circuit Resistance (Regulator Ground Circuit)</u> (cont'd.)	Change voltmeter connections to those shown for "meter (3)" in view C, figure 5. Observe ammeter and turn field control knob to obtain exactly 10 amp. Observe voltmeter. Turn field control knob to resistance "in" position and stop engine.	rust. Install bolt with new lockwasher and tighten securely.
12. <u>Circuit Resistance (Generator Ground)</u>		Reading less than .1 volt. Circuit functioning normally.  Reading more than .1 volt. Check for loose or poorly grounded generator and missing or loose engine ground cable. Remove paint, dirt and rust from between generator and mounting bracket or mounting bracket and engine. Poor generator ground will cause low charged batteries.
13. <u>Current Limiter</u> . Test current limiter to find cause of generator failure, or low charged batteries.	Operate engine at approximately 20 mph until temperature is normal. Select voltmeter scale; use lowest range that includes 30. Select ammeter scale; use lowest range that includes 30 amp. Stop engine and connect adapters, carbon pile load, voltmeter and ammeter as shown in view D, figure 5. Start engine and set hand throttle so engine speed is approximately 30 mph (1700 engine rpm). Adjust load control so voltmeter indicates less than 24. Observe meter. Cycle generator regulator by turning load control knob back until ammeter indicates less than 5 amp. Repeat checks several times.	Reading 24-27 amperes. Current limiter adjustment normal.  Reading more than 27 or less than 24 amp. Replace generator regulator. A current limiter set above 27 amp will cause a generator failure. A current limiter set below 24 amp may result in low charged batteries.
14. <u>Voltage Limiter</u> . Test voltage limiter to determine cause of low or over-charged batteries or repeated vehicle light bulb and other electrical component failures. Test is made on open circuit system (battery to regulator cable disconnected).	Disconnect ammeter and carbon pile used for current limiter test; leave voltmeter connected. See view D, figure 5. Select voltmeter scale; use lowest range that includes 30. Start engine and operate at approximately 30 mph (1700 engine rpm). Observe voltmeter. Reduce engine speed to idle and observe voltmeter.	Reading 27-28 volts (hot climate) or 28-29 volts (cold climate). Voltage limiter adjustment normal.  Reading more than 28 volts (hot climate) or less than 28 volts (cold climate). Replace generator regulator. If batteries use excessive amounts of water, voltage limiter may be set too high.

Table V - Troubleshooting with Electrical Test Equipment (continued)



VIEW A.

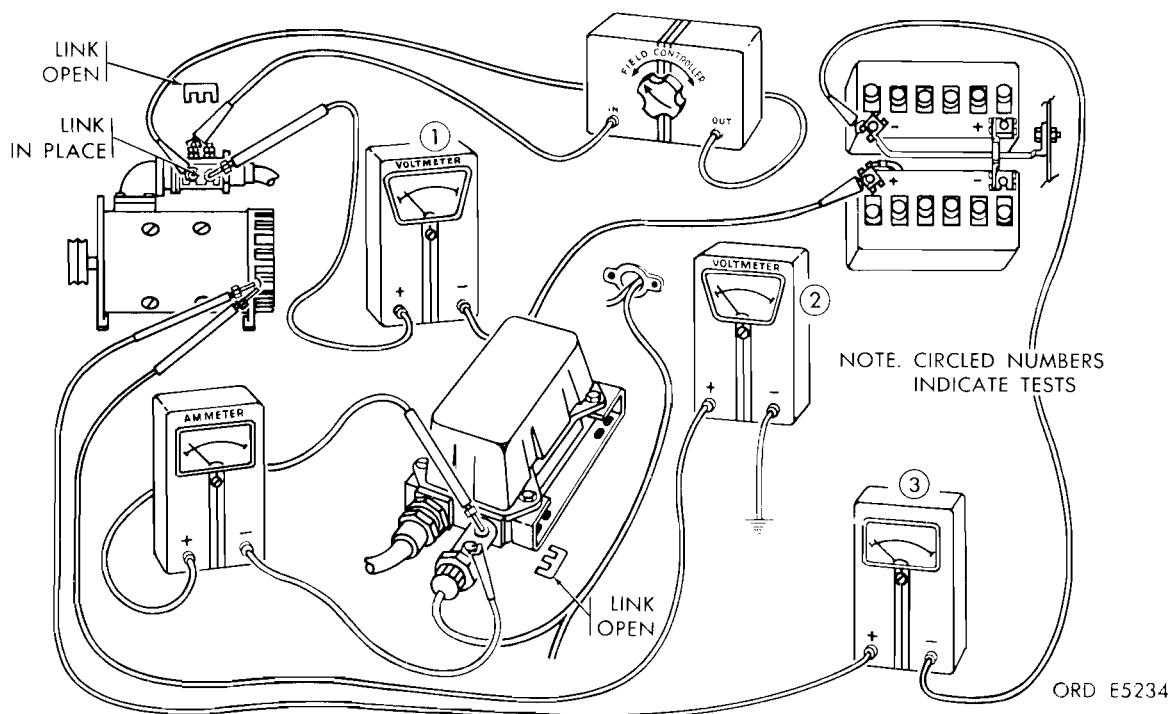


VIEW B.

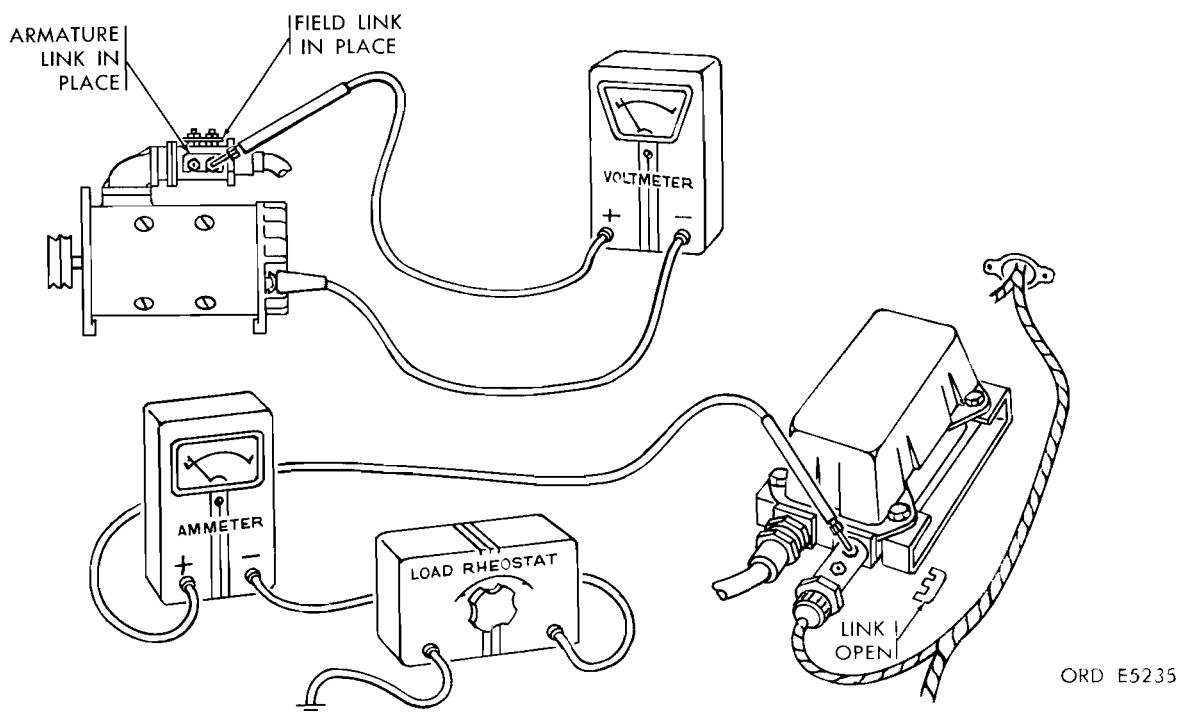
Figure 5. Hook-up for charging system tests

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)



VIEW C.



VIEW D.

Figure 5. Hook up for charging system tests

(continued)

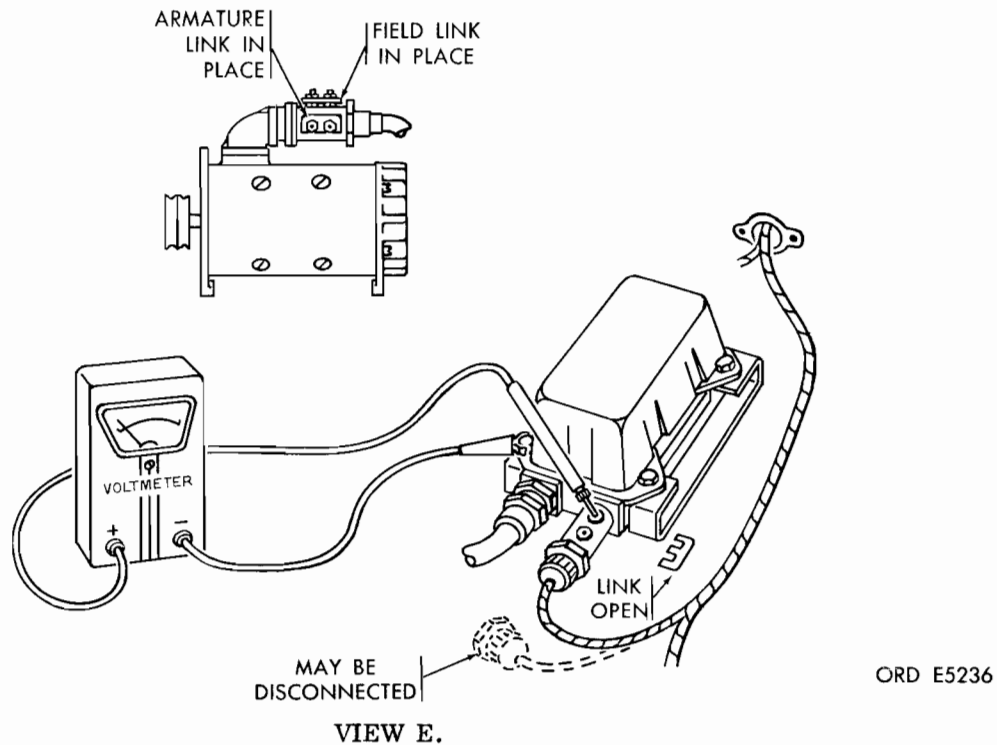


Figure 5. Hook-up for charging system tests

TEST	METHOD	RESULTS
<b>IGNITION SYSTEM (fig. 6) (continued)</b>		
The following tests when performed in the sequence presented, allow the technician to quickly determine the condition of the ignition distributor and ignition primary circuit without removing the distributor. When a test is completed, do not disconnect test equipment until the connections required for the next test have been determined.		
15. <u>Primary Circuit Resistance.</u> Test voltage drop across insulated side of ignition primary circuit to determine condition of ignition switch, primary wires and connections.	Install adapters and connect jumper wire and voltmeter as shown in view A figure 6. Select voltmeter scale that will most accurately indicate tenths of a volt. Turn ignition switch to "on" position. Observe voltmeter. Do not disconnect test equipment.	<p><u>Reading less than .2 volt</u> Ignition switch and primary circuit connections normal.</p> <p><u>Reading more than .2 volt</u> Ignition switch or circuit connections faulty. Turn switch to "off" and to "on" several times. If meter indicates a different voltage each time switch is turned on, replace ignition switch. If meter indicates same voltage each time switch is turned on, check for loose or corroded connections.</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<b>IGNITION SYSTEM (fig. 6) (continued)</b>		
16. <u>Breaker Point Resistance.</u> Test voltage drop across ignition distributor primary circuit to determine condition of breaker points and internal connections without removing cover. This test will also determine if ignition distributor is properly grounded to engine.	Connect voltmeter to adapter as shown in view B figure 6. Voltmeter negative lead must be grounded to engine. Select voltmeter scale; use range that includes 25 volts. Turn ignition switch to "on" position and observe meter. "Bump" engine with starter until meter pointer moves toward zero. Breaker points are now closed. Select voltmeter scale that will indicate tenths of a volt most accurately. Observe voltmeter. Do not disconnect test equipment.	<p><u>Reading less than .2 volt.</u> Breaker points, all internal primary connections and ignition distributor ground to engine are normal.</p> <p><u>Reading more than .2 volt.</u> Change negative voltmeter lead connection to ignition distributor base. If meter now indicates less than .2 volt, remove ignition distributor and clean engine contact surfaces. If meter indicates more than .2 volt with negative lead connected to ignition distributor base, remove ignition distributor cover and examine breaker points and primary cable connections.</p>
17. <u>Breaker Point Dwell.</u> Test the breaker point gap to determine cause of hard starting or engine misfire, without removing cover.	Calibrate dwell meter and turn selector switch to four cylinder position. Connect dwell meter and tachometer to adapter as shown in view C figure 6. Start engine and set throttle at 600 rpm. Observe dwell meter. Do not disconnect test equipment.	<p><u>Reading 39-44 degrees.</u> Breaker point gap normal.</p> <p><u>Reading more than 44 degrees.</u> Breaker point gap too small, and engine may be hard to start. Adjust gap.</p> <p><u>Reading less than 39 degrees.</u> Breaker point gap too large, and engine may misfire under load or at high speeds. Adjust gap.</p> <p>NOTE. Ignition timing must be checked whenever breaker point gap is adjusted.</p>
18. <u>Dwell Variation.</u> Test dwell variation to determine if ignition distributor should be removed because of shaft and bushing wear.	Make breaker point dwell test and observe dwell at idle (view C figure 6). Observe dwell meter. Slowly increase engine speed to 1500 rpm. As engine speed is increased note the highest and lowest dwell.	<p><u>Reading varies less than 3 degrees.</u> Ignition distributor shaft and bushing within specifications.</p> <p><u>Reading varies more than 3 degrees.</u> Replace ignition distributor. (Dwell variation is the difference between highest and lowest degrees of dwell observed as engine speed is increased).</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<u>IGNITION SYSTEM (fig. 6) (continued)</u>		
19. <u>Ignition Timing.</u> Test ignition timing to determine cause of engine over-heating, knocking, hard starting and lack of power.	Clean crankshaft pulley in area of timing notch. Clean timing pointer. Connect tachometer, timing light and adapter as shown in view D figure 6. Caution. If timing light is battery powered determine if 12 or 24 volts is required and connect as shown. Start engine and set idle speed at or below 500 rpm. Observe timing notch with timing light. Do not disconnect test equipment.	<p><u>Timing notch alined with pointer.</u> Ignition timing in correct adjustment.</p> <p><u>Timing notch above (past) pointer.</u> Ignition timing retarded (late). Adjust timing.</p> <p><u>Timing notch below pointer.</u> Ignition timing advanced (early). Adjust timing.</p>
20. <u>Ignition Timing Advance.</u> Test the advance of ignition timing to determine if ignition distributor must be removed for mechanical repairs to the spark advance governor.	Make ignition timing test. Start engine. Use timing light to observe timing notch and slowly increase engine speed to 1500 rpm. Hold engine speed at 1500 rpm and observe timing notch.	<p><u>Timing notch moves away from pointer.</u> Distributor governor mechanism operating. Ignition distributor need not be removed unless accurate calibration check is desired.</p> <p><u>Timing notch does not move or jumps from pointer.</u> Replace ignition distributor.</p> <p><u>Timing notch moves back and forth (engine speed constant).</u> Replace ignition distributor and repeat test. If timing mark still moves back and forth, check engine timing gears for wear.</p>



Table V - Troubleshooting with Electrical Test Equipment (continued)

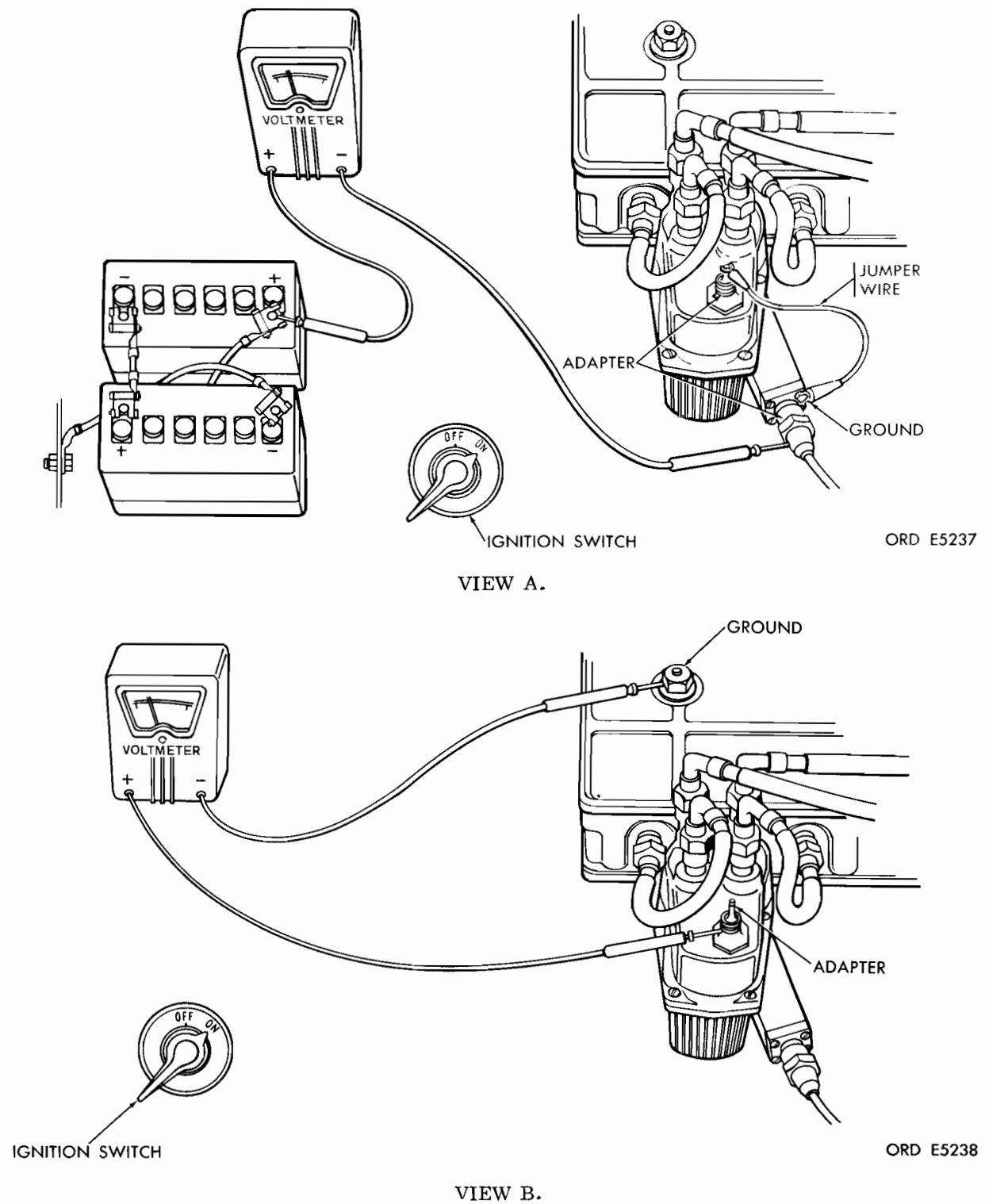
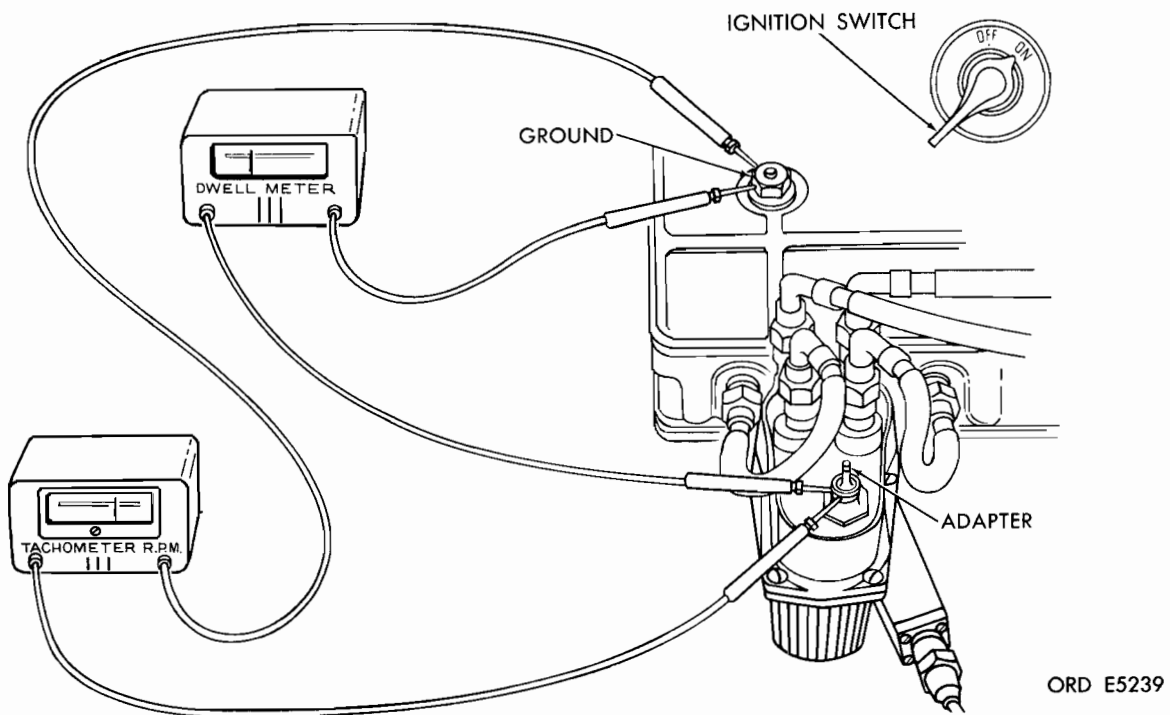


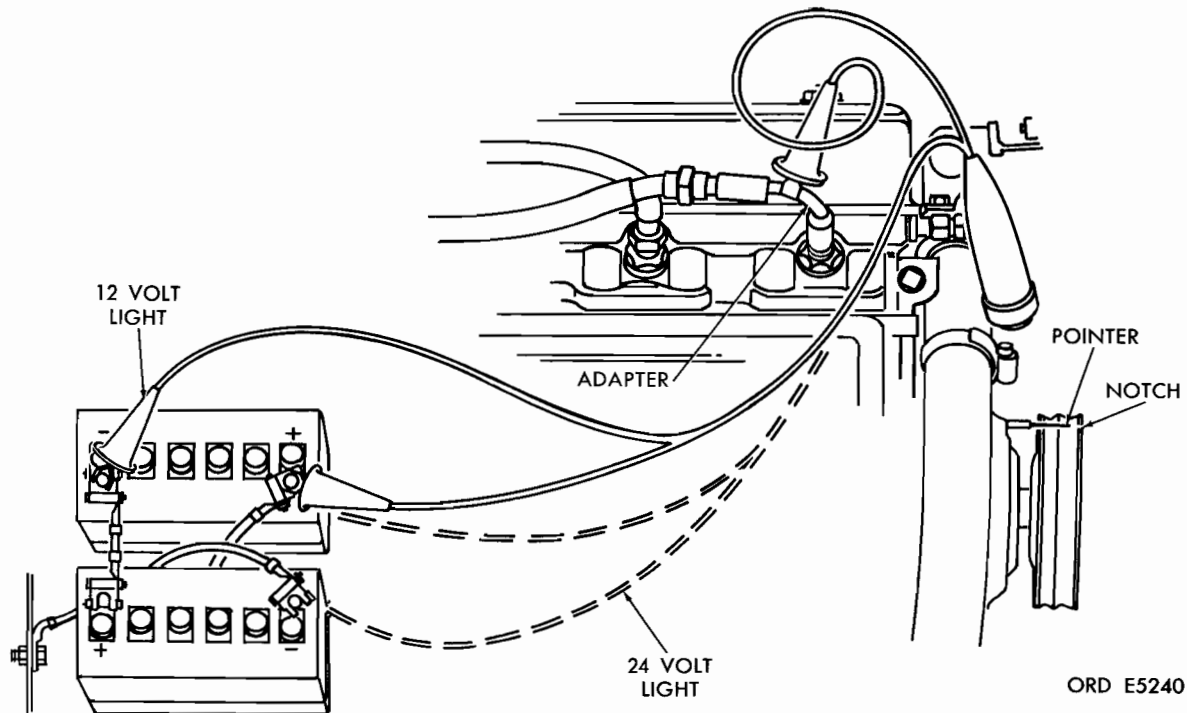
Figure 6. Hook-up for ignition system tests

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)



VIEW C.



VIEW D.

Figure 6. Hook-up for ignition system tests

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
LIGHTING SYSTEM (fig. 7)		
All light circuit defects cannot be listed in this table. The vehicle wiring diagram, figure 73, and the basic method used in the following tests will assist with any wiring problem. The basic method used is to determine if voltage is available as close to the faulty component as possible and at each succeeding connector in the circuit until the trouble is found. A test light or a voltmeter with a scale that includes 25 may be used for these tests. When no lamps will light, perform the lighting switch connector test; otherwise select appropriate test (items 22 through 30).		
21. <u>Service Headlamp Connectors. (Headlamp on one side only will not light.)</u> When only headlamps fail to light, test voltage at headlamp connectors of faulty lamp to determine if cause of lamp failure is connectors, bulb, socket, switches, or wiring.	Disconnect connector at lamp and connect voltmeter as shown in view A, figure 7. Turn lighting switch to "SER DRIVE" position. Observe voltmeter. If battery voltage is not indicated, operate dimmer switch.	<u>Reading indicated.</u> Replace sealed beam bulb. If new bulb does not light, pin connector of headlamp case is faulty. Replace pin connector.  <u>No reading indicated.</u> Wiring harness from headlamp to dimmer switch chafed or broken. Check harness and repair or replace as necessary.
22. <u>Service Headlamp Connectors (Headlamps on both sides will not light).</u>	Check for voltage at connectors of both lamps as in Test 21. Disconnect no. 17 and no. 18 wires at dimmer switch. Connect voltmeter negative lead to ground and with positive lead check for voltage at one of the exposed dimmer switch terminals.	<u>Reading indicated at headlamp connectors.</u> Replace sealed beam bulb. If new bulb does not light, pin connector of headlamp is faulty. Replace pin connector.  <u>Reading indicated at no. 17 and no. 18 switch terminals, but not at headlamp connectors.</u> Check wiring harness from headlamps to dimmer switch for chafed or broken wires.  <u>No reading indicated at both no. 17 and no. 18 dimmer switch terminals.</u> Disconnect no. 16 wire from dimmer switch and check for voltage at wire connector. If voltage is indicated at no. 16 wire, check harness from dimmer switch to lighting switch for chafed or broken wire. If harness is serviceable, perform lighting switch connector test (item 29, 30).

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
LIGHTING SYSTEM (fig. 7) (continued)		
23. <u>Front Black Out Lamps Connector.</u> Test for voltage at front black out marker or black out driving lamp connectors to determine if cause of failure is bulb, socket, switches or wiring.	Connect voltmeter as shown in view B figure 7. Turn lighting switch to position which should light faulty lamp. Observe voltmeter.	<p><u>Reading indicated.</u> Replace bulb. If new bulb does not light, replace socket and wire assembly.</p> <p><u>No reading indicated.</u> Check harness from lamp to lighting switch for chafed or broken wire. If harness is serviceable, perform lighting switch connector tests (items 29 and 30).</p>
24. <u>Rear Lamp Connectors.</u> When rear lamps fail to light, test for voltage at rear lamp connector to determine if cause of lamp failure is bulb, socket, switches or wiring.	Connect voltmeter as shown in view C figure 7. Turn lighting switch to position which should light faulty lamp, if stoplamp, depress brake pedal. Observe voltmeter.	<p><u>Reading indicated.</u> Replace bulb. If new bulb does not light, replace socket and wire assembly.</p> <p><u>No reading indicated.</u> Perform rear harness connector test (item 26).</p>
25. <u>Trailer Connector.</u> Test voltage at trailer connector to determine if cause of trailer lamp trouble is in vehicle or Trailer wiring harness and connections.	Turn lighting switch to position which should light faulty trailer lamp. Connect voltmeter as shown in view D figure 7 to pin socket of faulty circuit. Observe voltmeter.	<p><u>Reading indicated at correct pin socket.</u> Check the two no. 90 wire ground connections. If no. 90 wires have a tight clean ground, trailer electrical system is faulty.</p> <p><u>No reading indicated at correct pin socket.</u> Perform rear harness connector test (item 26).</p>
26. <u>Rear Harness Connector.</u> Test voltage at rear wiring harness connectors to determine if cause of failure is lighting switch or wiring harness.	Refer to view E figure 7 and disconnect connector of faulty circuit. Connect voltmeter as shown. Turn lighting switch to position which should light faulty lamp; if stoplamp is faulty, depress brake pedal. Observe voltmeter.	<p><u>Reading indicated.</u> Check rear harness from connectors to faulty lamp for chafed or broken wires.</p> <p><u>No reading indicated for black out marker or service connector.</u> Perform lighting switch connector tests (items 29 and 30).</p> <p><u>No reading indicated for black out or service stoplamp connector.</u> Perform stoplamp switch tests (items 27 and 28).</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<u>LIGHTING SYSTEM (fig. 7) (continued)</u>		
27. <u>Stoplamp Switch (Voltage to Switch) (No. 1).</u>	Turn lighting switch to "Stop light" position. Disconnect both no. 75 wires at stoplamp switch. Connect voltmeter negative lead to ground. Use prod on positive lead to check for voltage at one of the two no. 75 wires.	<u>Reading indicated at one no. 75 wire.</u> Perform stoplamp switch test no. 2 (item 28). <u>No reading indicated at either no. 75 wire.</u> Check harness from stoplamp switch to lighting switch connector for chafed or broken wire. If harness is serviceable perform lighting switch connector tests (items 29,30).
28. <u>Stoplamp Switch (Voltage through Switch) (No. 2).</u>	Connect "hot" no. 75 wire to one terminal of stoplamp switch. With brake pedal depressed, use test prod on positive voltmeter lead to check for voltage at exposed stoplamp terminal.	<u>Reading indicated.</u> Switch is serviceable. Check harness from stoplamp switch to lighting switch connector for chafed or broken wire. If harness is serviceable perform lighting switch connector tests (items 29,30).  <u>No reading indicated.</u> Replace switch.
29. <u>Lighting Switch Connector (No Lamps will Light).</u>	Remove lighting switch from panel and disconnect harness connector. Connect voltmeter negative lead to ground. Use test prod on voltmeter positive lead to check for battery voltage at the "F" pin socket of harness connector.	<u>Reading indicated.</u> Replace lighting switch.  <u>No reading indicated.</u> Check wiring harness from starter switch to lighting switch for chafed or broken wire or loose no. 10 wire connection at starter switch. Refer to view F, figure 7.
30. <u>Lighting Switch Connector (Some Lamps Fail to Light).</u>	Remove lighting switch from panel and disconnect harness connector. Connect jumper wire from "F" terminal to pin socket of faulty circuit.	<u>Lamp lights with jumper wire connected.</u> Replace lighting switch.  <u>Lamp does not light with jumper wire connected.</u> Check harness from lighting switch to front lamp or rear harness connector for chafed or broken wire.

Table V - Troubleshooting with Electrical Test Equipment (continued)

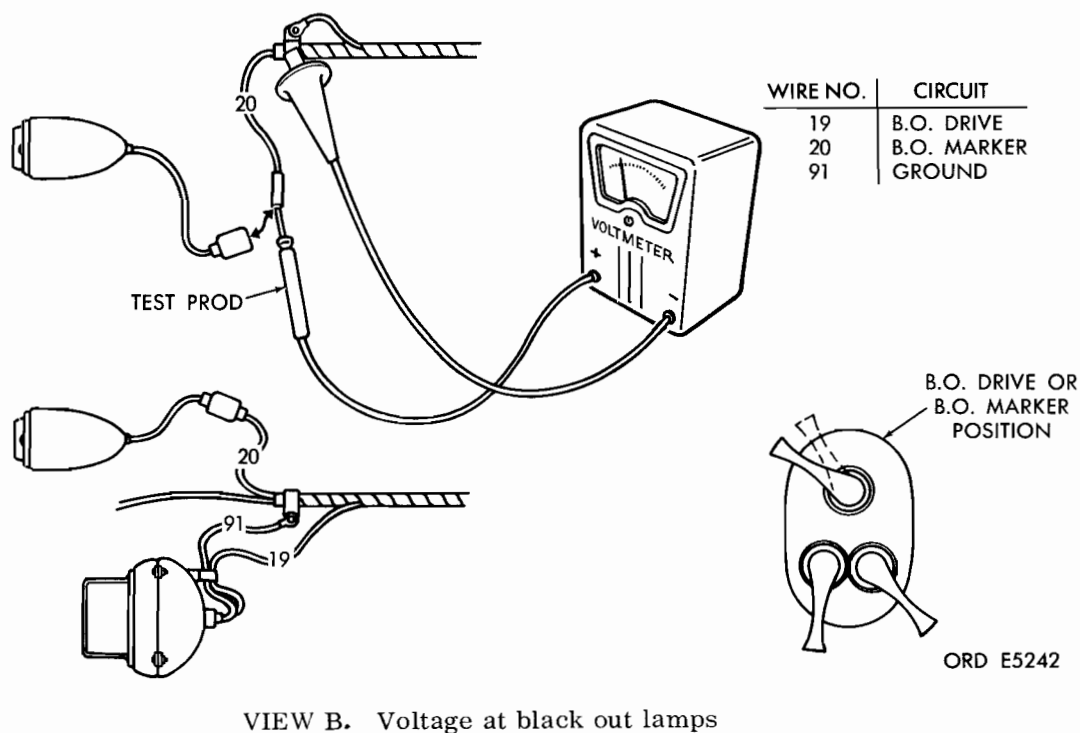
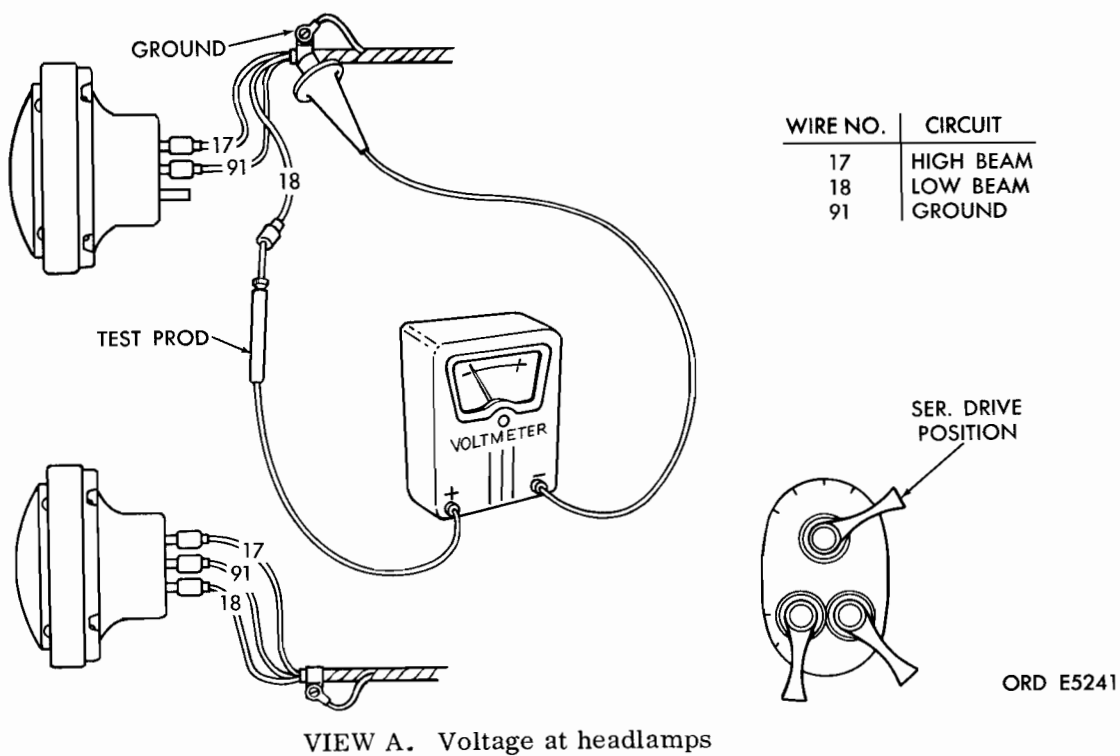


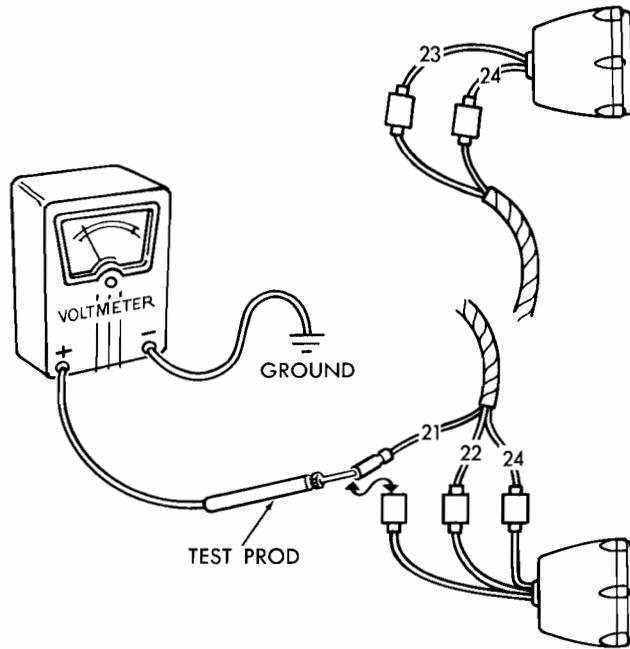
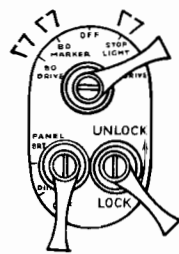
Figure 7. Hook-up for lighting system tests

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)

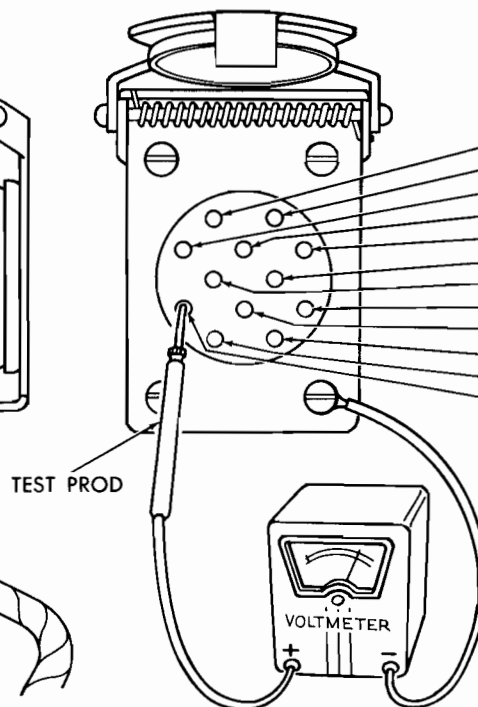
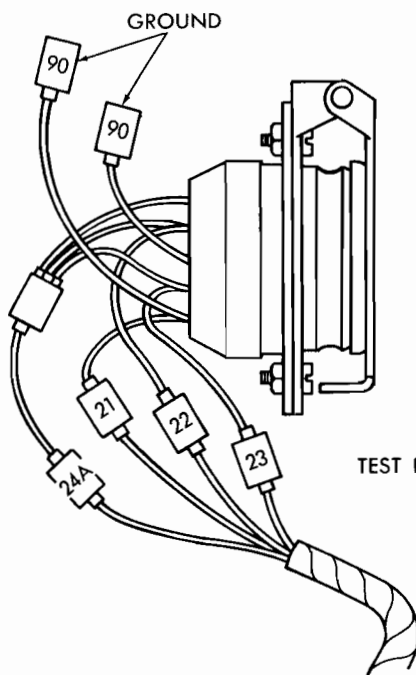
WIRE NO.	CIRCUIT
21	SERVICE REAR
22	SERVICE STOP
23	B.O. STOP
24	B.O. REAR

IN POSITION  
FOR LAMPS  
BEING TESTED



ORD E5243

VIEW C. Voltage at rear lamps



PIN	WIRE NO.	CIRCUIT
A	24A	REAR B.O. MARKER
J	NONE	NOT USED
B	24	SERVICE STOP
K	NONE	NOT USED
H	490	REAR B.O. MARKER
N	NONE	NOT USED
L	90	GROUND
F	23	B.O. STOP
M	NONE	NOT USED
E	21	SERVICE TAIL
D	90	GROUND
C	24B	REAR B.O. MARKER

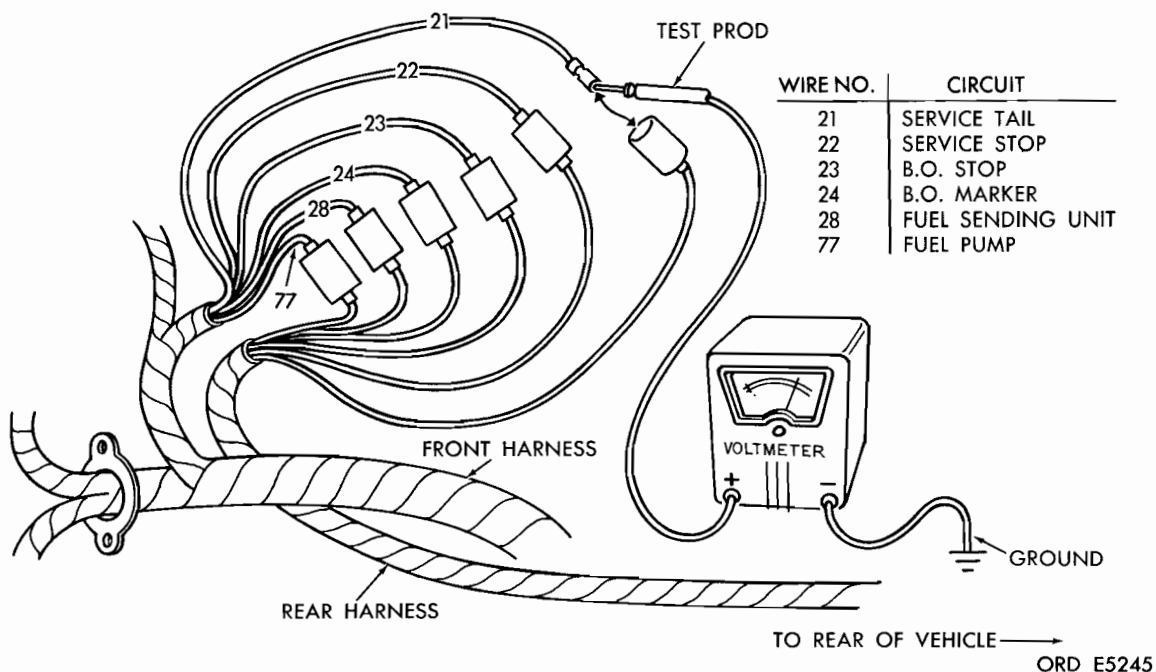
ORD E5244

VIEW D. Voltage at trailer receptacle

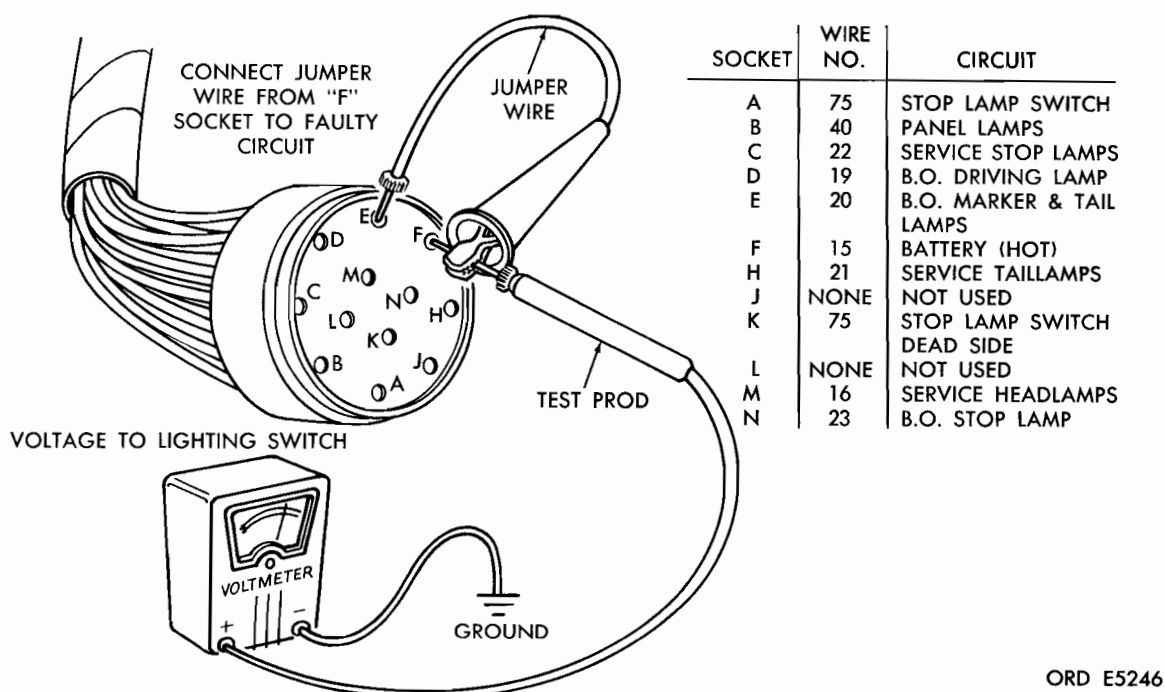
Figure 7. Hook-up for lighting system tests

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)



VIEW E. Voltage at rear harness



VIEW F. Lighting switch

Figure 7. Hook-up for lighting system tests



Table V - Troubleshooting with Electrical Test Equipment (continued)

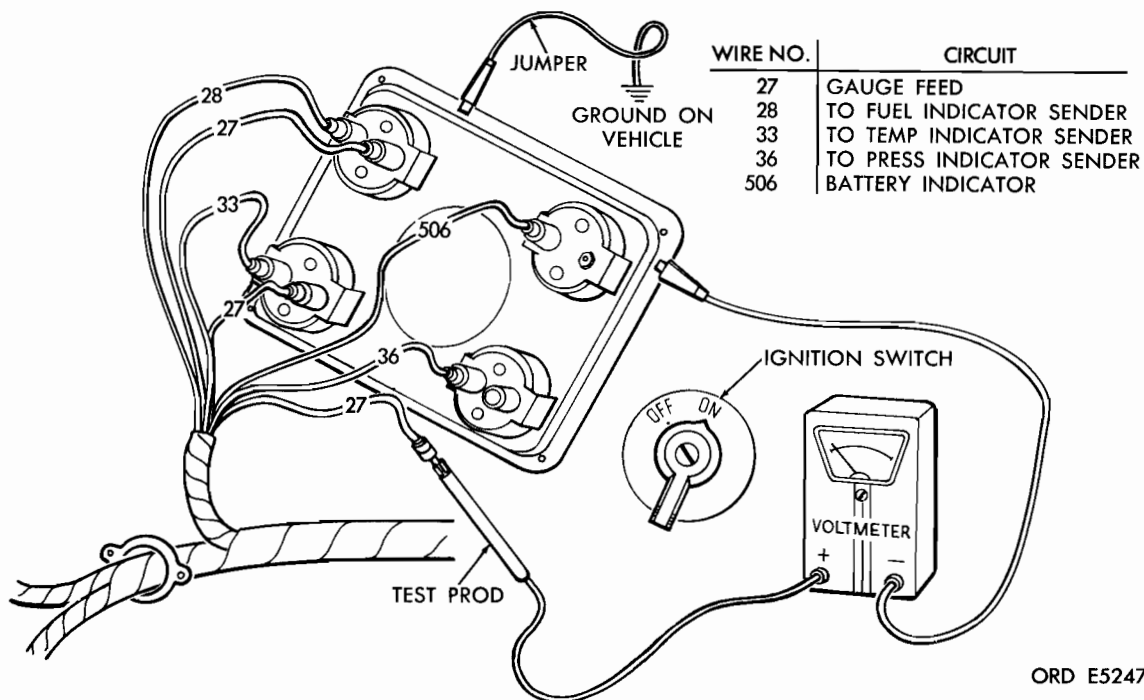
TEST	METHOD	RESULTS
<p align="center"><u>INSTRUMENTS, GAGES AND HORN (fig. 8)</u></p> <p>The test for faulty gage operation requires removal of the instrument cluster attaching screws to gain access to the connectors. <u>CAUTION. When instrument cluster is removed, connect a jumper wire from cluster panel to a ground on vehicle to prevent damage to gages.</u></p>		
<p>31. <u>Voltage to Indicator System.</u> When all gages are inoperative, check voltage to system to determine if wiring, circuit breaker or ignition switch is defective.</p>	<p>Remove and ground cluster. Select voltmeter scale; use range that includes 28 volts. Disconnect no. 27 (hot) wire at circuit breaker. Refer to figure Turn ignition switch to "ON" position. Connect negative voltmeter lead to ground on vehicle. Use test prod on positive meter lead to check for voltage at no. 27 wire connector. Refer to view A figure 8.</p>	<p><u>Reading indicated.</u> Inspect wiring harness from circuit breaker to gages for loose connections, chafed or broken no. 72 wires. If wire harness is serviceable, replace circuit breaker.</p> <p><u>No reading indicated.</u> Inspect wiring harness from circuit breaker to ignition switch for loose connections, chafing, or broken no. 72 wire. If wire harness is serviceable, replace ignition switch.</p>
<p>32. <u>Gage Sending Unit.</u> When pointer of one gage stays at either end of scale, check voltage at sender to determine if fault is sending unit, connections or wiring.</p>	<p>Select voltmeter scale; use range that includes 28 volts. Disconnect lead wire from sending unit of inoperative gage. Turn ignition switch to "ON" position. Connect negative voltmeter lead to ground on vehicle. Use test prod on positive meter lead to check for voltage at gage lead wire connector. Observe voltmeter.</p>	<p><u>Reading indicated.</u> Refer to sending unit resistance test (item 33).</p> <p><u>No reading indicated.</u> Inspect wiring harness from sending unit to gage for loose connections, chafing, or broken wire. Check for voltage at no. 27 wire of gage. Refer to voltage to indicator system test (item 31).</p>
<p>33. <u>Sending Unit Resistance (Oil Pressure Sending Unit).</u></p>	<p>Start engine and set hand throttle so engine speed is approximately 20 mph. Observe cluster gage. Disconnect no. 36 wire from pressure sending unit. Connect one ohmmeter lead to ground on engine and other lead to pin connector on sending unit. Observe ohmmeter. Stop engine. Do not change hand throttle position. Remove sending unit and install test pressure gage. Start engine and observe gage.</p>	<p><u>Reading approximately same on cluster gage and test gage.</u> Gage system is functioning normally. Check engine lubrication system if pressure is not normal.</p> <p><u>Readings not the same and resistance (ohms) of sending unit not within tolerance (view B fig. 8).</u> Replace sending unit.</p> <p><u>Readings not the same and resistance of sending unit is within tolerance (view B fig. 8).</u> Replace gage unit.</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
INSTRUMENTS, GAGES AND HORN (fig. 8) (continued)		
34. <u>Sending Unit Resistance (Temperature Sending Unit).</u>	Remove radiator filler cap and insert a test thermometer into filler opening. Start engine and operate until thermometer temperature is stable. Observe panel gage. Disconnect no. 33 wire from temperature sending unit. Connect one ohmmeter lead to ground on engine and other lead to connector pin of sending unit. Observe ohmmeter and thermometer. Stop engine.	<p><u>Readings approximately same on cluster gage and thermometer.</u> Gage system functioning normally. If engine temperature is above or below normal, check engine and cooling system.</p> <p><u>Readings not the same and resistance (ohms) of sending unit not within tolerance (view C fig. 8).</u> Replace sending unit.</p> <p><u>Readings not the same and resistance is within tolerance (view C fig. 8).</u> Replace gage unit.</p>
35. <u>Sending Unit Resistance (Fuel Sending Unit).</u>	Disconnect feed wire and remove sending unit from tank. Connect one ohmmeter lead to base of sending unit and the other lead to connector pin. Observe ohmmeter and slowly move sending unit float from top to bottom stops. Measure float positions at stops, view D fig. 8.	<p><u>Readings indicate even increase from zero at bottom stop to 50 ohms at top stop.</u> Sending unit is serviceable. Replace gage.</p> <p><u>Readings do not indicate even increase, or pointer movement is erratic.</u> Sending unit is defective; replace unit.</p> <p><u>Float positions faulty.</u> Replace sending unit.</p>
36. <u>Battery - Generator Indicator.</u>	Check battery condition. If battery is charged and indicator does not register, disconnect lead at indicator. Connect voltmeter to lead. Select scale that includes 30 volts. Observe voltmeter.	<p><u>Reading indicated.</u> Indicator is faulty; install new battery generator indicator.</p> <p><u>No reading indicated.</u> Check wiring harness from indicator to battery for loose or corroded connections, chafed, or broken wires.</p>

Table V - Troubleshooting with Electrical Test Equipment (continued)

TEST	METHOD	RESULTS
<b>INSTRUMENTS, GAGES AND HORN (fig. 8) (continued)</b>		
37. <u>Horn Assembly.</u>	Disconnect leads at horn. Attach voltmeter to "HOT" lead and ground. Select scale that includes 28 volts.	<p><u>Reading indicated.</u> Connect hot wire to horn and ground other horn connector. If horn does not operate, replace horn. If horn does operate, perform horn ground circuit test (item 38).</p> <p><u>No reading indicated.</u> Perform horn positive circuit test (item 39). <u>Continuity indicated</u> Perform horn positive circuit test (item 39). <u>No continuity indicated.</u> Defective wire or horn switch. Replace as necessary.</p> <p><u>No voltage indicated.</u> Replace defective horn-to-circuit breaker wire, circuit breaker, or circuit breaker to battery wire as necessary.</p>
38. <u>Horn Ground Circuit (From horn to horn switch).</u>	Check each segment of the ground circuit for continuity.	
39. <u>Horn positive circuit (From horn to battery).</u>	Using voltmeter, check circuit breaker, and wire to battery for voltage.	



VIEW A. Voltage to instruments

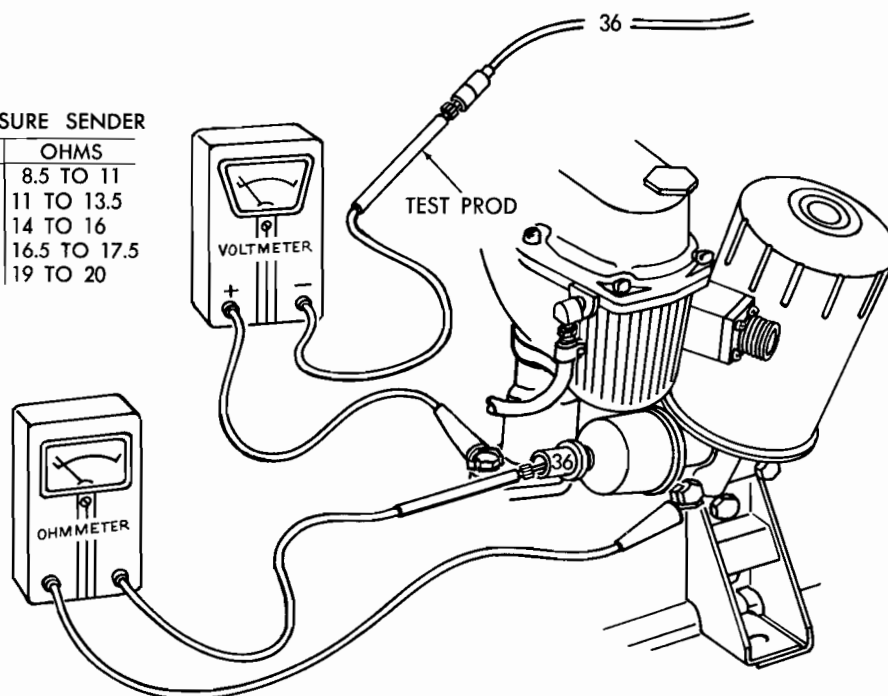
Figure 8. Hook-up for instruments, gages, and horn

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)

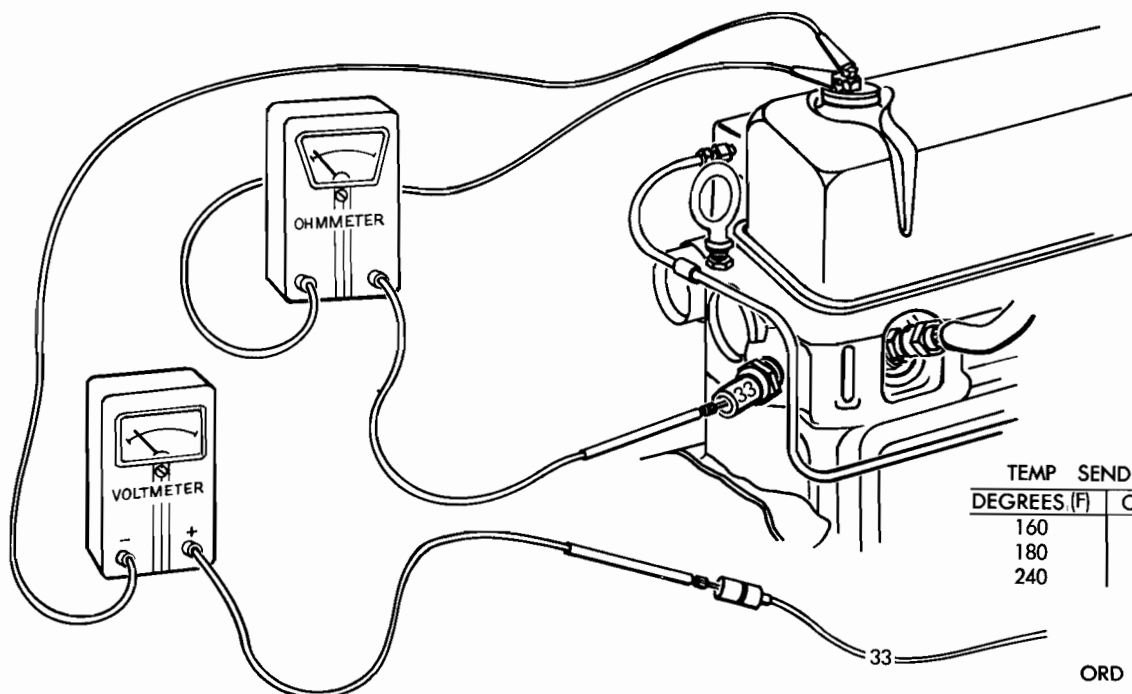
PRESSURE SENDER

LB	OHMS
20	8.5 TO 11
25	11 TO 13.5
30	14 TO 16
35	16.5 TO 17.5
40	19 TO 20



ORD E5248

VIEW B. Oil pressure sending unit



TEMP SENDER	
DEGREES (F)	OHMS
160	1200
180	917
240	450

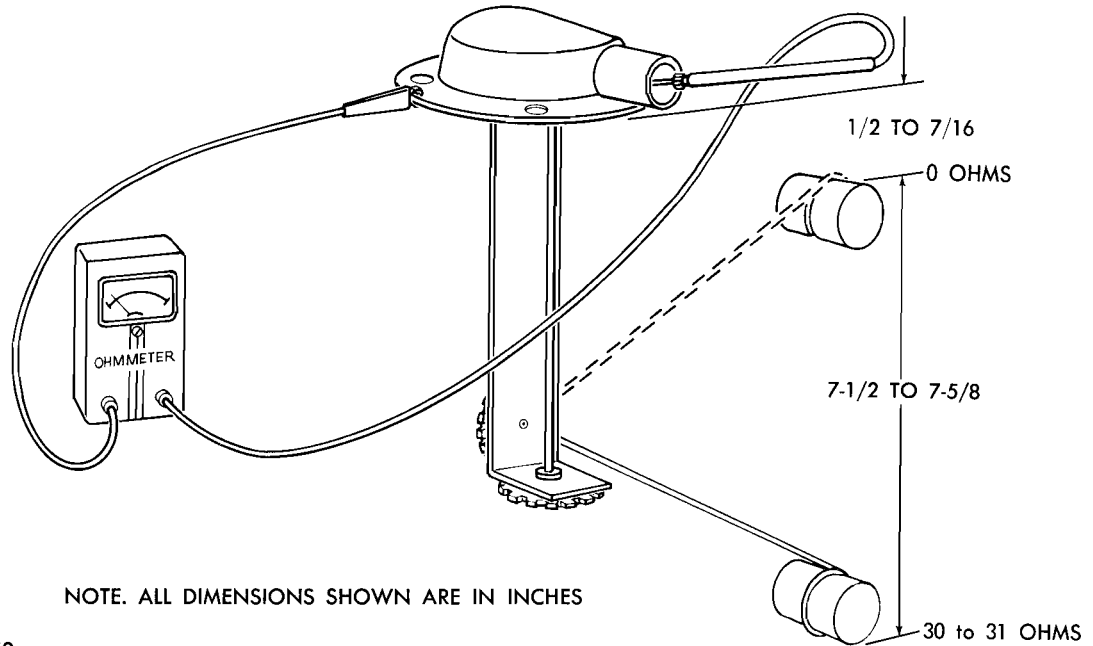
ORD E5249

VIEW C. Temperature sending unit

Figure 8. Hook-up for instruments, gages, and horn

(continued)

Table V - Troubleshooting with Electrical Test Equipment (continued)



ORD E5250

VIEW D. Fuel level sending unit

Figure 8. Hook-up for instruments, gages, and horn

TEST	METHOD	RESULTS
<b>FUEL SYSTEM</b>		
40. <u>Fuel Pump (Inoperative fuel pump can be caused by a faulty fuel pump, faulty oil pressure safety switch, faulty circuit breaker, or faulty harness).</u>	Disconnect lead at fuel pump. Connect voltmeter lead to harness connector and check for voltage with starter cranking engine.	<p><u>Reading indicated at fuel pump connector.</u> If fuel pump does not operate, replace fuel pump.</p> <p><u>No reading indicated.</u> Check for voltage at oil pressure safety switch terminals no. 77 and no. 77a, and with starter cranking engine at no. 77b. If no voltage is available at terminal no. 77a, check for voltage at circuit breaker. If circuit breaker feed is 28 volts but output is not indicated, replace circuit breaker. If voltage is available at terminal no. 77b with starter cranking engine but not at no. 77, replace oil pressure safety switch.</p>

## Section VI. POWER PLANT

### 26. GENERAL

The power plant consists of the engine, clutch, transmission and transfer, parking brake, radiator and all the various engine accessories, less the air cleaner and transmission and transfer shift levers. The power plant can be removed as a unit without draining the cooling system, engine oil or transmission oil. The radiator, clutch and all of the engine accessories can be replaced without removal of the power plant.

To replace the engine, transmission, or transfer, the power plant must be removed from the vehicle. For description of engine refer to section VII, paragraph 31. Replacement engines will come fully equipped with all accessories and ready for immediate installation. Coordinate engine replacement with ordnance maintenance personnel. Engine replacement must be recorded in DA Form 478, MWO and Major Unit Assembly Replacement Record and Organization Equipment File.

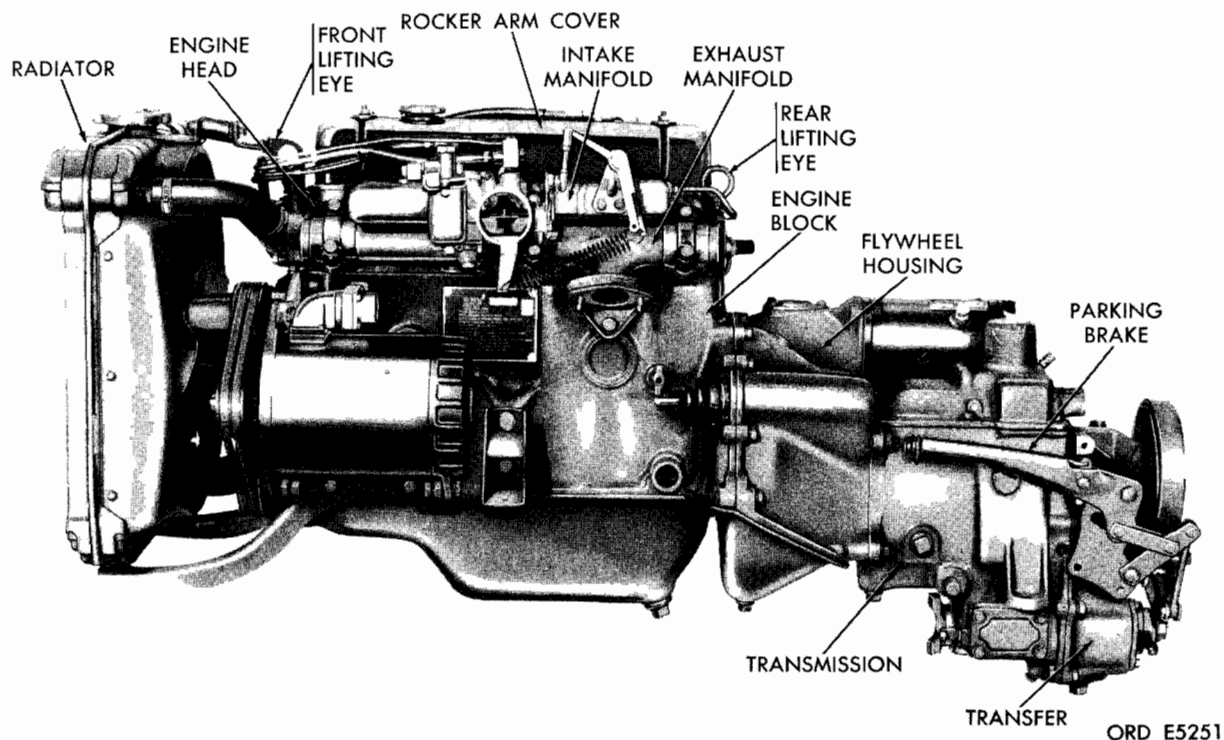
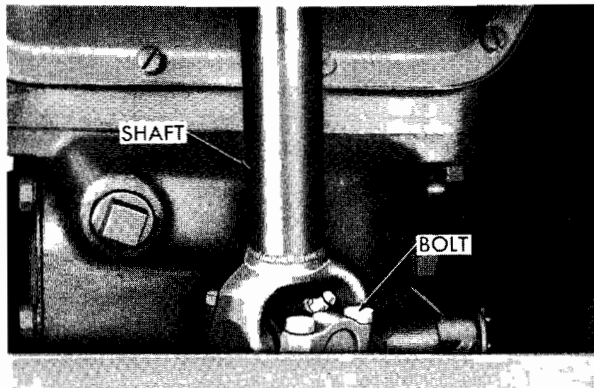


Figure 9. Side view of complete power plant

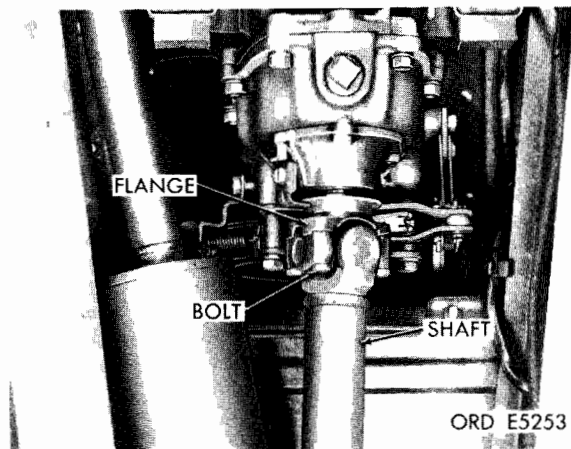
## 27. POWER PLANT

a. Removal. Refer to figure 10, steps 1 through 34.



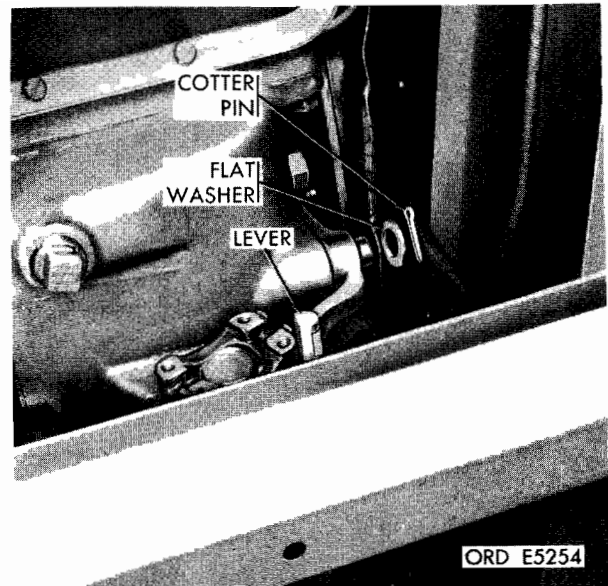
ORD E5252

STEP 1 - Remove four bolts (both ends) securing front propeller shaft to transfer and the differential.



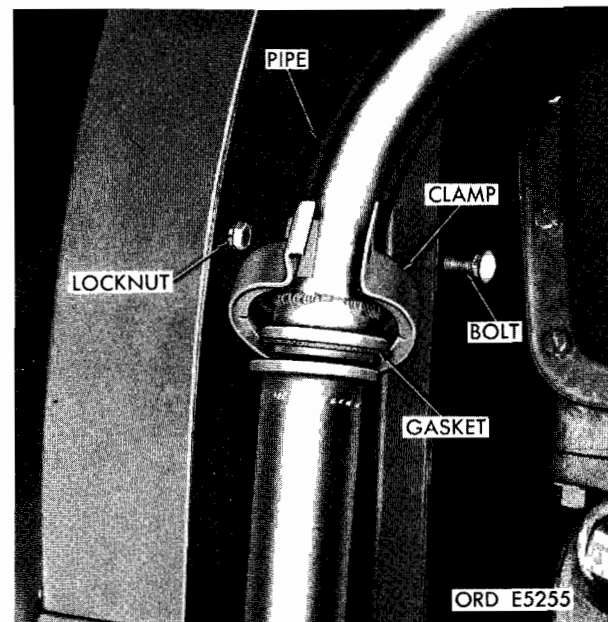
ORD E5253

STEP 2 - Remove four bolts securing rear propeller shaft to transfer output shaft flange.



ORD E5254

STEP 3 - Remove cotter pin and flat washer securing transfer shift lever to transfer.

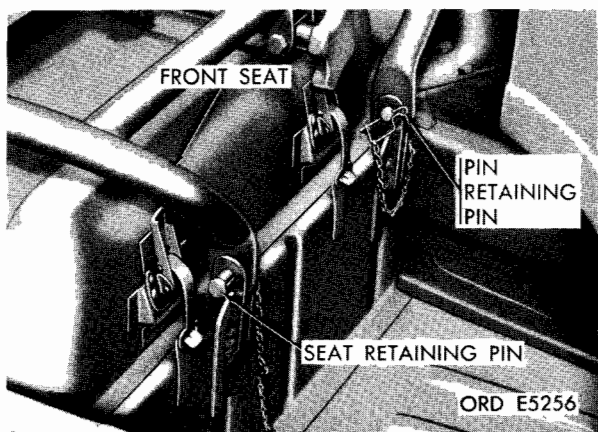


ORD E5255

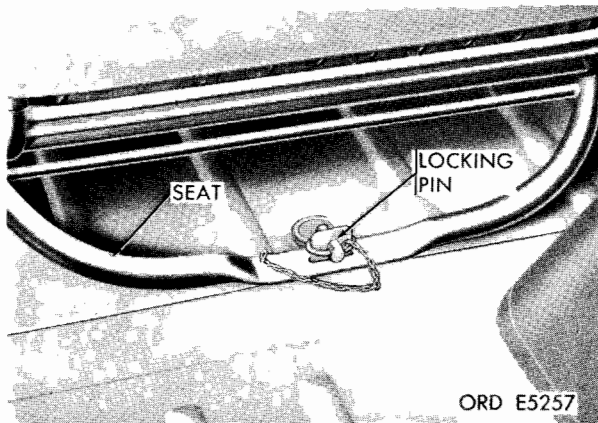
STEP 4 - Remove locknut and bolt from clamp securing muffler inlet pipe to muffler.

Figure 10. Power plant removal

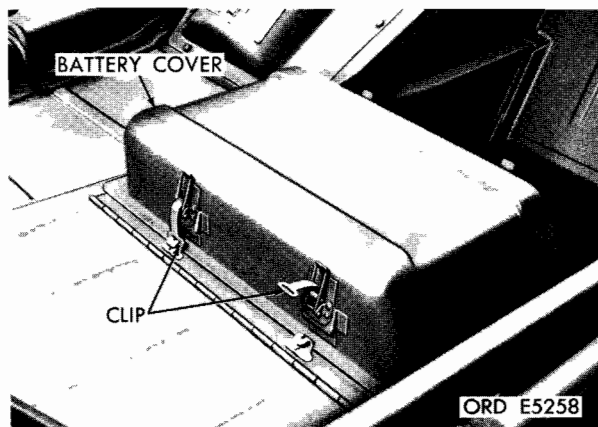
(continued)



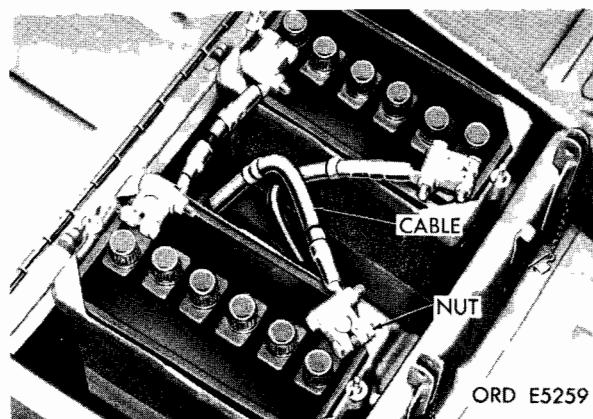
STEP 5 - Remove pin retaining pins and seat retaining pins from front of seat.



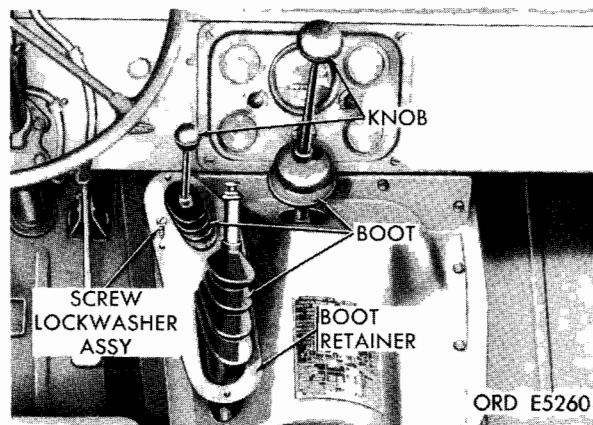
STEP 6 - Remove locking pin from rear of seat.



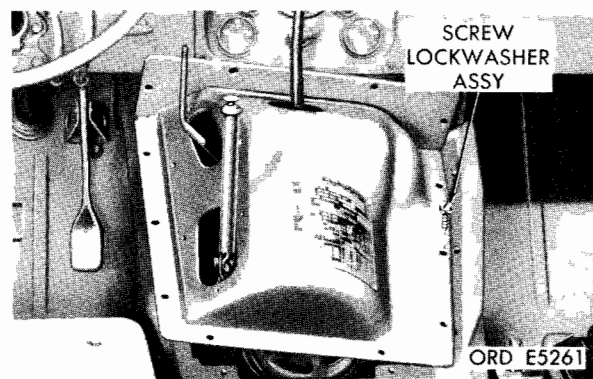
STEP 7 - Open front and rear hold-down snap clips on battery cover.



STEP 8 - Loosen nut and remove ground cable from battery terminal post.



STEP 9 - Unscrew and remove knobs. Remove six screws and lockwashers securing boot retainer to transmission cover plate and remove boots and boot retainer.

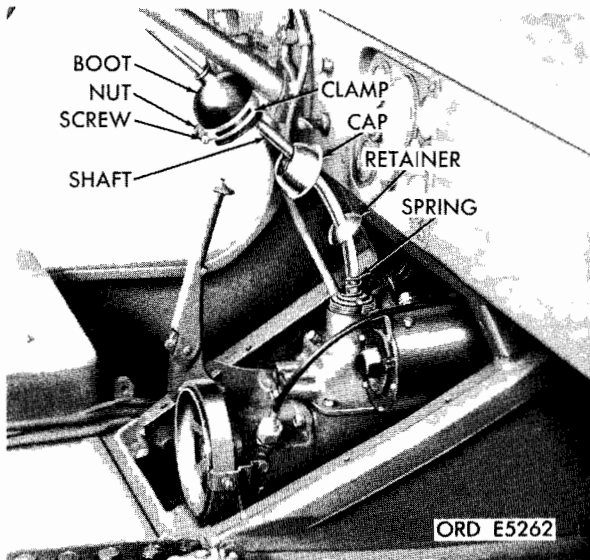


STEP 10 - Remove twelve screws and lockwashers securing transmission cover plate to floor panel.

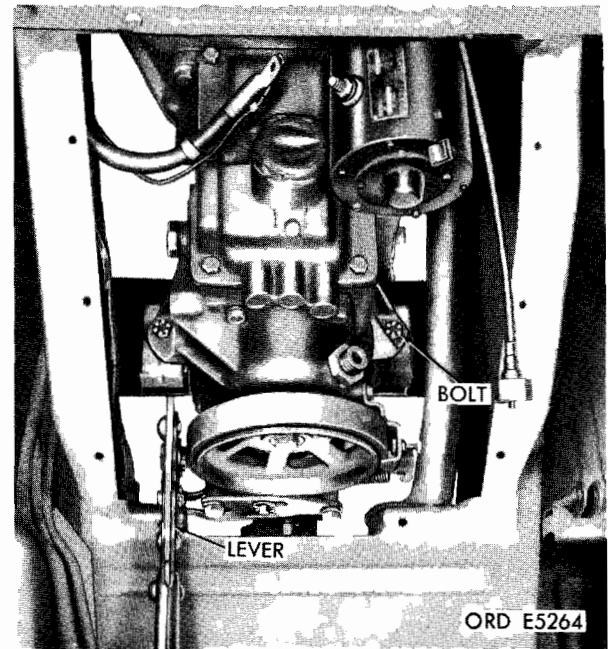
Figure 10. Power plant removal

(continued)

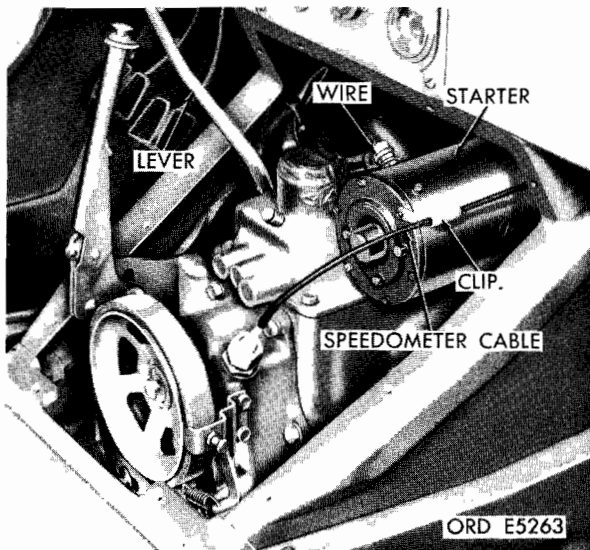




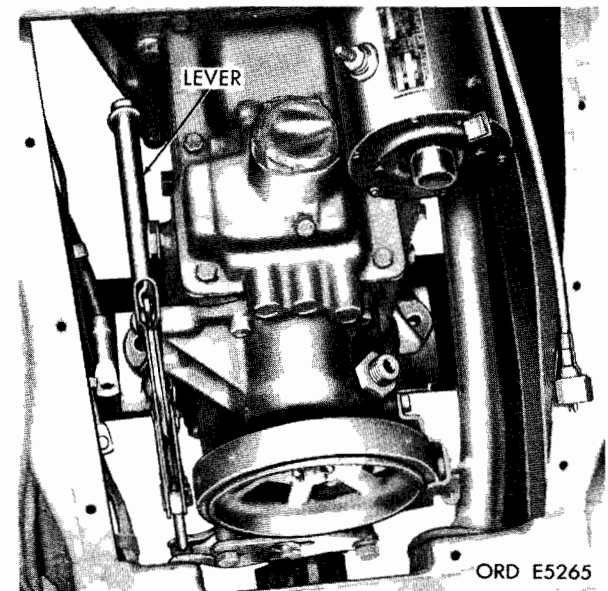
**STEP 11** - Loosen screw on clamp and remove gear shift boot. Unscrew and remove gear shift lever assembly and tape clean rag over gear shift opening.



**STEP 13** - Remove two bolts and lockwashers securing parking brake lever to transfer. Pull lever rearward and remove two rear support mounting bolts.



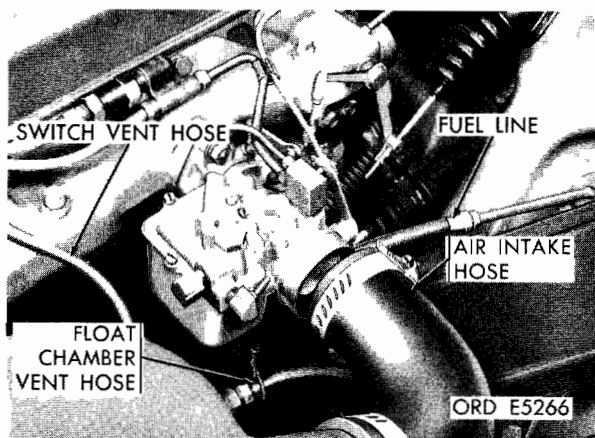
**STEP 12** - Unscrew speedometer cable connector from transfer. Remove speedometer cable from clip on starter. Remove nut and flat washer securing electrical cables to starter terminal. Slide transfer shift lever off shaft.



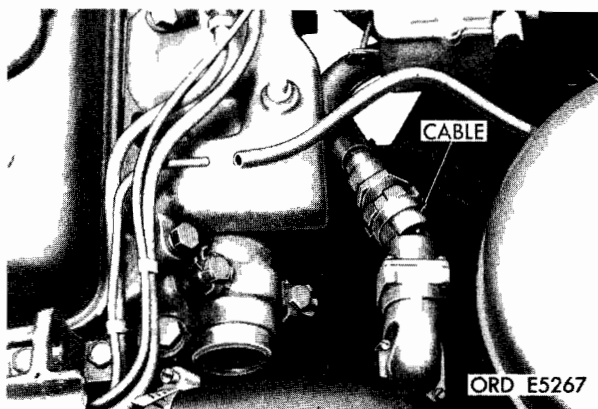
**STEP 14** - Position parking brake lever forward beside transmission housing.

Figure 10. Power plant removal

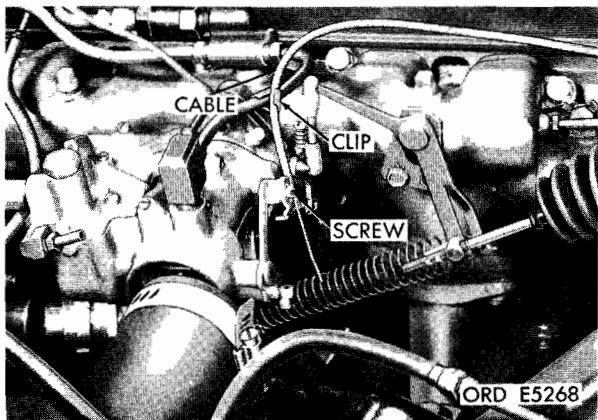
(continued)



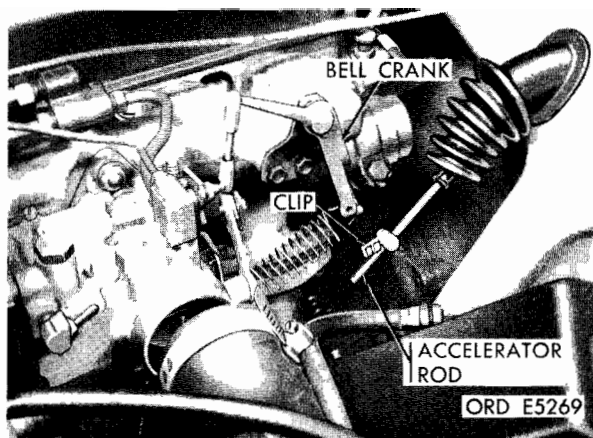
STEP 15 - Loosen clamps and remove hoses at carburetor and remove oil pressure safety switch hose above manifold.



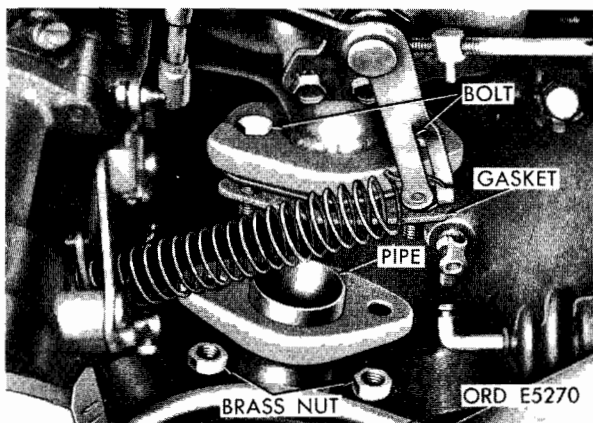
STEP 16 - Using spanner wrench, unscrew generator to regulator cable at generator.



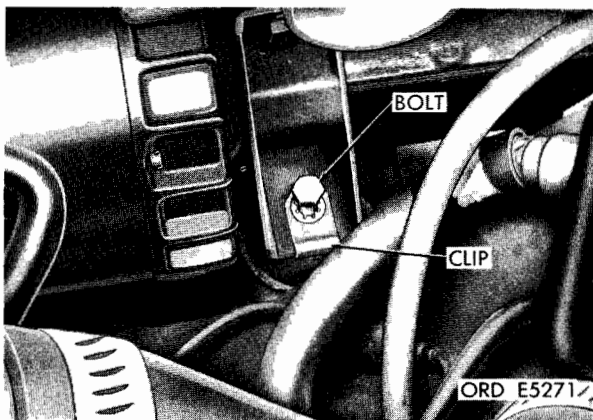
STEP 17 - Remove clip and loosen two screws securing choke control cable.



STEP 18 - Remove clip securing accelerator rod to bell crank.



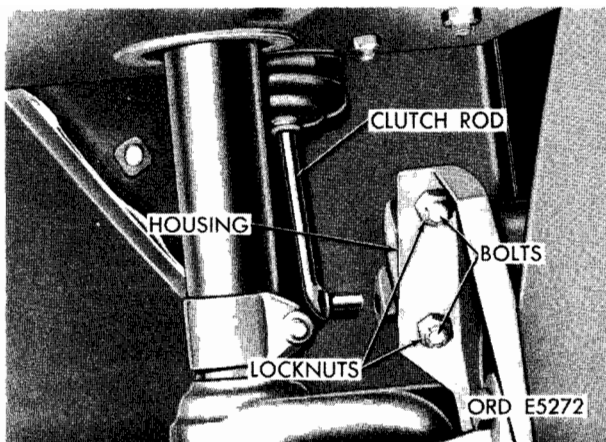
STEP 19 - Remove two brass nuts securing muffler inlet pipe to exhaust manifold. NOTE: Pipe will drop free when disconnected.



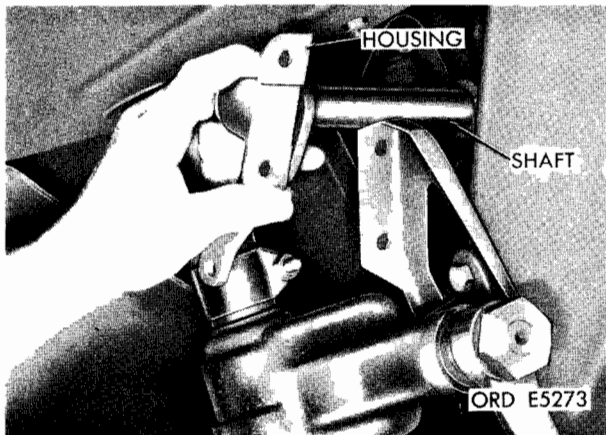
STEP 20 - Remove front support mounting bolt and clip.

Figure 10. Power plant removal

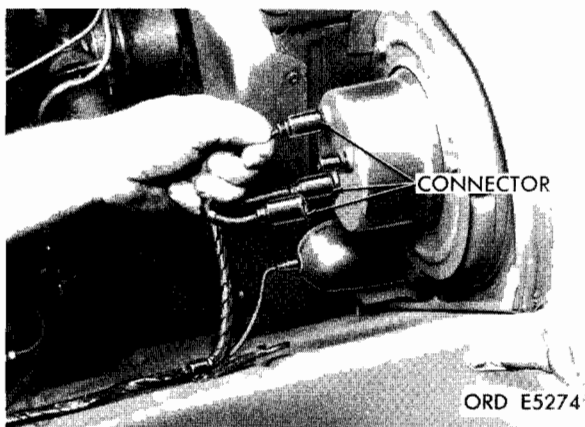
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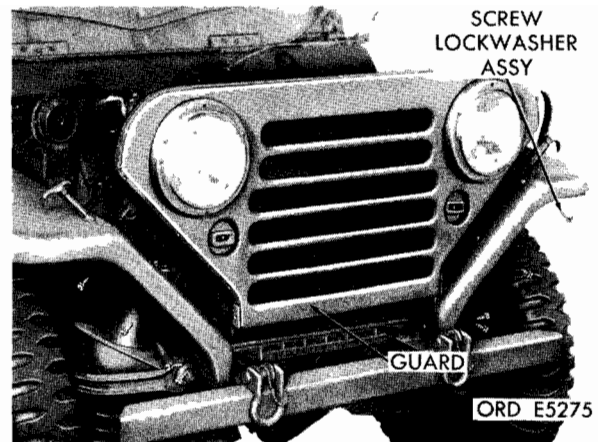
STEP 21 - Remove two bolts and locknuts securing clutch cross shaft housing.



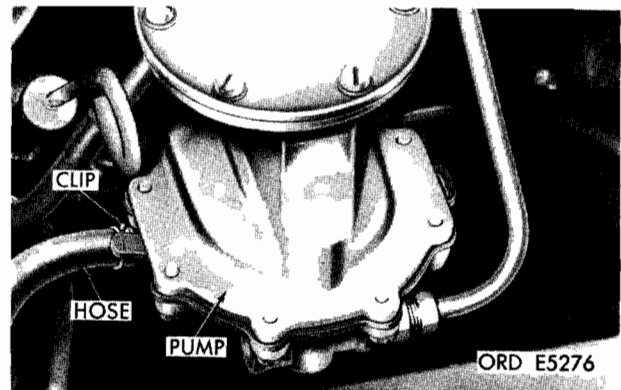
STEP 22 - Remove clutch cross shaft and housing.



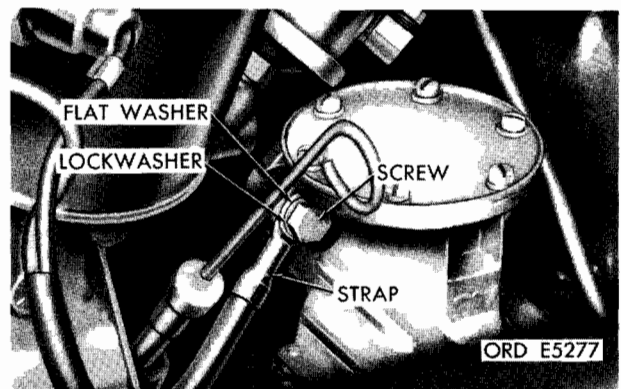
STEP 23 - Disconnect eight connectors from headlights and blackout marker lights.



STEP 24 - Remove eight screw and lockwasher assemblies securing brush guard to fenders.



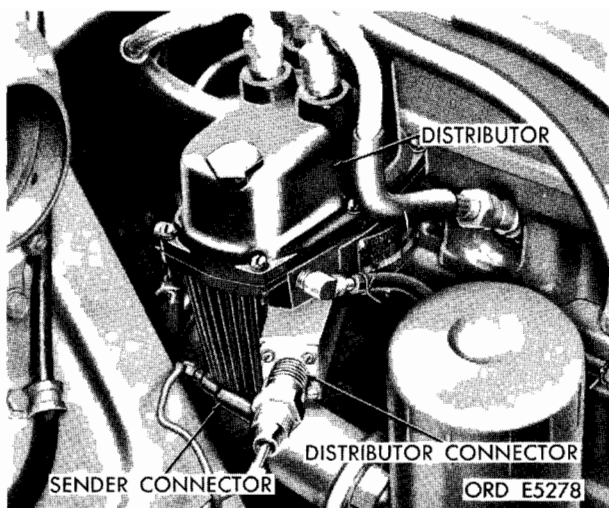
STEP 25 - Remove clip securing windshield wiper vacuum hose to vacuum pump.



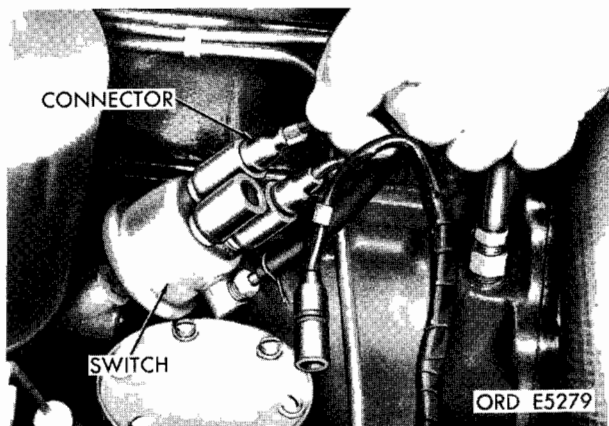
STEP 26 - Remove screw, lockwasher, and flat washer securing ground strap and vacuum pump to engine block. Remove ground strap and replace screw and washers.

Figure 10. Power plant removal

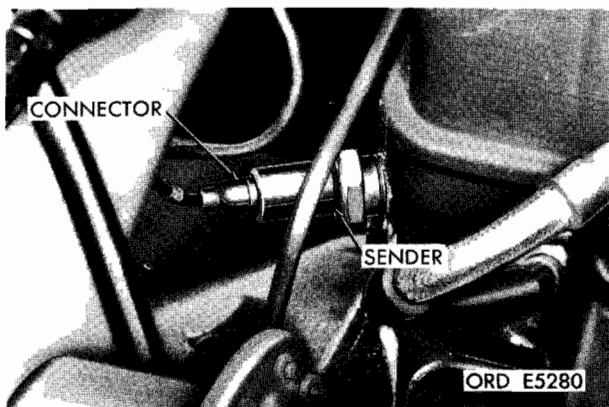
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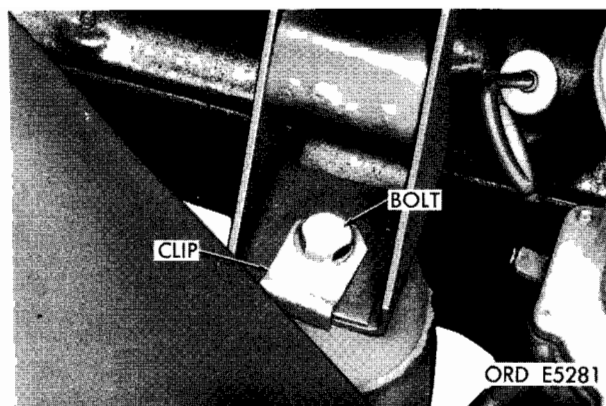
STEP 27 - Unscrew ignition distributor electrical connector. Disconnect oil pressure sender connector.



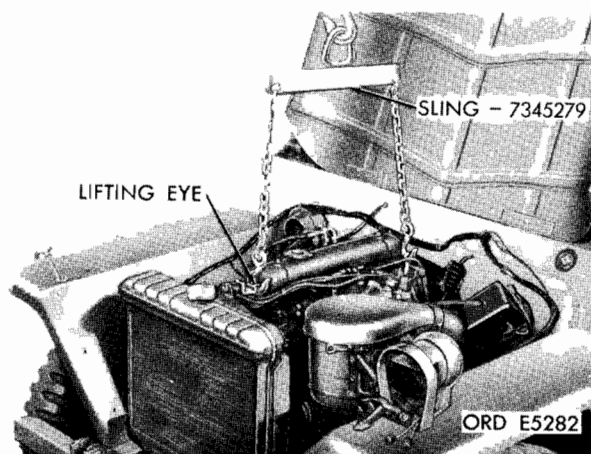
STEP 28 - Pull electrical connectors from oil pressure safety switch.



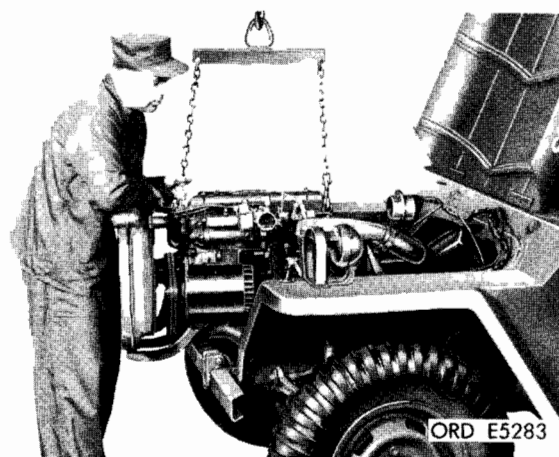
STEP 29 - Pull electrical connector from temperature indicator sender.



STEP 30 - Remove front support mounting bolt and clip.



STEP 31 - Hook sling into lifting eyes.

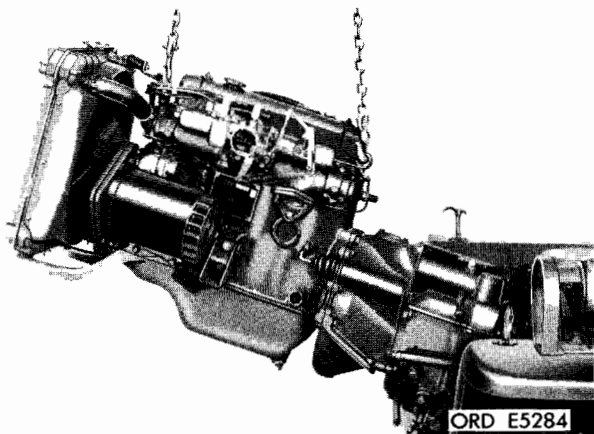


STEP 32 - Raise power plant, counterbalancing front portion so as to prevent damage to adjacent parts.

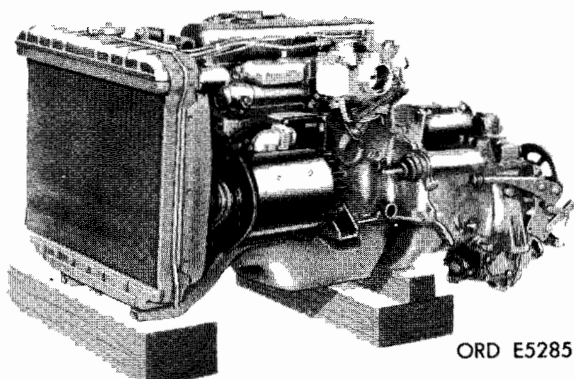
Figure 10. Power plant removal

(continued)





STEP 33 - Continue raising power plant and pushing vehicle rearward.



STEP 34 - Place power plant on supports for disassembly.

Figure 10. Power plant removal

b. Installation. Prior to installation, check to be sure that all parts are installed on the power plant that were on it when it was removed from the vehicle. To install the power plant, begin at step 34, figure 10 and work back through step 1. The following attaching parts are to be torqued to the values shown:

Engine front support  
bolt (3/8-24) ————— 20-30 lb - ft

Engine rear support  
bolt (7/16-20) ————— 40-50 lb - ft

Muffler inlet pipe  
flange nut (3/8-24) ————— 15-20 lb - ft

Brush guard to  
fender bolt (1/4-28) ————— 3-4 lb - ft

Exhaust inlet pipe  
clamp nut (5/16-24) ————— 12-15 lb - ft

Propeller shaft univer-  
sal joint bolt (5/16-24) — 25-30 lb - ft

## 28. ENGINE ASSEMBLY

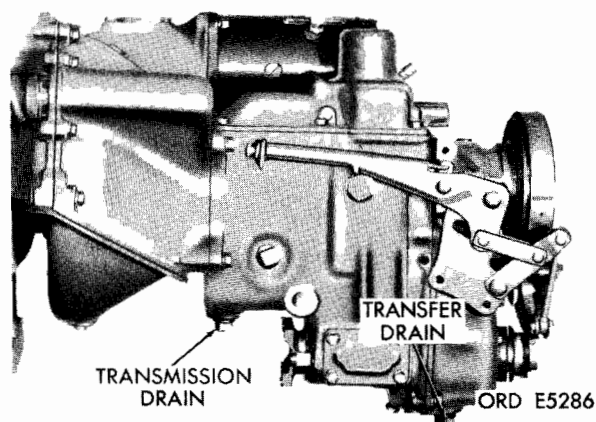
a. General. To remove the engine from the power plant it is necessary to remove the transmission transfer assembly and the radiator.

b. Removal. Remove power plant from vehicle (par. 27). Refer to paragraphs 29 and 30.

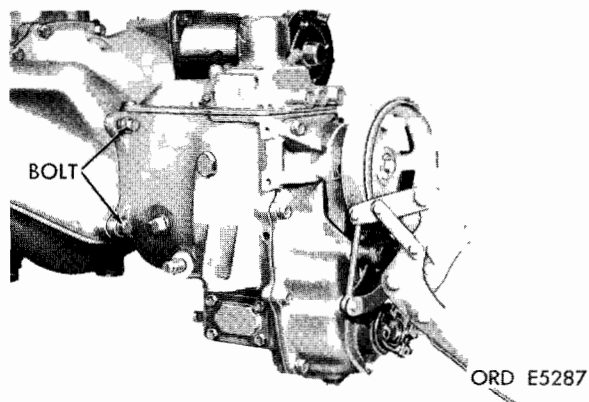
c. Installation. Install radiator and transmission transfer assembly (pars. 29 and 30).

## 29. TRANSMISSION TRANSFER ASSEMBLY

a. Removal. Refer to figure 11, step 1 through 3.

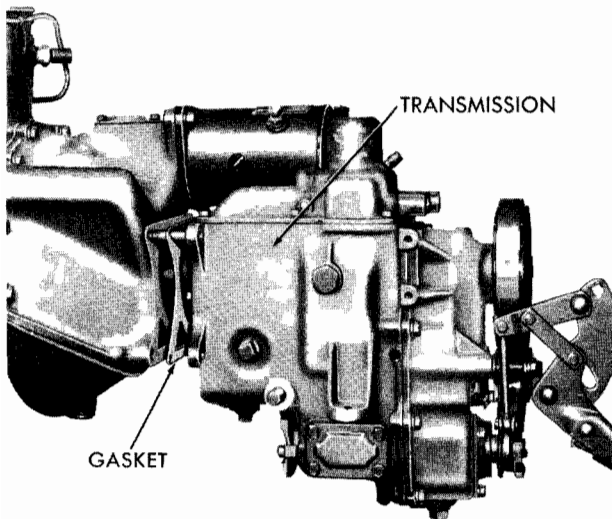


STEP 1 - Drain transmission and transfer.



STEP 2 - Remove four mounting bolts and lockwashers.

Figure 11. Transmission transfer assembly removal (continued)



ORD E5288

STEP 3 - Remove transmission; remove and discard gasket. For installation use new gasket.

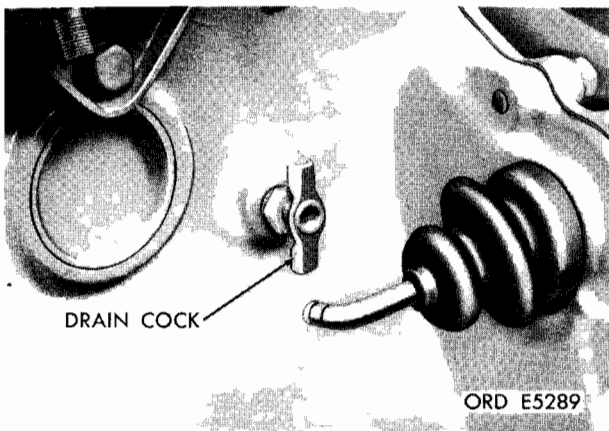
Figure 11. Transmission transfer assembly removal

b. Installation. Refer to figure 11, steps 3 back through 1. Torque the transmission case to flywheel housing bolts (7/16-14) to 37-42 lb-ft. Refer to lubrication chart for type and quantity of lubricant.

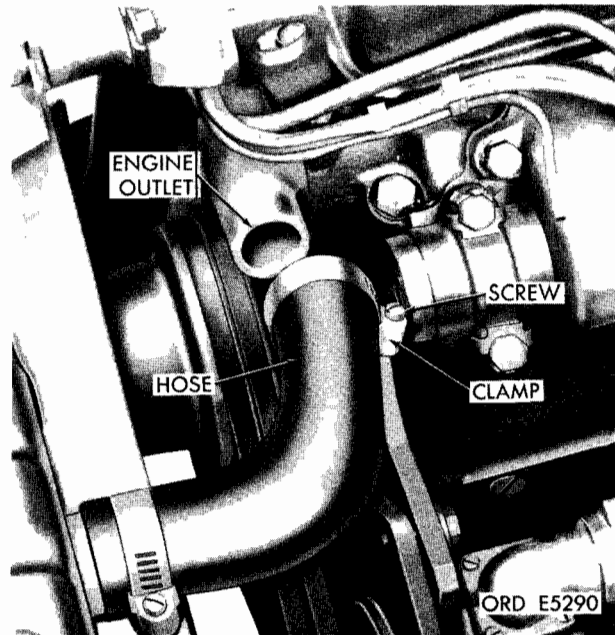
### 30. RADIATOR ASSEMBLY (POWER PLANT REMOVED)

a. Removal. Refer to figure 12 steps 1 through 7.

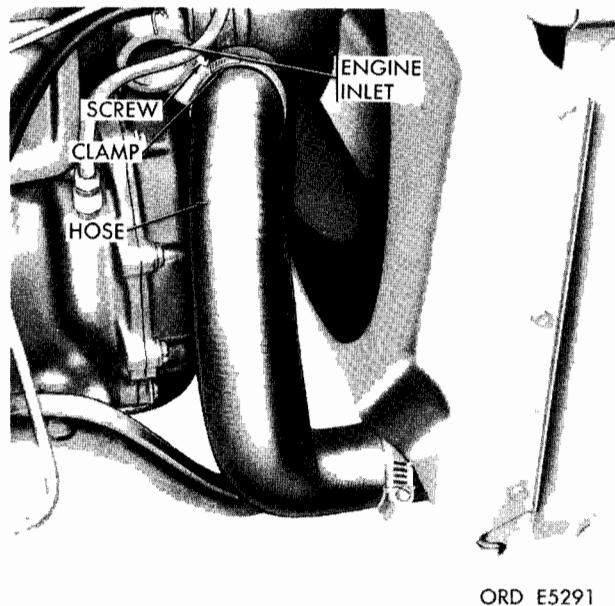
STEP 1 - Drain radiator. Refer to TM 9-2320-218-10.



STEP 2 - Open drain cock and drain engine block.

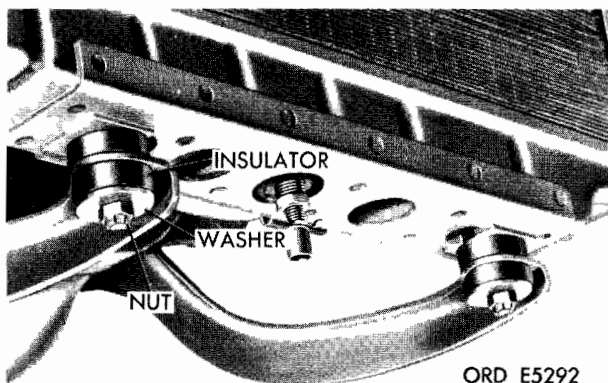


STEP 3 - Loosen screw in radiator hose clamp and pull radiator inlet hose off engine outlet.

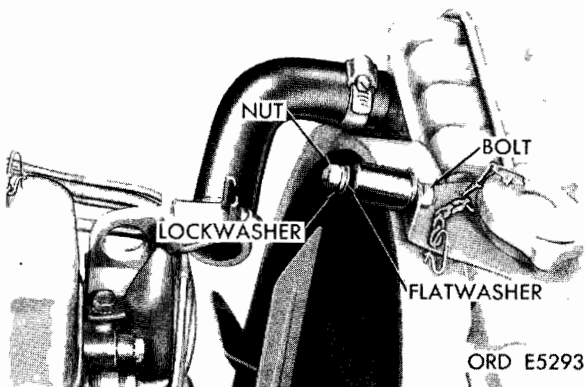


STEP 4 - Loosen screw in radiator hose clamp and pull radiator outlet hose off engine inlet.

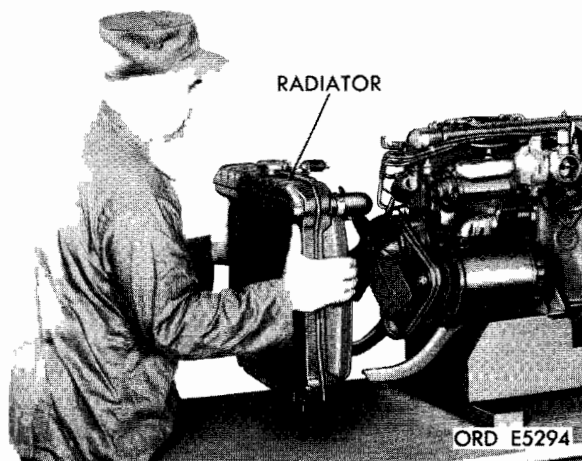
Figure 12. Radiator removal (continued)



STEP 5 - Remove two lower mounting nuts, washers, and insulators.



STEP 6 - Loosen nut, lockwasher, and flat washer and slip radiator upper mount (rubber) from engine lifting eye bracket.



STEP 7 - Remove radiator.

Figure 12. Radiator removal

b. Installation. Refer to figure 12, steps 7 back through 1. The following attaching parts are to be torqued to the values shown:

Radiator to support  
mounting nut  
(5/16-18) \_\_\_\_\_ 12-15 lb-ft

Radiator upper  
bracket to insula-  
tor (5/16-24) \_\_\_\_\_ 15-18 lb-ft

## Section VII. ENGINE DESCRIPTION AND MAINTENANCE IN VEHICLE

### 31. DESCRIPTION AND DATA

a. Description. The engine is four-cylinder, in-line, four-cycle, water-cooled, with overhead valves. Positive crankcase ventilation is provided through a closed ventilation system. All ignition system components are waterproof. Pressure lubrication, with a full-flow oil filter is provided by a gear-type oil pump. A built-in by-pass in the top of the oil filter provides oil to the system in case the filter element becomes clogged.

b. Locational Terms. The fan end of the engine will be referred to as the "front", and the flywheel end as the "rear". The terms left and right respectively refer to the engine as viewed from the rear. The crankshaft rotates in a counter clockwise direction when viewed

from the rear of the engine. Cylinders are numbered from the front.

#### c. Engine Data.

Bore \_\_\_\_\_ 3.875 in.  
Compression ratio \_\_\_\_\_ 7.5 to 1  
Compression  
pressure \_\_\_\_\_ 135 to 145 psi  
Cylinders \_\_\_\_\_ 4  
Piston  
displacement \_\_\_\_\_ 141.5 cu. in.  
Firing order \_\_\_\_\_ 1-3-4-2  
Horsepower \_\_\_\_\_ 71 at 4000 rpm  
Oil capacity (including oil filter) \_\_\_\_\_ 5 qt  
Stroke \_\_\_\_\_ 3.00 in.  
Valve Clearance:  
Exhaust \_\_\_\_\_ 0.015 in. (hot)  
Intake \_\_\_\_\_ 0.015 in. (hot)

**Weights:**

Power plant ————— 528 lb  
Engine, w/flywheel  
and accessories  
(dry weight) ————— 326 lb  
Engine, w/flywheel  
w/o accessories  
(dry weight) ————— 281 lb

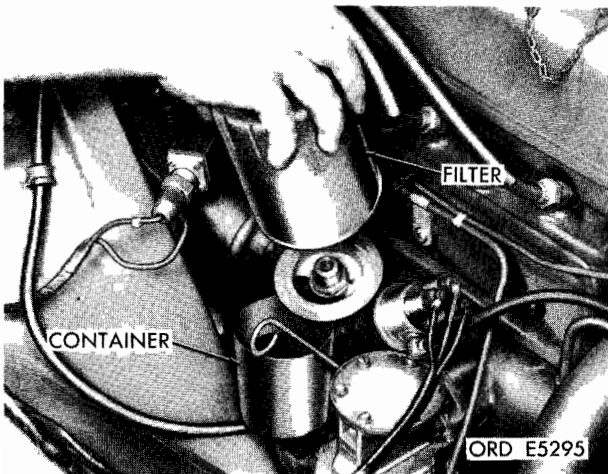
### 32. OPERATIONS PERFORMED WITH ENGINE IN VEHICLE

The majority of operations authorized to organizational maintenance personnel are to be performed with the engine installed in the vehicle. Refer to the maintenance allocation chart (app. II) for the operations authorized to organizational maintenance personnel. Refer to the manual index to locate appropriate paragraphs on engine components or accessories.

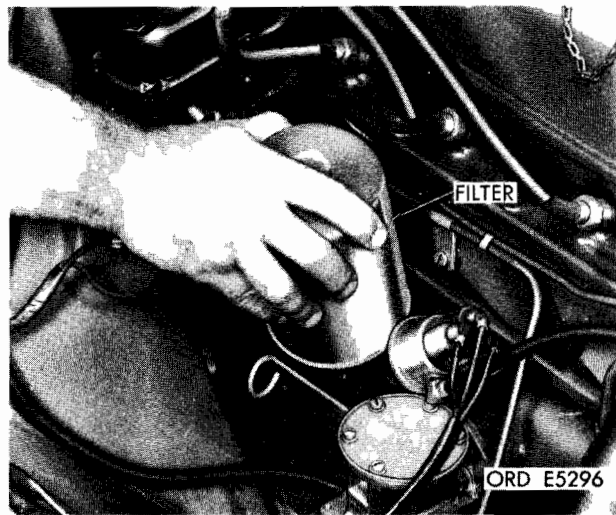
### 33. OIL FILTER

a. General. The oil filter is a disposable type which is removed and discarded as an assembly when the oil filter is due for replacement. Replacement is accomplished without tools, since it is designed for hand loosening and tightening. The filter is full flow type under full pump pressure and will show any leak immediately.

b. Replacement. Steps 1 and 2, figure 13 show operations for replacing oil filter.



STEP 1 - Place container under oil filter. Grasp oil filter and turn counter-clockwise to remove.

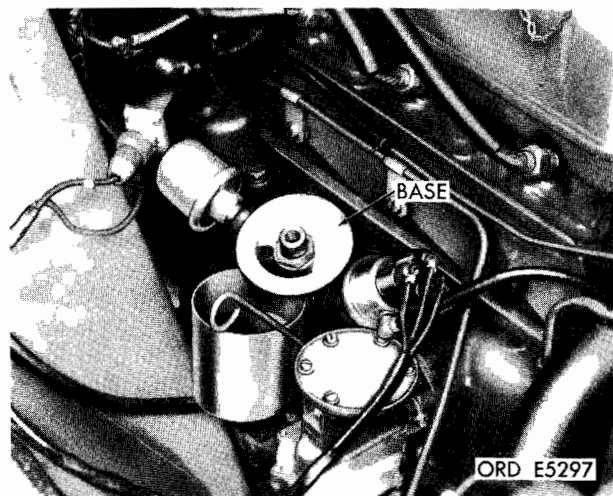


STEP 2 - Install new filter - turn clockwise. Operate engine and check for leaks.

Figure 13. Removing and installing oil filter

### 34. OIL FILTER MOUNTING BASE

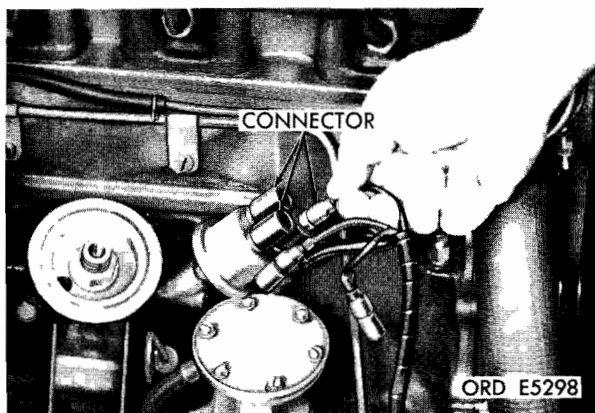
a. Removal. Steps 1 through 8, figure 14, show operations for removing oil filter mounting base.



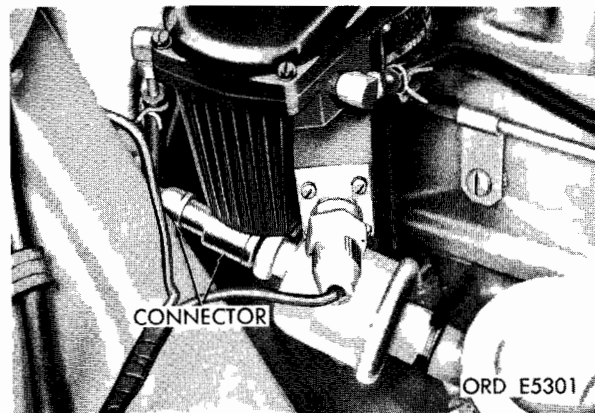
STEP 1 - Remove oil filter from oil filter mounting base - turn counter-clockwise.

Figure 14. Oil filter mounting base removal (continued)

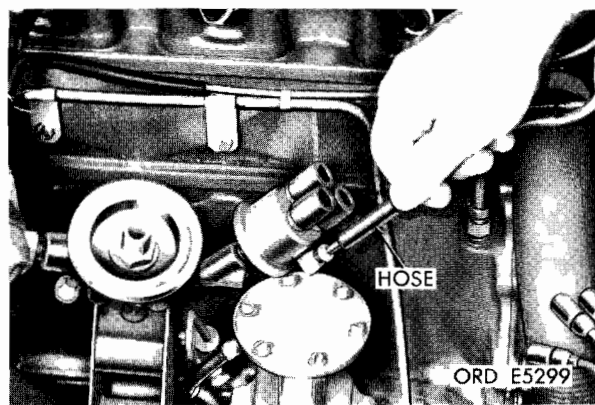




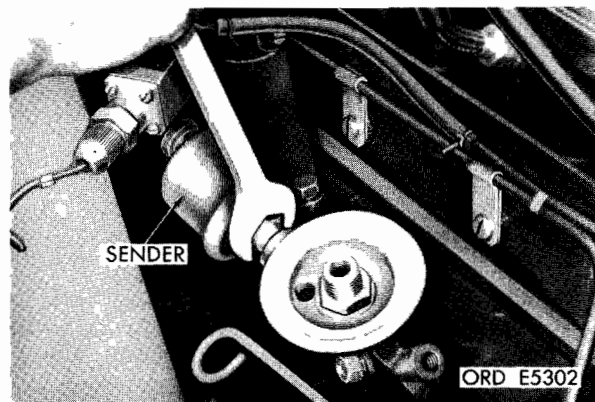
STEP 2 - Grasp electrical cables at oil pressure safety switch and pull, separating male and female connectors.



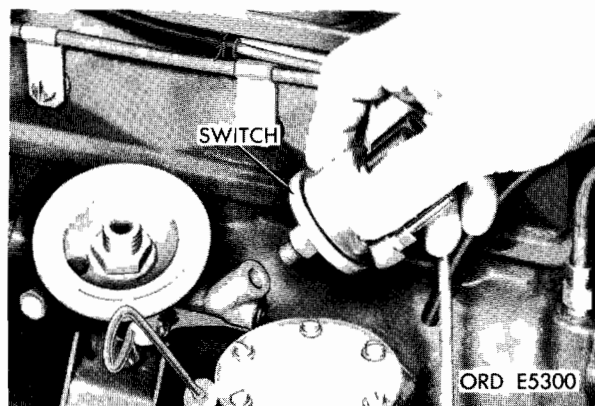
STEP 5 - Pull oil pressure sender electrical cable, separating male and female connectors.



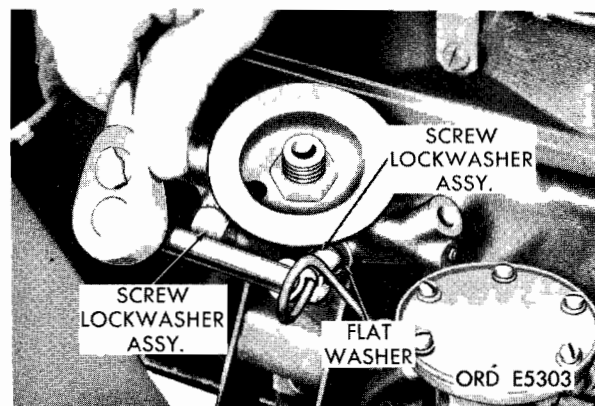
STEP 3 - Loosen clamp and pull vent hose off oil pressure safety switch.



STEP 6 - Unscrew oil pressure sender from oil filter mounting base.



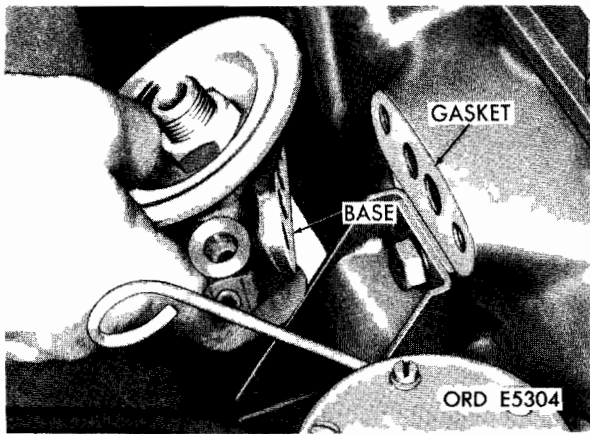
STEP 4 - Unscrew oil pressure safety switch.



STEP 7 - Remove two screw and lockwasher assemblies and flat washers.

Figure 14. Oil filter mounting base removal

(continued)



STEP 8 - Remove oil filter mounting base.  
Remove and discard gasket.

Figure 14. Oil filter mounting base removal

b. Installation. Refer to figure 14, steps 8 back through 1. Use new gasket.

### 35. OIL PRESSURE SAFETY SWITCH

a. Description. The oil pressure safety switch automatically stops the flow of fuel to the carburetor when the engine oil pressure falls below 3-1/2 to 7-1/2 psi. This action is accomplished by the switch cutting off current to the electric fuel pump. In order to start the engine (when it would normally have no oil pressure) a second circuit is connected to the starting motor and switch, by-passing the safety circuit only while the starter is being used. The second circuit also prevents fuel pump operation when only the ignition switch is turned on, preventing accidental flooding of the carburetor.

b. Removal. Refer to figure 14, steps 2 through 4.

c. Installation. Steps 4 back through 2, figure 14, show operations for installing oil pressure safety switch.

d. Testing Oil Pressure Switch.

NOTE. This is an emergency procedure when the engine stops with indications that the safety switch may be defective (Fuel pump inoperative). Before testing switch insure that oil in crankcase is sufficient for operation.

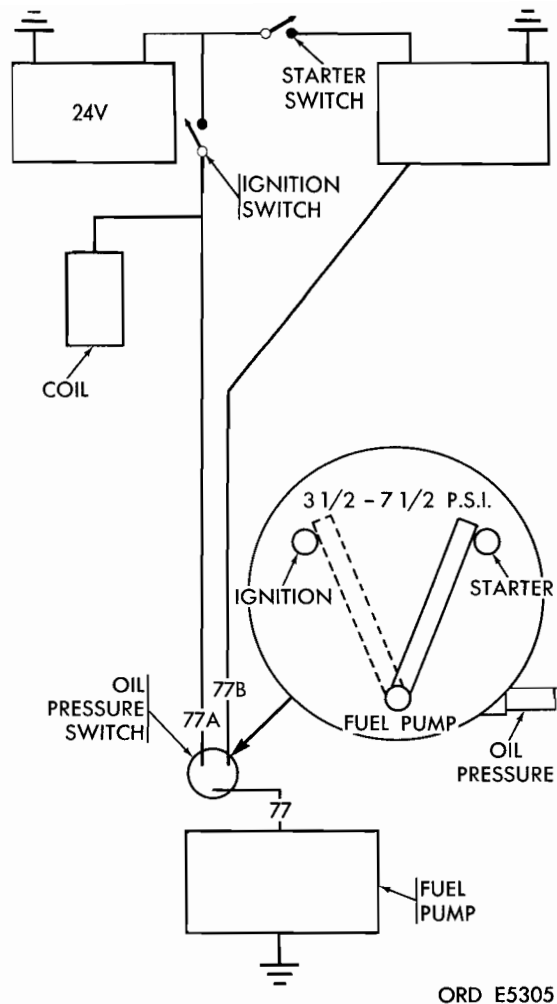


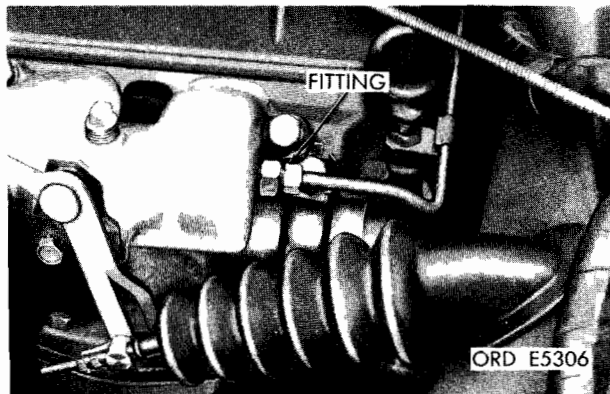
Figure 15. Oil pressure safety switch circuit diagram

- (1) Disconnect switch leads no. 77 and no. 77-A from the safety switch. (These wires control the safety cut-off feature).
- (2) Connect the above two leads together with a jumper wire. The electric fuel pump should now operate with ignition switch on.
- (3) If fuel pump operates with leads connected together, start the engine and immediately check if pressure is indicated on oil pressure gage.
- (4) If no pressure is indicated, shut off engine and notify ordnance maintenance personnel. If pressure is indicated, replace the safety switch.

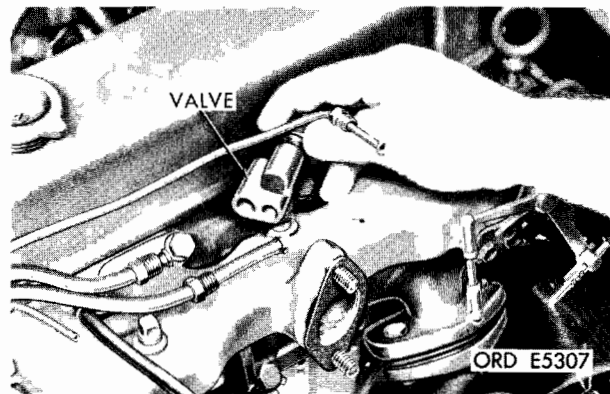
### 36. INTAKE MANIFOLD

a. Removal. Steps 1 through 6, figure 16, show operations for removing intake manifold.

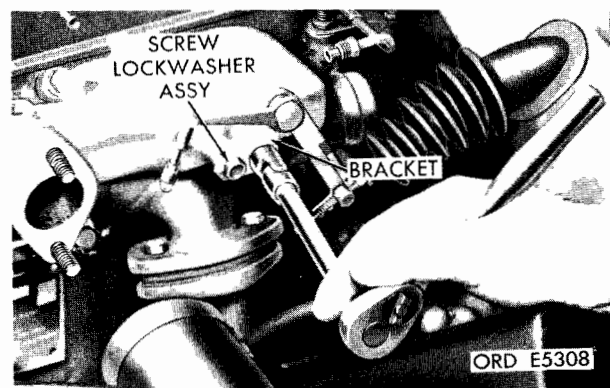
STEP 1 - Remove air cleaner base and carburetor (pars. 50 and 51).



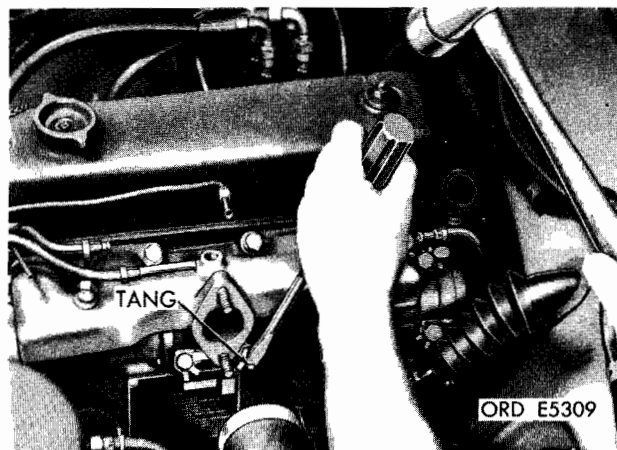
STEP 2 - Unscrew vent line fittings from metering valve.



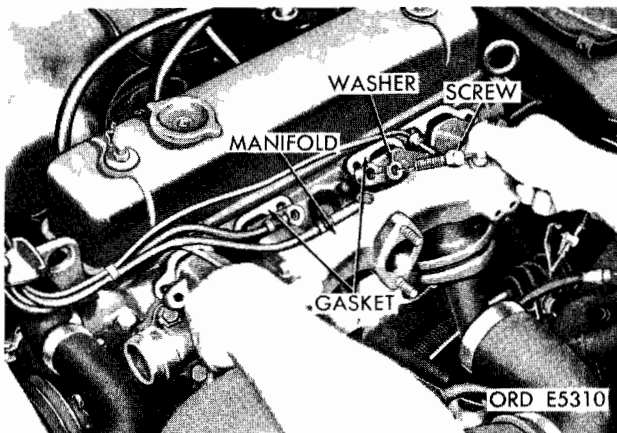
STEP 3 - Unscrew metering valve from intake manifold.



STEP 4 - Remove two bellcrank screw and lockwasher assemblies securing accelerator bellcrank bracket to intake manifold.



STEP 5 - Open tangs on two lower screws.



STEP 6 - Remove six screws securing intake manifold to cylinder head. Discard gaskets.

Figure 16. Intake manifold removal

b. Installation. Steps 6 back through 1, figure 16, show operations for installing intake manifold.

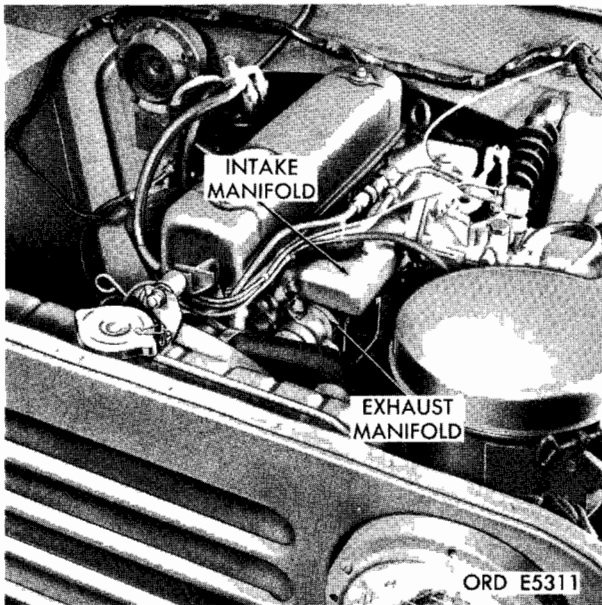
NOTE. Always use new gaskets for installation. The following torque values apply for installation.

Short mounting screws—23-28 lb-ft  
Long mounting screws—10-12 lb-ft

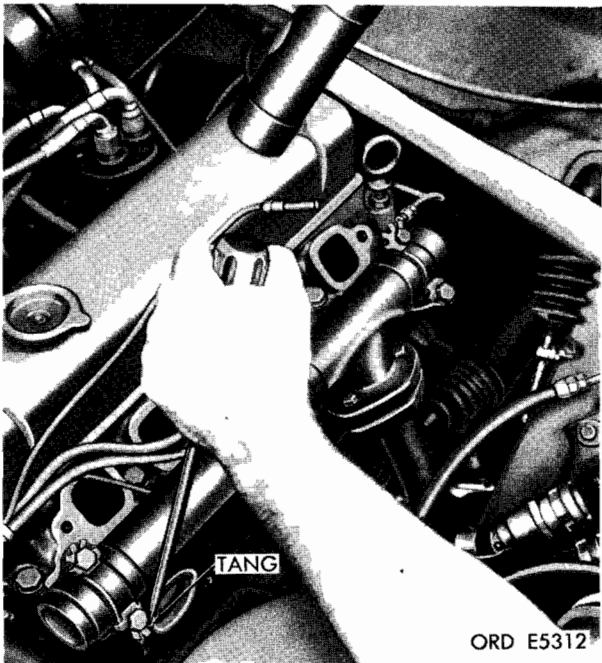
After installation, apply a small amount of oil at the carburetor and intake manifold flanges to determine if manifold is leaking. If oil is drawn in, the manifold is leaking.

## 37. EXHAUST MANIFOLD

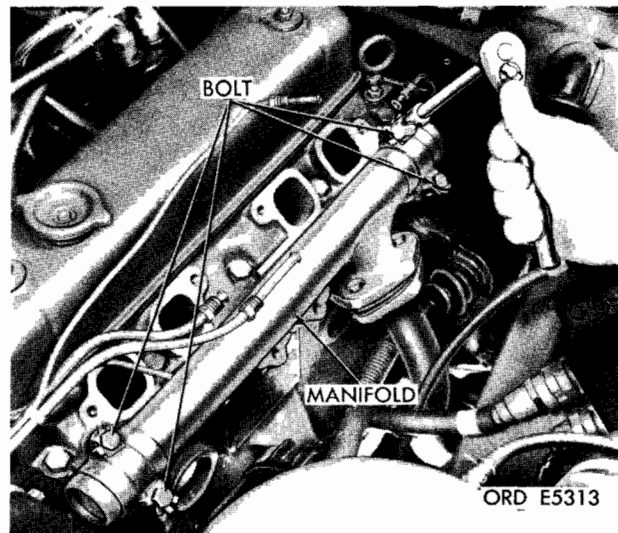
a. Removal. Refer to figure 17, steps 1 through 4.



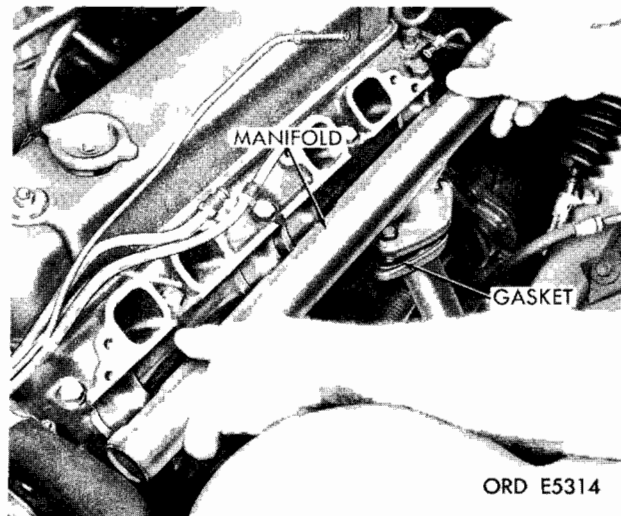
STEP 1 - Remove intake manifold (par. 36) and disconnect inlet pipe.



STEP 2 - Open locking tangs on four mounting bolts.



STEP 3 - Remove four exhaust manifold mounting bolts.



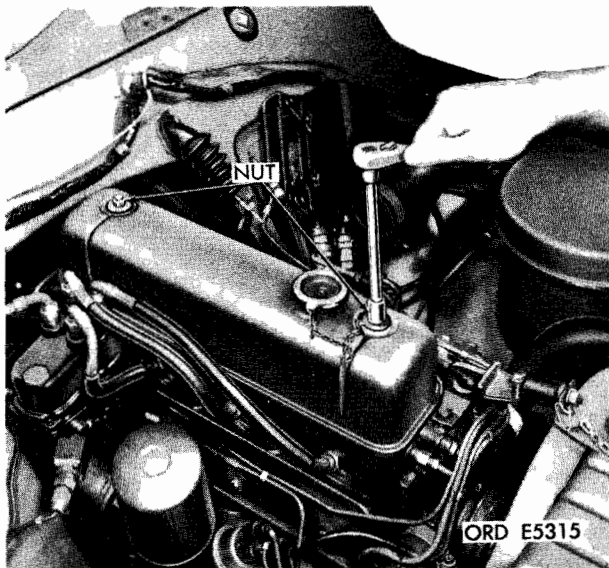
STEP 4 - Remove two brass nuts securing inlet pipe to exhaust manifold. Lift off exhaust manifold and discard inlet pipe gasket. NOTE. No gasket is used between the cylinder head and the exhaust manifold.

Figure 17. Exhaust manifold removal

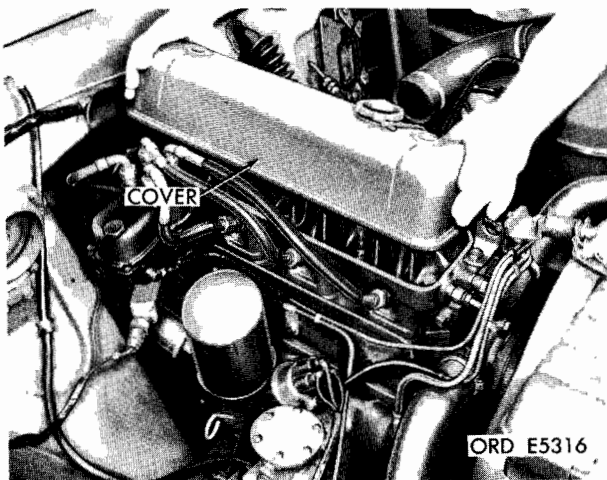
b. Installation. Steps 4 back through 1, figure 17, show operations for installing exhaust manifold. Always use a new exhaust pipe gasket when installing exhaust manifold. For installation, secure mounting bolts to a torque of 10-12 lb-ft.

### 38. CYLINDER HEAD

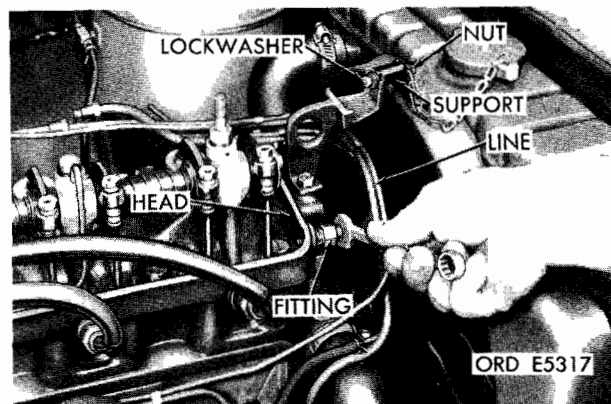
a. Removal. Refer to figure 18, steps 1 through 7. Remove carburetor (par. 51), remove intake manifold (par. 36), remove exhaust manifold (par. 37), drain cooling system (TM 9-2320-218-10) and remove thermostat (par. 45).



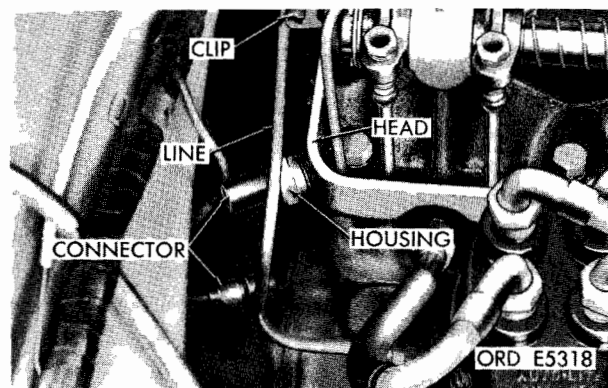
STEP 1 - Remove two rocker arm cover nuts and washers.



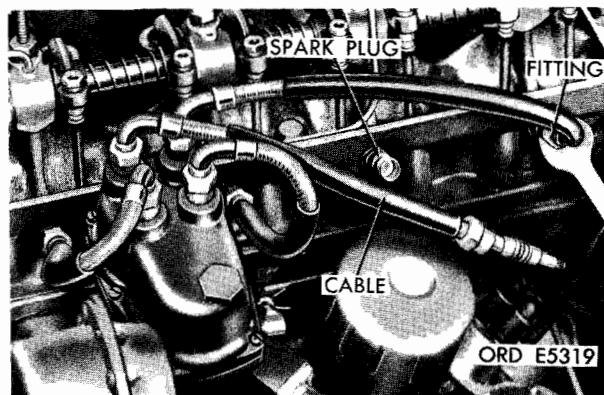
STEP 2 - Remove rocker arm cover and gasket. Discard gasket.



STEP 3 - Remove two nuts and lockwashers and remove radiator top support (rubber). Unscrew fitting securing ventilation line to cylinder head.



STEP 4 - Grasp temperature indicator electrical cable and pull, separating male and female connectors.

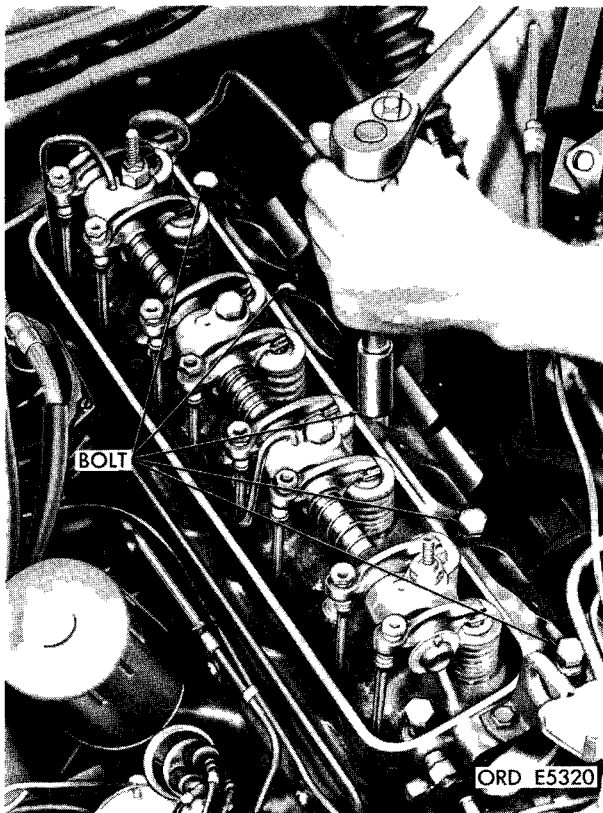


STEP 5 - Unscrew fittings securing spark plug cables to spark plugs. Unscrew spark plugs.

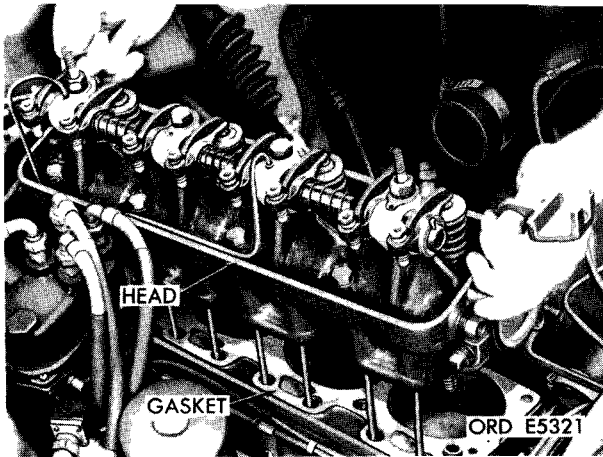
Figure 18. Cylinder head removal

(continued)





STEP 6 - Remove cylinder head bolts.  
 NOTE. Five bolts on the right, under the rocker arm assembly, must remain in the cylinder head due to lack of clearance.

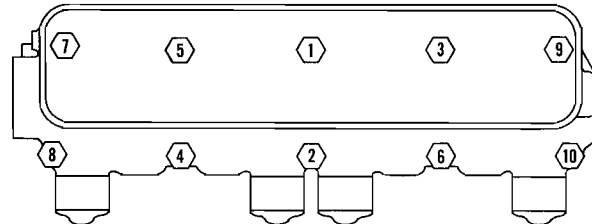


STEP 7 - Remove cylinder head and discard gasket.

Figure 18. Cylinder head removal

b. Installation. Refer to figure 18, steps 7 back through 1. Use new cylinder head gasket and new rocker arm cover gasket.

NOTE. Engine does not have to be up to normal operating temperature before tightening cylinder head bolts. Apply MIL-S-7916 sealer to cylinder head bolts before installing.



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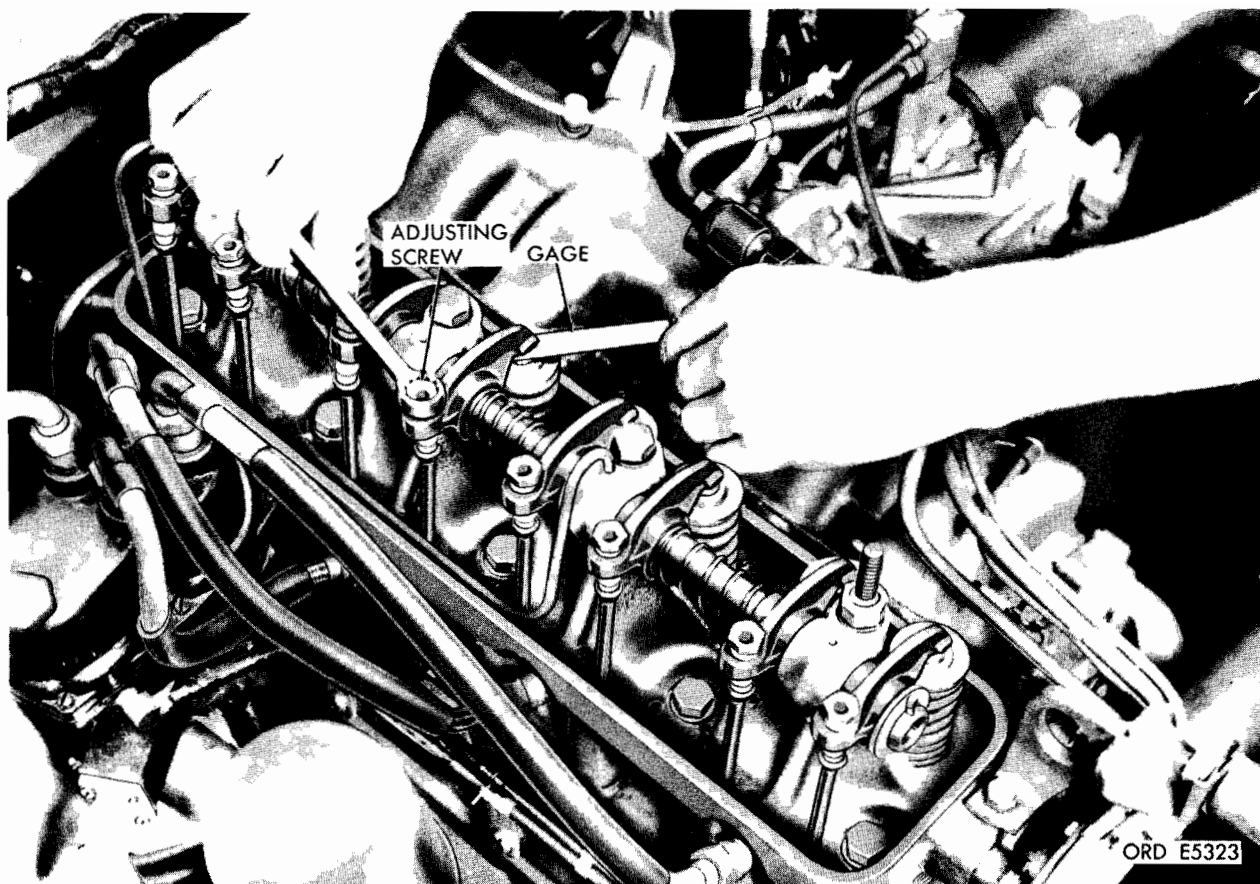
Figure 19. Cylinder head bolt tightening sequence

Tighten cylinder head bolts in four stages; torque all bolts to 10 lb-ft ; torque all bolts to 55-60 lb-ft ; torque all bolts to 60-65 lb-ft ; torque all bolts to 65-70 lb-ft. Fill cooling system, refer to (TM 9-2320-218-10). Adjust valve clearance (par. 39). Torque rocker arm cover and nuts to 10-15 lb-ft.

### 39. VALVE TAPPET ADJUSTING SCREW

a. General. The valve tappet adjusting screw has a self-locking interference type thread. During adjustment, if it is found that the torque of the adjusting screw is below 3 ft.lb., the screw must be discarded and a new screw installed. To remove the valve tappet adjusting screw, simply turn all the way out.

b. Adjustment. Figure 20 shows operations for adjusting valve tappet clearance.



STEP 1 - Operate engine for a minimum of 30 minutes at 1200 rpm to warm engine to normal operating temperature.

STEP 2 - Allow engine to idle and remove rocker arm cover.

STEP 3 - Insert feeler gage between valve stem and rocker arm pad and adjust to .015 inch.

STEP 4 - Examine rocker arm cover and gasket for damage; install new cover or gasket if necessary. Torque nuts on rocker arm cover to 10-15 lb-ft.

Figure 20. Adjusting valve clearance

#### 40. CYLINDER COMPRESSION TEST

a. Start engine and run until normal operating temperature is reached.

b. Remove spark plugs (par. 69 and fig. 52).

c. Pull the throttle control out to wide open position. Make sure the choke control is pushed in all the way against the instrument panel.

d. Insert compression gage (fig. 21) into the

spark plug holes, one at a time, beginning with number one cylinder, and crank engine with the starter. Record the highest compression reading from each cylinder on DA Form 461.

e. Compare the compression pressures of the cylinders. Normal compression pressure is from 135 to 145 psi at a starter speed of 185 rpm. The minimum compression allowable is 125 psi. Readings of cylinder pressure should not vary more than 10 psi. A low compression reading on two adjacent cylinders indicates the possibility of a leak from one cylinder to the other at the cylinder head gasket. The leakage

may be caused by improperly tightened cylinder head bolts or a faulty cylinder head gasket. Tighten the cylinder head bolts to a torque of 60-65 pound-feet in the sequence shown in figure 15. Check cylinder compression again. If compression is still low on adjacent cylinders, there may be leakage because of a faulty cylinder head gasket. Check the manifold vacuum (par. 41) to see if there is leakage at the gasket. Notify ordnance maintenance personnel.

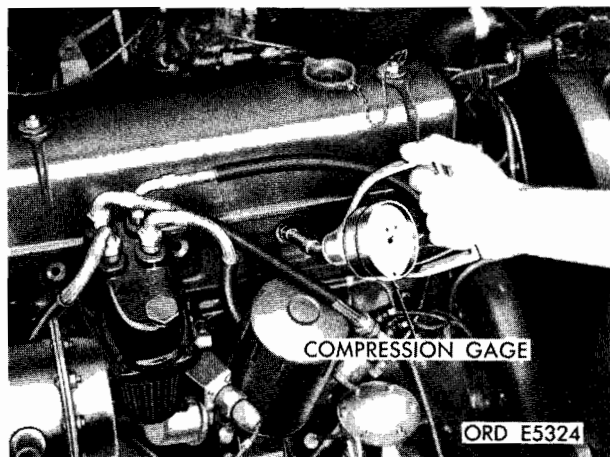


Figure 21. Compression test

f. If compression readings are uniformly low, the low compression may be due either to leakage at the valves or piston rings, or incorrect valve timing. Perform the manifold vacuum test (par. 41) to determine the cause of low compression.

g. If compression pressures of cylinders vary more than 10 psi, or are lower than 125 psi (after corrections indicated by the vacuum test have been made), notify ordnance maintenance personnel.

h. After completing compression test, install spark plugs.

i. Remove rocker arm cover and tighten cylinder head bolts as shown in par. 38. Replace rocker arm cover.

#### 41. MANIFOLD VACUUM TEST

a. Remove the pipe plug installed in the top

rear of the intake manifold. Insert adapter on end of vacuum gage hose (fig. 22). Be sure all connections are tight, as even a slight leak will result in a false reading.

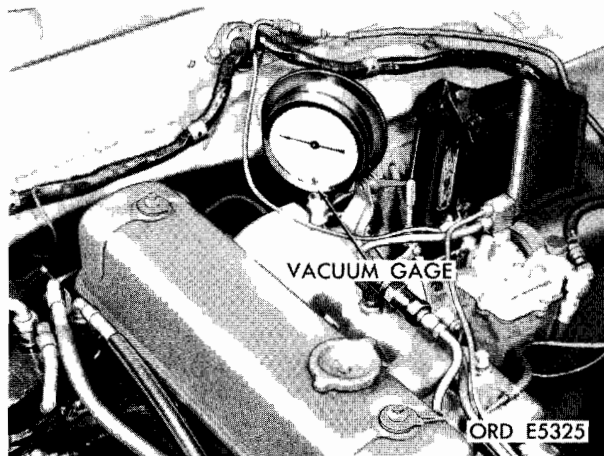


Figure 22. Vacuum test

b. Start engine and run at idling speed until minimum operating temperature (160°F.) is reached. Check carburetor adjustments (par. 51).

c. With the engine idling at 600 rpm, vacuum gage should show a steady reading of from 17 to 21 inches of mercury. As a further check, open and close the throttle quickly. If the engine is in good condition vacuum should drop to 2 inches at wide open throttle and quickly return to approximately 25 inches at closed throttle. If this action is not obtained, worn piston rings, or an abnormal restriction in the carburetor, air cleaner, or exhaust system are indicated.

d. Incorrect valve timing is indicated by a steady reading of approximately 10 inches of mercury.

e. Weak valve springs are indicated by a rapid fluctuation of the gage hand when the engine is accelerated. If a valve sticks at times only, the vacuum drops 4 or 5 inches momentarily when the valve sticks. Fluctuation of the gage hand between 14 and 19 inches indicates that the valve guides are worn.



f. A slow movement of the gage hand between 12 and 16 inches indicates poor carburetion.

g. Leakage at the carburetor gasket is indicated by a low steady reading. Leakage of compression between the cylinders is indicated by the gage hand drifting regularly between 5 and 19 inches. Worn or poorly fitted piston rings or scored pistons and cylinder walls are indicated by the gage hand remaining lower than

normal, at approximately 15 inches.

NOTE. The above readings are for sea level operations. At higher elevations, the vacuum gage readings are lowered approximately 1 inch of mercury for each 1,000 feet increase in altitude.

h. After performing the manifold vacuum test, install the 1/4-inch pipe plug into the intake manifold. Tighten the plug.

## Section VIII. COOLING SYSTEM

### 42. GENERAL

#### a. Description

- (1) Cooling System. The cooling system is a forced circulation, pressurized type and consists of the water pump, fan, shroud, drive belts, thermostat, hoses, radiator, and a pressurizing radiator filler cap. The coolant is drawn from the lower tank of the radiator by the water pump and is circulated through the cylinder block and cylinder head. After circulating throughout the cylinder block and cylinder head, the coolant is forced through an outlet connection past the thermostat, if it is open, into the upper tank of the radiator. As the coolant drops to the lower tank of the radiator, it is cooled by air drawn through the radiator by the fan and the motion of the vehicle. When, because of insufficient operating temperature, the thermostat is closed, constant circulation of the coolant is provided by a drilled passage connecting the cylinder head with the intake side of the pump.
- (2) Water Pump. The water pump is a centrifugal type unit mounted on the front face of the cylinder block, and driven by two V-belts. The pump shaft and double row ball bearing are integral. The bearing is packed with special high-melting point grease at the time of manufacture and requires no further lubrication. The shaft and bearing unit is retained in the housing by a snap ring. The seal assembly is pressed into the pump housing. One side of the thrust washer of the seal assembly bears against the machined surface of the impeller and the other side is cemented to a rubber bellows which is in turn ce-

mented to the seal retainer. A coil spring, an integral part of the seal, maintains a constant pressure against the thrust washer and the machined surface of the impeller, assuring a positive seal. A drain hole is provided in the bottom of the housing to prevent water seepage past the seal from entering the ball bearing. The pump pulley hub is pressed on the pump shaft.

- (3) Fan. The fan is a four-blade type with blades spaced irregularly to dampen out noise. The fan is bolted to the water pump hub which is pressed on the pump shaft. The bolts used to fasten the fan blades also retain the water pump fan pulley, which is driven from the crankshaft pulley by two V-belts.
- (4) Radiator. The radiator is of vertical tube-and-fin construction, utilizing a pressure filler cap which maintains a pressure of approximately seven pounds per square inch. By operating under this pressure, the boiling point of the coolant is raised approximately 19 degrees. An overflow tube is provided on the radiator to allow the escape of coolant and/or pressure when the pressure rises above the limit of the pressure cap. The radiator cap assembly also contains a vacuum relief valve which allows air into the radiator if a vacuum is created. Drain cocks are located at the left rear side of the cylinder block and at the bottom center of the radiator to provide for complete drainage of the coolant. The radiator is mounted to support brackets (rubber insulated) on both sides of the engine block. A rubber insulator support is provided at the center of the top of the radiator to control fore and aft motion of the radiator.

(5) Radiator Shroud. The radiator shroud is attached to the radiator and is designed to prevent recirculation of air.

(6) Thermostat. The thermostat is a spring and cartridge-type, located in the cylinder head and retained by the water outlet connection. The thermostat restricts the flow of coolant to the radiator until a pre-determined temperature is reached, thus maintaining an efficient operating temperature.

b. Data.

Drive Belts

Number \_\_\_\_\_ 2  
 Type \_\_\_\_\_ "V" Wedge  
 Width \_\_\_\_\_ 0.38 in.  
 "V" Angle \_\_\_\_\_ 36°  
 Effective length \_\_\_\_\_ 33.08 in.

Fan

Type \_\_\_\_\_ Four blade  
 Diameter \_\_\_\_\_ 15.0 in.

Radiator

Type \_\_\_\_\_ Nested fin and tube  
 Capacity \_\_\_\_\_ 8 qt

Radiator Cap

Type \_\_\_\_\_ Controlled pressure  
 Pressure \_\_\_\_\_ 7 psi

Thermostat

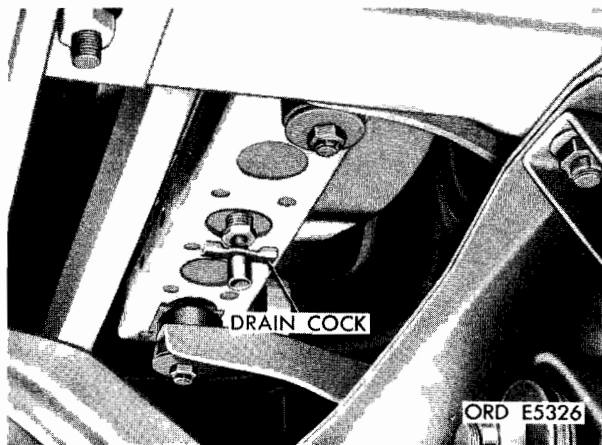
Type \_\_\_\_\_ Spring cartridge  
 Location \_\_\_\_\_ Cylinder head  
 Opening temperature \_\_\_\_\_ 180°

Water pump

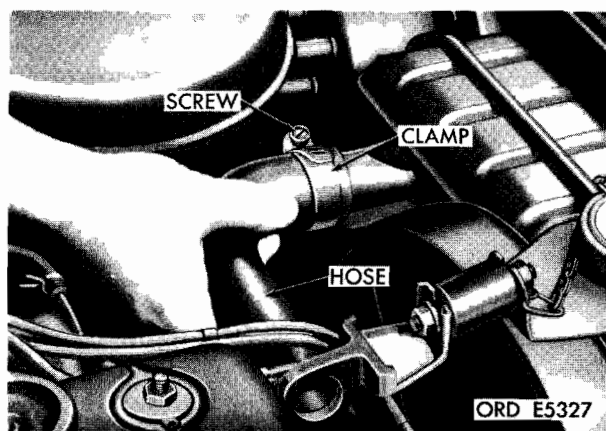
Type \_\_\_\_\_ Centrifugal  
 Drive \_\_\_\_\_ Double belt  
 Location \_\_\_\_\_ Front of cylinder block

## 43. RADIATOR

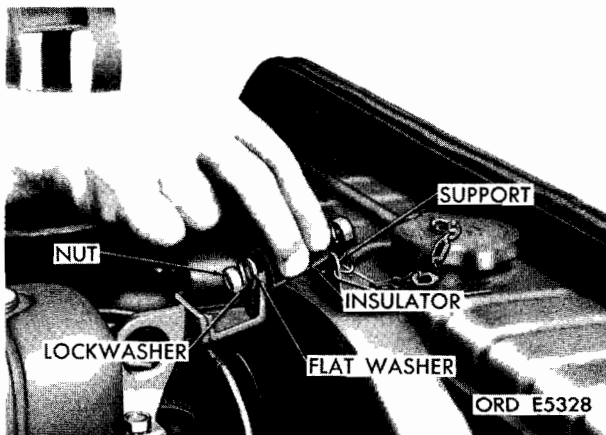
a. Removal. Refer to figure 23, steps 1 through 6 for removing radiator installed in the vehicle.



STEP 1 - Open drain cock and drain radiator. Refer to TM 9-2320-218-10 and TM 9-2858 when filling cooling system.

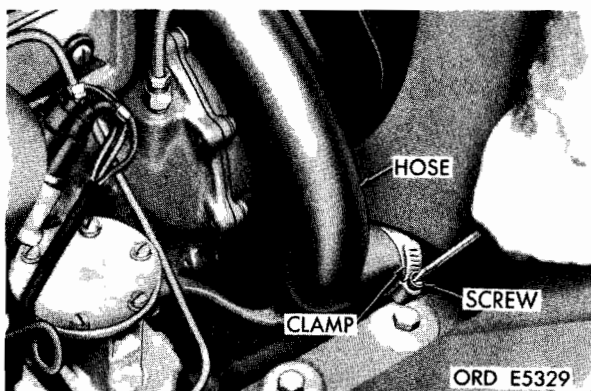


STEP 2 - Loosen screw in radiator hose clamp and pull inlet hose from radiator.

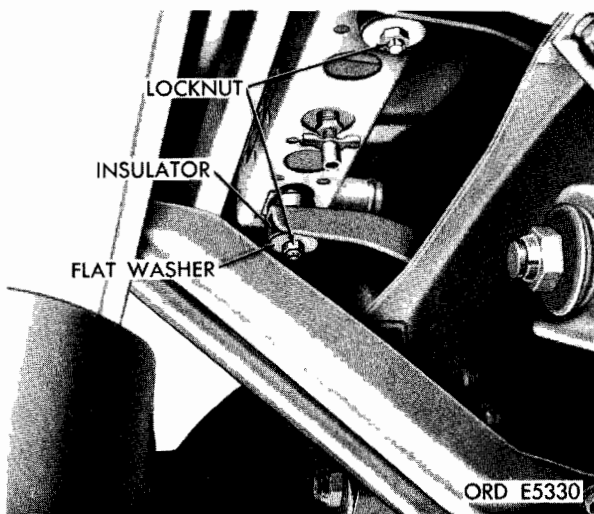


STEP 3 - Loosen nuts and remove radiator upper support (rubber).

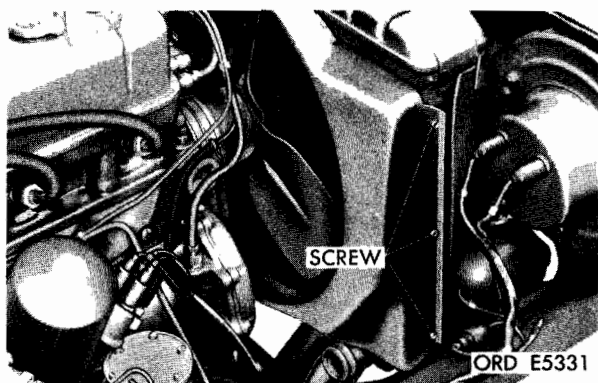
Figure 23. Radiator removal (continued)



STEP 4 - Loosen screw in radiator hose clamp and pull outlet hose from radiator.



STEP 5 - Remove two lower mounting nuts, washers, and insulators.



STEP 6 - Remove six screw and lockwasher assemblies from shroud and remove radiator.

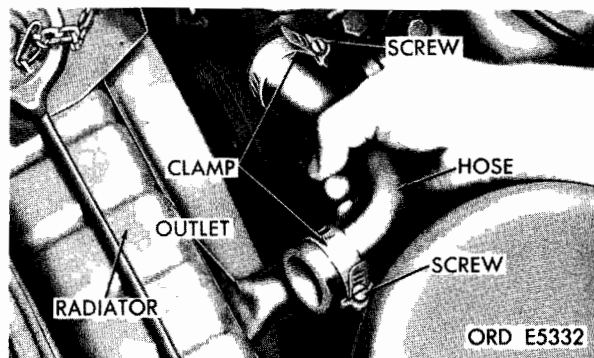
Figure 23. Radiator removal

b. Installation. Steps 6 back through 1, figure 23, show operations for installing radiator. The following attaching parts are to be torqued to the values shown:

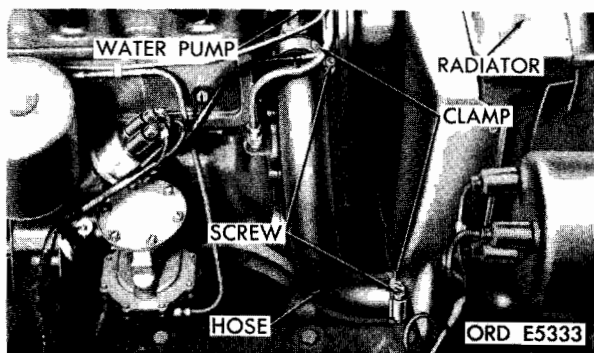
Support bracket to engine mounting bolt (3/8-16)	25-30 lb-ft
Radiator to support mounting nut (5/16-24)	12-15 lb-ft
Radiator upper bracket to insulator nut (5/16-24)	12-15 lb-ft
Radiator upper insulator bracket to block bolt (5/16-18)	8-10 lb-ft

#### 44. RADIATOR HOSES

a. Removal. Steps 1 and 2, figure 24 show operations for removing radiator hoses.



STEP 1 - Drain cooling system (fig. 23, step 1). Loosen clamp screws and clamps. Pull hose from water outlet and radiator.



STEP 2 - Loosen clamp screws and clamps. Pull hose from water pump and radiator.

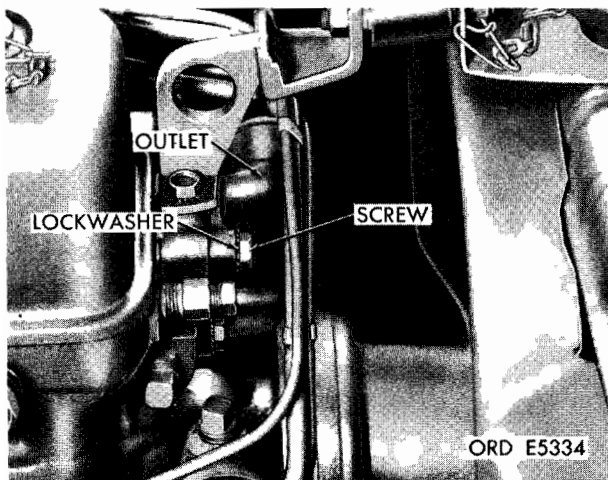
Figure 24. Radiator hose removal

b. Installation. Clean hose connections before installing hoses. Step 2 back to 1, figure 24, show operations for installing radiator hoses. Fill cooling system as specified in TM 9-2320-218-10. Check for coolant leaks.

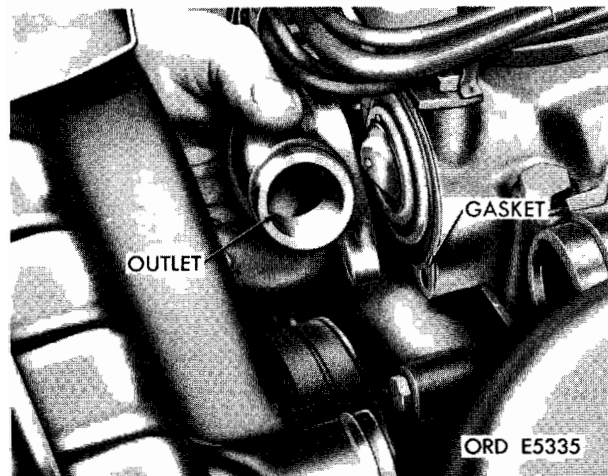
## 45. THERMOSTAT

Before removing thermostat, drain cooling system, figure 23, step 1. Remove radiator upper hose, step 1, figure 24.

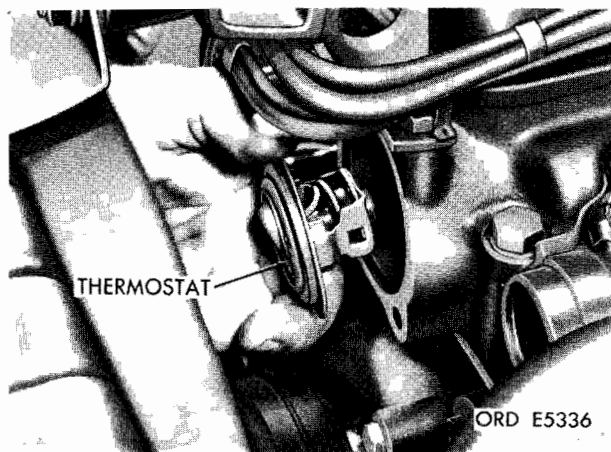
a. Removal. Steps 1 through 3, figure 25, show operations for removing thermostat.



STEP 1 - Remove two water outlet mounting screws and lockwashers.



STEP 2 - Remove water outlet and gasket. Discard gasket.



STEP 3 - Remove thermostat from cylinder head.

Figure 25. Thermostat removed

b. Installation. Clean water outlet gasket surfaces on cylinder head and water outlet before installing gasket and water outlet. Clean hose connections before installing upper hose. Steps 3 back through 1, figure 25 show operations for installing thermostat.

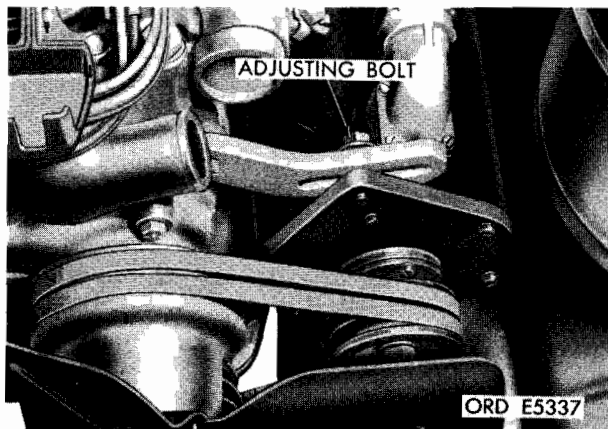
NOTE. Always use new gasket. Fill cooling system as specified in TM 9-2320-218-10. Check for coolant leaks.

c. Test. Open thermostat valve and place .003 inch thickness gage between valve and frame. Release valve. Gage should be held by valve spring pressure on valve. If thermostat cannot be suspended by thermostats hold on gage discard as defective. If it holds onto the gage, place in water which has been heated to 175°F. If gage is released discard thermostat. If gage is not released continue to heat water. Thermostat will be considered usable if it releases between 177°F and 182°F. If it holds onto gage above 182°F, discard thermostat.

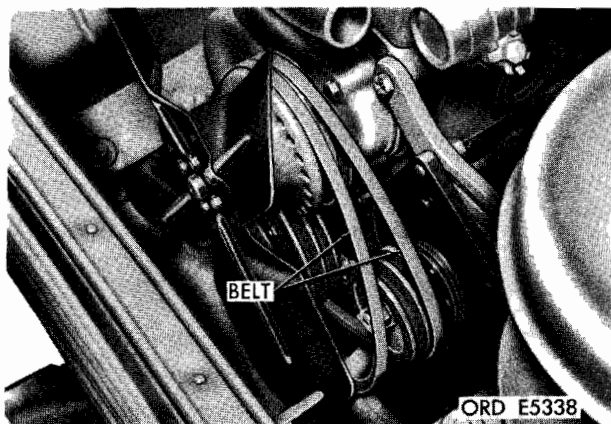
## 46. WATER PUMP, FAN, FAN PULLEY, AND DRIVE BELTS

a. Removal. Steps 1 through 6, figure 26, show operations to remove water pump with radiator removed (par. 43).

NOTE. To remove fan, fan pulley, or drive belts, follow the steps shown in figure 26 to the point required for such removal. For removal of drive belts only, it is not necessary to remove radiator.



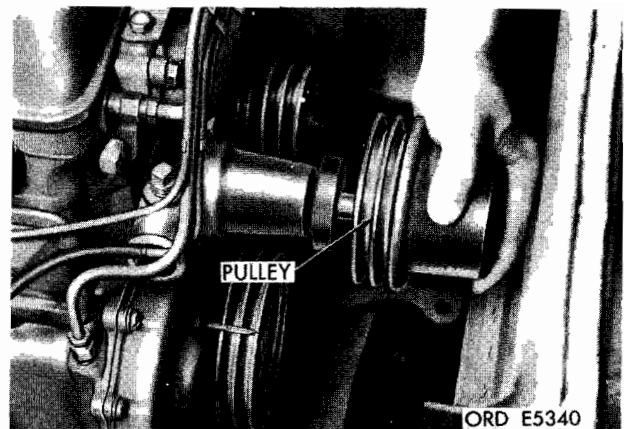
**STEP 1** - Loosen generator mounting bolts on bottom of generator and loosen adjusting bolt. Move generator toward engine and tighten adjusting bolt.



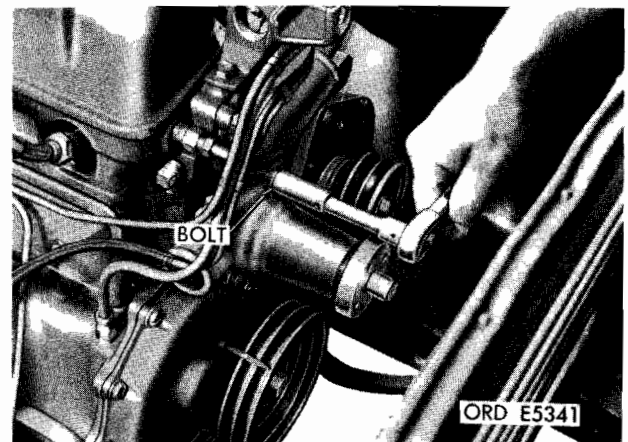
**STEP 2** - Remove drive belts.



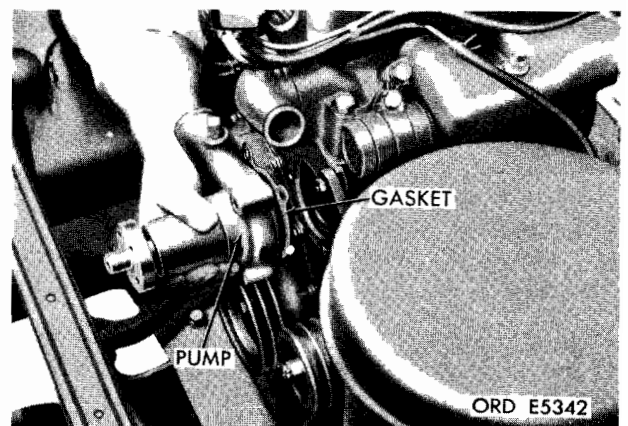
**STEP 3** - Remove four screws and lockwashers securing fan and fan pulley to water pump shaft. Remove fan.



**STEP 4** - Remove fan pulley.



**STEP 5** - Remove three bolts securing water pump to cylinder block.



**STEP 6** - Remove water pump and gasket. Discard gasket.

Figure 26. Water pump removal



b. **Installation.** Clean water pump gasket surfaces on cylinder head and water pump before installing water pump and gasket. Steps 6 back through 1, figure 26, show operations for installing water pump. Refer to paragraph 47 for drive belt adjustment. For installation, use new gasket. The following attaching parts should be torqued to the values shown:

Generator Adjusting	
Arm bolt (3/8-16)	45-50 lb-ft
Water Pump to Block	
Bolt (5/16-18)	10-15 lb-ft
Water Outlet to Head	
Bolt (5/16-18)	10-15 lb-ft

#### 47. ADJUSTING DRIVE BELT TENSION

Perform the following five steps to adjust drive belt tension. Figure 27 shows the method of measuring drive belt tension.

a. Hook scale under one fan belt perpendicular to belt and midway between water pump and generator pulleys. Use heavy wire extension if necessary.

b. Place ruler in stationary position beside scale.

c. Pull upward on scale. Adjust belt tension for 1/2 inch travel when scale reads 20 - 25 lb.

d. Check the other belt.

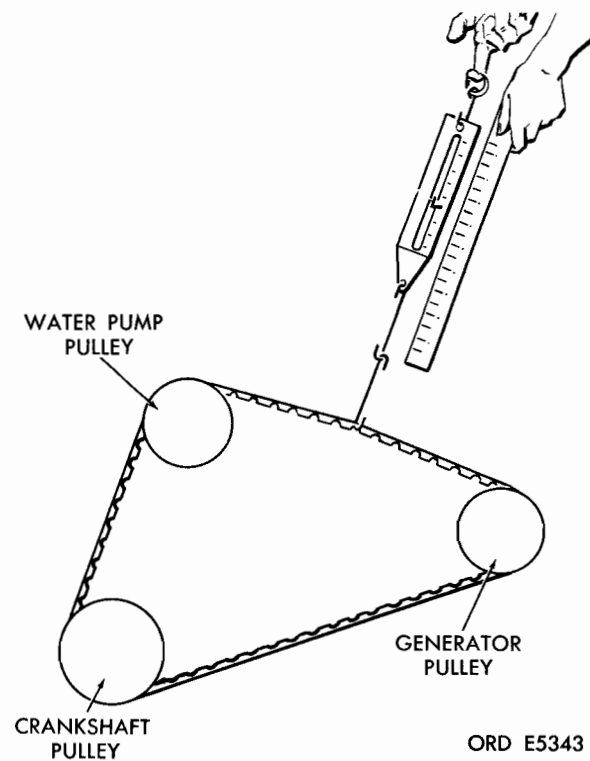


Figure 27. Measuring drive belt tension

e. If the two belts differ in tension, or if they are too long or too short, replace with a matched set.

### Section IX. FUEL SYSTEM

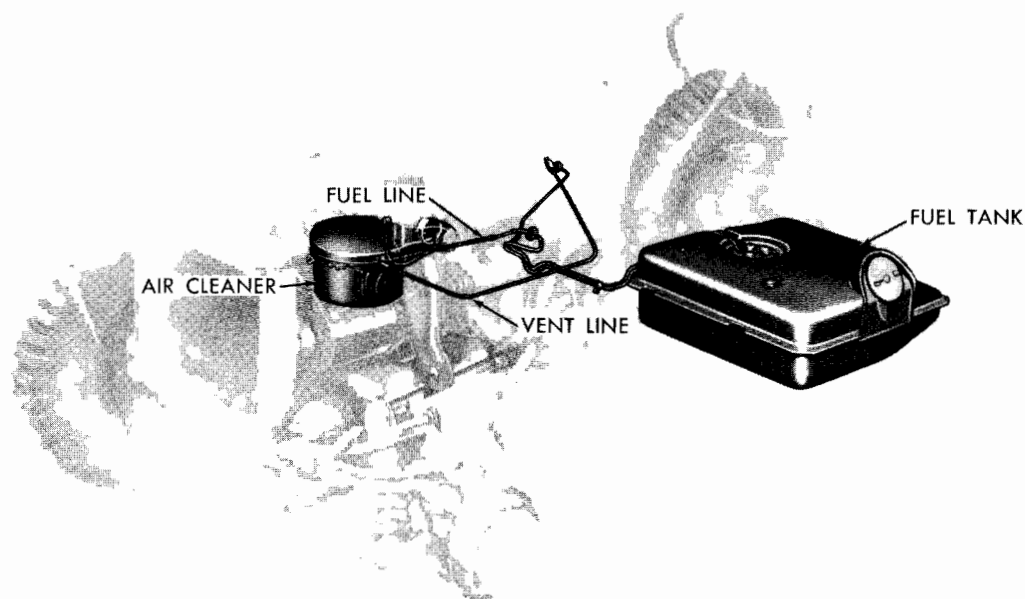
#### 48. DESCRIPTION

a. **General.** The units comprising the fuel and air intake system include the carburetor, air cleaner, fuel pump, fuel filter, fuel tank, connecting fuel lines, and electric wire for the fuel pump. Figure 28 is a phantom view of fuel and vent lines. Figure 29 is a schematic of the accelerator pedal, throttle, and choke control.

b. **Carburetor.** The carburetor is a single venturi, side-draft type, mounted on the intake manifold on the left side of the engine. The carburetor is manually controlled with the accelerator pedal, hand choke, and throttle through connecting rods and cables. It is vented through the float chamber to the air cleaner to provide for underwater operation.

c. **Air Cleaner.** The air cleaner is an oil bath, top-access-type, mounted on brackets attached to the forward part of the left fender in the engine compartment, and connected to the carburetor by a flexible air hose. The carburetor float chamber is vented to the air cleaner cover. The fuel tank is vented at a tee on the air cleaner body. The oil pressure safety switch is also vented at the same opening in the air cleaner body. The perforated side cap on the air cleaner can be replaced by an air intake pipe extension for underwater operation.

d. **Fuel Pump and Filter.** The fuel pump and filter assembly is located inside the fuel tank as a single unit, and is accessible from the top of the tank. The fuel pump is a 24 volt, electrically operated, plunger-type. The pump con-



ORD E5344

Figure 28. Fuel and vent lines

tains a hollow steel plunger in a brass cylinder. Valves are attached to the lower end of the plunger and the cylinder. The valves operate in the same manner as a common lift pump. The plunger has no seal, but is freely fitted in the cylinder. The fuel itself provides a seal between the piston and the cylinder. This principle permits the pump to maintain a pressure of approximately 4 psi. The solenoid causes the plunger to compress the pumping spring. The spring design governs the pump static pressure. All fuel entering the pump passes through the filter element in which the pump is completely enclosed. The electrical connection is water-proof. The fuel pump is controlled by a double throw safety switch, the mechanical linkage being actuated by oil from the engine main oil gallery. One contact of the switch forms a series connection between the fuel pump and the

starter switch. The other contact forms a series connection between the ignition switch and the fuel pump. When the starter switch is depressed, the first circuit is closed, and the fuel pump operates. Pump operation continues after releasing the starter switch since the safety switch opens the first circuit and closes the second circuit when the engine oil pressure reaches 3 1/2 to 5 psi. All parts of the electrical circuit are tamper-proof and hermetically sealed in helium atmosphere. The pump is radio-interference-suppressed. The filter element is replaceable, self-contained, and of a cylindrical type. It is made from helically-wound ribbons of phenolic-resin-impregnated cellulose. Any impurities in the fuel are deposited on the entrance edges of the ribbons where they can be easily cleaned off without damage to the filter element.

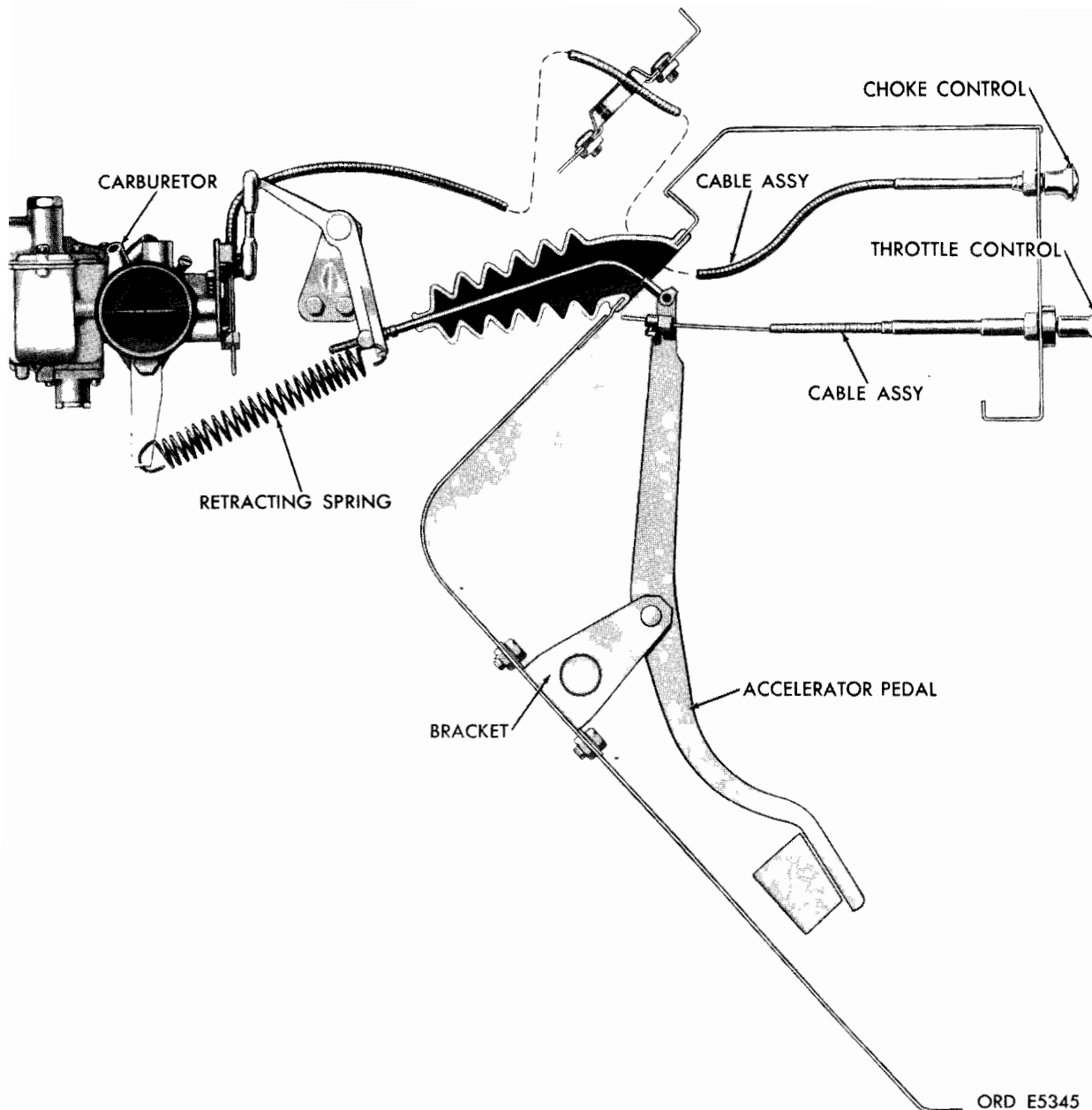


Figure 29. Accelerator pedal, throttle, and choke control

e. **Fuel Tank.** The fuel tank is of terneplate steel, two-piece, seam-welded construction, and is located under the driver's seat on the left side of the vehicle. In operation, the tank is vented to the atmosphere through a vent line between the fuel pump cover and the air cleaner, and through the pressure filler cap. A drain plug is provided in the bottom center of the tank.

Access to the drain plug requires the removal of a body access plug.

f. **Fuel Line.** The fuel line consists of formed metal tubing from the fuel pump to the engine compartment, a coupling, and flexible hose to the carburetor.



## 49. DATA

### Air Cleaner Assembly

Capacity \_\_\_\_\_ 2.5 pt

Type \_\_\_\_\_ Oil bath - top access

### Carburetor

Choke Operation—Manual

Type \_\_\_\_\_ Side draft

### Fuel Filter

Location \_\_\_\_\_ In fuel tank

Type \_\_\_\_\_ Impregnated paper

### Fuel Pump

Location \_\_\_\_\_ In fuel tank

Type \_\_\_\_\_ Electric plunger

### Fuel Tank

Location \_\_\_\_\_ Under driver's seat

Capacity \_\_\_\_\_ 17.7 gal.

Type \_\_\_\_\_ Pressurized

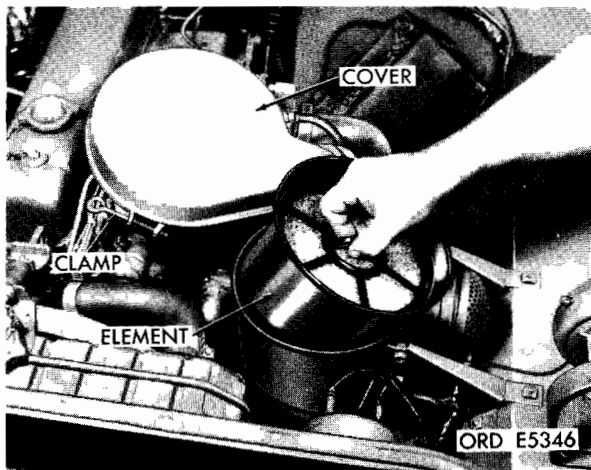
### Fuel Tank Filler Cap

Type \_\_\_\_\_ Pressurized w/valve

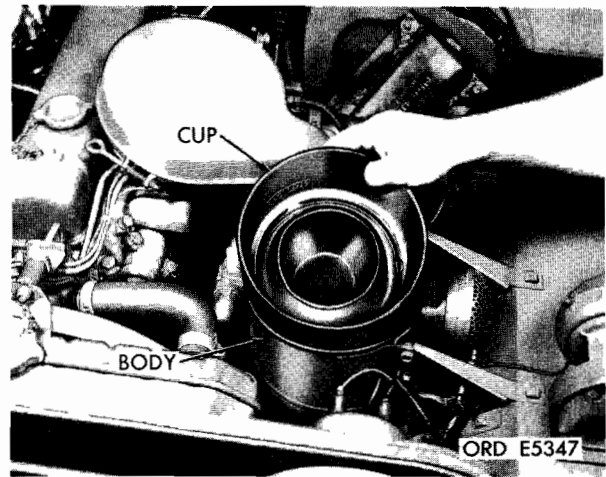
## 50. AIR CLEANER

a. Servicing. Steps 1 through 4, figure 30, show operations for servicing the air cleaner.

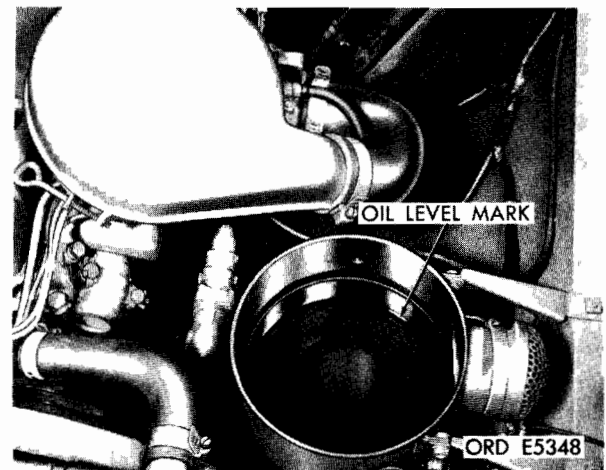
STEP 1 - Loosen clamp and remove air cleaner cover.



STEP 2 - Lift out air cleaner element.



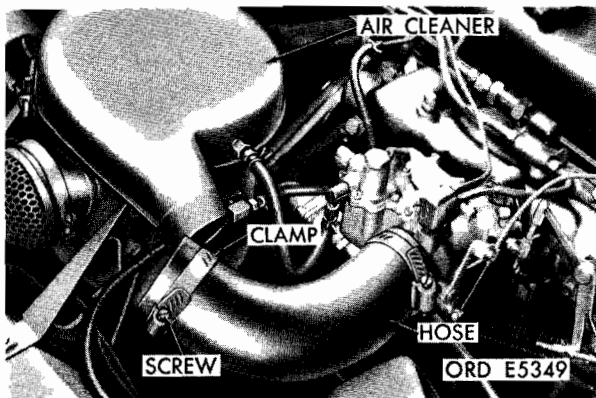
STEP 3 - Lift out oil cup. Discard used oil. Clean oil cup, air cleaner element, and air cleaner body using dry cleaning solvent or mineral spirits paint thinner.



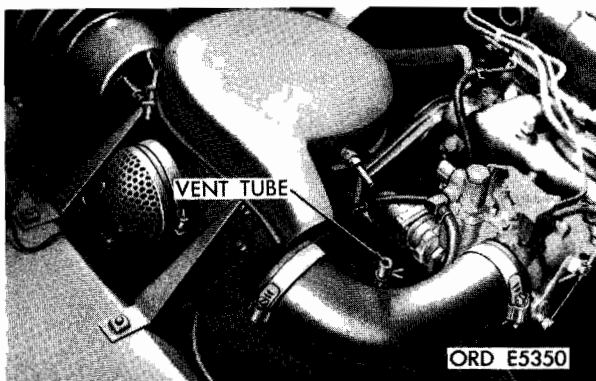
STEP 4 - Place oil cup in body and fill to level mark with fresh engine oil. Refer to lubrication chart in TM 9-2320-218-10. Install air cleaner element and secure air cleaner cover.

Figure 30. Servicing air cleaner

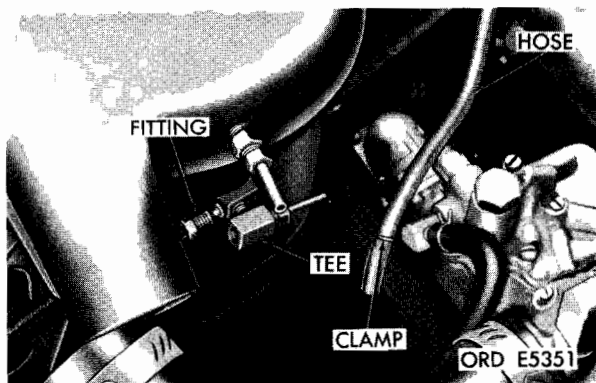
b. Removal. Steps 1 through 4, figure 31, show operations for removing air cleaner.



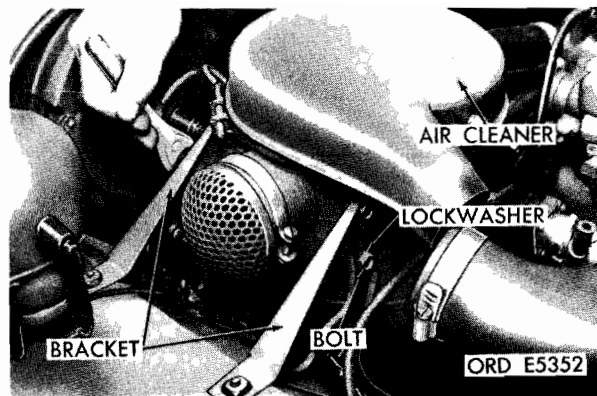
STEP 1 - Loosen clamp screw and clamp at air intake hose. Remove hose from air cleaner.



STEP 2 - Expand wire clamp on carburetor float chamber vent hose and move clamp two inches away from air cleaner. Pull hose from tube.



STEP 3 - Unscrew fuel tank vent hose and expand wire clamp on oil pressure switch vent hose. While clamp is expanded move it two inches away from tee attached to air cleaner. Pull hoses from tee.



STEP 4 - Remove four air cleaner to air cleaner bracket bolts and lockwashers. Lift air cleaner from engine compartment.

Figure 31. Air cleaner removal

c. Installation. Steps 4 back through 1, figure 31, show operations for installing air cleaner.

## 51. CARBURETOR

### a. Adjustments

- (1) General. Adjustment of the carburetor is accomplished by means of the idle mixture adjusting screw (fig. 32) and the idle speed adjusting screw. Make all carburetor adjustments with engine running at normal operating temperatures.
- (2) Idle mixture. Turn the idle mixture adjusting screw until it just touches the needle seat or the engine begins to lag; then turn OUT until the engine operates smoothly (approximately one full turn).
- (3) Idle speed. The idle speed adjusting screw on the throttle lever (fig. 32) should be set to idle the engine at 450-500 rpm.

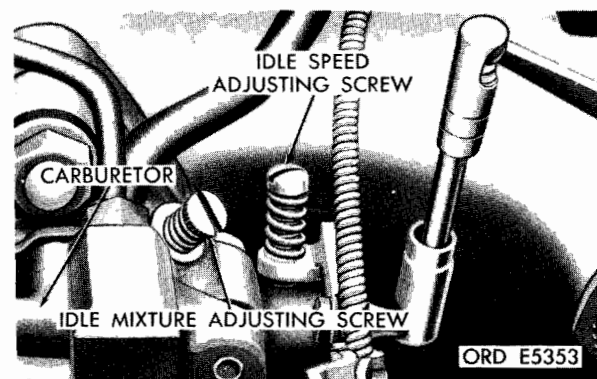
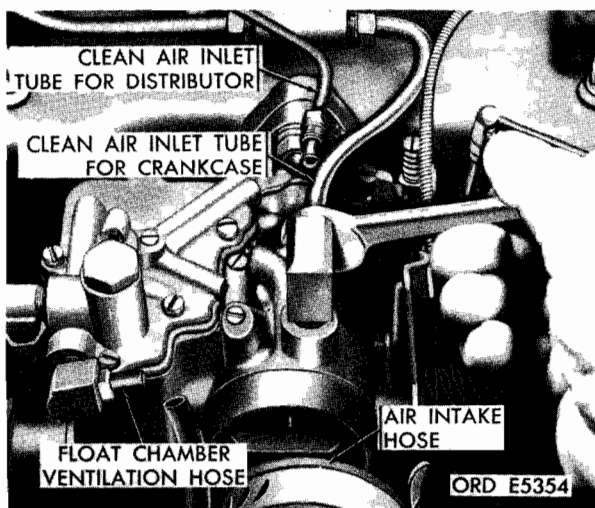
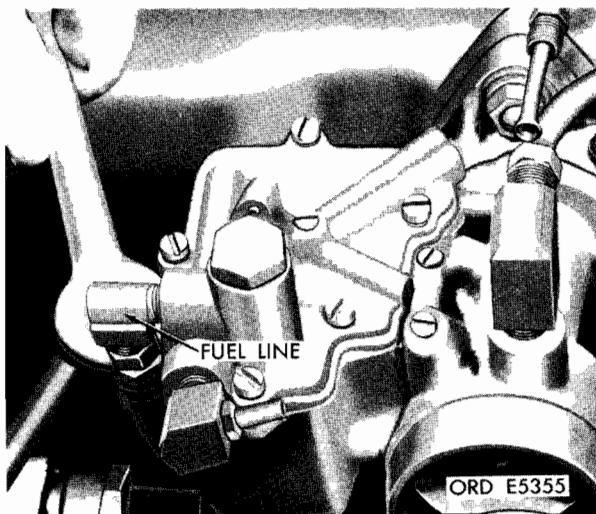


Figure 32. Carburetor adjustment

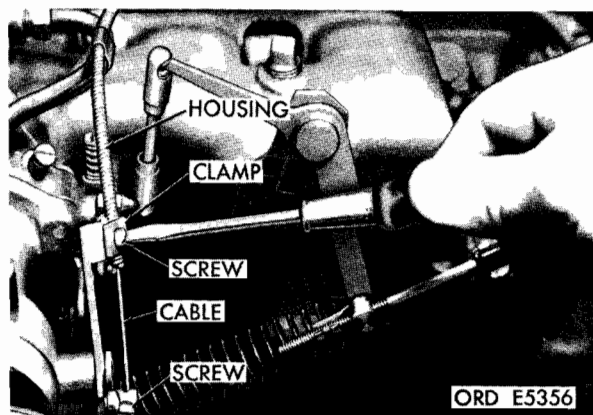
b. Removal. Steps 1 through 6, figure 33, show operations for removing the carburetor.



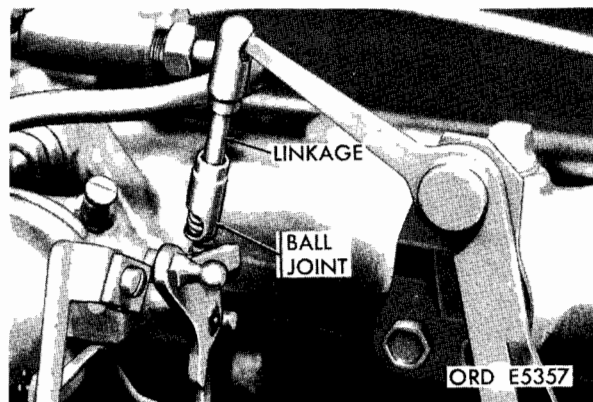
**STEP 1 -** Disconnect ventilation tube fittings. Expand wire clamp on float chamber ventilation hose and move two inches away from fitting. Pull hose from fitting. Loosen intake air hose clamp screw and loosen clamp. Pull hose from carburetor.



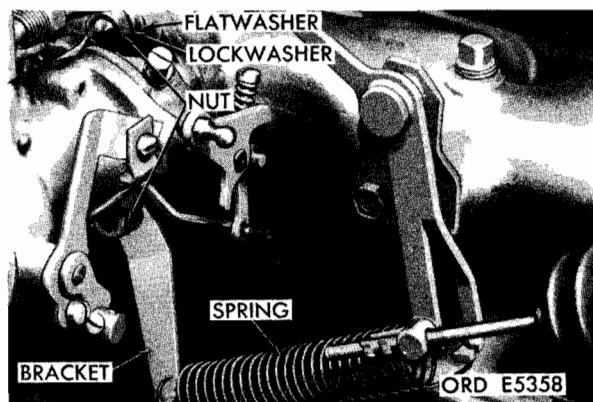
**STEP 2 -** Disconnect flexible fuel line at carburetor.



**STEP 3 -** Loosen two screws retaining choke control cable and housing and pull cable assembly through clamp.



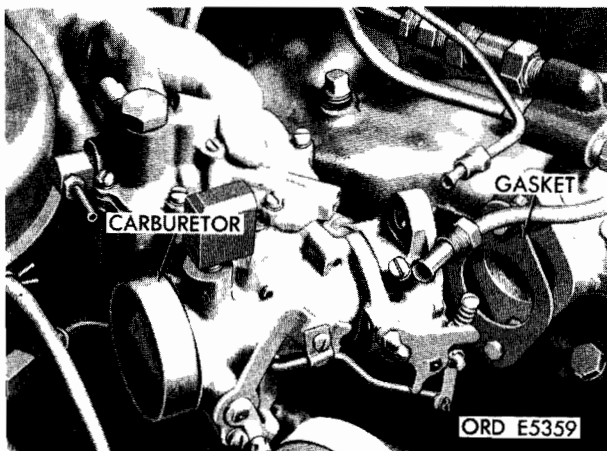
**STEP 4 -** Disconnect throttle linkage at throttle valve arm ball joint.



**STEP 5 -** Remove retracting spring. Remove two carburetor mounting nuts, lockwashers and flat washers. Remove accelerator retracting spring bracket.

Figure 33. Carburetor removal

(continued)



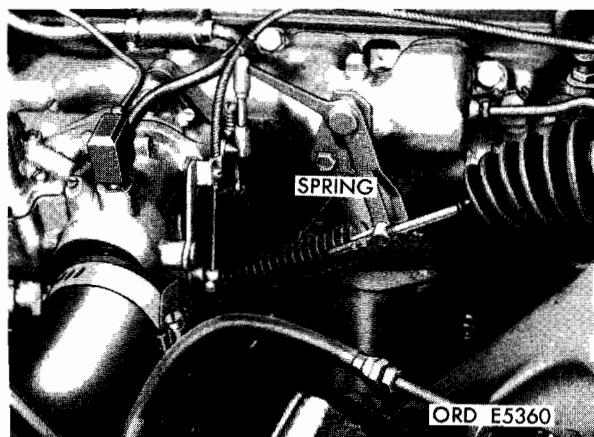
STEP 6 - Move carburetor and gasket away from intake manifold. Discard gasket.

Figure 33. Carburetor removal

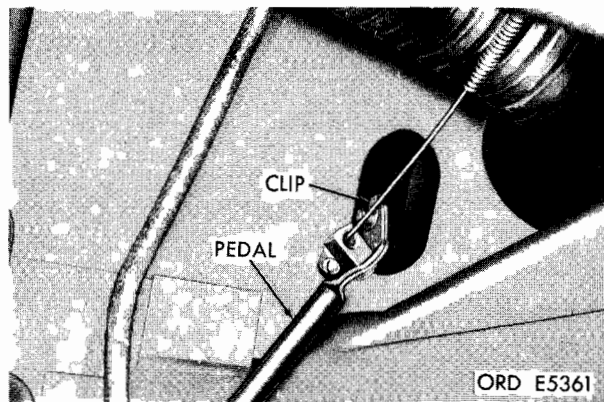
c. Installation. Clean carburetor gasket surfaces on carburetor and intake manifold before installing gasket and carburetor. Clean hose connections before installing hoses. Steps 6 back through 1, figure 33 show operations for installing the carburetor. Use a new gasket when installing carburetor. Bring engine up to normal operating temperature and adjust carburetor.

## 52. ACCELERATOR PEDAL

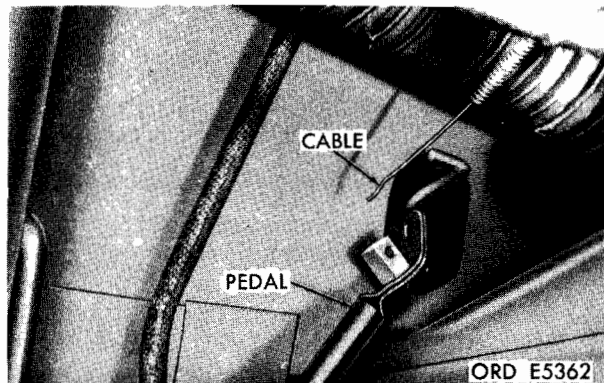
a. Removal. Figure 34, steps 1 through 4, show operations to remove accelerator pedal.



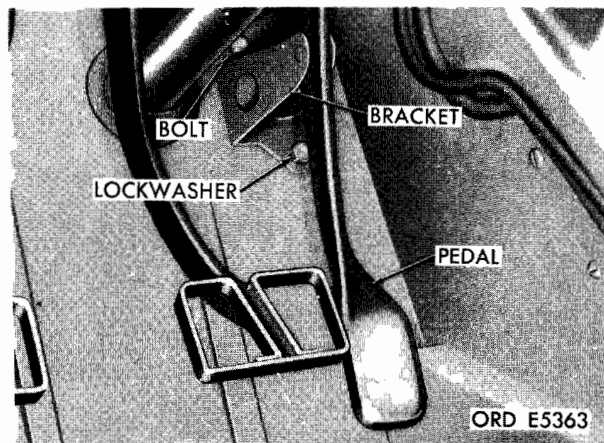
STEP 1 - Remove accelerator pedal retracting spring.



STEP 2 - Remove accelerator rod to pedal snap clip.



STEP 3 - Loosen screw and disconnect throttle cable from end of accelerator pedal.



STEP 4 - Remove two bolts and lockwashers from accelerator pedal bracket. Remove accelerator pedal.

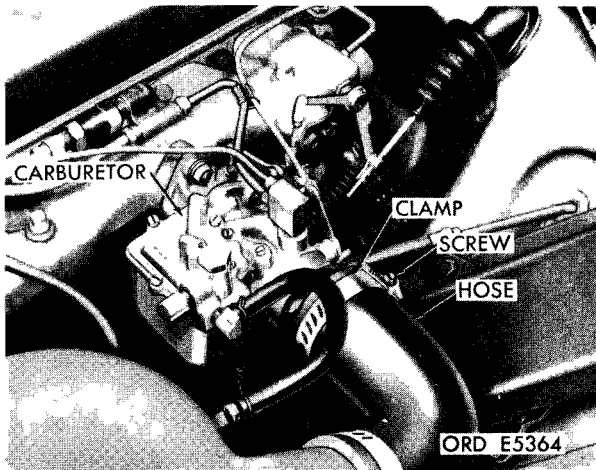
Figure 34. Accelerator pedal removal

b. Installation. Figure 34, steps 4 back through 1, show operations for installing the accelerator pedal.

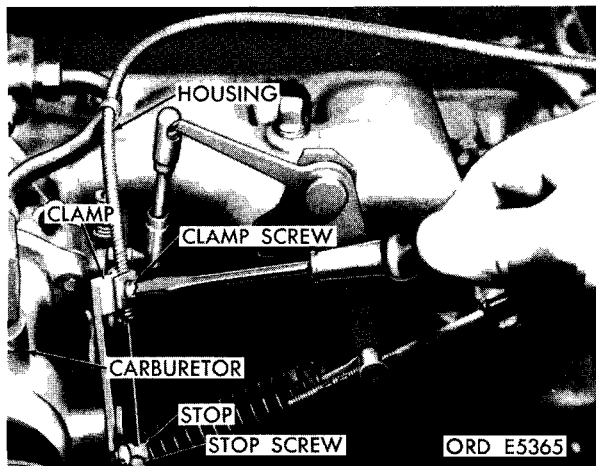
c. Adjustment. Adjust threaded link on accelerator pedal rod (fig. 34, step 1) to obtain wide open throttle at carburetor with .25 inch clearance under accelerator pedal pad.

### 53. CHOKE CONTROL ROD AND CABLE

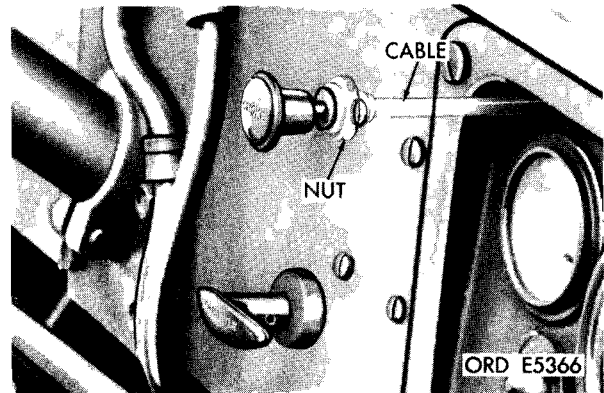
a. Removal. Steps 1 through 4, figure 35, show operations for removing choke control rod and cable.



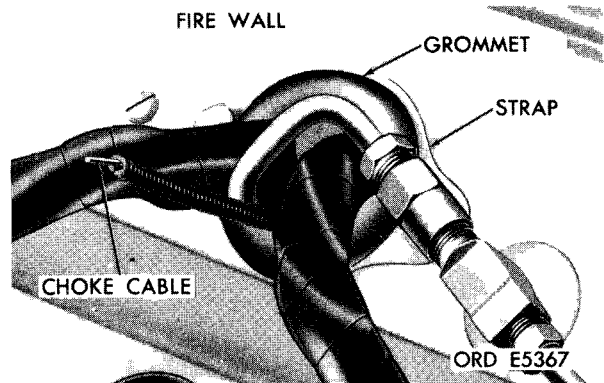
STEP 1 - Loosen air intake hose clamp screw and loosen clamp. Pull hose away from carburetor.



STEP 2 - Loosen choke control cable housing clamp screw. Loosen cable stop screw. Pull control cable and housing assembly from stop and clamp.



STEP 3 - Remove nut and lockwasher behind instrument panel from choke control cable.



STEP 4 - Thread cable assembly out of fire wall grommet and through dash panel. If necessary remove strap at fire wall grommet.

Figure 35. Choke control rod and cable removal

b. Installation. Steps 4 back through 1, figure 35, show operations for installing choke control rod and cable.

NOTE. Before completing Step 2, perform adjustments c(3) and (4) below.

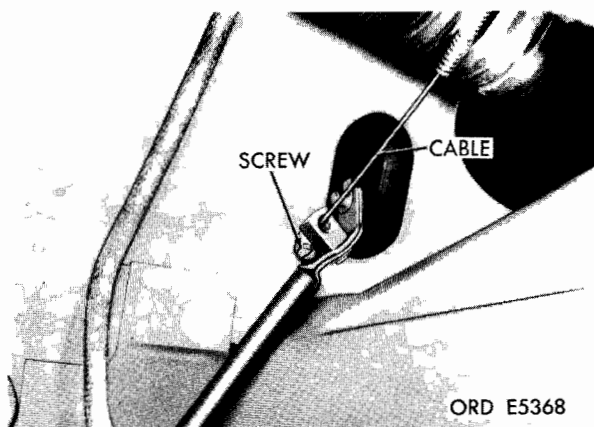
c. Adjustment. Refer to figure 35 and proceed as follows:

- (1) Remove air cleaner hose at carburetor in order to view the choke control plate when making adjustment.
- (2) Loosen screw at the choke control cable stop at carburetor.
- (3) Set choke control knob .06 inch out from instrument panel.
- (4) Adjust choke control cable so the choke control plate in the carburetor is in fully open position.
- (5) Secure cable and install air cleaner hose.

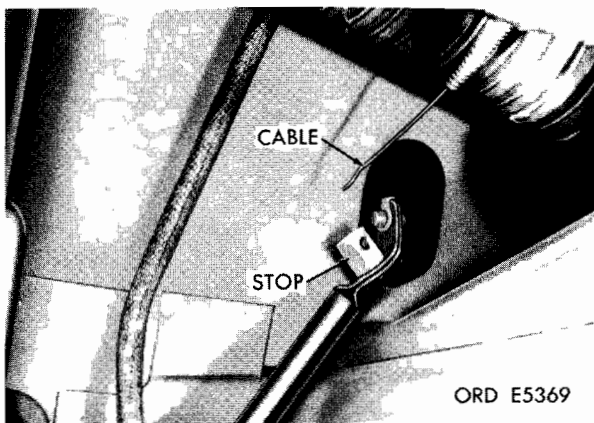


## 54. THROTTLE CONTROL

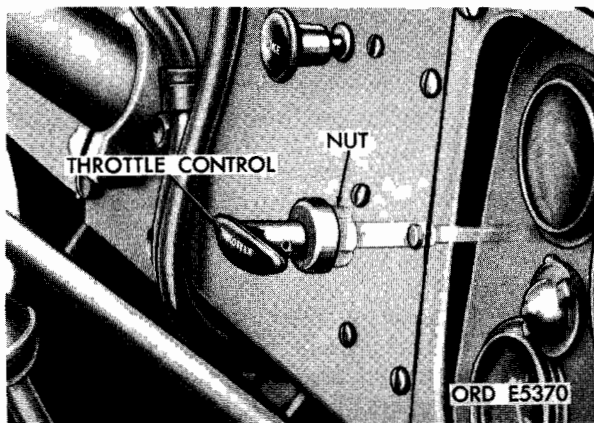
a. Removal. Steps 1 through 4, figure 36, show operations for removing hand operated throttle control.



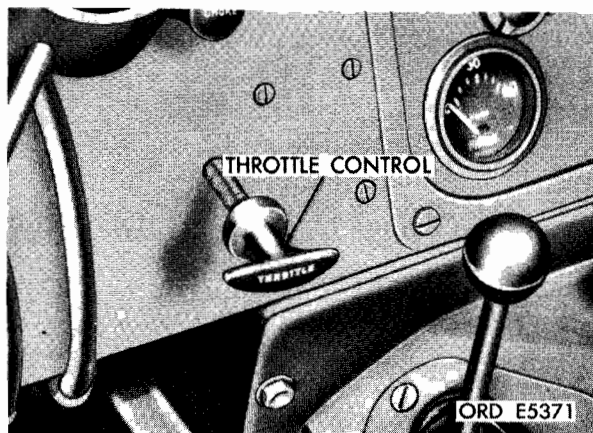
STEP 1 - Loosen set screw on throttle control cable.



STEP 2 - Remove stop from throttle control cable.



STEP 3 - Remove nut behind dash panel.



STEP 4 - Thread throttle control assembly out of dash panel.

Figure 36. Throttle hand control removal

b. Installation. Steps 4 back through 1, figure 36, show operations for installing hand operated throttle control.

NOTE. Before completing the installation steps, perform adjustments c(3) and (4) below.

c. Adjustment. Refer to fig. 36 and proceed as follows:

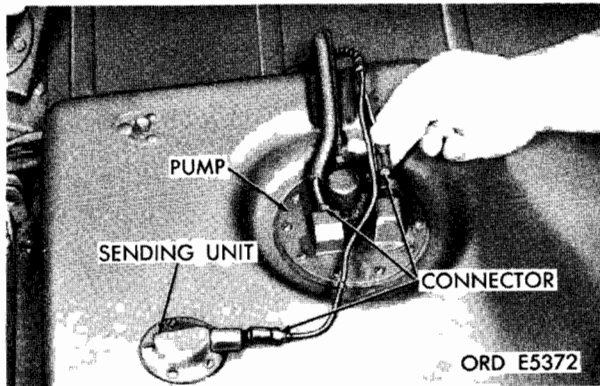
- (1) Loosen set screw at cable stop.
- (2) Set hand throttle control knob .06 inch out from dash panel.
- (3) Adjust throttle control cable so throttle control plate at carburetor is in fully closed position.
- (4) Tighten set screw.

## 55. FUEL PUMP

a. Removal. Steps 1 through 4, figure 37, show operations for removing fuel pump.

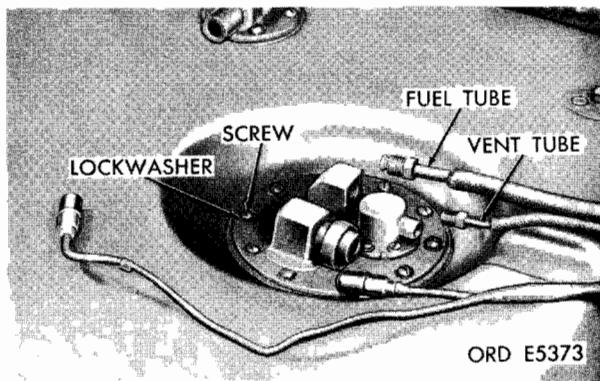
NOTE. If fuel tank is full, drain enough fuel to prevent overflow when fuel pump is removed.

STEP 1 - Remove seats (fig. 10, steps 5 to 6). Disconnect battery ground terminal (fig. 10, steps 7 and 8).

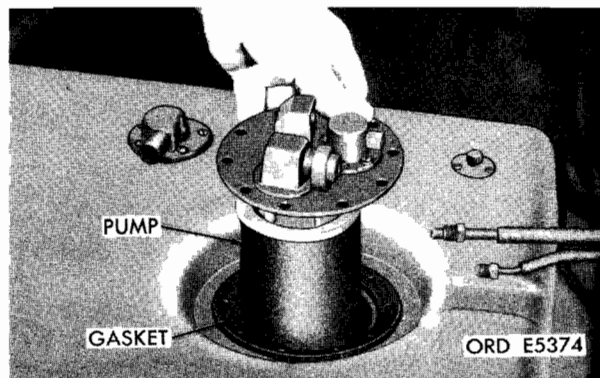


STEP 2 - Disconnect electrical connectors, fuel pump, and sending unit.

**WARNING.** While removing fuel pump assembly do not allow sparks or open flame near fuel tank.



STEP 3 - Disconnect fuel and vent tubes. Remove ten fuel pump to fuel tank screws and lockwashers.



STEP 4 - Lift fuel pump out of fuel tank. Remove gasket and discard.

Figure 37. Fuel pump removal

b. **Installation.** Clean fuel pump gasket surfaces on fuel pump and fuel tank before installing pump and gasket. Steps 4 back through 1, figure 37, show operations for installing fuel pump.

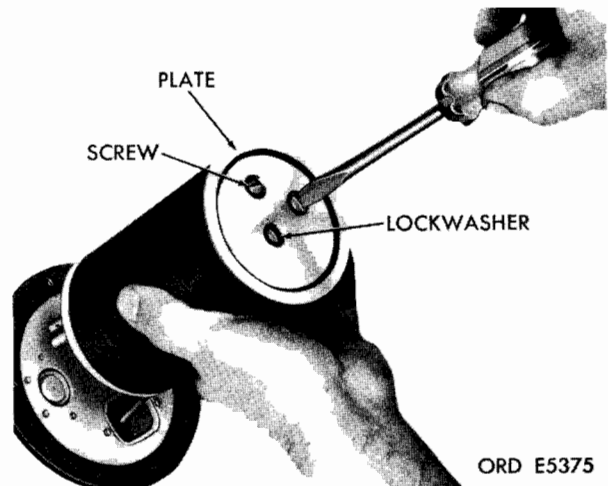
c. **Testing Fuel Pump Pressure.**

- (1) Disconnect fuel tube at carburetor.
- (2) Using a pressure gage, hold tapered adapter to fuel tube.
- (3) Start engine. Engine should normally operate due to sufficient fuel in carburetor. If engine does not start, continue operating starter until maximum reading on pressure gage is obtained. Correct pressure is from 3 to 5 lb.
- (4) When maximum reading is obtained, stop test and connect fuel tube.

## 56. FUEL FILTER ELEMENT

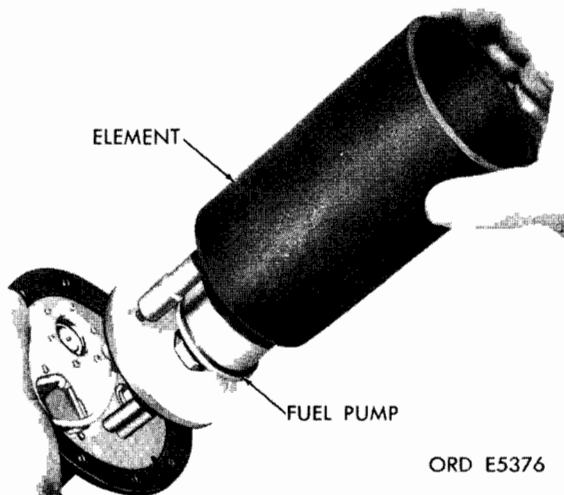
a. **Removal.** Steps 1 through 3, figure 38, show operations for removing fuel filter element from fuel pump.

STEP 1 - Preliminary Operations. Remove seats (fig. 10, steps 5 and 6). Disconnect battery ground cable (fig. 10, steps 7 and 8). Disconnect and remove fuel pump (par. 55).



STEP 2 - Remove three screws and lockwashers. Remove filter retaining plate.

Figure 38. Fuel filter element removal (continued)



STEP 3 - Remove fuel filter element,

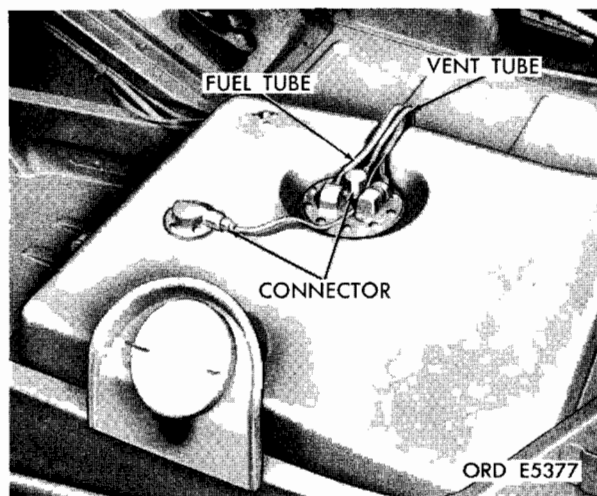
Figure 38. Fuel filter element removal

b. Installation. Steps 3 back through 1, figure 38, show operations for installing fuel filter element.

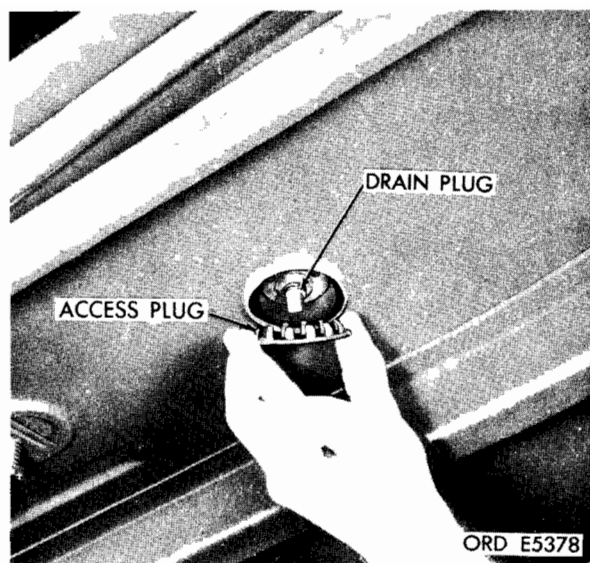
## 57. FUEL TANK

a. Removal. Steps 1 through 5, figure 39, show operations for removing the fuel tank.

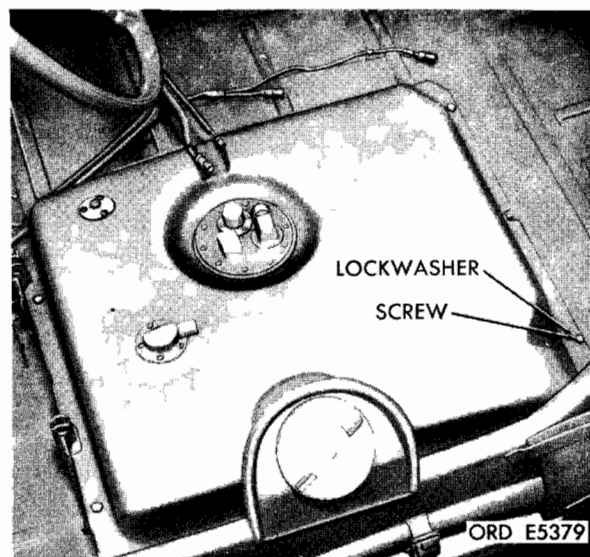
STEP 1 - Preliminary Operations. Remove seats (fig. 10, steps 5 and 6). Disconnect battery ground cable (fig. 10, steps 7 and 8).



STEP 2 - Unscrew fuel and vent tubes and pull electrical connectors from fuel pump and fuel gage sending unit.



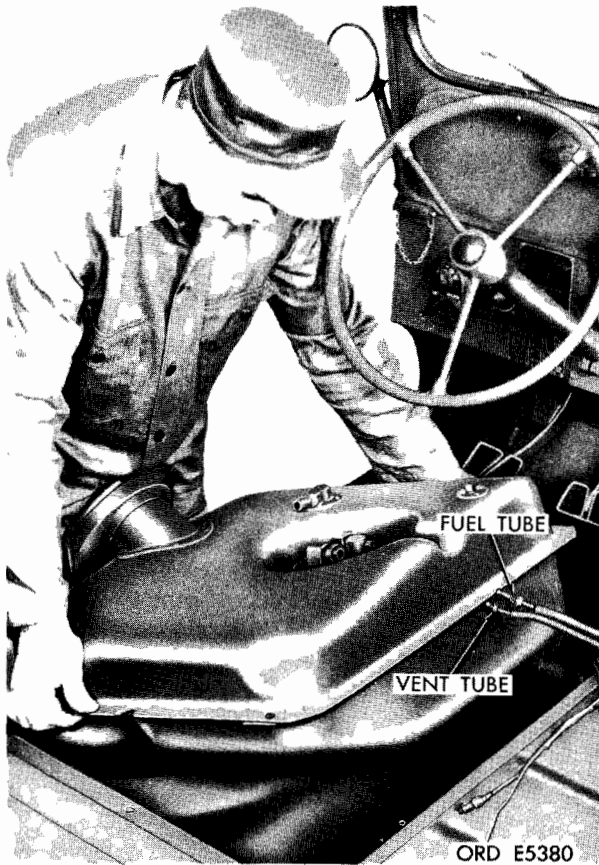
STEP 3 - Pry access plug from underbody and unscrew drain plug to drain tank.



STEP 4 - Pull electrical connector from fuel gage sending unit. Remove four fuel tank mounting screws and lockwashers.

Figure 39. Fuel tank removal continued





STEP 5 - Bend fuel and vent tubes carefully as necessary and remove fuel tank.

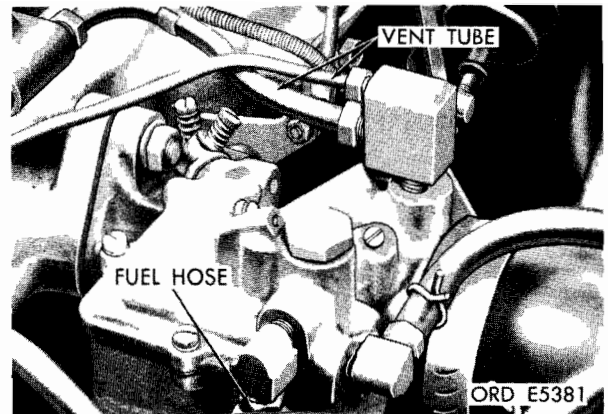
Figure 39. Fuel tank removal

b. Installation. Steps 5 back through 1, figure 39, show operations for installing the fuel tank.

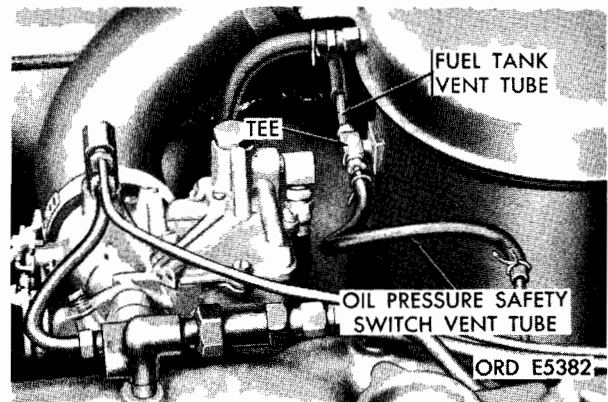
## 58. FUEL AND FUEL VENTILATION TUBES, HOSES, AND CONNECTORS

a. General. Views A, B, and C, figure 40, show the fuel and fuel ventilation tubes, hoses, and connections in the engine compartment and in the passenger compartment.

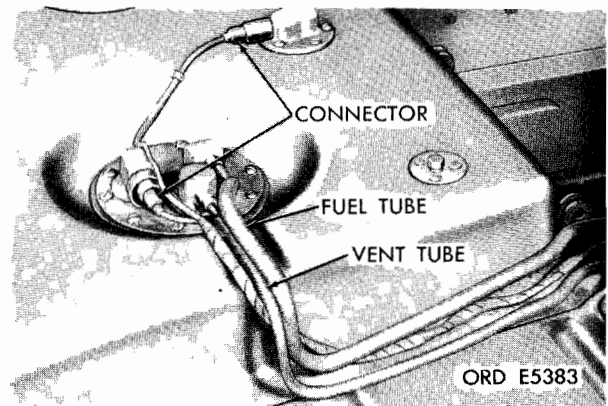
b. Removal. All fuel and fuel ventilation tube connections are made with flared end male and female type fittings. To remove a tube, hose or fitting, use suitable tools and disconnect and remove.



VIEW A - Vent tube and fuel tubes in engine compartment.



VIEW B - Venting tee for fuel tank and oil pressure safety switch.



VIEW C - Vent tube and fuel tube at fuel tank.

Figure 40. Fuel and ventilation hoses

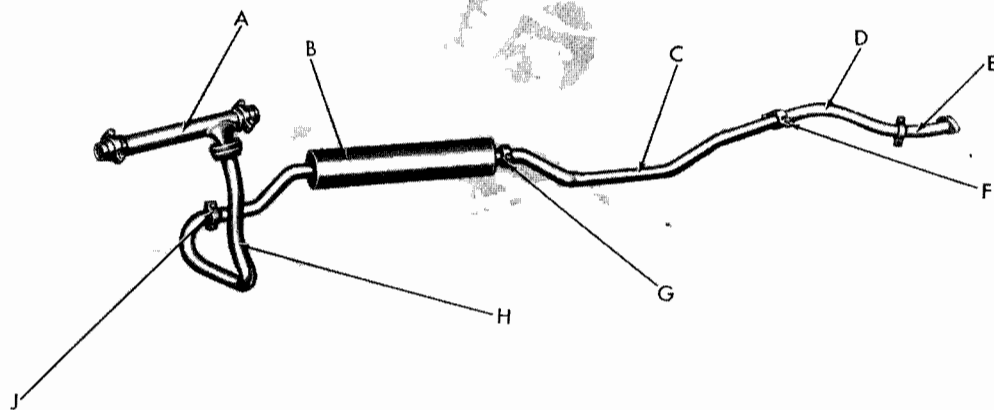
c. Installation. When installing fuel and fuel ventilation tubes, start all threads by hand being careful not to cross thread the connection. Tighten all connections securely, but do not over tighten. Inspect for leaks.

## Section X. EXHAUST SYSTEM

### 59. DESCRIPTION

The exhaust system consists of a muffler inlet pipe, muffler, front outlet pipe, and rear outlet pipe; together with necessary clamps,

gaskets, bolts, nuts, and lockwashers. Figure 41 is a phantom view of the exhaust system.



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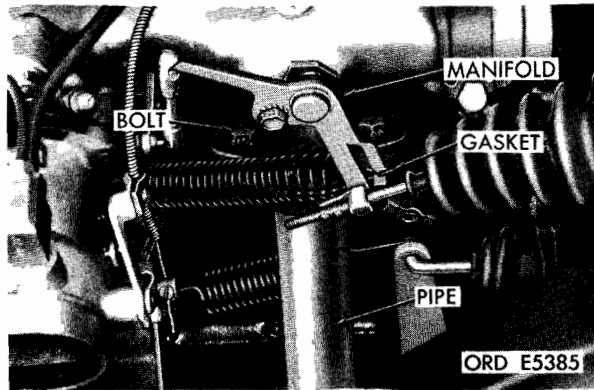
A. Exhaust manifold  
B. Muffler  
C. Front outlet pipe  
D. Rear outlet pipe  
E. Rear pipe hanger

F. Front to rear outlet pipe  
clamp  
G. Muffler to outlet pipe clamp  
H. Muffler inlet pipe  
J. Inlet pipe to muffler clamp

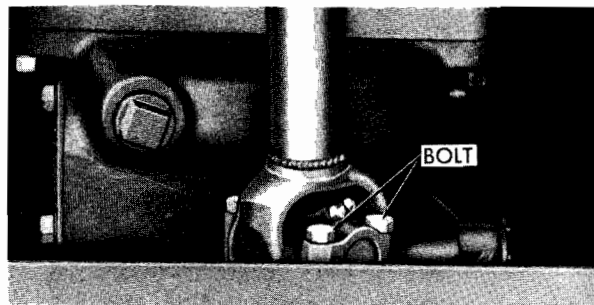
Figure 41. Phantom view of the exhaust system

## 60. MUFFLER INLET PIPE

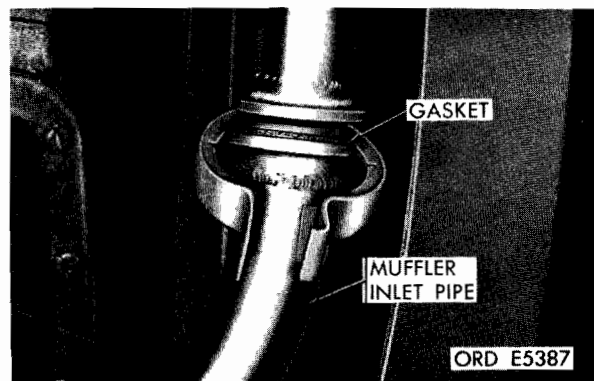
a. Removal. Steps 1 through 3, figure 42, show operations for removing muffler inlet pipe.



STEP 1 - Remove two brass nuts and lock-washers securing muffler inlet pipe to exhaust manifold and discard gasket.



STEP 2 - Raise vehicle and remove four bolts from rear universal joint of front propeller shaft.



STEP 3 - Remove screw from clamp securing muffler inlet pipe to muffler and discard gasket.

Figure 42. Muffler inlet pipe removal

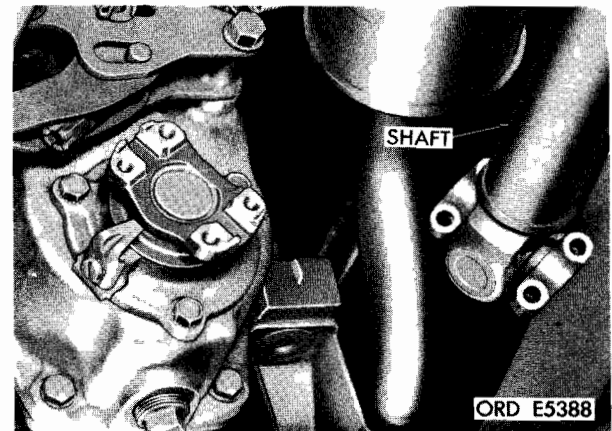
b. Installation. Steps 3 back through 1, figure 42, show operations for installing muffler inlet pipe. The following attaching parts should be torqued to the values shown:

Muffler Inlet Pipe  
to Exhaust Manifold Bolts (3/8-24) — 15-20 lb-ft  
Bolts for Muffler Inlet  
Pipe Clamp (5/16-18) — 12-15 lb-ft  
Universal Joint Bolt  
(5/16-24) — 25-30 lb-ft

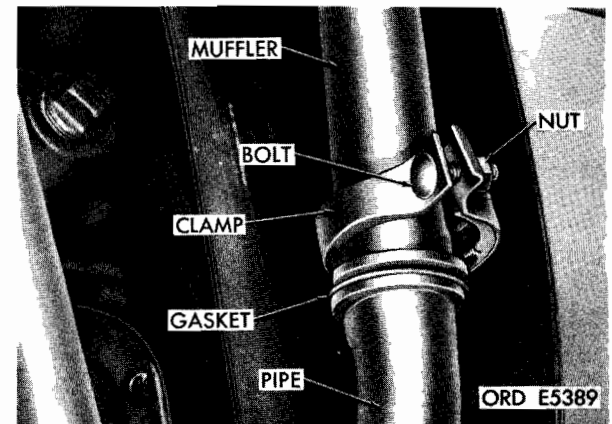
NOTE. Use new gaskets for installation.

## 61. MUFFLER

a. Removal. Steps 1 through 4, figure 43, show operations for removing muffler.

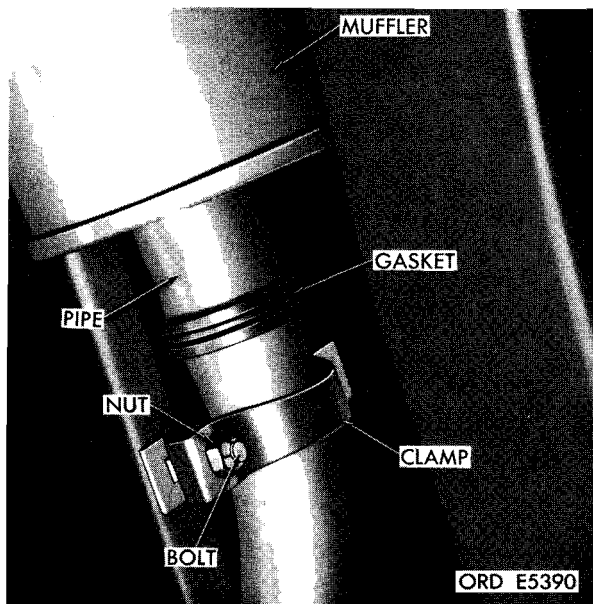


STEP 1 - Raise vehicle and remove four bolts from front end of rear propeller shaft.

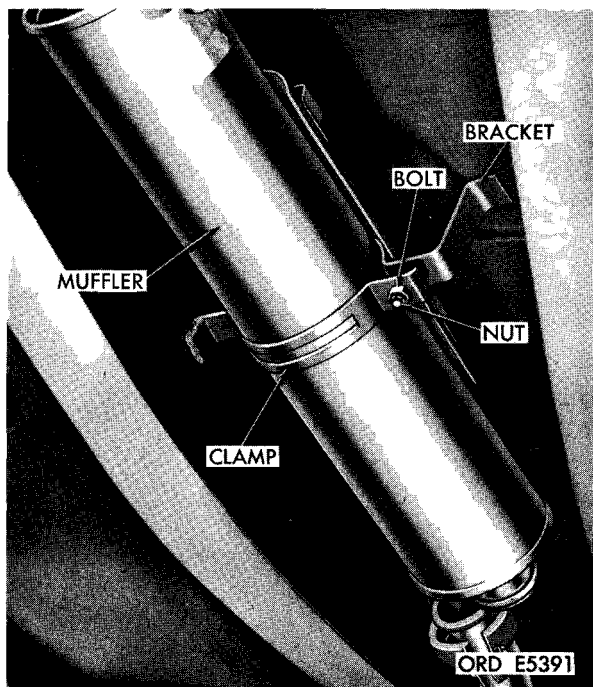


STEP 2 - Remove nut and bolt from clamp securing muffler inlet pipe to muffler and discard gasket.

Figure 43. Muffler removal (continued)



STEP 3 - Remove nut and bolt from clamp securing front outlet pipe to muffler and discard gasket.



STEP 4 - Remove nut and bolt from muffler retainer clamp and remove muffler.

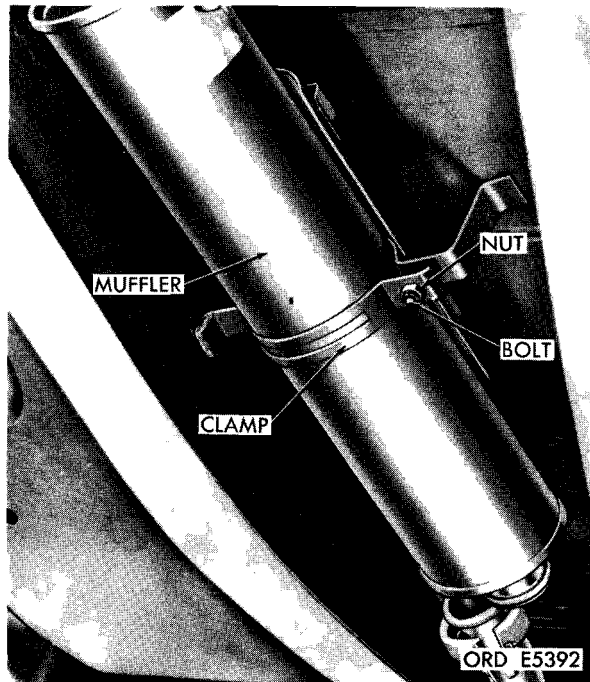
Figure 43. Muffler removal

b. Installation. Steps 4 back through 1, figure 43, show operations for installing muffler. Torque value for 5/16-24 nuts is 12-15 lb-ft.

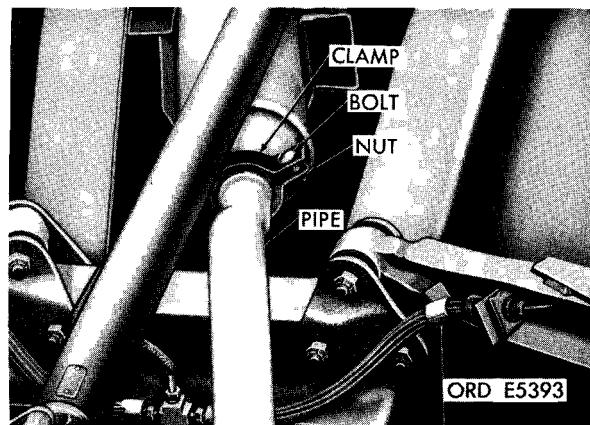
NOTE. Use new gaskets for installation.

## 62. FRONT OUTLET PIPE

a. Removal. Steps 1 through 3, figure 44, show operations for removing front outlet pipe.

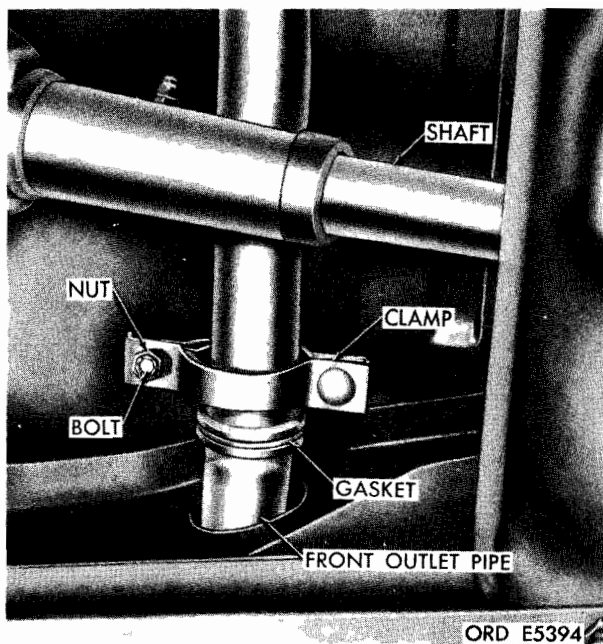


STEP 1 - Loosen muffler retaining bracket nut and bolt. Loosen bracket.



STEP 2 - Remove nut and bolt from clamp securing front outlet pipe to rear of muffler. Discard gasket.

Figure 44. Front outlet pipe removal  
(continued)



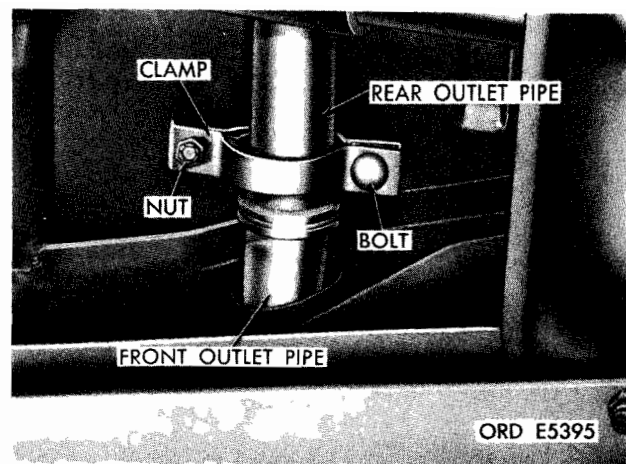
STEP 3 - Remove two nuts and bolts from clamp securing front outlet pipe to rear outlet pipe. Discard gasket. Work pipe down and out, rotating as necessary to clear drive shaft.

Figure 44. Front outlet pipe removal

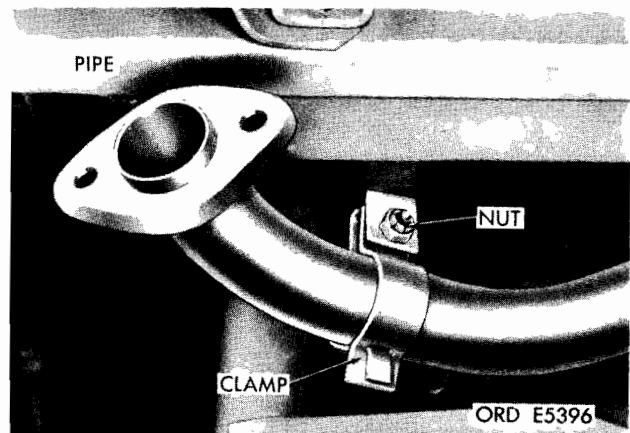
b. Installation. Steps 3 back through 1, figure 44, show operations for installing front outlet pipe. Use new gaskets for installation. Torque value for 5/16-24 nuts is 12-15 lb-ft.

## 63. REAR OUTLET PIPE

a. Removal. Steps 1 and 2, figure 45, show operations for removing rear outlet pipe.



STEP 1 - Loosen two nuts and bolts. Separate front outlet pipe from rear outlet pipe. Discard gasket.



STEP 2 - Remove nut and bolt from clamp retaining rear outlet pipe to frame.

Figure 45. Rear outlet pipe removal

b. Installation. Steps 2 back to 1, figure 45, show operations for installing rear outlet pipe. Use new gaskets for installation. Torque value for 5/16-24 bolts is 12-15 lb-ft.

## Section XI. IGNITION SYSTEM

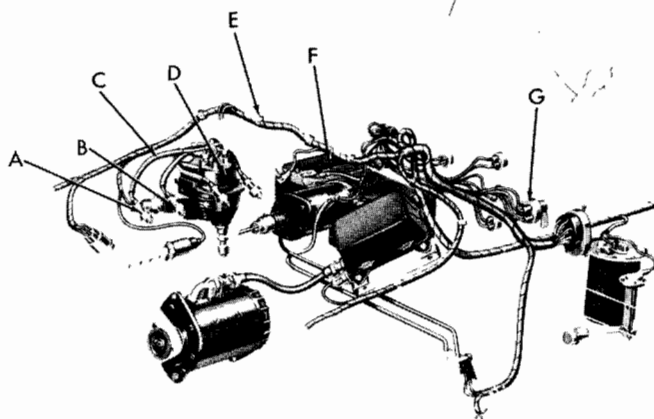
### 64. DESCRIPTION AND DATA

a. Description. The ignition system consists of distributor, coil, spark plugs, and circuit cables. The distributor assembly consists of the distributor and ignition coil in a single housing mounted on the right side of the engine block and is driven through the oil pump by the cam-

shaft. The primary, or low voltage circuit, consists of the batteries, ignition switch, breaker points, primary capacitor, breaker point capacitor, and the primary windings of the ignition coil. The secondary, or high voltage circuit, consists of the secondary windings

of the coil, distributor rotor, distributor cover, cap assembly, spark plugs, and spark plug cable assemblies. The ignition system is waterproof

and includes devices for suppressing radio interference (pars. 176 to 178). Figure 46 is a phantom view of the ignition system.



ORD E5397

A. Spark plug  
B. Housing for radio  
suppression capacitor  
C. Spark plug cable

D. Ignition distributor  
E. Ignition wiring  
F. Battery  
G. Ignition

Figure 46. Phantom view of the ignition system

b. Data

Distributor Assembly

Rotation (rotor  
end) \_\_\_\_\_ counter clockwise  
Type of Advance \_\_\_\_\_ centrifugal  
Breaker point  
opening \_\_\_\_\_ .020

Breaker arm

spring tension \_\_\_\_\_ 17 to 20 oz

Voltage \_\_\_\_\_ 24

Cam Angle \_\_\_\_\_ 39°

Timing \_\_\_\_\_ 6° BTDC

Spark Plugs

Thread size \_\_\_\_\_ 14-mm

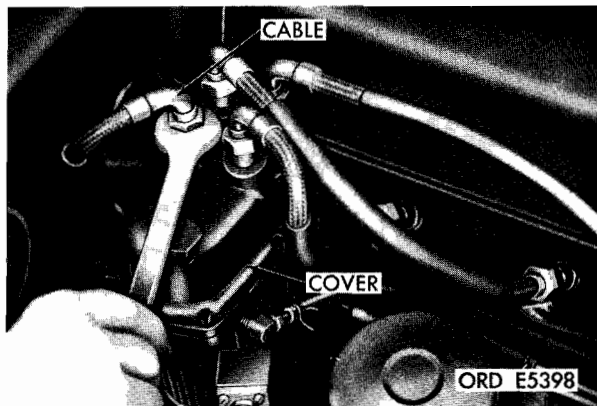
Gap \_\_\_\_\_ .029 to .032 in.

## 65. ORGANIZATIONAL MAINTENANCE

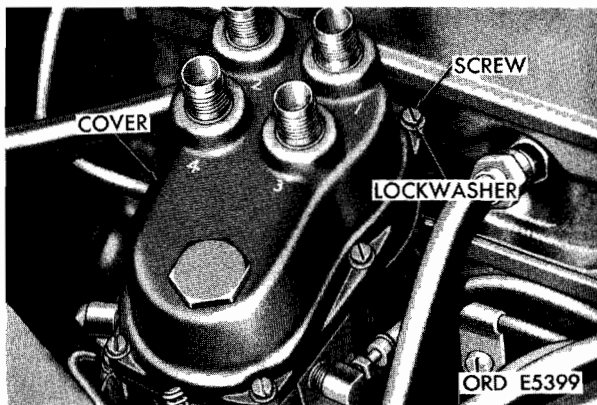
Periodic inspection and lubrication of the ignition system is the responsibility of the using organization. See lubrication chart for detailed instructions. Information for ignition system maintenance is shown in paragraph 66 and 67. Operations not described are the responsibility of ordnance maintenance units.

## 66. DISTRIBUTOR REPAIR

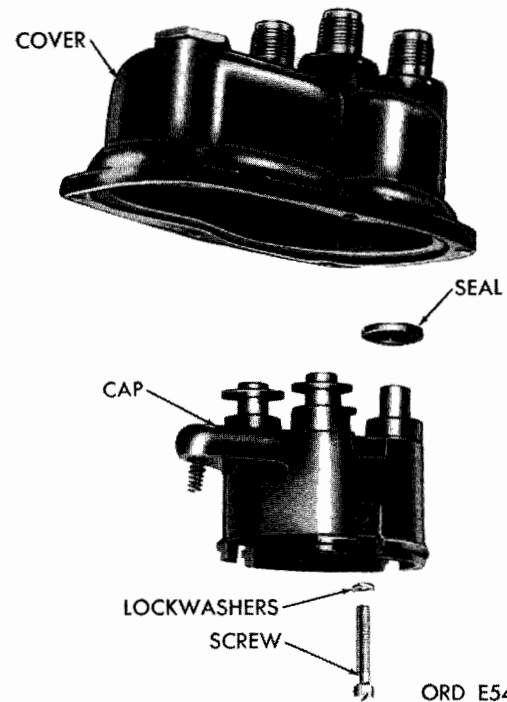
Refer to figure 47, steps 1 through 14. To remove and inspect a part that is suspected of being defective, as described in the troubleshooting chart, follow the steps only to the point required. During repair, discard worn or damaged sealing rings and gaskets, using new ones at installation.



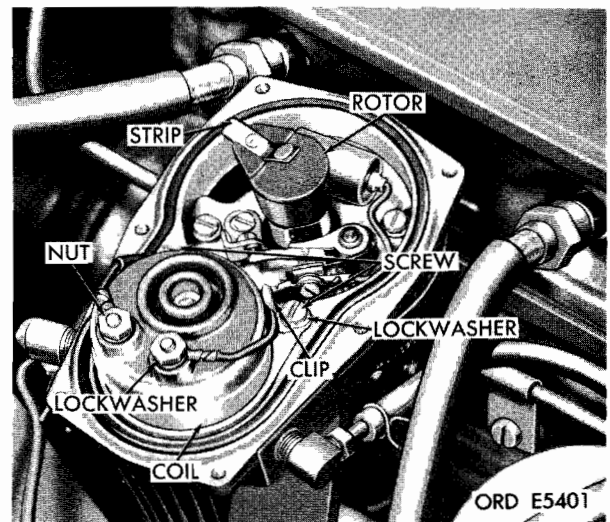
STEP 1 - Remove four spark plug cables from cap and cover assembly.



STEP 2 - Remove six screws and remove cap and cover assembly.



STEP 3 - Remove cap from cover and check for cracks and carbon tracks. Check inserts in cap for excessive burning.



STEP 4 - Lift rotor off cam and check for cracks, loose contact strip, and excessive burning. Remove two terminal wire nuts and lockwashers. Remove coil mounting screws and lockwashers. Remove cable clips.

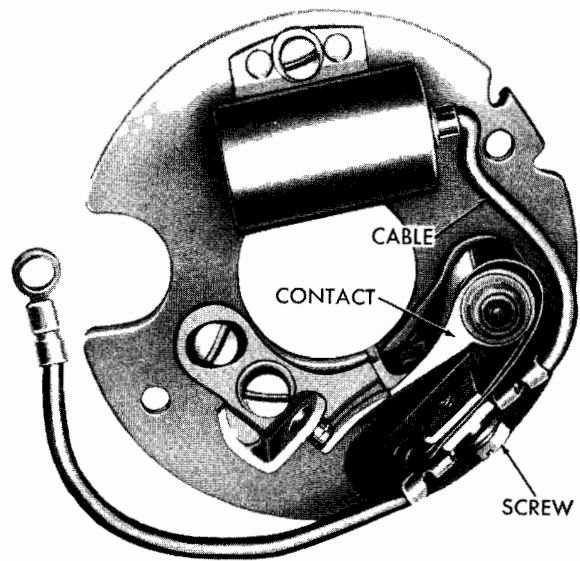
Figure 47. Distributor repair

(continued)

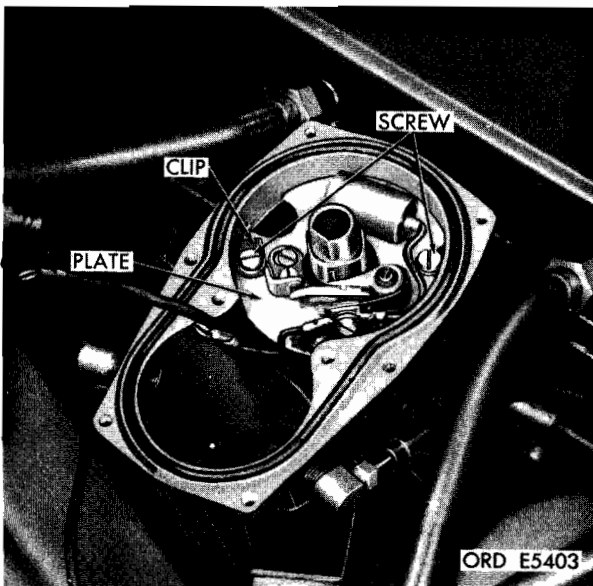




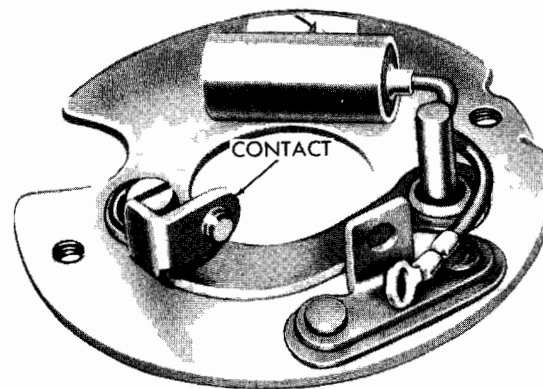
STEP 5 - Remove two terminal wires. Lift coil out of distributor base. Check coil for dents and cracks.



STEP 7 - Remove terminal screw and remove capacitor cable and moveable contact.



STEP 6 - Remove two breaker plate retaining screws and clips and remove breaker plate.

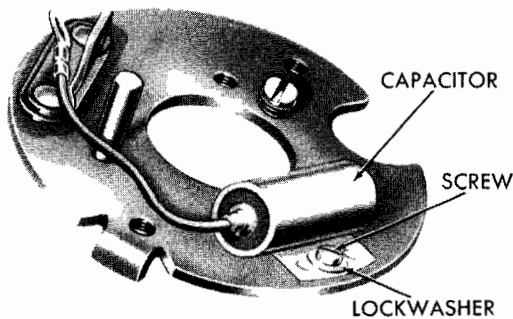


STEP 8 - Remove stationary contact.

Figure 47. Distributor repair

(continued)

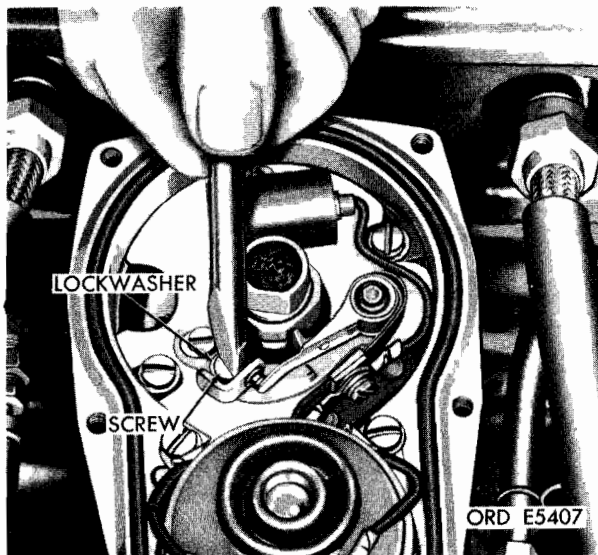




ORD E5406

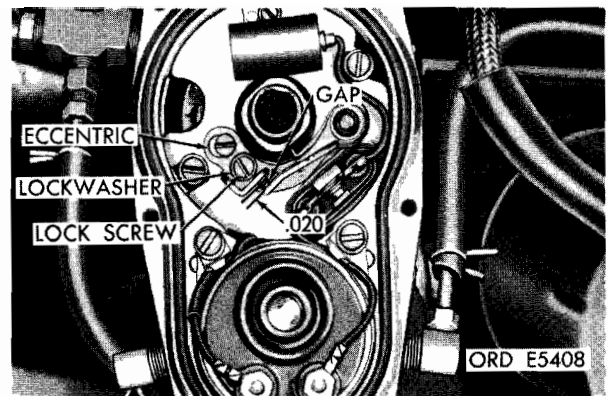
STEP 9 - Remove screw and lockwasher and remove capacitor.

STEP 10 - When new contact points are assembled and breaker plate is installed, adjust point gap as follows: turn crankshaft by pulling top of fan toward right side of vehicle until breaker points are full open with the rubbing block of the moveable contact arm resting on one of four high points of cam.



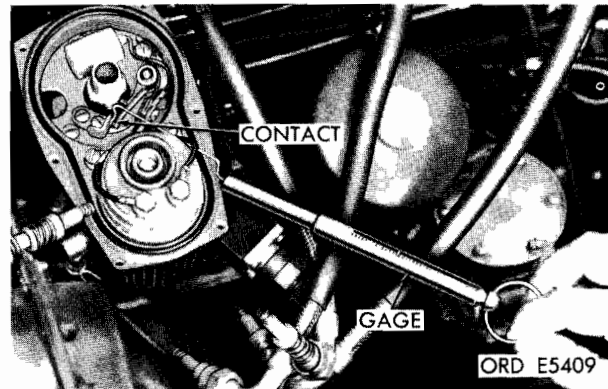
ORD E5407

STEP 11 - Loosen stationary contact mounting screw and lockwasher.



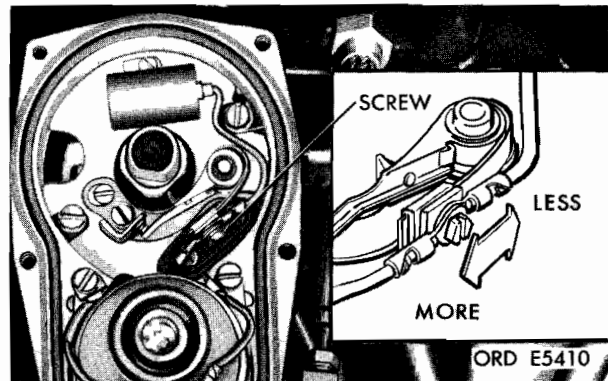
ORD E5408

STEP 12 - Adjust point gap by turning adjusting eccentric until gap is .020 inch. Tighten contact mounting screw and lockwasher.



ORD E5409

STEP 13 - Attach spring gage to end of moveable contact and pull on gage at right angles to moveable contact.



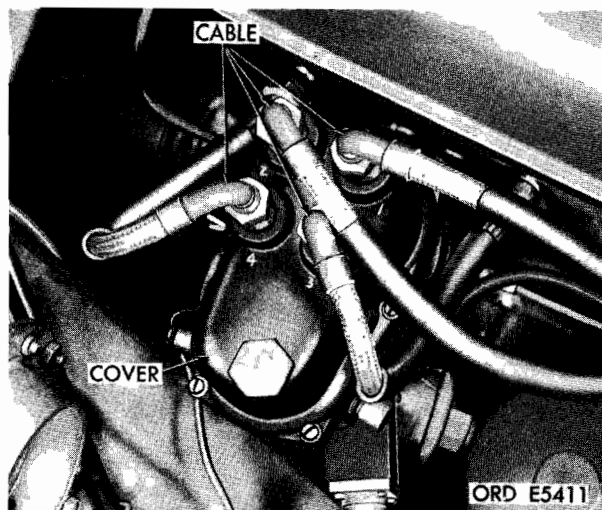
ORD E5410

STEP 14 - Adjust spring tension by positioning spring slot until desired tension is obtained and then tighten terminal screw. Points should start to open with a pull of 17 to 20 ounces.

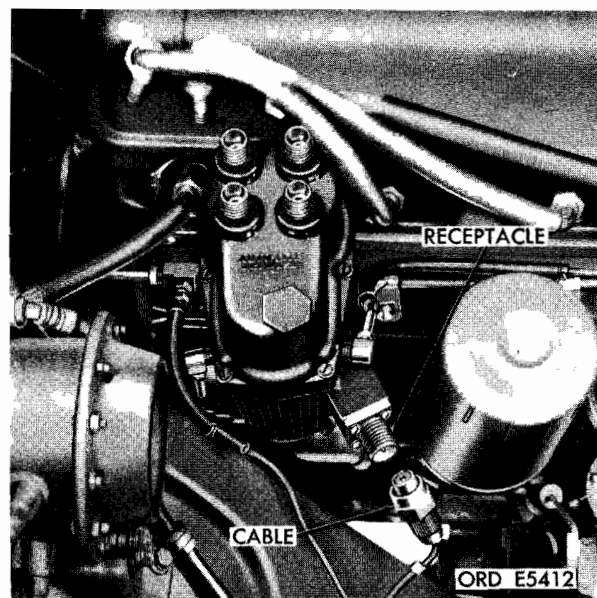
Figure 47. Distributor assembly repair

## 67. DISTRIBUTOR REPLACEMENT

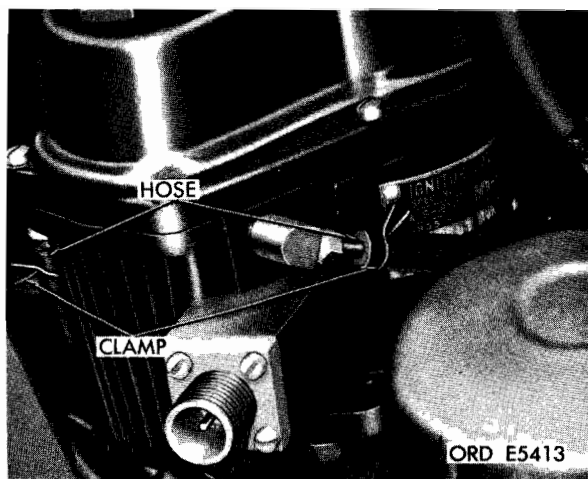
a. Removal. Steps 1 through 4, figure 48, show operations for removing the distributor assembly from the vehicle.



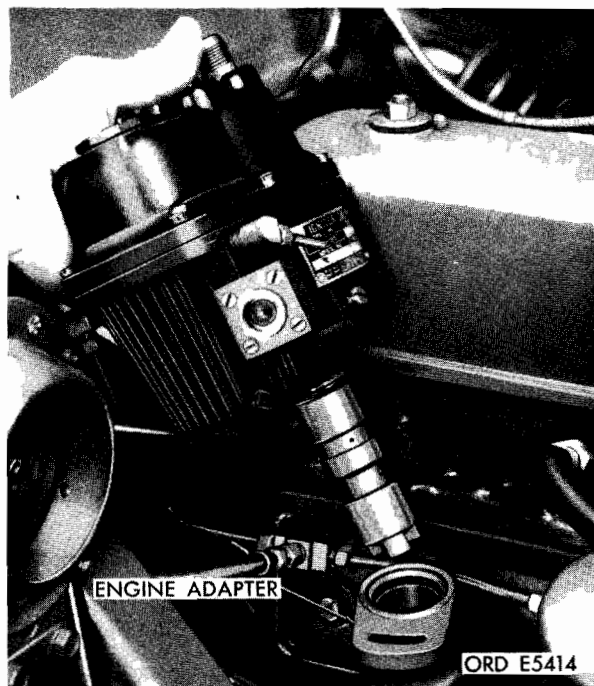
STEP 1 - Mark cover so as to identify spark plug cables for installation and disconnect cables.



STEP 2 - Disconnect primary cable at receptacle.



STEP 3 - Remove spring clamp and pull vent hoses off.



STEP 4 - Remove mounting screw located at slotted hole in adapter, flat washer and lockwasher, from ignition distributor at engine adaptor. Lift distributor out of adaptor.

NOTE. When assembling, make sure distributor shaft, bottoms in drive slot in engine block before tightening mounting screw.

Figure 48. Distributor removal

b. Installation. Steps 4 back through 1, figure 48, show operations for installing the distributor assembly on the vehicle. After installing distributor on vehicle, ignition timing operations must be performed as shown in (par. 68).

## 68. IGNITION TIMING

a. General. Ignition timing is accomplished by three separate and consecutive procedures; breaker point set adjustment, approximate timing by distributor positioning, and precise timing by using an adapter, timing light, and a tachometer. Figure 49 is a schematic showing correct hook-up for ignition timing with timing light and adapter.

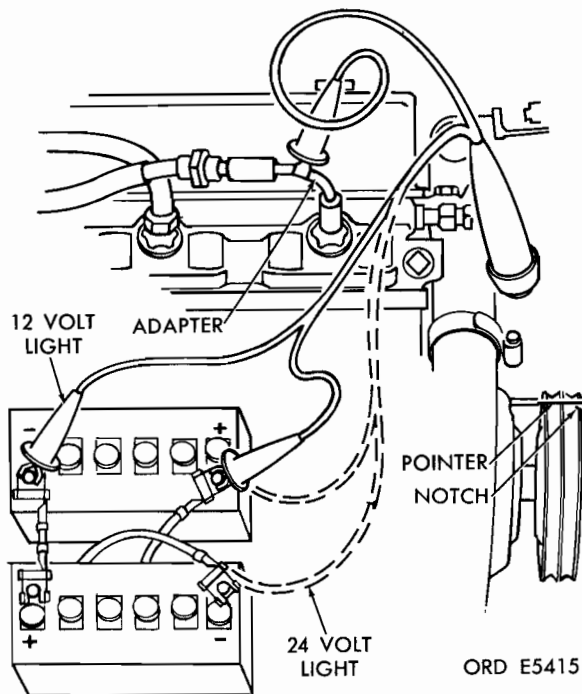


Figure 49. Schematic showing correct hook up for ignition timing with timing light and adapter.

**NOTE.** If the distributor has been removed from the vehicle, perform the steps outlined under figure 50.

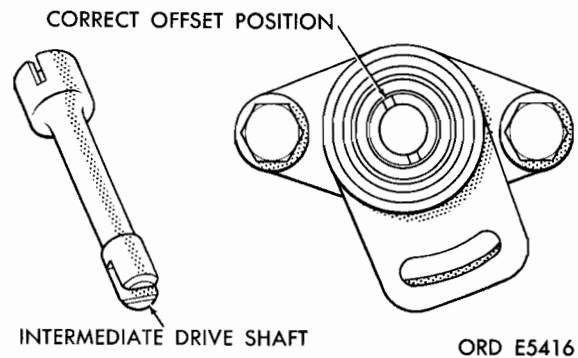
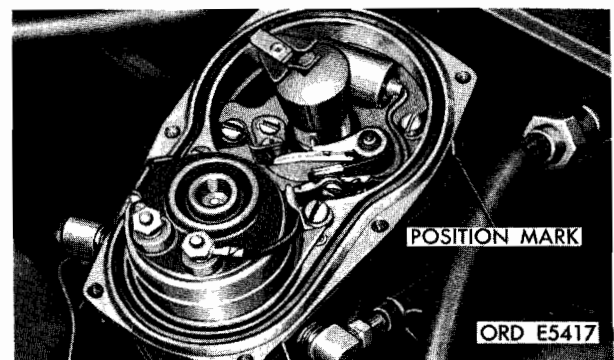


Figure 50. Locating no. 1 cylinder top dead center.

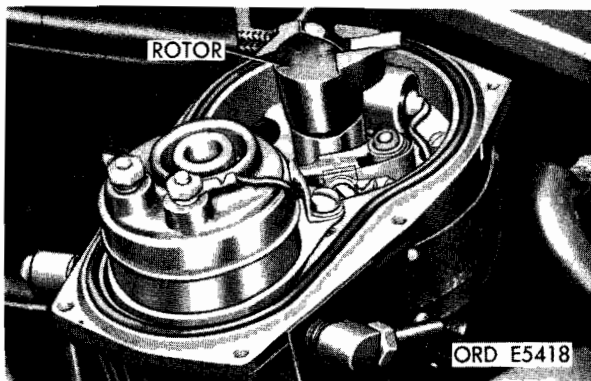
- (1) Remove cylinder no. 1 spark plug and rotate crankshaft clockwise, when viewed from the front, until piston no. 1 is on the compression stroke, as evidenced by an outrush of air through the spark plug port.
- (2) Continue clockwise rotation until the 6° ignition timing mark on the crankshaft pulley approximately 9/32 inch to the right of the timing pointer.
- (3) With intermediate distributor drive shaft removed, look into engine adapter. The drive tongue should be in the offset position shown in figure 50.
- (4) Place small end of intermediate drive shaft in engine adapter and rotate until slot bottoms on drive tongue.

b. Timing. Steps 1 through 9, figure 51, show operations required for ignition timing.

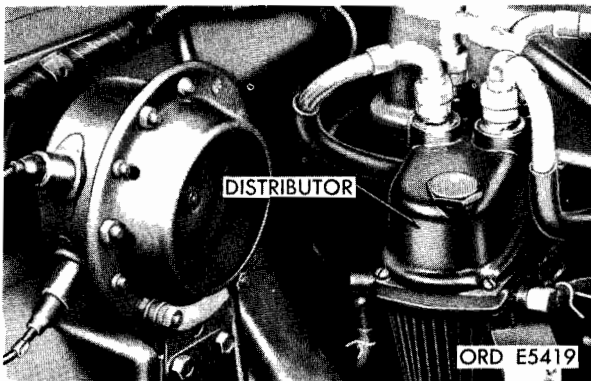


STEP 1 - Mark the position of the no. 1 spark plug cable on distributor base. Adjust breaker point assembly (fig. 47) but do not install cap and cover assembly.

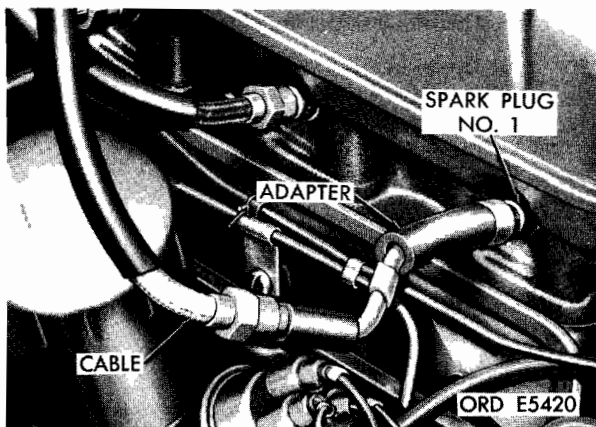
Figure 51. Ignition timing (continued)



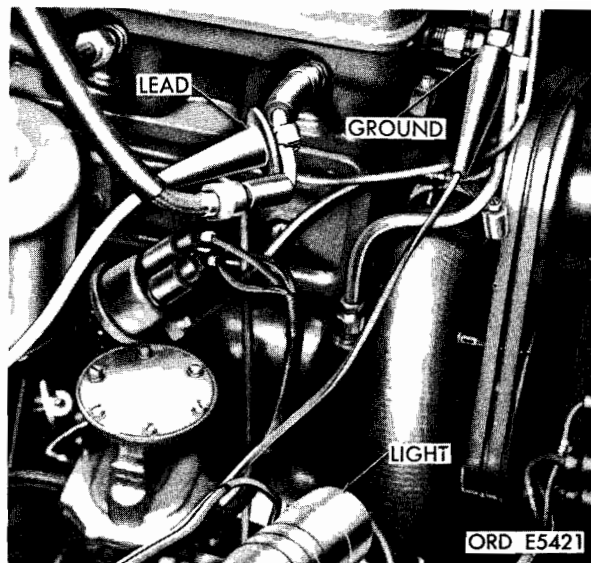
STEP 2 - Rotate crankshaft until rotor is positioned toward no. 1 spark plug cable mark and timing marks are aligned.



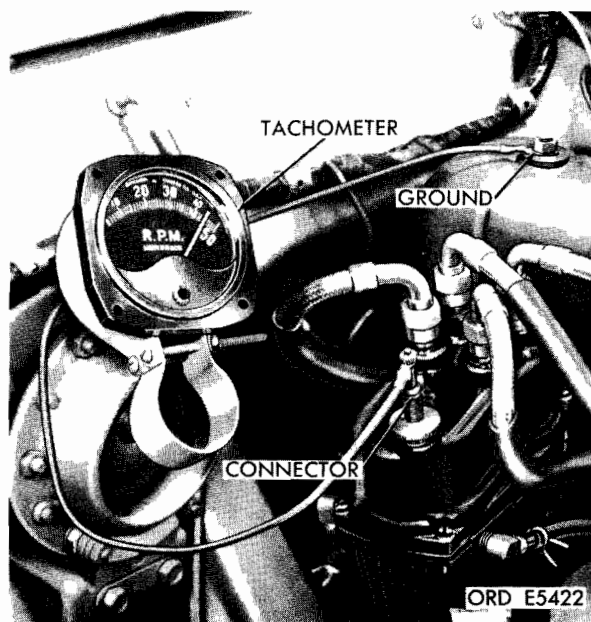
STEP 3 - Slowly rotate distributor counter-clockwise until breaker points just start to open. Tighten mounting screw to a snug fit and install cap and cover assembly.



STEP 4 - Remove no. 1 spark plug cable from spark plug, place timing light adapter on spark plug, and attach spark plug cable to timing light adapter.



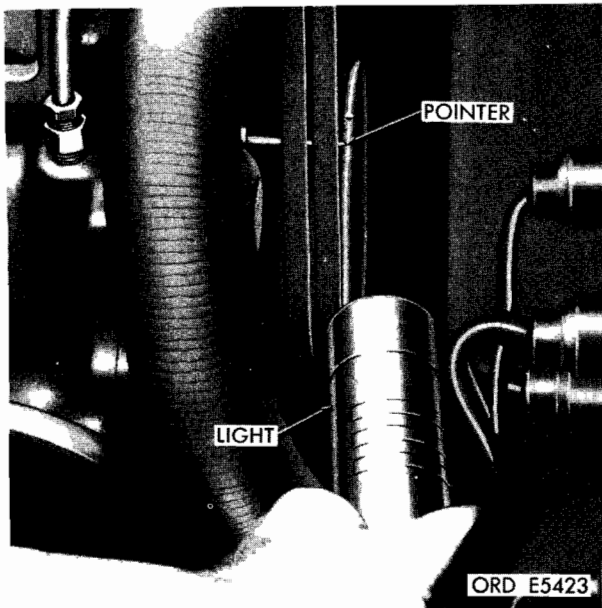
STEP 5 - Connect timing light leads to timing light adapter, ground, and battery.



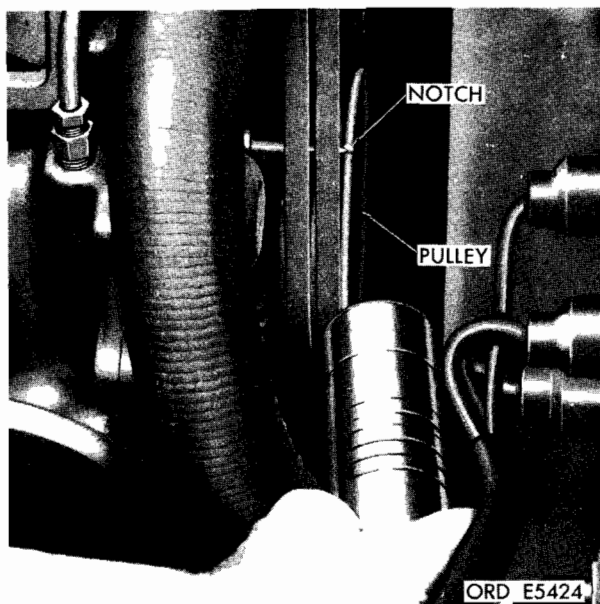
STEP 6 - Attach tachometer to primary connector and ground. Adjust engine idle to 450 to 500 rpm.

Figure 51. Ignition timing

(continued)



STEP 7 - With engine idling, direct timing light at timing pointer on timing gear cover.



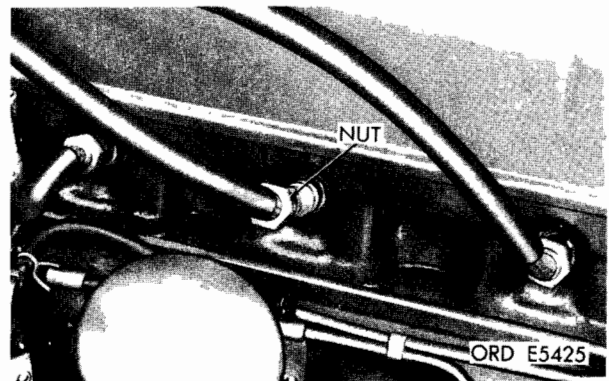
STEP 8 - Slowly rotate distributor until timing pointer and crankshaft pulley notch are alined. When timing marks are alined, firing will take place at 6° before top dead center of piston travel. When this alinement is accomplished, tighten distributor to distributor mounting screw.

STEP 9 - After tightening check timing to determine that tightening has not disturbed alinement. Increase engine speed while directing timing light to notch and pointer. Notch should move away from pointer if distributor automatic advance is functioning. Disconnect all timing devices and install timing plug and spark plug cable.

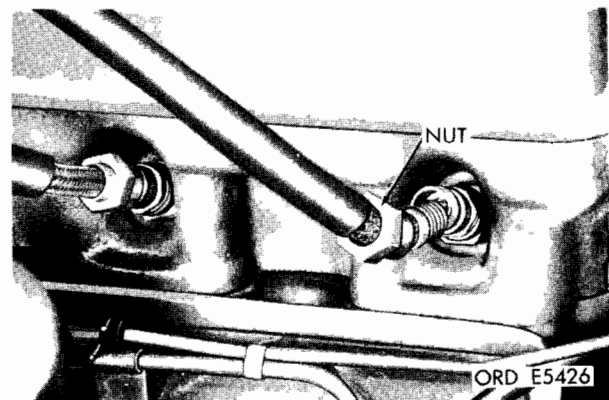
Figure 51. Ignition timing

## 69. SPARK PLUGS AND SPARK PLUG CABLES

a. Removal. Steps 1 through 5, figure 52, show operations for removing spark plugs and spark plug cables.



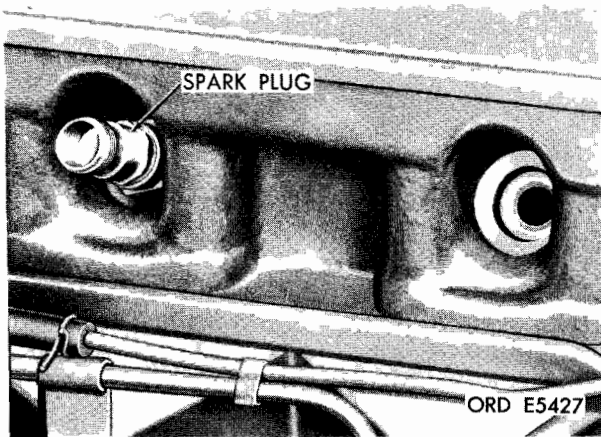
STEP 1 - Disconnect terminal nuts securing spark plug cable to spark plugs.



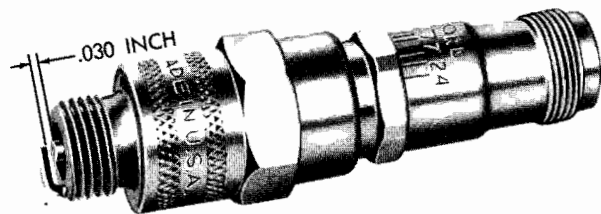
STEP 2 - Remove all dirt from cylinder head recess around spark plugs.

Figure 52. Spark plug and spark plug cables  
(continued)

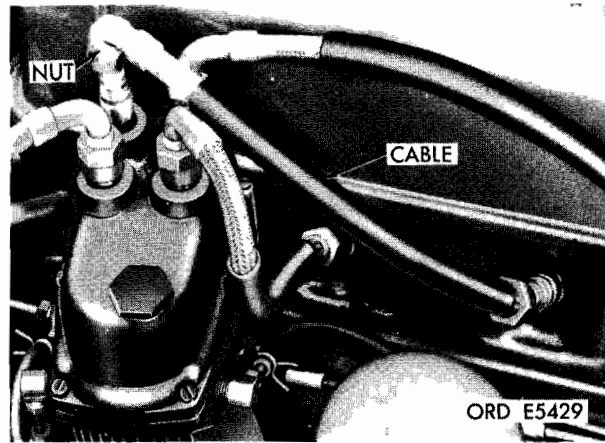




STEP 3 - Use a deep socket wrench and remove spark plugs. Discard spark plug gaskets.



STEP 4 - Clean spark plugs on a spark plug cleaner and tester. Adjust gap to .030 inch.



STEP 5 - Disconnect terminal nuts between spark plug cables and distributor, and between spark plug cables and spark plugs. Remove cables.

Figure 52. Spark plug and spark plug cable removal

b. Installation. Steps 5 back through 1, figure 52, show operations for installing spark plugs. Use new spark plug gaskets for installation. Torque all spark plugs to 25-30 lb-ft.

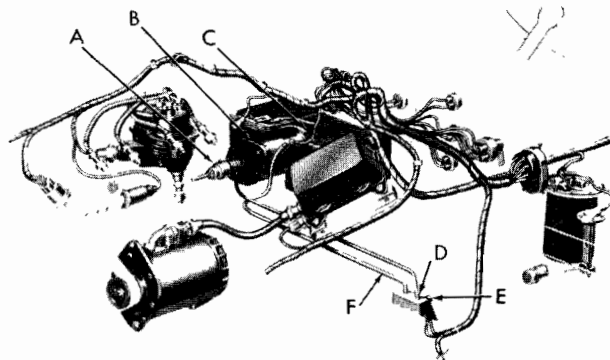
NOTE. Step 5 shows the four spark plug cables. If it is necessary to install new spark plug cables, mark correct cable numbers on distributor.

## Section XII. STARTING SYSTEM

### 70. DESCRIPTION AND DATA

a. Description. The starting system consists of starting motor assembly, starter switch, and connecting electrical cables. Figure 53 is a phantom view of the starting system. The starting motor is a 24 volt, series wound, two pole, four brush, waterproof unit. It is

mounted on the right rear face of the flywheel housing. The starting motor assembly is equipped with an overrunning clutch to prevent damage to the starting motor at engagement with the flywheel or when engine speed is greater than that of the starting motor.



ORD E5430

A. Bendix drive (overrunning clutch)  
 B. Starting motor  
 C. Battery to starter cable

D. Starter switch  
 E. Starter switch button  
 F. Starter switch to starting motor cable

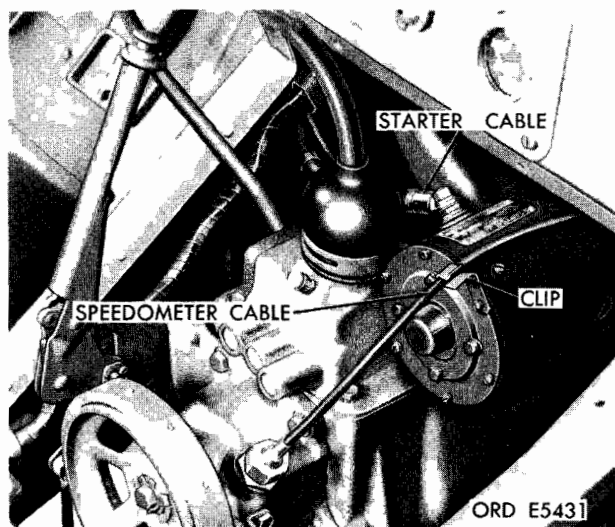
Figure 53. Phantom view of the starting system

b. Data

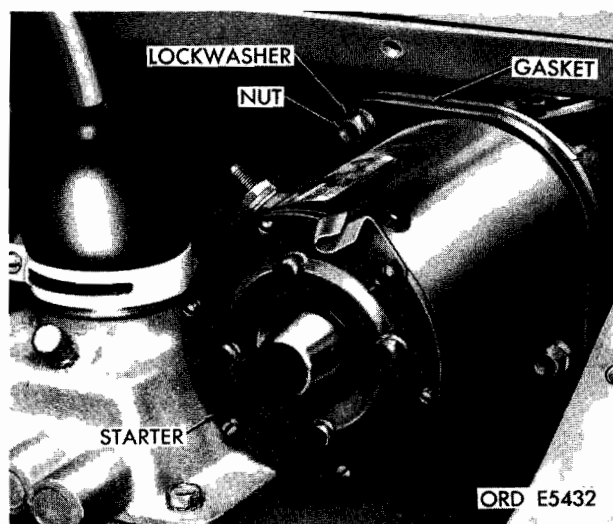
Starting Motor		Series
Type	_____	24
Voltage	_____	follow-through (overrunning clutch)
Drive	_____	below clutch pedal
Starting Switch	_____	bracket on clutch pedal
Actuated by	_____	

## 71. STARTING MOTOR

a. Removal. Steps 1 and 2, figure 54, show operations for removing starting motor.



**STEP 1** - Disconnect battery ground cable and remove transmission cover plate (fig. 10, steps 5 to 10). Remove speedometer cable from transfer and from speedometer cable clip attached to starter. Remove clip.



**STEP 2** - Remove two starting motor mounting nuts and lockwashers. Lift off starting motor and gasket. Discard gasket.

Figure 54. Starting motor removal

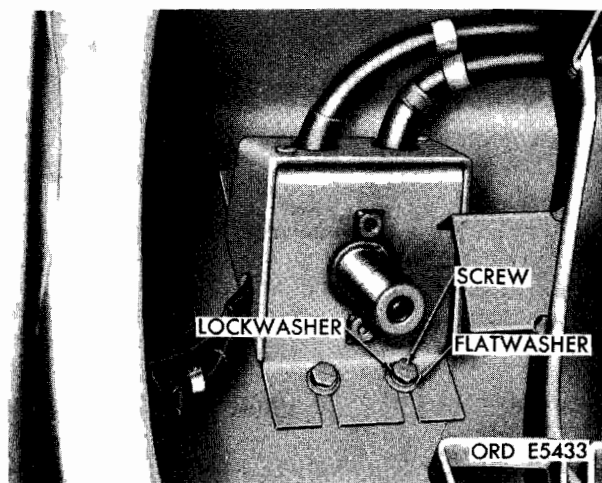
b. Installation. Clean starter mounting gasket surfaces on starter and flywheel housing before installing gasket and starter. Steps 2 and 1, figure 54, show operations for installing starting motor. Use new gasket for installation.

## 72. STARTING SWITCH

a. Removal. Steps 1 through 4, figure 55, show operations for removal of starting switch.

b. Installation. Refer to figure 55, steps 4 back through 1.

**STEP 1** - Disconnect battery ground cable (fig. 10 steps 5-8).

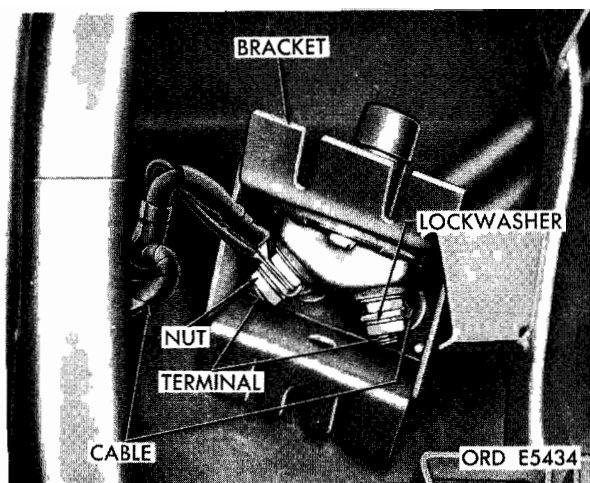


**STEP 2** - Remove four screws, flat washers and lockwashers securing starting switch bracket to floor.

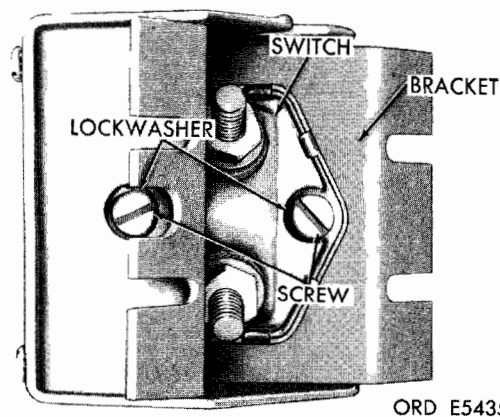
Figure 55. Starting switch removal

(continued)





STEP 3 - Pull starting switch bracket away from floor and remove two nuts and lockwashers securing cables to cable terminals.



STEP 4 - Remove two screws and lockwashers mounting starting switch to bracket and remove switch.

Figure 55. Starting switch removal

## Section XIII. GENERATING SYSTEM

### 73. DESCRIPTION AND DATA

a. Description. The generating system consists of generator, generator regulator, and connecting cables. Figure 56 is a phantom view of the generating system. The generator is a two-brush, 25 ampere, 24 volt, waterproof unit, mounted on the left side of the engine. It is driven by two crankshaft driven "V" belts. The generator regulator consists of three units; the voltage limiter which controls generator output voltage to prevent overcharging the batteries; the current limiter which prevents overloading the generator; and the cut out which prevents discharging of the batteries when generator output falls below the level required to charge the batteries.

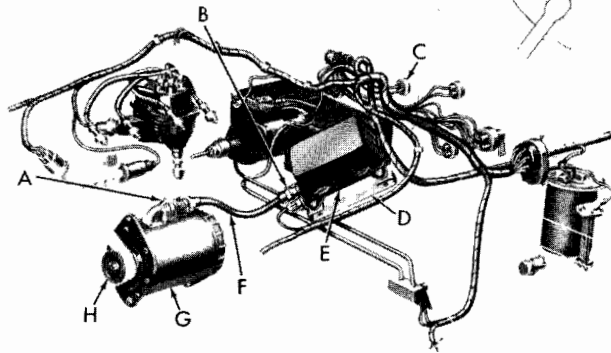
#### b. Data

##### Generator

rated output — 25 amp  
ground  
polarity — negative  
voltage — 28.5  
type — shunt wound  
cut in speed — 1310 generator rpm

##### Generator Regulator

current limit — 25 amp  
ground  
polarity — negative  
voltage — 24  
cutout closing  
voltage — 25.5 to 27.2 volts  
voltage limiting at 70°F — 28.2 to 28.8 volts



ORD E5436

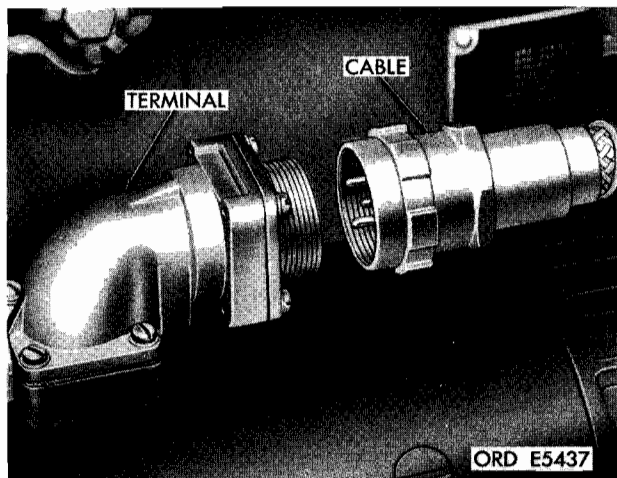
- |  |   |
|--|---|
| A. Generator electrical receptacle           | E. Generator regulator                    |
| B. Generator regulator electrical receptacle | F. Generator to generator regulator cable |
| C. Battery generator indicator               | G. Generator                              |
| D. Battery generator mounting bracket        | H. Generator drive pulley                 |

Figure 56. Phantom view of generating system

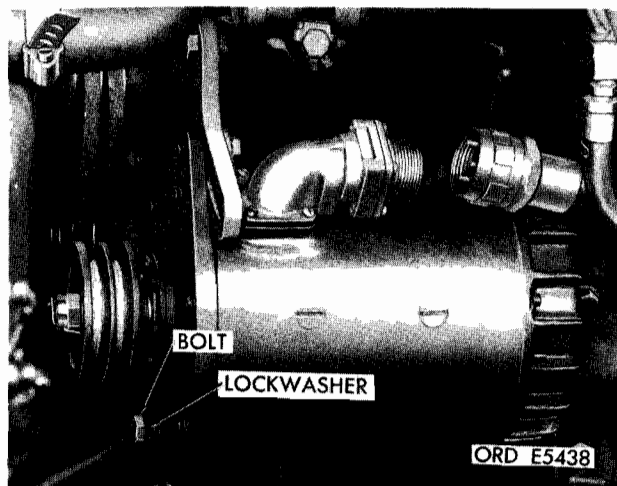
## 74. GENERATOR ASSEMBLY

a. Removal. Steps 1 through 6, figure 57, show operations for removing generator assembly and for removing pulley from generator.

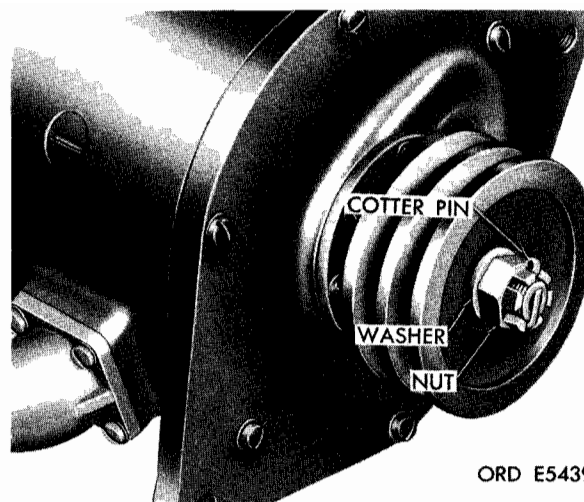
**STEP 1** - Remove air cleaner (par. 50, fig. 27, steps 1-4). Loosen generator and remove fan belts (par. 46, fig. 26, steps 1-2).



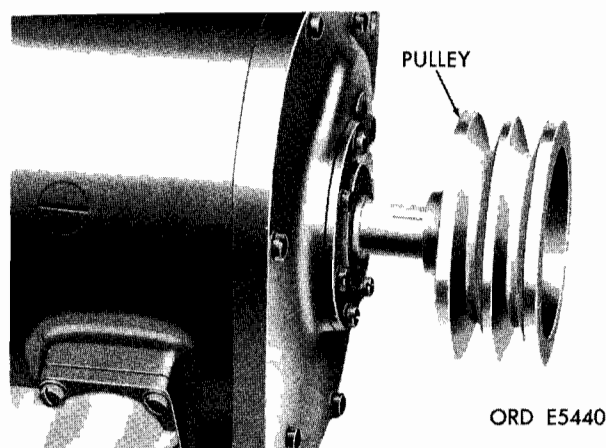
**STEP 2** - Disconnect generator-to-generator regulator cable at generator terminal.



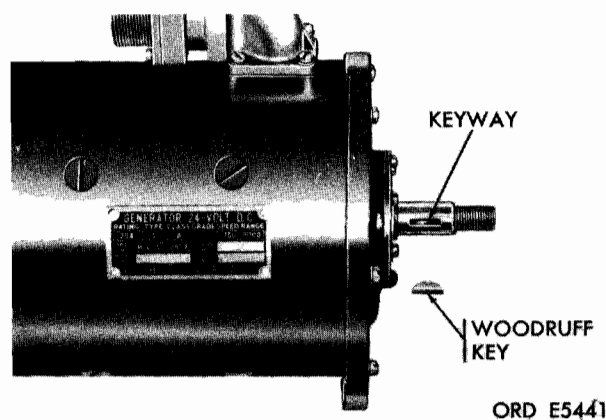
**STEP 3** - Remove two mounting bolts and lock washers and remove generator.  
**NOTE.** When installing generator make sure generator mounting bracket bolts are tight. Loose bolts may cause damage to the cylinder block.



**STEP 4** - Remove cotter pin, washer, and nut. Discard cotter pin.



**STEP 5** - Remove pulley from generator shaft using suitable puller.



**STEP 6** - Remove woodruff key from slot in generator drive.

Figure 57. Generator removal

b. Installation. Steps 6 back through 1, figure 57, show operations for installing generator assembly and for installing pulley on generator. Use new cotter pins at installation. When installing pulley on replacement generator, be sure spacer, Woodruff key, pulley, and washer are properly seated. Torque pulley nut to 35-40 lb-ft.

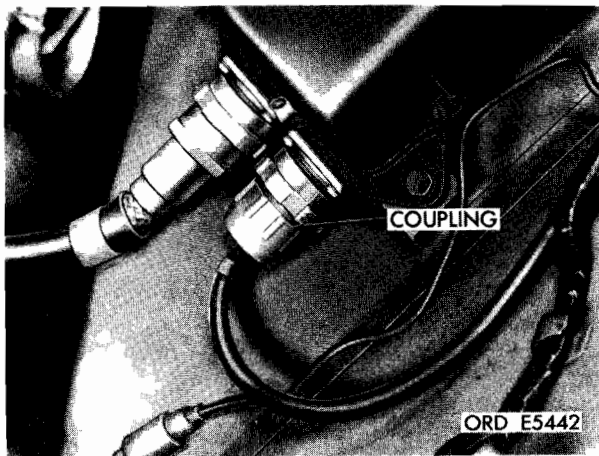
**WARNING.** All generators are shipped without lubricant. Before installing on vehicle, 0.4 oz of MIL-O-2104 oil must be added to oil reservoir.

**NOTE.** Refer to paragraph 47 for drive belt adjustment.

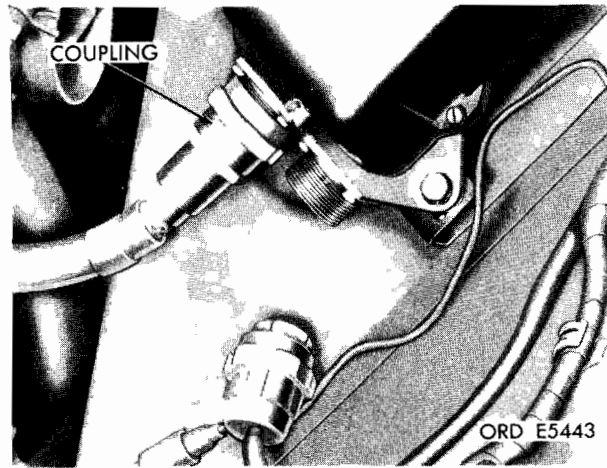
## 75. GENERATOR REGULATOR

a. Removal. Steps 1 through 4, figure 58, show operations for removing generator regulator.

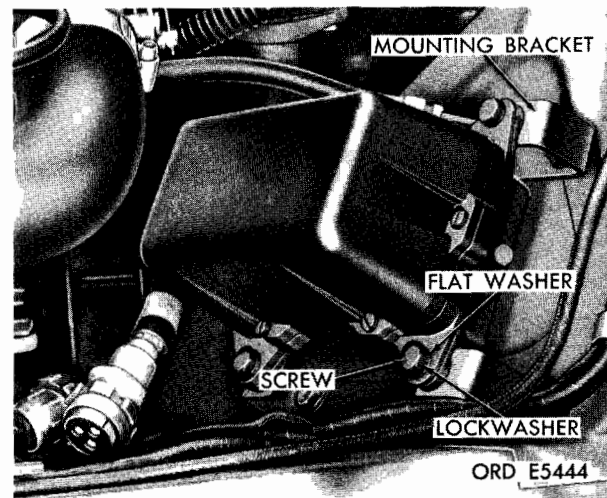
**STEP 1 - WARNING.** Disconnect battery ground cable (fig. 10, step 5 to 8). Remove air cleaner hose (fig. 31, step 1).



**STEP 2 -** Using spanner wrench, disconnect generator regulator cable coupling and pull plug out of receptacle.



**STEP 3 -** Using spanner wrench, disconnect generator to generator regulator cable coupling and pull plug out of receptacle.



**STEP 4 -** Remove mounting screws and washers and remove generator regulator with mounting brackets attached.

Figure 58. Generator regulator removal

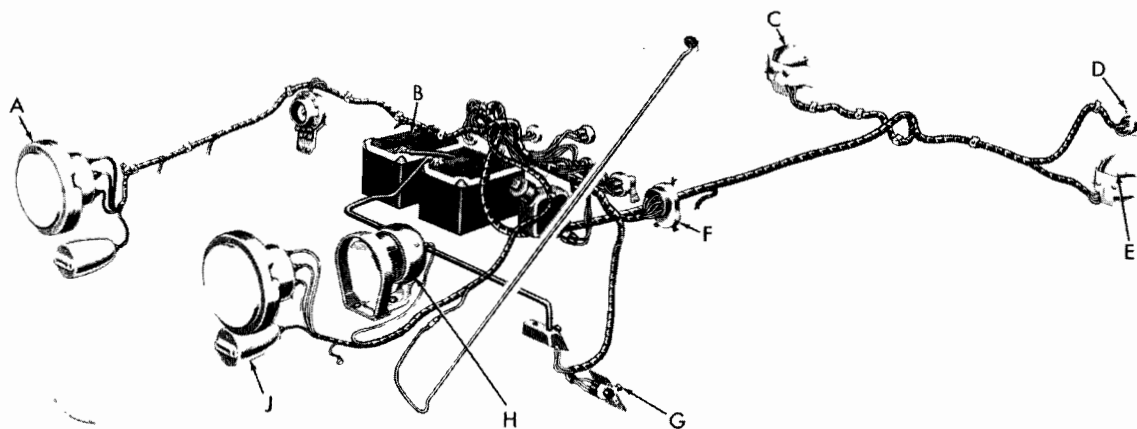
b. Installation. Steps 4 back through 1, figure 58, show operations for installing generator regulator.

## Section XIV. BATTERIES AND LIGHTING SYSTEM

### 76. DESCRIPTION

a. General. The batteries and lighting system are waterproofed. A circuit breaker in the light switch protects the lighting system from overload. All light circuits are controlled by

the light switch on the instrument panel. Figure 73 shows the wiring diagram and cable identification for the vehicle. Figure 59 is a phantom view of the batteries and lighting system. Cables are identified by numbered tags near the end of each cable.



ORD E5445

A. Headlight  
B. Batteries  
C. Blackout and service taillight  
D. Trailer receptacle

E. Blackout and service stoplight  
F. Light switch  
G. Dimmer switch  
H. Blackout drive light  
J. Blackout service

Figure 59. Phantom view of the batteries and lighting system

b. Batteries. The 24 volt primary circuit is supplied by two 12 volt lead and acid-type storage batteries, connected in series. The batteries and connections are designed for under water operation.

c. Service headlights. The sealed beam-type service headlights are mounted in the brush guard. High or low beam is selected by a foot-operated dimmer switch.

d. Blackout driving light. A single blackout driving light is mounted on the left front fender. This driving light supplies a diffused, low-intensity light beam, for use when the tactical situation prohibits use of the service headlights.

e. Blackout marker lights. Two light assemblies, one mounted below each service headlight, serve the purpose of blackout marker lights.

f. Blackout tail and stop light. The blackout tail and stop light is mounted on the right rear corner of the vehicle body. The unit includes two lamps, a blackout stop light in the upper half, and a blackout taillight in the lower half.

g. Service tail and stop light assembly. The service tail and stop light assembly is mounted in the left rear corner of the vehicle body. The upper half of the assembly houses two lamp units, a service taillight, and a service stop light. The lower half houses a single lamp unit, a black out taillight.

h. Trailer coupling electrical receptacle. A four-terminal receptacle is mounted on the left rear corner of the body of the vehicle. This receptacle provides a means of connecting the electrical units of a towed trailer to the vehicle electrical system. When connected, trailer lights are controlled by the towing vehicle light switch.

## 77. DATA

### Battery:

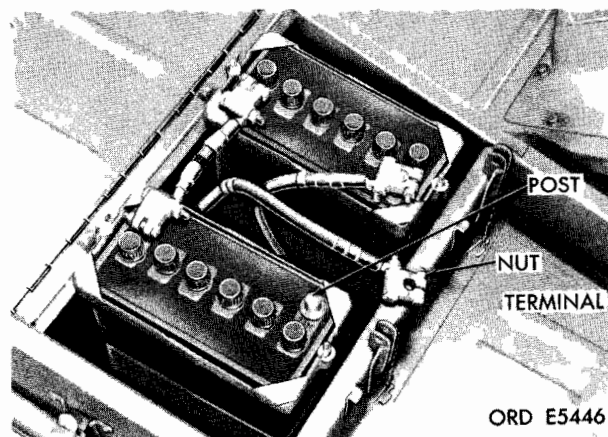
Model	_____	2 HN
Voltage	_____	12
Plates per cell	_____	11
Terminal	_____	
grounded	_____	negative
Type	_____	waterproof
Number used	_____	2
Connected in	_____	
vehicle	_____	series for 24v
Ampere-hour	_____	
capacity	_____	45 at 20 hr rate

## 78. BATTERIES

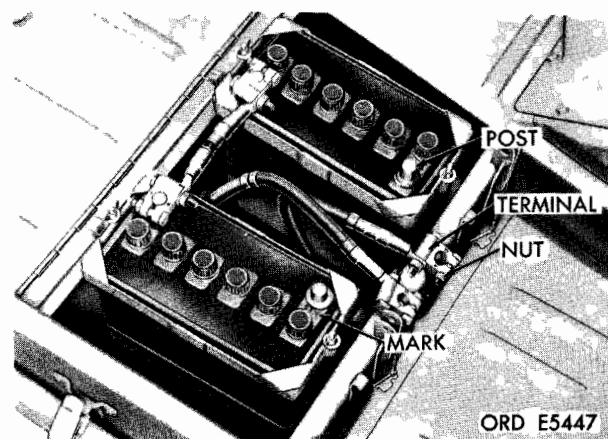
a. General. For instructions on adding water, cleaning, performing specific gravity test, and for charging batteries, refer to TM-9-2857.

b. Removal. Steps 1 through 6, figure 60, show operations for removing batteries.

STEP 1 - Remove passenger seat and battery compartment cover (fig.10, steps 5-7).



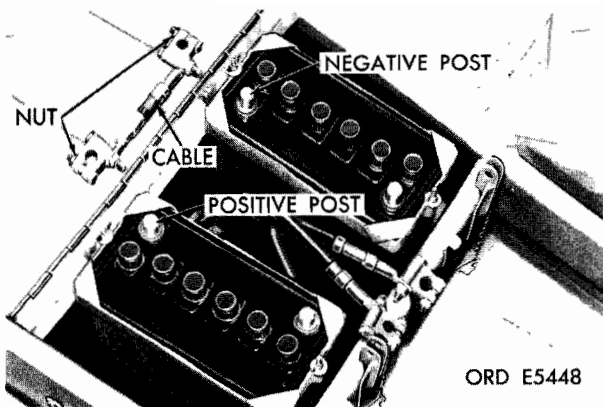
STEP 2 - Loosen battery ground cable terminal bolt nut and remove ground cable terminal from negative post of right battery.



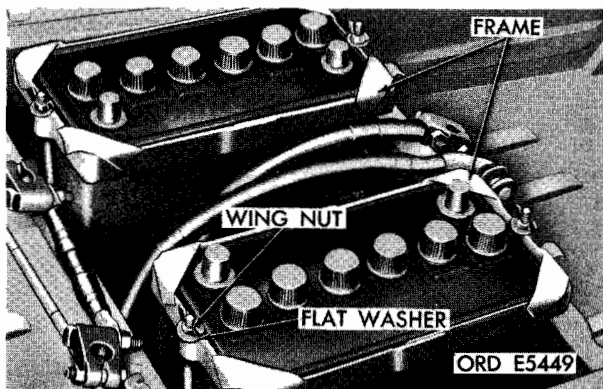
STEP 3 - Loosen battery cable terminal bolt nut and remove cable terminal from positive post of left battery.  
**CAUTION.** Prior to assembly make sure all switches are "OFF".

Figure 60. Battery removal

(continued)



**STEP 4** - Loosen battery connector cable terminal bolt nuts and remove battery connector cable from positive post of right battery and negative post of left battery.



**STEP 5** - Remove four battery hold down wing nuts and flat washer. Remove two hold down frames.

**STEP 6** - Lift batteries from compartment. **CAUTION.** Do not use a lifting strap that connects to battery posts

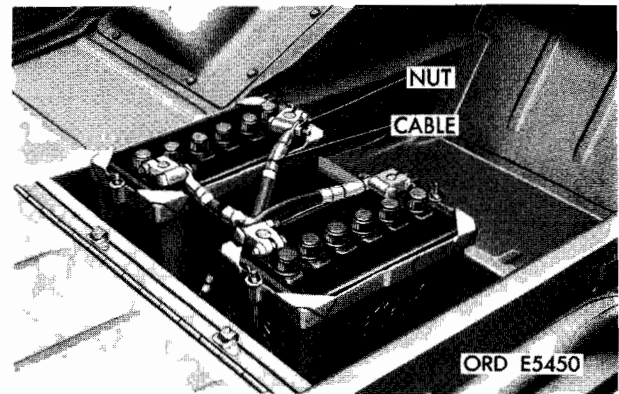
Figure 60. Battery removal

c. **Installation.** Steps 6 back through 1, figure 60, show operations for installing batteries. After installation, check battery polarity. Turn headlights on. If lights illuminate and battery generator indicator registers no apparent reading, one battery is reversed. If indicator registers CHG, both batteries are reversed. Correct installation as necessary.

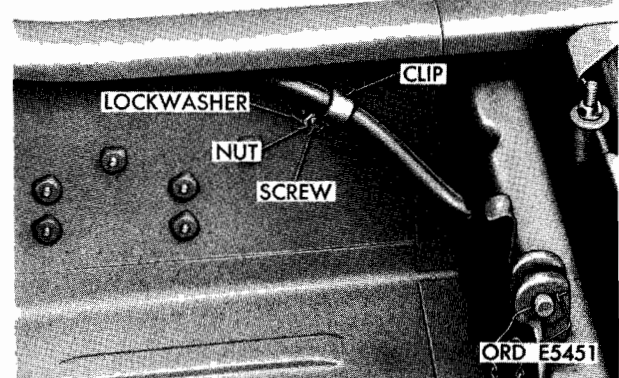
## 79. BATTERY TO STARTING SWITCH CABLE (POSITIVE)

a. **Removal.** Refer to figure 61, steps 1 through 10.

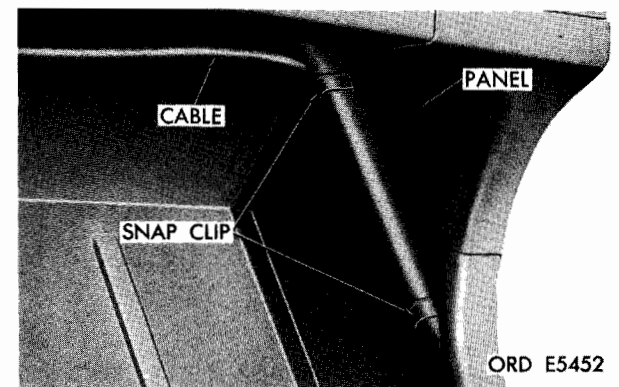
**STEP 1** - Remove passenger seat (fig. 10, steps 5 to 6) and battery cover (fig. 10, steps 7 to 8).



**STEP 2** - Loosen terminal nut and remove positive cable from left battery and remove terminal from cable end.



**STEP 3** - Remove nut, lockwasher and screw, and rubber covered clip at inside of body side panel sill.

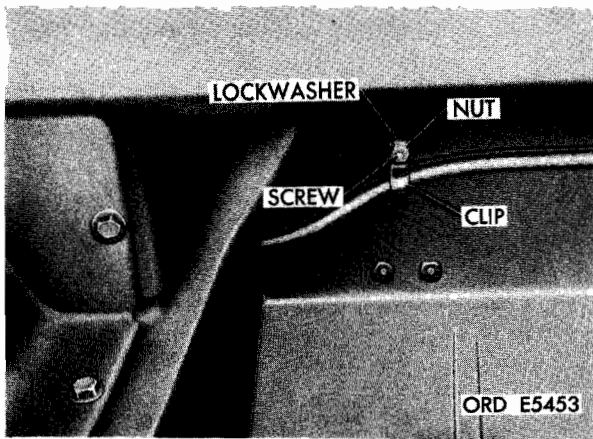


**STEP 4** - Remove snap clips securing cable to inside of body side panel sill.

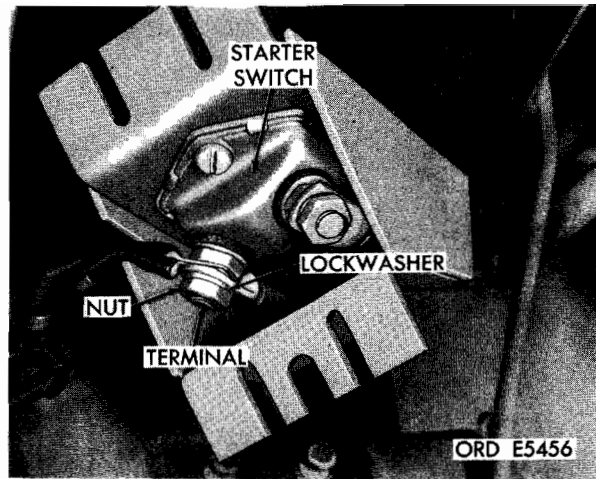
Figure 61. Battery to starting switch cable removal

(continued)

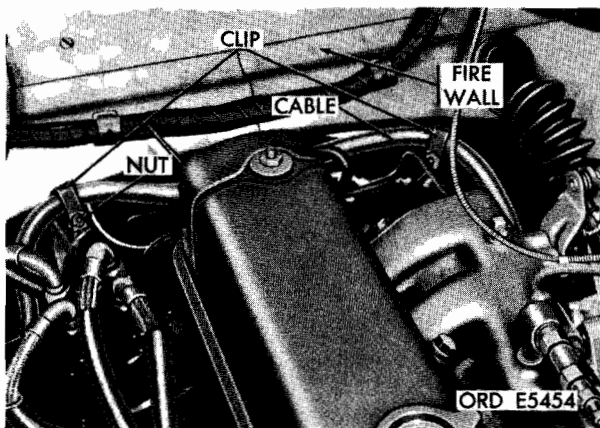




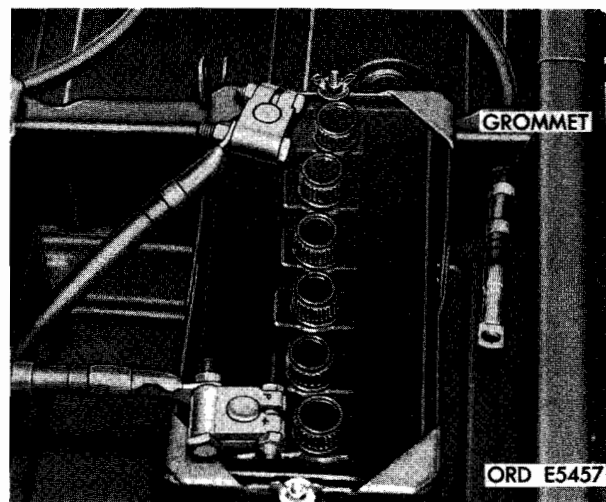
**STEP 5** - Remove nut, lockwasher and screw. Remove rubber covered clip on fire wall and cable inside passenger compartment.



**STEP 8** - Remove starting switch (par. 72). Remove cable from terminal (fig. 55, step 3).



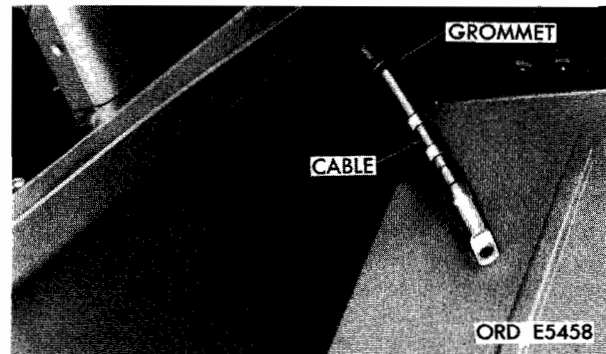
**STEP 6** - Remove nuts and remove clips securing cable to fire wall in engine compartment.



**STEP 9** - Thread cable out of grommet at battery compartment.



**STEP 7** - Remove nut and remove rubber covered clip from fire wall above clutch pedal.



**STEP 10** - Thread cable out of grommets at both sides of transmission tunnel. Remove cable.

Figure 61. Battery to starting switch cable removal



b. Installation. Refer to figure 61, steps 10 back through 1.

## 80. HEADLIGHTS

a. Adjustment. Refer to figure 62, steps 1 through 6.

STEP 1 - Position vehicle on a level floor with no load in vehicle. Headlights should be 25 feet from a smooth vertical surface. Inflate tires to proper pressure (TM 9-2320-218-10).

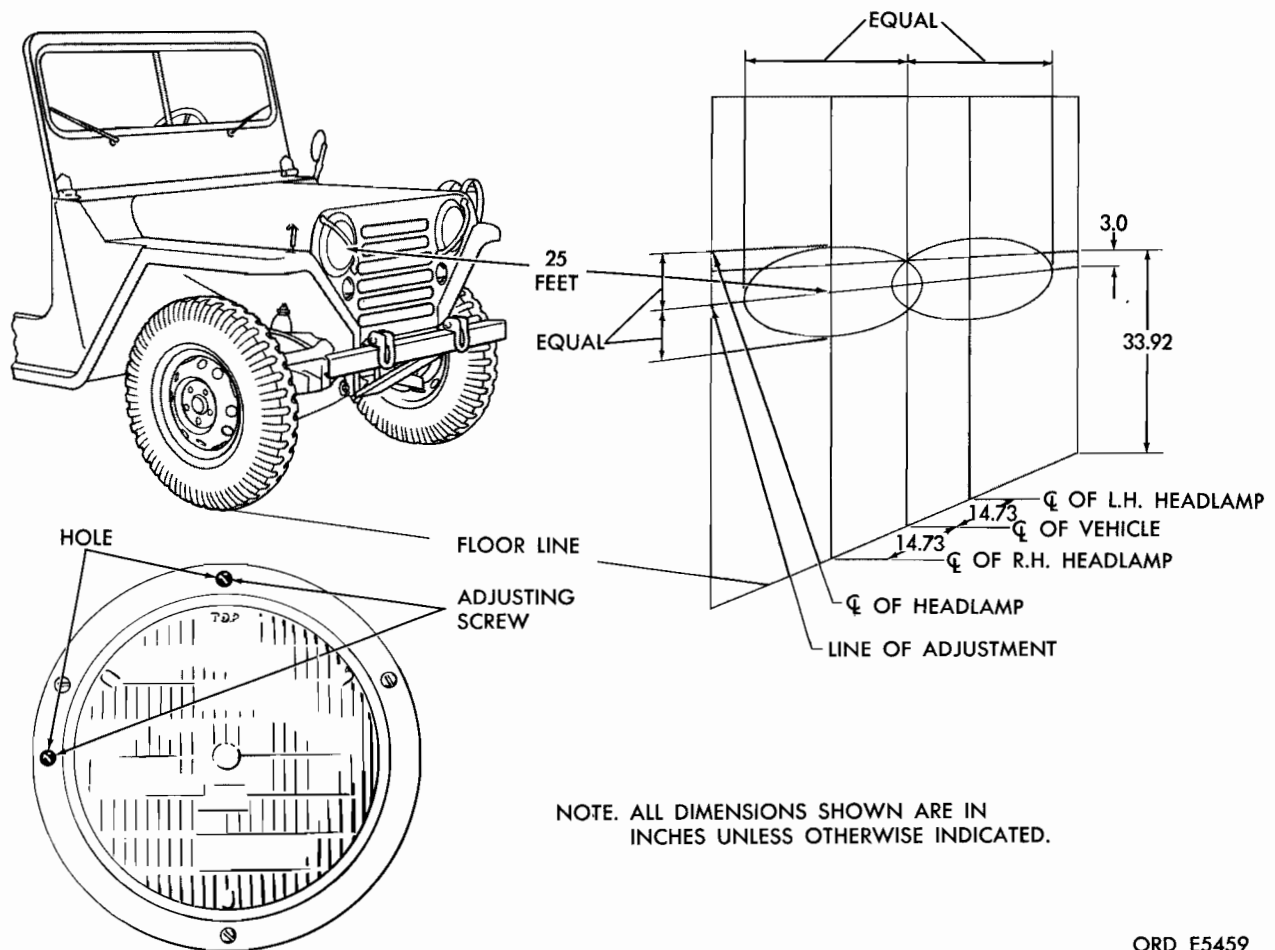
STEP 2 - Measure centerline of headlights from floor; draw a horizontal line at that height on the flat surface. Draw a second line parallel to and 3" below first line.

STEP 3 - Draw a vertical line intersecting the first two lines at the projected centerline of the vehicle.

STEP 4 - Measure distance between two headlight centers, then divide distance equally on both sides of centerline. Draw a vertical line at these points, intersecting the first two lines.

STEP 5 - Turn headlights on and select high beam. Cover one light while adjusting the other.

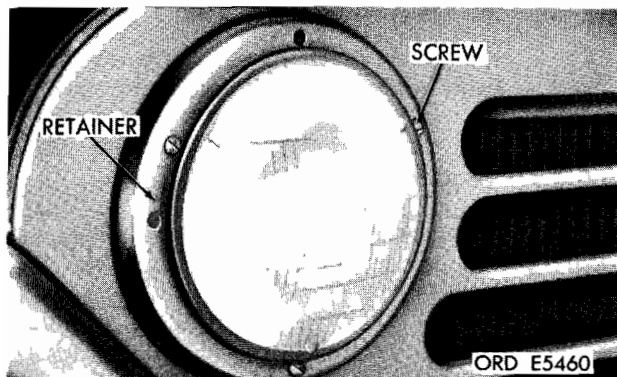
STEP 6 - Turn adjusting screws in or out until beam is adjusted to a pattern as near as possible to that shown above. Adjust other headlight in same manner.



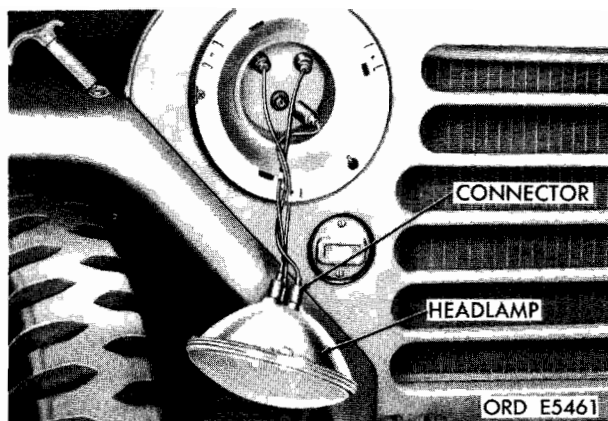
ORD E5459

Figure 62. Headlight adjustment

b. Replacement of Sealed Beam Lamp. Refer to figure 63, steps 1 and 2.



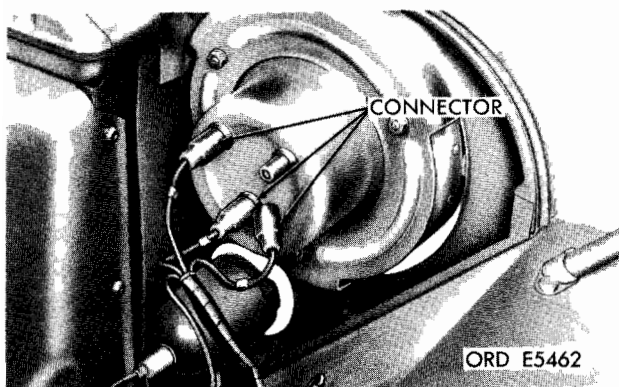
**STEP 1 -** Remove three screws and lockwashers. Remove lamp retainer.



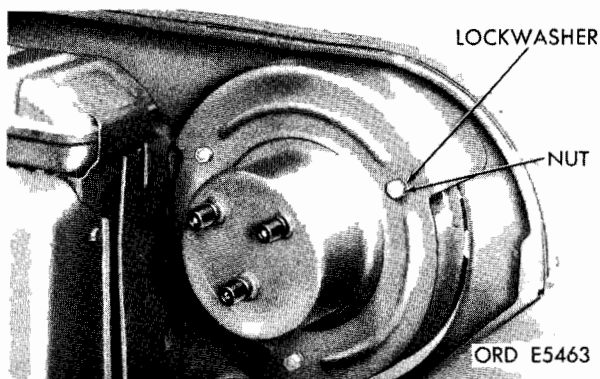
**STEP 2 -** Pull lamp out of recess. Pull electrical connectors apart. Remove lamp unit.

Figure 63. Sealed beam headlamp replacement

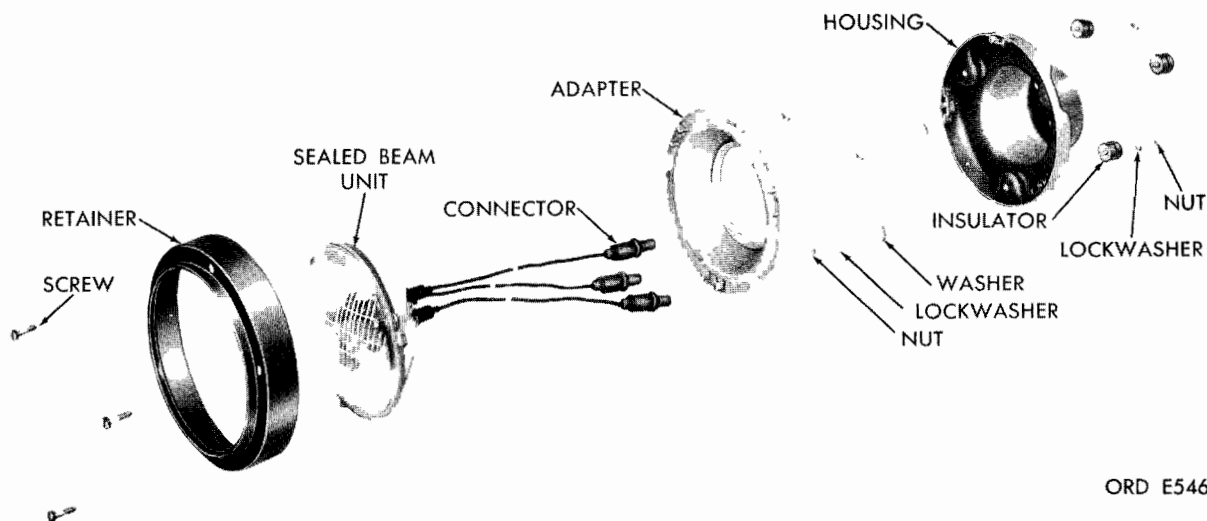
c. Removal of Headlight Assembly. Refer to figure 64 steps 1 through 4.



**STEP 1 -** Disconnect electrical connectors.



**STEP 2 -** Remove three nuts and lockwashers securing headlight assembly to brush guard. Remove headlight assembly.



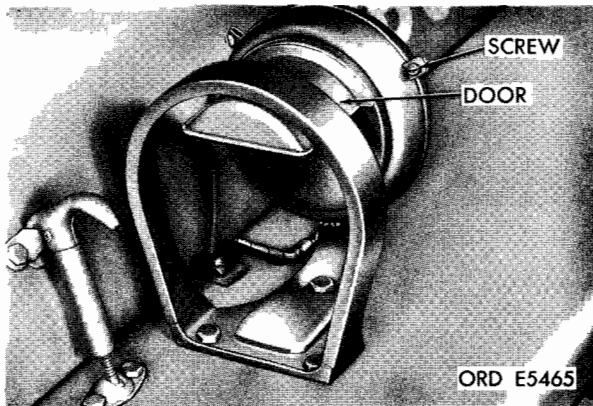
**STEP 3 -** Assemble or disassemble headlight.  
Figure 64. Headlight assembly

STEP 4 - NOTE. Whenever a new headlight assembly is installed in the vehicle it is necessary that headlights be adjusted (par. 80a, fig. 62).

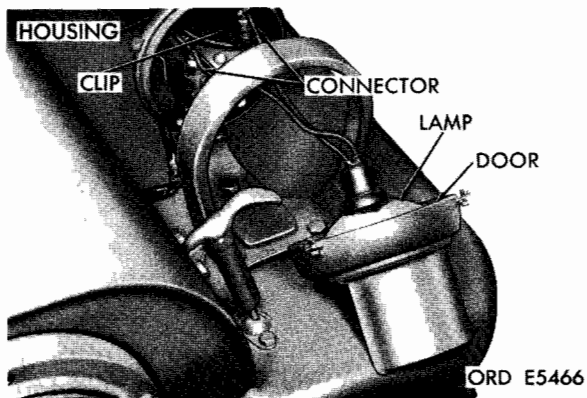
d. Installation of Headlight Assembly. Refer to figure 64, steps 4 back through 1.

## 81. BLACKOUT DRIVING LIGHT

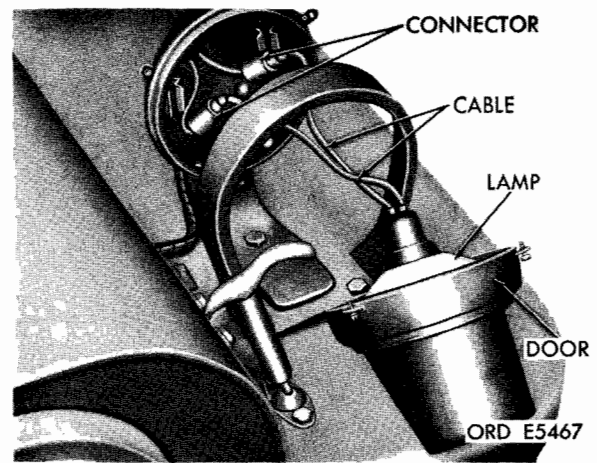
a. Replacement of Sealed Beam Lamp Unit. Refer to figure 65, steps 1 through 4.



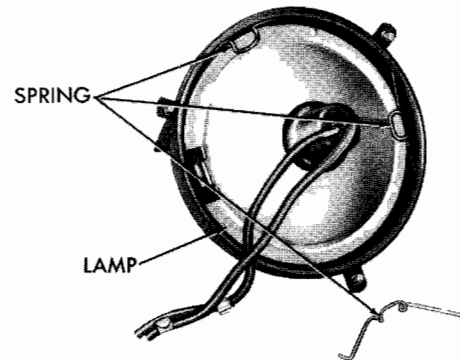
STEP 1 - Remove three screws securing door assembly.



STEP 2 - Pull door and lamp assembly free from housing and pull cable connectors free from retaining clips.

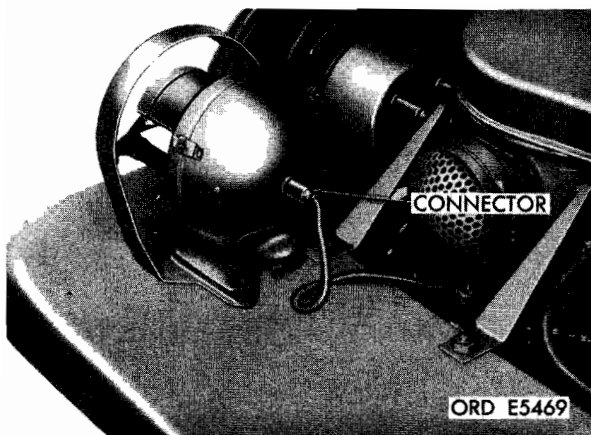


STEP 3 - Grasp cable and pull firmly, separating male and female connections and remove door and lamp assembly.

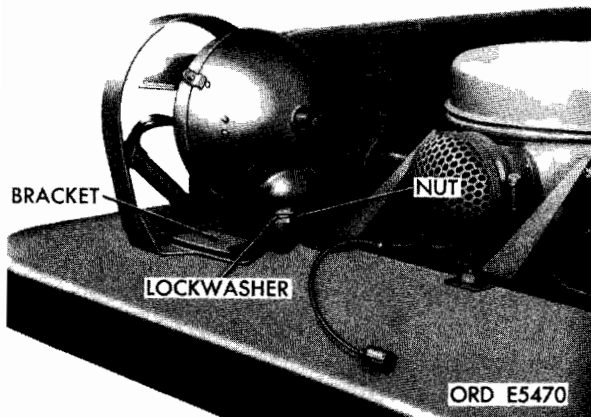


STEP 4 - Remove three lamp retaining springs and remove sealed beam lamp.

Figure 65. Sealed beam blackout driving lamp replacement



**STEP 1 -** Grasp cable and pull, separating male and female connectors.



**STEP 2 -** Remove nut and lockwasher securing blackout driving light assembly to bracket.

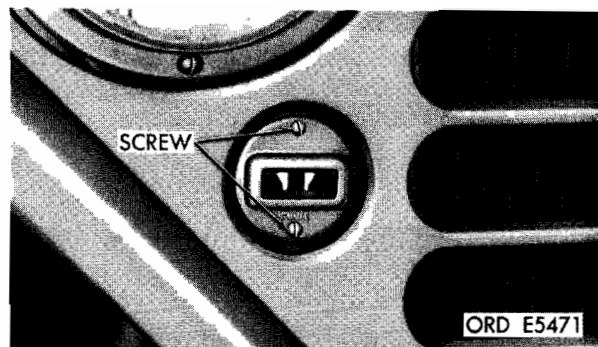
Figure 66. Blackout driving light assembly removal

**b. Removal of Blackout Driving Light Assembly.** Refer to figure 66, steps 1 and 2.

**c. Installation of Blackout Driving Light Assembly.** Figure 66, steps 2 back through 1 show operations for installing blackout driving light assembly.

## 82. BLACKOUT MARKER LIGHT

**a. Replacement of Blackout Marker Lamp.** Refer to figure 67, steps 1 and 2.



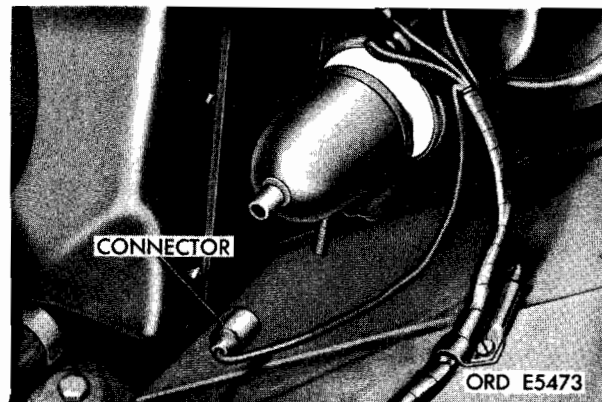
**STEP 1 -** Remove two screws and remove door assembly.



**STEP 2 -** Grasp lamp, turn counterclockwise and remove. Install new lamp. Install door assembly and screws.

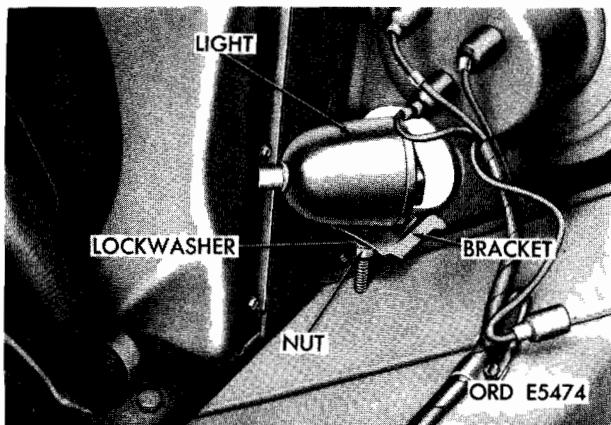
Figure 67. Blackout marker lamp replacement

**b. Removal of Blackout Marker Light Assembly.** Refer to figure 68, steps 1 through 3.



**STEP 1 -** Grasp cable and pull, separating male and female connectors.

Figure 68. Blackout marker light assembly removal (continued)



**STEP 2** - Remove nut and lockwasher securing blackout marker light assembly to bracket.

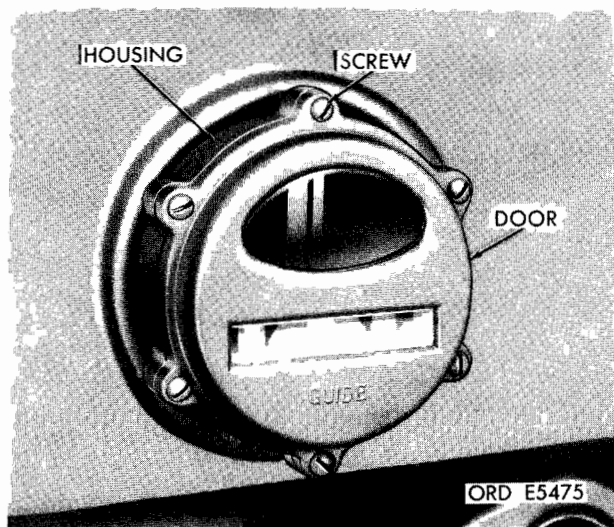
c. Installation of Blackout Marker Light Assembly. Refer to figure 68, steps 2 back through 1.

Figure 68. Blackout marker light assembly removal

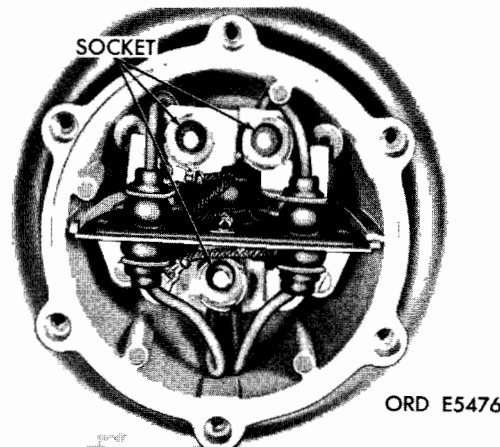
### 83. TAIL AND STOP LIGHT ASSEMBLIES - BLACKOUT AND SERVICE

**NOTE.** Procedures shown below apply to either tail light assembly with the only exception being the number of electrical cable connections. The service tail light has three cable connections and the blackout tail light has only two.

a. Replacement of Lamps. Refer to figure 69, steps 1 and 2.



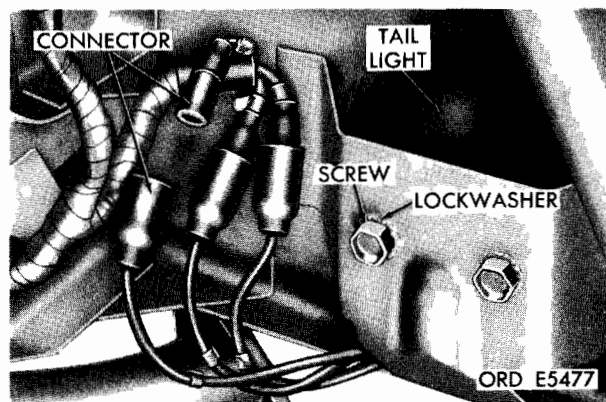
**STEP 1** - Remove six screws securing door to light housing. Remove door



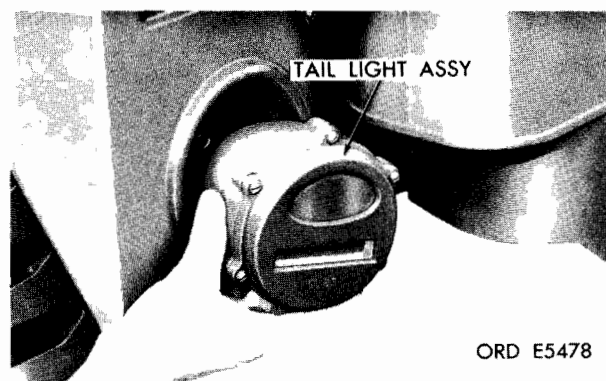
**STEP 2** - Press lamp in and turn counter-clockwise and remove lamp. Install new lamp. Install door and screws.

Figure 69. Tail lamp replacement

b. Tail Light Assembly Removal. Refer to figure 70, steps 1 and 2.



**STEP 1** - Disconnect cable connectors. Remove two screws and lockwashers securing the tail light assembly.



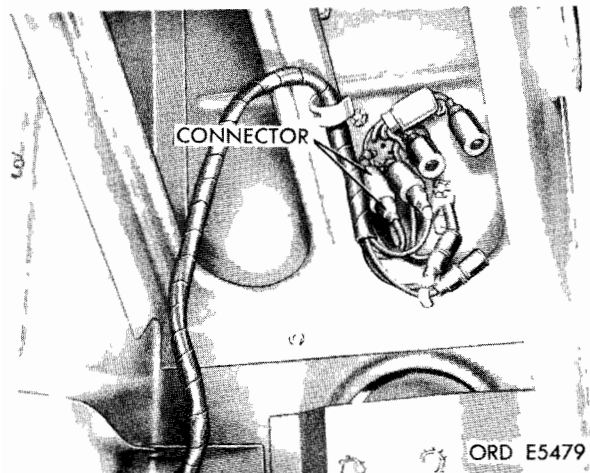
**STEP 2** - Remove from opening in body.

Figure 70. Tail light assembly removal

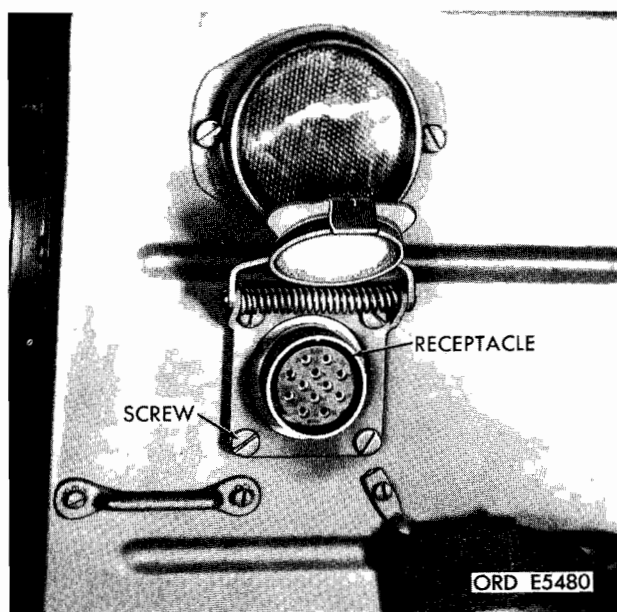
c. Tail Light Assembly Installation. Refer to figure 70, steps 2 back to 1.

#### 84. TRAILER ELECTRICAL CONNECTOR RECEPTACLE

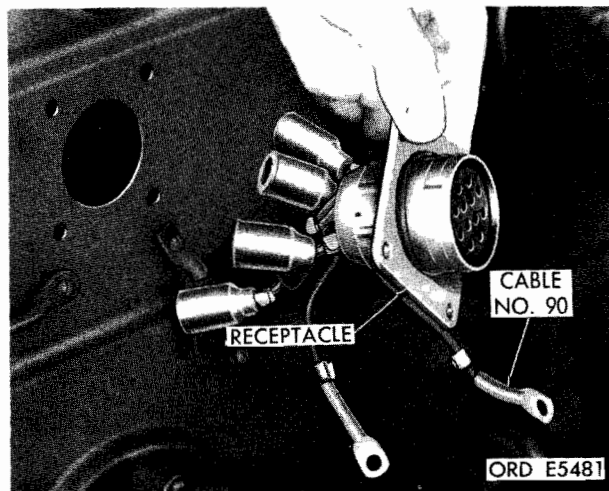
a. Removal. Refer to figure 71, steps 1 through 3.



STEP 1 - Grasp cables and pull, separating male and female connectors.



STEP 2 - Remove screws securing trailer electrical connector receptacle.



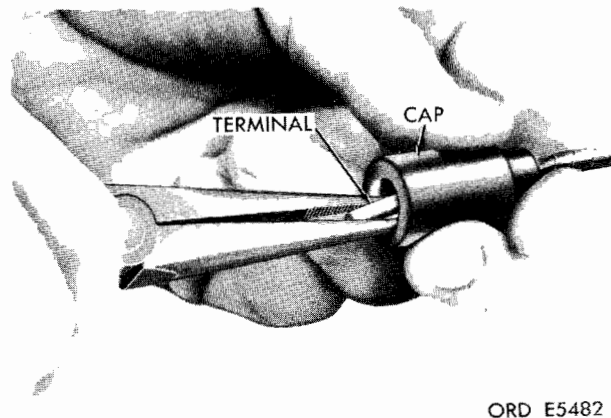
STEP 3 - Remove trailer electrical connector receptacle.

Figure 71. Trailer receptacle removal

b. Installation. Refer to figure 60, steps 3 back through 1.

#### 85. REPAIR OF ELECTRICAL CABLES

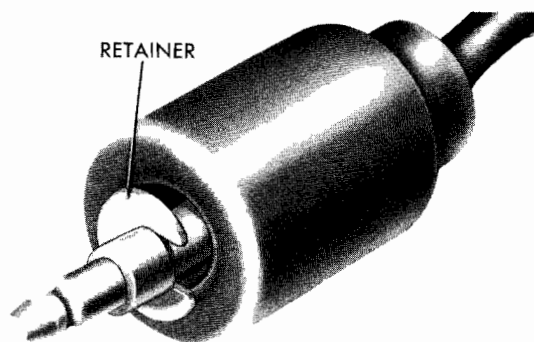
All repairs to electrical cables will be made in accordance with TB ORD 650. Terminals of braided cables will not be repaired. Figure 72, steps 1 through 3, show operations for exposing the male terminals of non braided cables. Damaged terminals will be removed and new terminals soldered or crimped in place. To expose female terminals of non braided cables simply pull the rubber water proof cap toward center of the cable away from the terminal.



STEP 1 - Use suitable tool and pull terminal out of rubber cap.

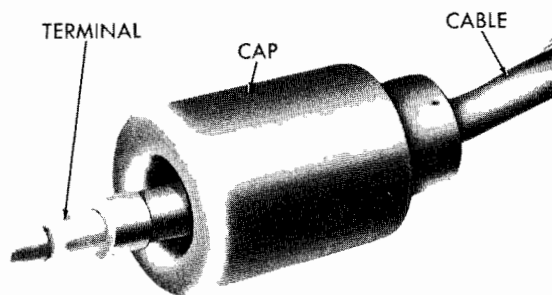
Figure 72. Exposing male terminals for repair





ORD E5483

STEP 2 - Pull "C" type retainer washer off cable.



ORD E5484

STEP 3 - Slide rubber cap off cable exposing terminal for repair.

Figure 72. Exposing male terminals for repair

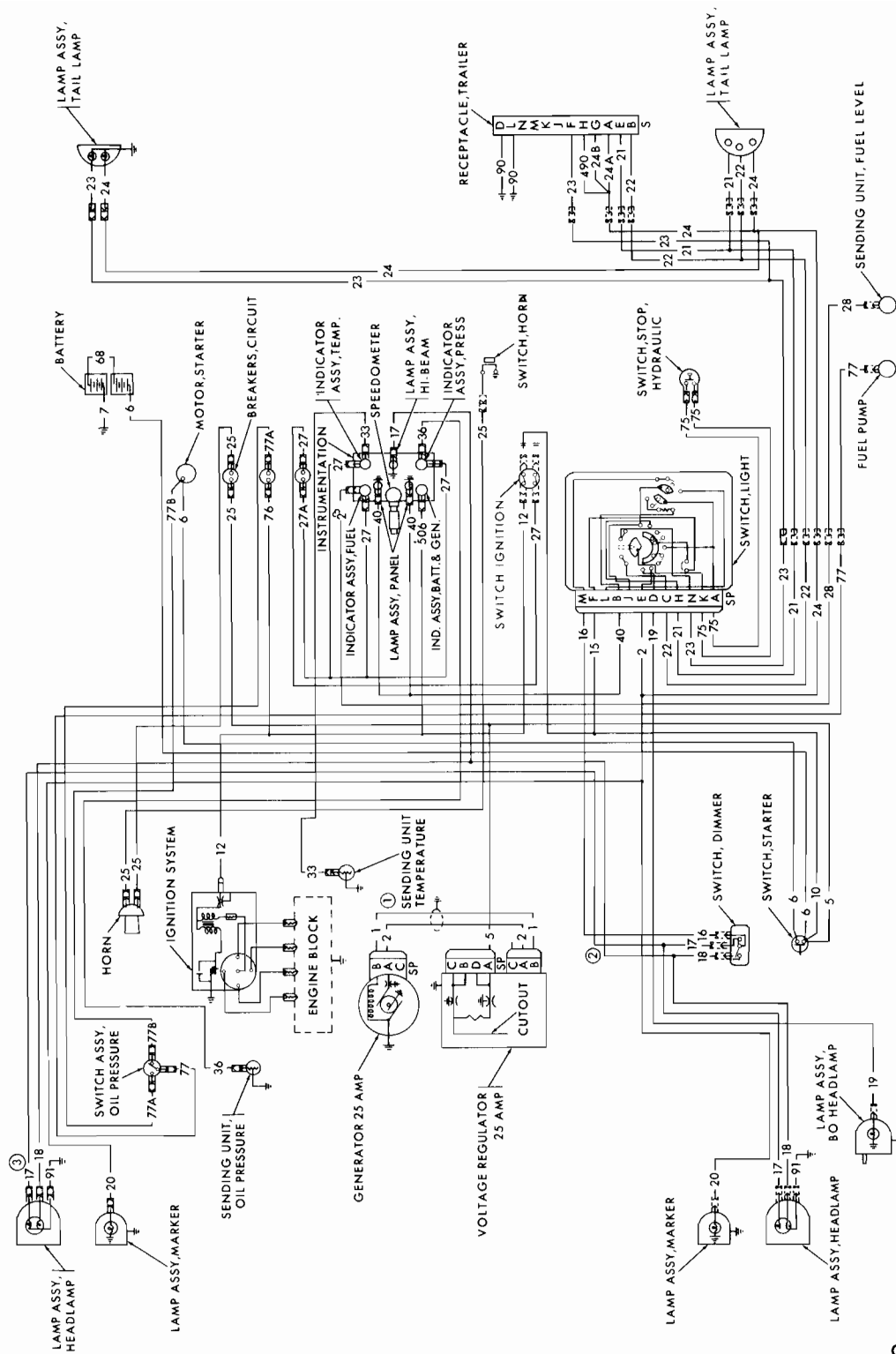
## 86. ELECTRICAL CABLES

a. General. Each electrical cable (except the spark plug cables) is identified by a numbered metal tag at each end of the cable. All cables in a single circuit are identified by the same number; however, when cables are connected through more than one connector, they may connect to a different numbered terminal at each connector. Refer to figure 61 when replacing cables.

b. Circuit Identification. Table VI lists each circuit number in the electrical system and briefly traces each circuit. A point-to-point check for circuit continuity can be made, using a battery operated test light, and a voltmeter equipped with long cables and suitable probes.

TABLE VI - Circuit Numbers and Descriptions

Circuit No.	Circuit
1	Generator field circuit
2	Generator armature circuit
3	Generator armature circuit
5	Battery to regulator and splice
6	Battery to starter circuit
7	Battery to ground
10	Battery feed to instrument panel
11	Ignition switch feed
12	Ignition switch to ignition coil and splice
15	Main light switch feed
16	Light switch to dimmer switch
17	Dimmer switch to headlamp - high beam
18	Dimmer switch to headlamp - low beam
19	Lighting switch to blackout driving lamp
20	Lighting switch to blackout marker lamps
21	Lighting switch to service tail lamp
22	Lighting switch to service stop lamp
24	Lighting switch to blackout tail lamp
24A-24B	Blackout tail lamp to trailer receptacle
25	Horn to horn switch
25A	Circuit breaker to horn
25B	Horn circuit feed
27	Instrument feed
28	Fuel gage to sending unit
33	Water temp gage to sending unit
36	Oil pressure gage to sending unit
40	Instrument lamp circuit
68	Battery interconnecting cables
75	Spotlight switch circuit
76	Fuel pump circuit feed
77	Oil pressure switch to fuel pump
77A	Circuit breaker to oil pressure switch
77B	Starter to oil pressure switch
90	Trailer receptacle to ground
91	Headlamp to ground
490	Clearance lamp blackout trailer feed
506	Generator charge indicator circuit



ORD E5485

Figure 73. Vehicle electrical components and cable identification



## Section XV. INSTRUMENT PANEL, GAGES, SWITCHES, SENDING UNIT AND HORN

### 87. GENERAL

a. Instrument Cluster. The speedometer (with odometer), battery-generator indicator, fuel level gage, temperature indicator, oil pressure indicator, headlight highbeam indicator, and two instrument panel lights are mounted in the instrument panel. The panel, together with mounted instruments and lights is referred to as the instrument cluster.

b. Switches. The vehicle contains the following switches, coverage for which is provided in this section or as indicated:

- (1) Lighting switch (par. 90 )
- (2) Foot headlight dimmer switch (par. 91 )
- (3) Stoplight switch (par. 92 )
- (4) Oil pressure safety switch (par. 35)
- (5) Starting switch (par. 72 )
- (6) Ignition switch (par. 89 )
- (7) Horn switch (par. 95 )

c. Sending Unit. The fuel level sending unit is mounted in the top of the fuel tank and transmits the fuel level in the tank to the fuel gage in the instrument panel.

d. Horn. The horn is of the vibrator type, electrically operated through the horn switch, and is waterproofed. The horn is mounted on the right side of the firewall in the engine compartment and is connected to the horn button (switch) by one cable. It is protected by the horn circuit breaker, which is mounted behind the instrument panel to the left of the instrument cluster.

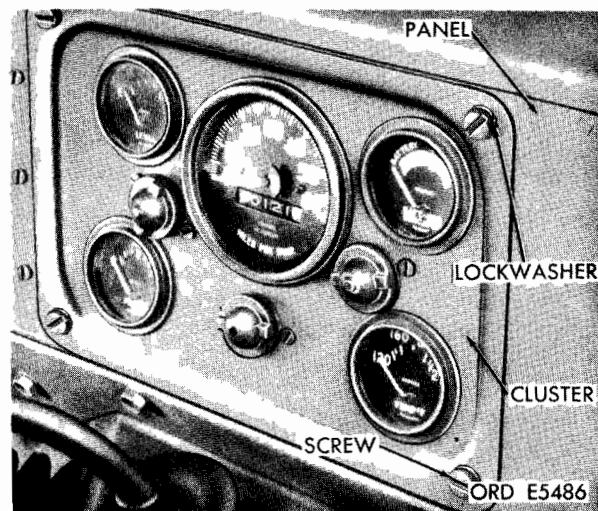
e. Circuit Breakers. Four circuit breakers protect circuits in the electrical system. Three are mounted behind the instrument panel and to the left of the instrument cluster. The top circuit breaker protects the temperature indicator, fuel gage, and the oil pressure gage. The middle circuit breaker protects the fuel pump circuit, and the bottom circuit breaker protects the horn circuit. The fourth circuit breaker, protecting the light circuit, is an integral part of the light switch.

f. Cable Numbers. Standard circuit or cable numbers are used throughout the electrical system, where possible. The cable numbers are stamped on small metal tags attached near both ends of each cable. These numbers are shown in table VI and in figure 73.

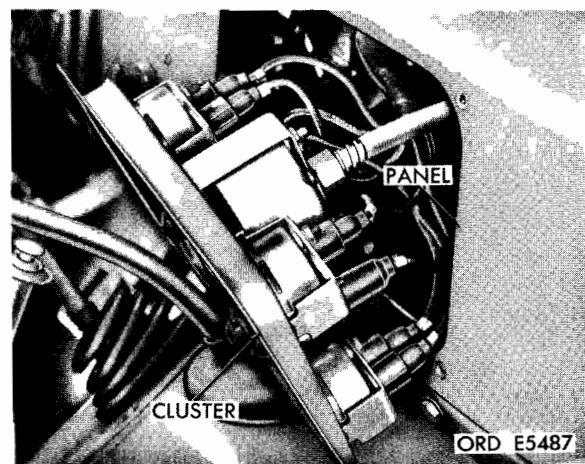
### 88. INSTRUMENT CLUSTER

**WARNING.** If gages are to be tested with Instrument Cluster pulled away from dash panel, Instrument Cluster must be grounded to dash panel, otherwise, polarity of gages will be reversed.

a. Removal. Refer to figure 74, steps 1 through 4.



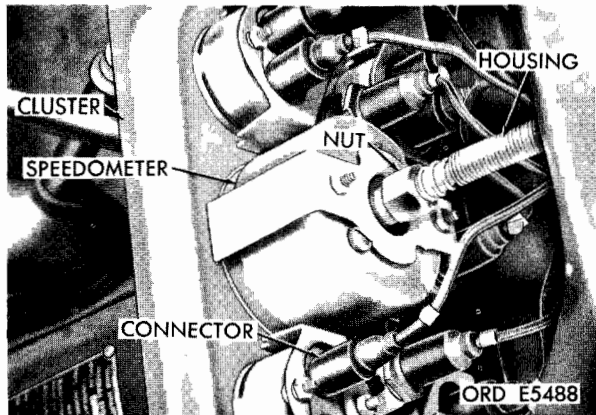
STEP 1 - Remove four screws and lockwashers securing instrument cluster to dash panel.



STEP 2 - Pull instrument cluster out and away from dash panel.

Figure 74. Instrument cluster removal  
(continued)

STEP 3 - Removal of individual gages and indicators may be made with instrument cluster in this position (step 2). To completely remove instrument cluster, proceed to step 4.



STEP 4 - Grasp electrical cables and pull, separating male and female connectors (all electrical connections). Disconnect speedometer cable and remove instrument cluster.

Figure 74. Instrument cluster removal

b. Installation. Refer to figure 74, steps 4 back through 1.

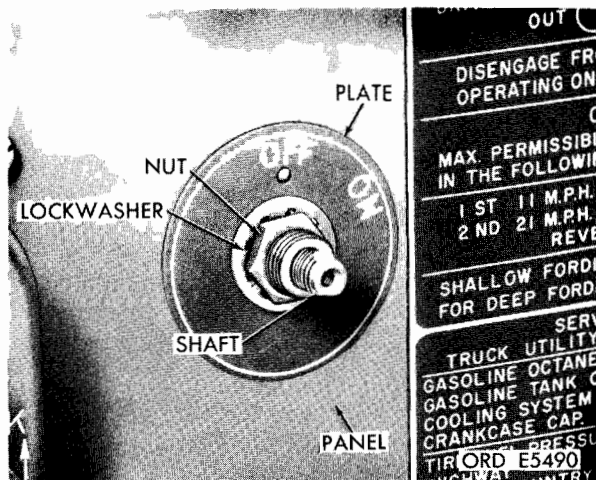
## 89. IGNITION SWITCH

a. Removal. Refer to figure 75, steps 1 through 4.

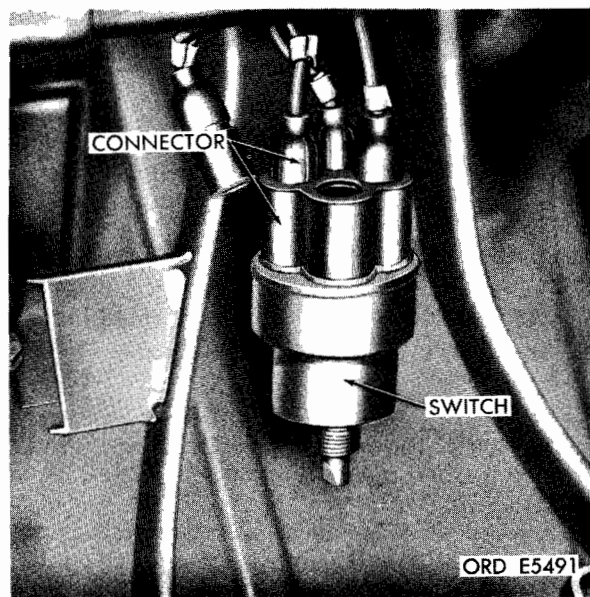
STEP 1 - Disconnect battery ground cable from negative terminal (fig. 10, steps 5 to 8).



STEP 2 - Remove screw from center of switch lever and remove switch lever.



STEP 3 - Remove nut and lockwasher securing the ignition switch and switch name plate to the dash panel. Push light switch through dash panel and lower below dash panel.



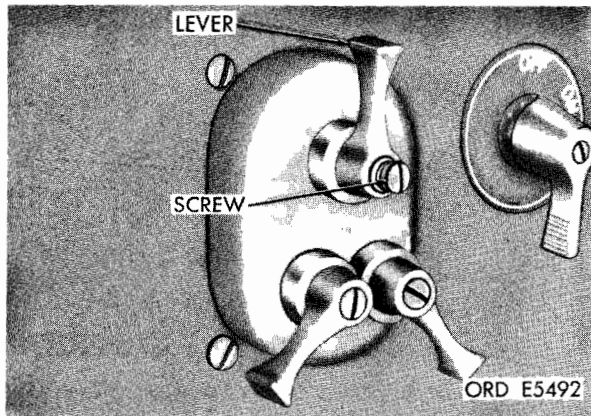
STEP 4 - Disconnect cable connectors. For installation, match serrated male and female connectors.

Figure 75. Ignition switch removal

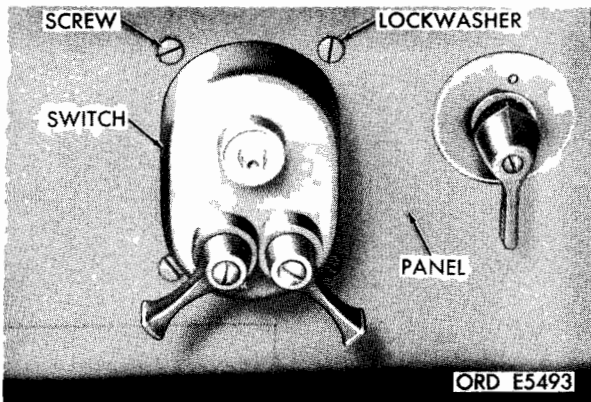
b. Installation. Refer to figure 75, steps 4 back through 1.

## 90. LIGHTING SWITCH

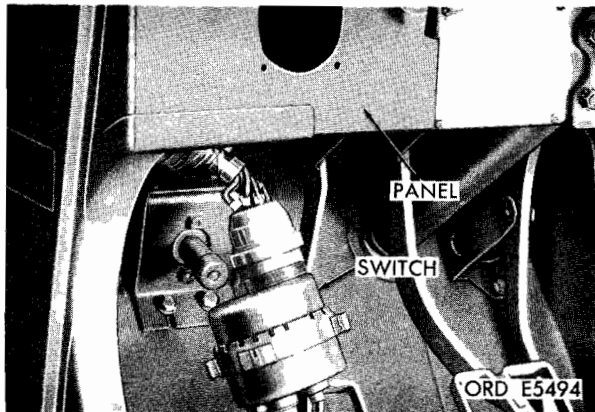
a. Removal. Refer to figure 76, steps 1 through 4.



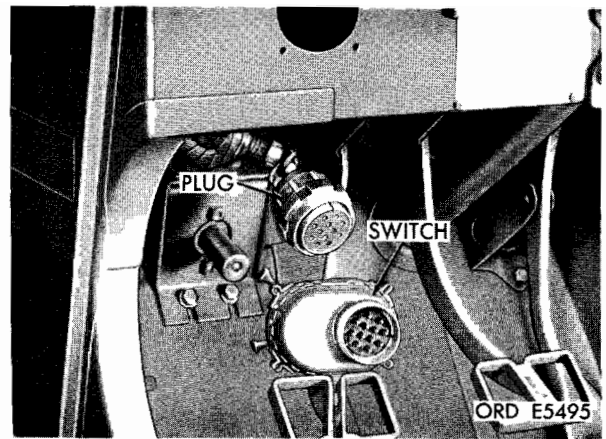
STEP 1 - Remove retaining screw, lockwasher, and flatwasher. Remove top light switch lever and flatwasher.



STEP 2 - Remove four screws and lockwashers securing light switch to dash panel.



STEP 3 - Push light switch through dash panel and lower below dash panel.



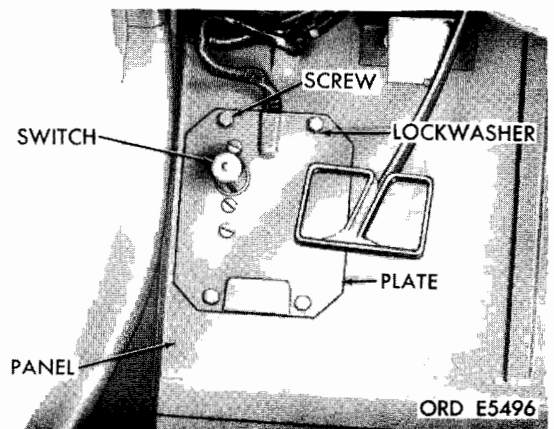
STEP 4 - Unscrew cable plug nut and pull cable plug out of light switch.

Figure 76. Lighting switch removal

b. Installation. Refer to figure 76, steps 4 back through 1.

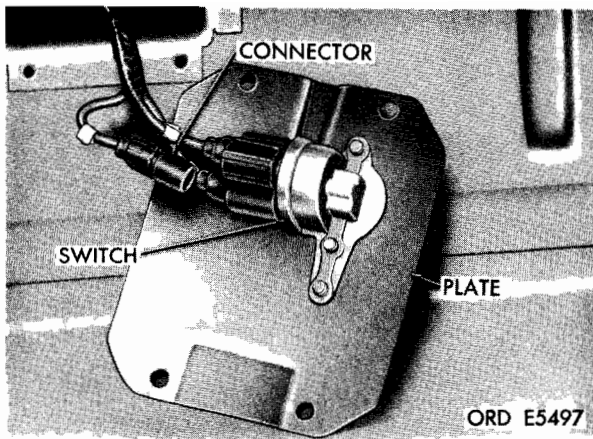
## 91. FOOT HEADLIGHT DIMMER SWITCH

a. Removal. Refer to figure 77, steps 1 through 3.

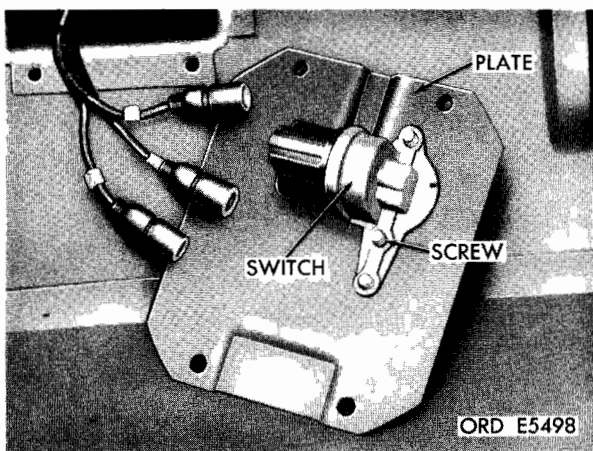


STEP 1 - Remove four screws and lockwashers securing mounting plate to floor panel.

Figure 77. Foot headlight dimmer switch removal (continued)



STEP 2 - Grasp cables and pull, separating male and female connectors.



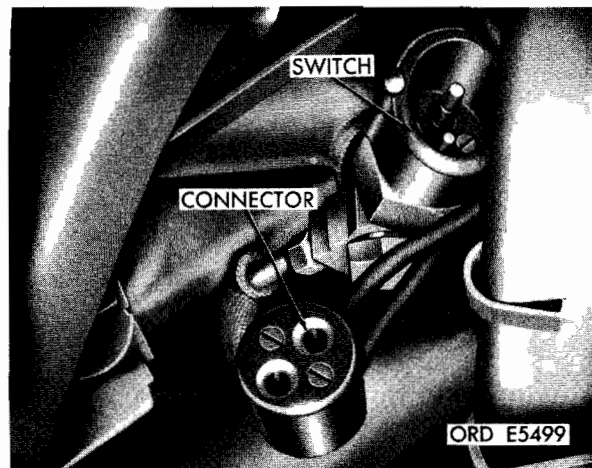
STEP 3 - Remove three screws and lockwashers securing dimmer switch to mounting plate and remove switch.

Figure 77. Foot headlight dimmer switch removal

b. Installation. Refer to figure 77, steps 3 back through 1.

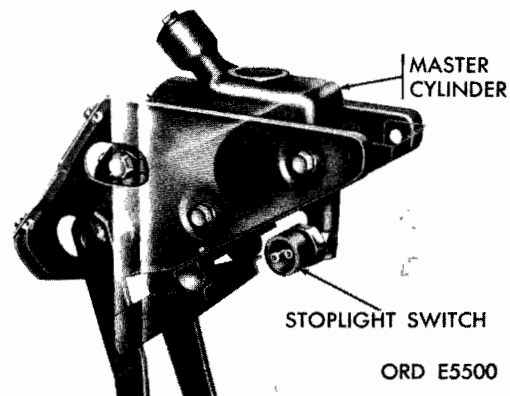
## 92. STOP LIGHT SWITCH

a. Removal. Refer to figure 78, steps 1 through 3.



STEP 1 - Disconnect cable connectors at stop light switch located behind the instrument panel on the bottom of the master cylinder assembly.

STEP 2 - NOTE. Before removing stop light switch, obtain a suitable container since brake fluid will drain from master cylinder when switch is removed. When new stop light switch is installed, fill master cylinder with new supply of brake fluid (TM-9-2320-218-10)



STEP 3 - Unscrew stop light switch from brake master cylinder.

Figure 78. Stop light switch removal

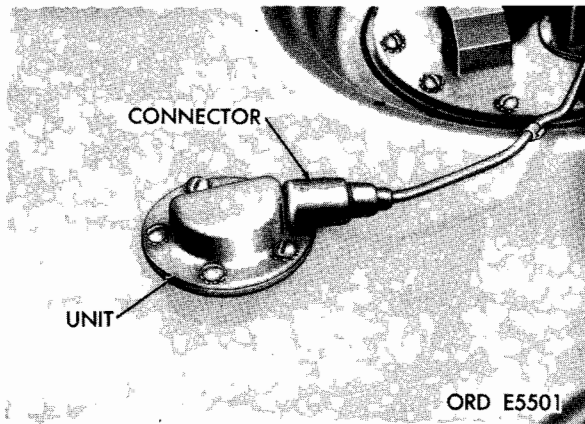
b. Installation. Refer to figure 78, steps 3 back through 1.



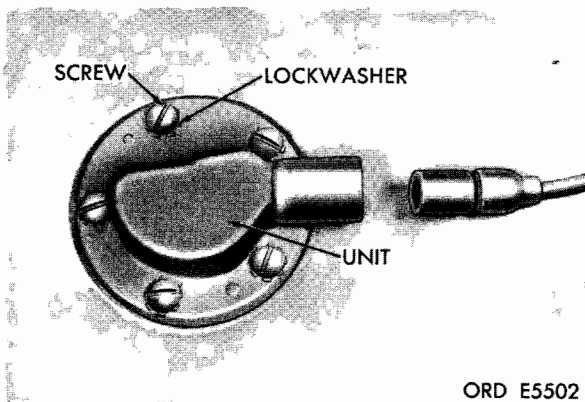
### 93. FUEL LEVEL SENDING UNIT

a. **Removal.** Refer to figure 79, steps 1 through 4.

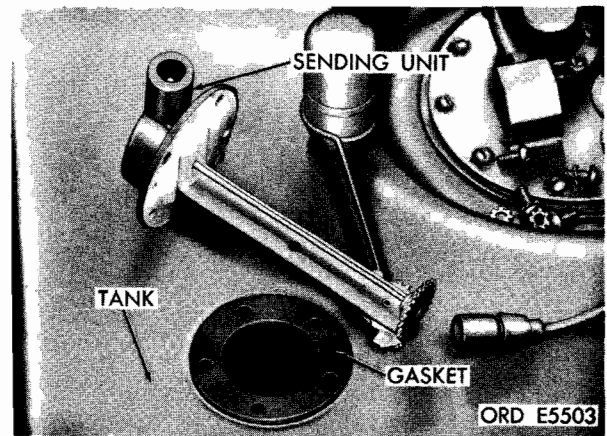
STEP 1 - Remove front seats (fig. 10), steps 5 through 6) and disconnect battery ground cable (fig. 10, steps 7 through 8).



STEP 2 - Grasp cable and pull, separating male and female connectors from fuel level sending unit.



STEP 3 - Remove five screws and lockwashers retaining the fuel level sending unit to fuel tank.



STEP 4 - Lift fuel level sending unit out of fuel tank and discard gasket.

**CAUTION.** Do not allow sparks or open flame near fuel tank when removing or installing fuel level sending unit

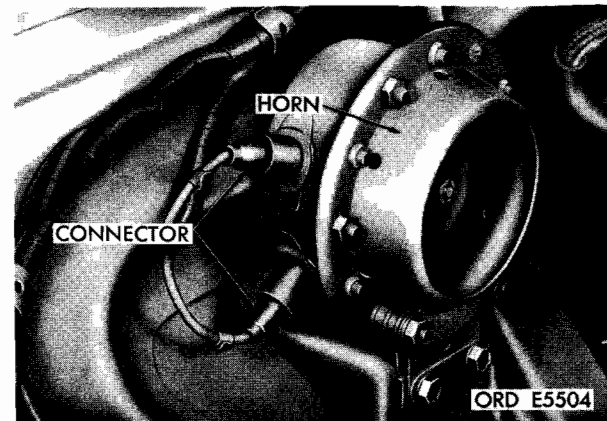
Figure 79. Fuel level sending unit removal

b. **Installation.** Refer to figure 79, steps 4 back through 1. Clean fuel level sending unit gasket surfaces on unit and fuel tank before installing unit and gasket. For installation, use a new gasket. Check for leaks and operation.

### 94. HORN ASSEMBLY

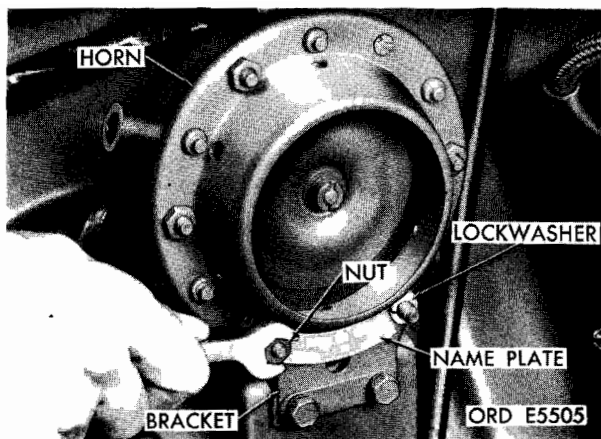
a. **Adjustment.** Refer to TM 9-8627 for instructions for adjusting the horn assembly.

b. **Removal.** Refer to figure 80, steps 1 and 2.



STEP 1 - Grasp cable and pull, separating male and female connector for each cable.

Figure 80. Horn assembly removal  
(continued)



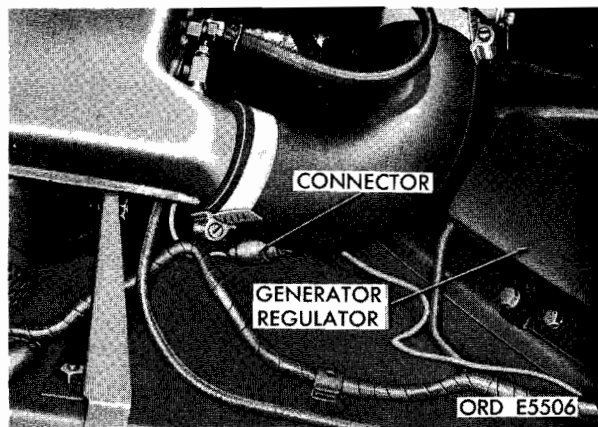
STEP 2 - Remove two nuts, flat washers, name-plate and lockwashers securing horn assembly to horn mounting bracket.

Figure 80. Horn assembly removal

c. Installation. Refer to figure 80, steps 2 back to 1.

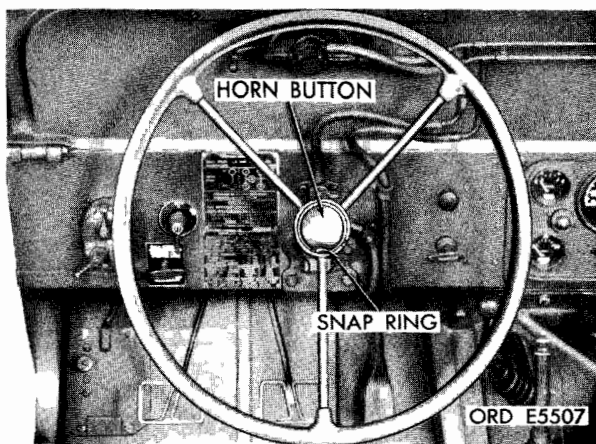
## 95. HORN SWITCH

a. Removal. Refer to figure 81, steps 1 through 3.



STEP 1 - Grasp cable and pull, separating male and female connectors at horn cable located below generator regulator.

STEP 2 - Disassemble cable connector (Refer to fig. 72, steps 1 through 3).



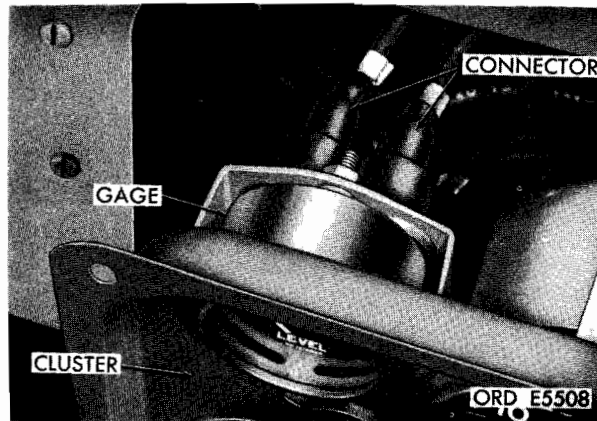
STEP 3 - Use suitable tool and pry out horn switch snap ring. Pull horn switch and cable from steering column.

Figure 81. Horn switch removal

b. Installation. Refer to figure 81, steps 1 back through 1.

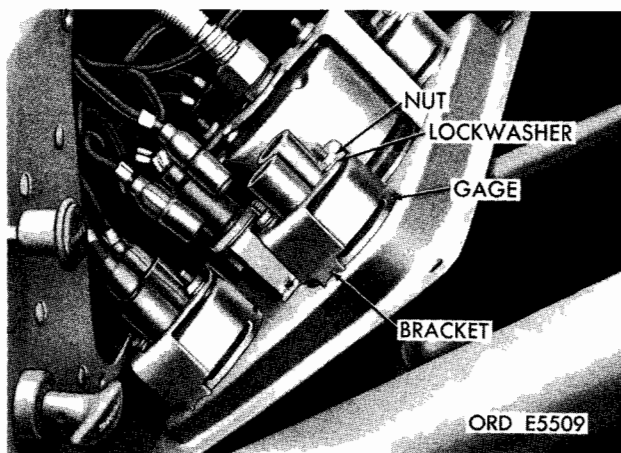
## 96. FUEL GAGE

a. Removal. Refer to figure 82, steps 1 and 2.



STEP 1 - Remove instrument cluster, (par. 88). Grasp fuel gage cable and pull, separating male and female connector for each cable.

Figure 82. Fuel level gage removal



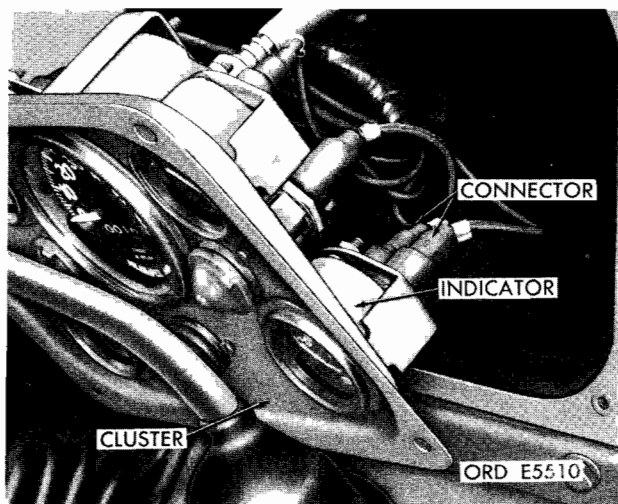
**STEP 2 -** Remove two nuts and lockwashers securing fuel gage and remove retaining bracket and fuel gage.  
**CAUTION.** Fuel gage will fall out of instrument cluster face.

Figure 82. Fuel level gage removal

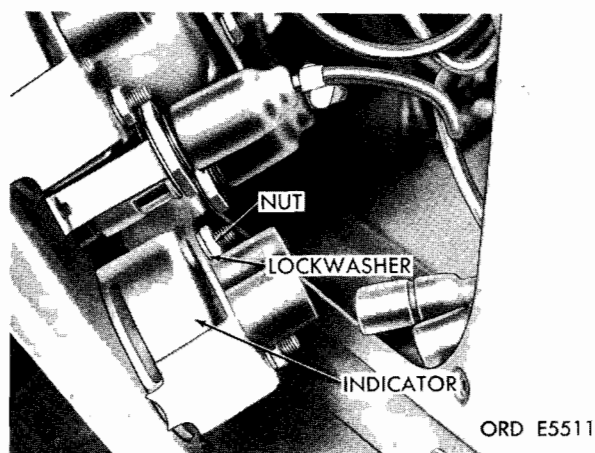
b. Installation. Refer to figure 82, steps 2 back to 1.

## 97. TEMPERATURE INDICATOR

a. Removal. Refer to figure 83, steps 1 and 2.



**STEP 1 -** Remove instrument cluster (par. 88). Grasp temperature indicator cables and pull, separating male and female connectors.



**STEP 2 -** Remove two nuts and lockwashers securing temperature indicator.  
**CAUTION.** Temperature indicator will fall out of instrument cluster face.

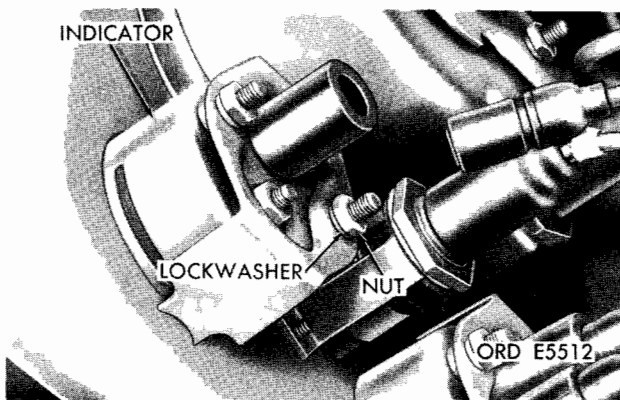
Figure 83. Temperature indicator removal

b. Installation. Refer to figure 83, steps 2 back to 1.

## 98. BATTERY-GENERATOR INDICATOR

a. Removal. Refer to figure 84, steps 1 and 2.

**STEP 1 -** Remove instrument cluster (par. 88). Grasp generator indicator cables and pull, separating male and female connectors.



**STEP 2 -** Remove two nuts and lockwashers securing battery-generator indicator.

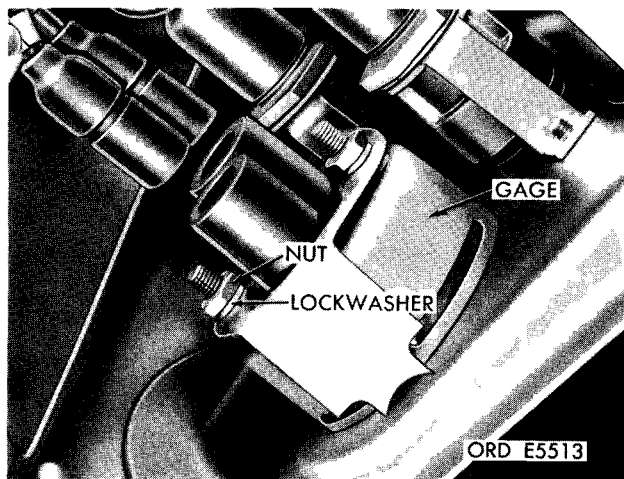
Figure 84. Battery-generator indicator removal

b. Installation. Refer to figure 84, steps 2 back to 1.

## 99. OIL PRESSURE GAGE

a. Removal. Refer to figure 85, steps 1 and 2.

**STEP 1** - Remove instrument cluster (par. 88). Grasp oil pressure gage cables and pull, separating male and female connectors.



**STEP 2** - Remove two nuts and lockwashers securing oil pressure gage.

NOTE. Oil pressure gage will fall out of instrument cluster.

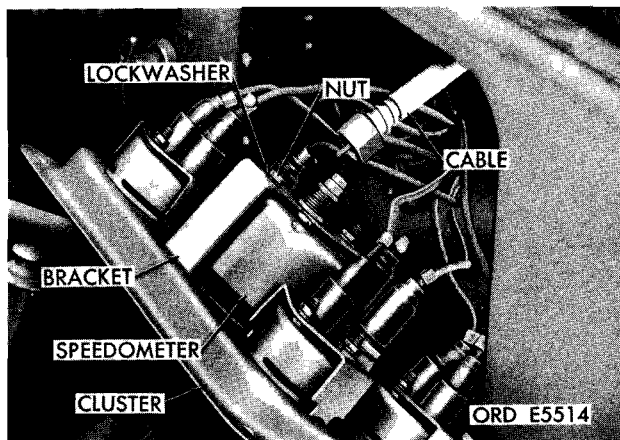
Figure 85. Oil pressure gage removal

b. Installation. Refer to figure 85, steps 2 back to 1.

## 100. SPEEDOMETER ASSEMBLY

a. Removal. Refer to figure 86, steps 1 and 2.

**STEP 1** - Remove instrument cluster (par. 88) and disconnect speedometer cable from housing assembly by loosening nut securing cable to speedometer housing. Pull cable free from speedometer.



**STEP 2** - Remove two nuts, lockwashers, and bracket securing speedometer to instrument cluster and remove speedometer.

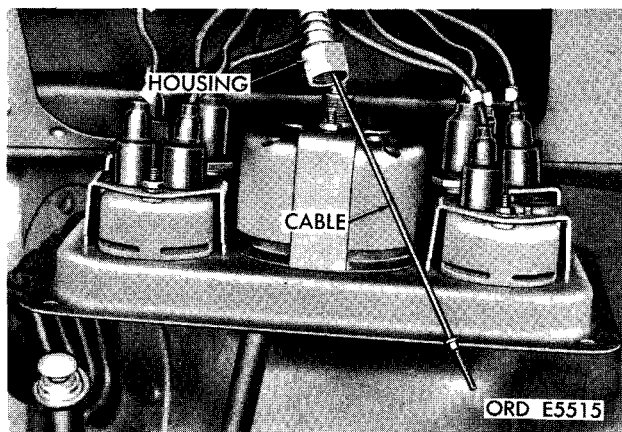
Figure 86. Speedometer assembly removal

b. Installation. Refer to figure 86, steps 2 back to 1.

## 101. SPEEDOMETER CABLE AND HOUSING

a. Removal. Refer to figure 87, steps 1 through 4.

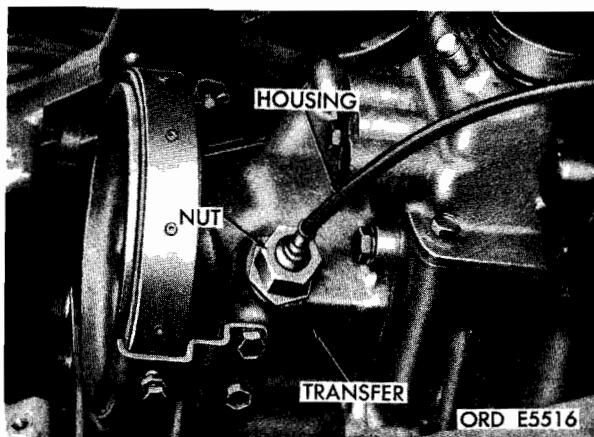
**STEP 1** - Remove instrument cluster (par. 88) and disconnect speedometer cable from speedometer by loosening nut securing housing to speedometer.



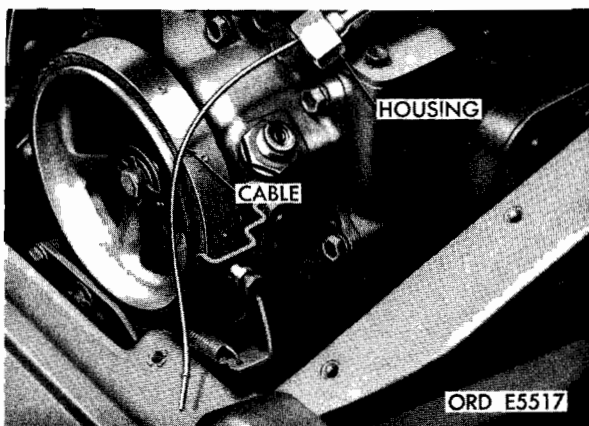
**STEP 2** - Pull cable from housing.

Figure 87. Speedometer cable and housing removal





**STEP 3 -** Remove transmission cover plate (steps 9 thru 10, fig. 10). Loosen nut securing cable housing and remove housing from transfer.



**STEP 4 -** Remove remaining portion of broken cable. Housing must be removed if damaged.

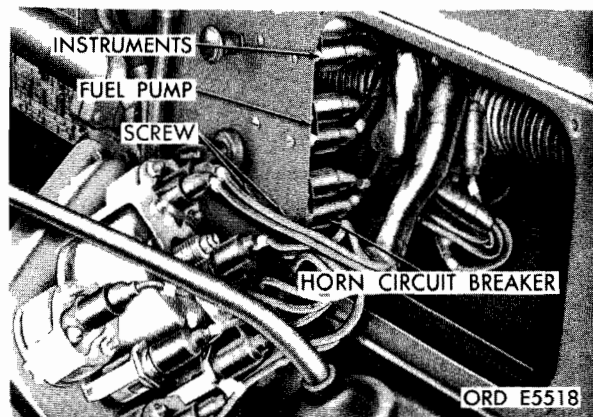
Figure 87. Speedometer cable and housing removal

**b. Installation.** Refer to figure 87, steps 4 back through 1.

## 102. CIRCUIT BREAKERS

**a. Removal.** Refer to figure 88, steps 1 and 2. **NOTE.** The three circuit breakers are removed and installed in the same manner.

**STEP 1 -** Remove instrument cluster (par. 88, steps 1 and 2) and remove speedometer cable housing from speedometer. Move cluster to right to provide access to circuit breakers.



**STEP 2 -** Grasp cables and pull, separating male and female connectors. Remove two screws, nuts, and lockwashers. Secure circuit breaker to dash panel and remove horn circuit breaker.

Figure 88. Circuit breaker removal

**b. Installation.** Refer to figure 88, steps 2 back through 1.

## 103. INSTRUMENT CLUSTER LAMPS AND LENS

Instrument cluster lamps and lens are replaced from the front of the instrument panel. Removal of the lens is accomplished by turning counter-clockwise until completely out. Lamp removal is accomplished after lens is removed by depressing lamp, turning counter-clockwise, and lifting out. Refer to TM 9-2320-218-10 for step by step pictures for removing the lamps and lens. Figure 89 shows location of instrument cluster lamps and lens.

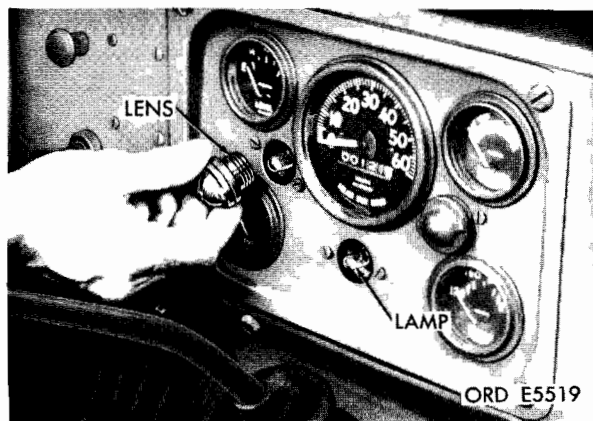


Figure 89. Location of instrument and cluster lamps and lens.

## Section XVI. VENTILATION SYSTEM

### 104. DESCRIPTION

Positive ventilation of the engine and distributor is provided by metal tubing, rubber hoses, ventilation control valve, and tube fittings. The ventilation system uses vacuum from the intake manifold to remove fuel and water vapor from the engine. This vacuum is also used to ventilate the distributor. Figure 91 shows the various lines and components of the ventilation system. Clean air is drawn in through the air cleaner, passes through the ventilation control valve (metering valve) and cir-

culates down through the push rod chamber and moves to the cylinder head. Air and fumes are drawn from the rocker arm chamber into the intake manifold and in this way the manifold vacuum maintains a continuous circulation of air through the crankcase. Ventilation of the distributor is maintained in the same manner; however, this ventilation is separated from the engine ventilation system to eliminate the possibility of crankcase fumes entering the distributor. Figure 90 is a schematic of the ventilation system.

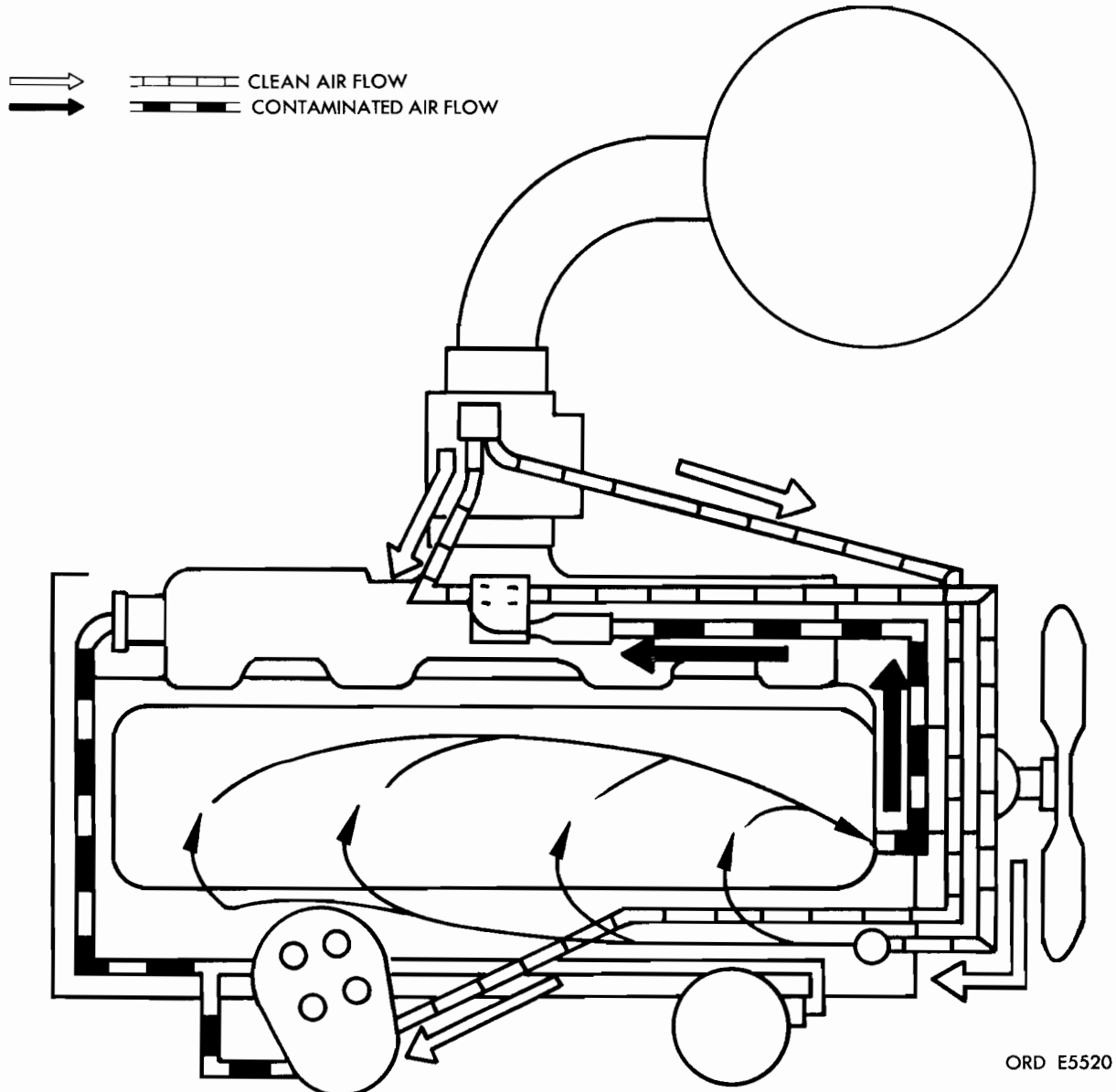


Figure 90. Crankcase ventilation system

## 105. MAINTENANCE

The ventilation system should be periodically inspected for loose connections and damaged tubing and hoses. Oil leakage at the tappet cover or rocker arm cover is an indication that the ventilation control valve (metering valve) is restricted.

## 106. REPAIR

Repair of the ventilation system consists of replacing the inoperative valve, tubing, hose, or fitting. To replace a part, disconnect, remove, and replace.

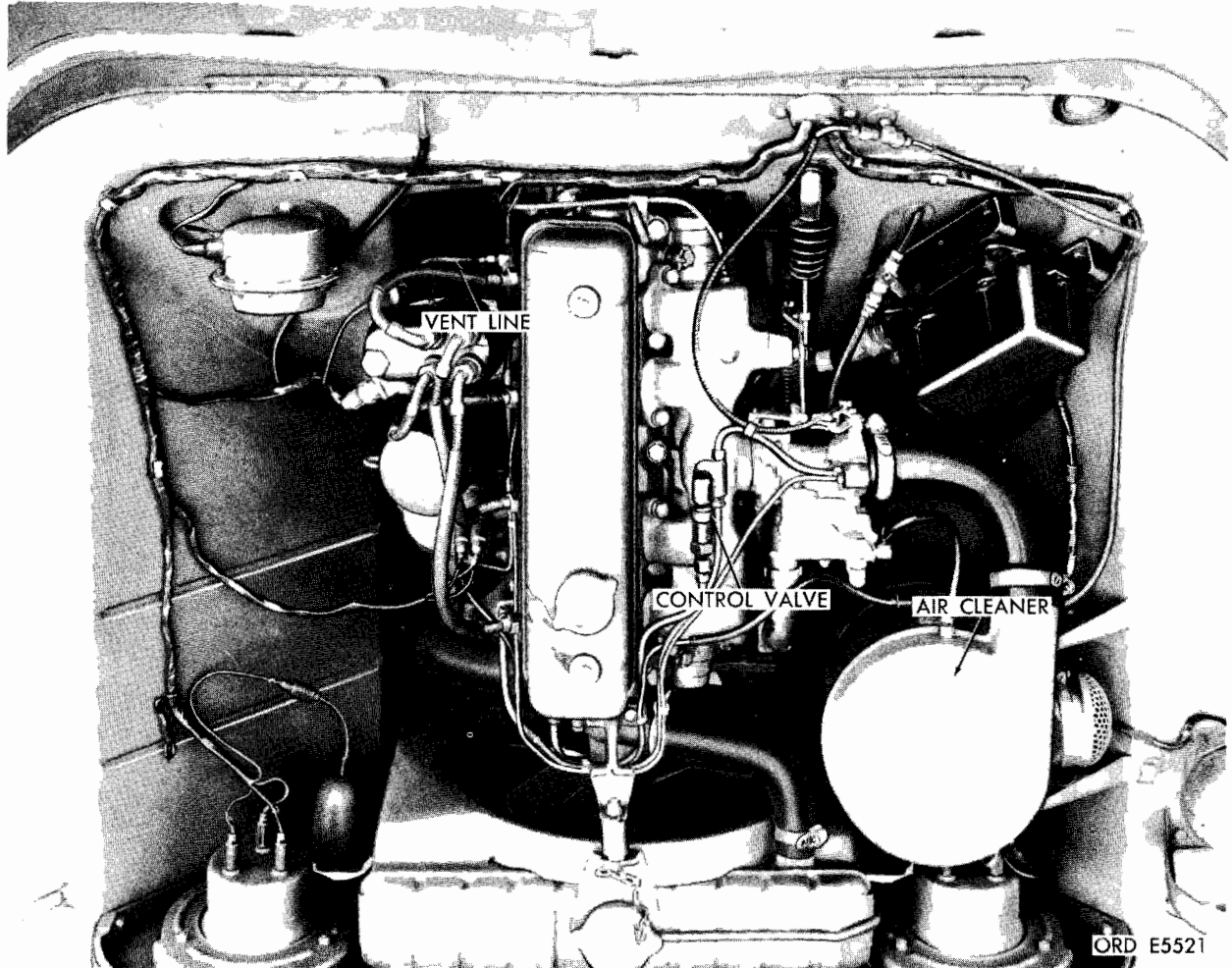


Figure 91. Ventilation system - lines and fittings

## 107. CONTROL VALVE

If symptoms indicate the ventilation control valve is restricted, the valve should be disassembled, cleaned, and inspected as follows.

- a. Unscrew valve retaining nut.
- b. Remove the valve and spring.
- c. Wash the valve, seat, and all orifices with dry cleaning solvent or volatile mineral spirits to remove carbon or gum.
- d. Inspect the valve, seat and spring for obvious damage.
- e. If there is no apparent damage, assemble the valve and install on vehicle.

## Section XVII. CLUTCH

### 108. DESCRIPTION AND DATA

a. Description. The clutch is a single disk dry type unit and consists of a driven disk assembly and a pressure plate assembly. Both assemblies are located between the engine and transmission and are housed in the waterproof flywheel housing. The driven disk assembly is mounted on the splined transmission input shaft. The pressure plate assembly is bolted to the flywheel. The driven disk assembly includes a hub, torsional springs, and two friction type facings riveted on both sides of the disk. The pressure plate assembly includes a pressure plate, coil springs, and levers. The coil springs maintain a constant force on the pressure plate which in turn holds the driven disk in contact with the flywheel face. By depressing the clutch pedal, the throw-out bearing is forced against the levers, causing the pressure plate to move away from the clutch disk thereby disengaging the two assemblies. A ball bearing assembly is installed in the flywheel and serves as a pilot for the transmission input shaft. The release bearing is a sealed ball type and is a part of the clutch release hub and bearing assembly. The release lever is ball-stud mounted in the flywheel housing. The inner end of the release lever engages the groove in the release bearing hub for actuating the hub and bearing.

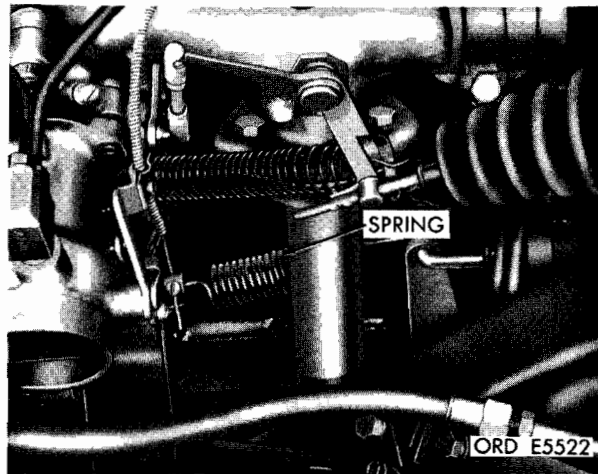
#### b. Data

##### Clutch

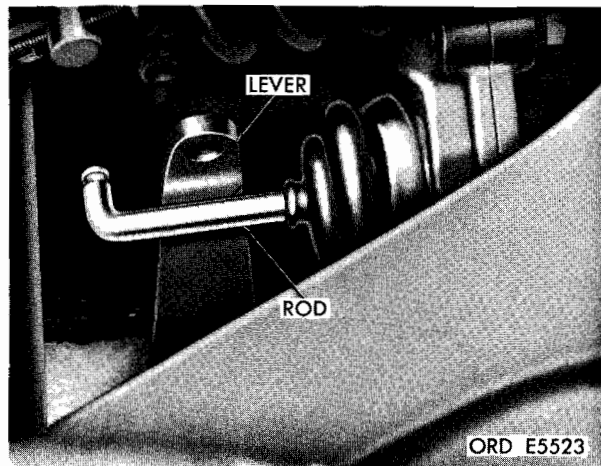
Type \_\_\_\_\_ Single dry disk  
Size \_\_\_\_\_ 8.50 in. dia  
Free Pedal  
Travel \_\_\_\_\_ .91 to 1.09 in.

### 109. CLUTCH LINKAGE ADJUSTMENT

a. General. Clutch pedal free travel of approximately one inch must be maintained. Free travel is the distance between the clutch pedal released position and the point when the clutch starts to disengage. If free travel is not maintained, slippage occurs between the clutch facings and causes the facings to become worn.



STEP 1 - Remove clutch return spring located on left side of engine.



STEP 2 - Slip rod out of clutch release equalizer shaft lever.

Figure 92. Clutch pedal free travel adjustment

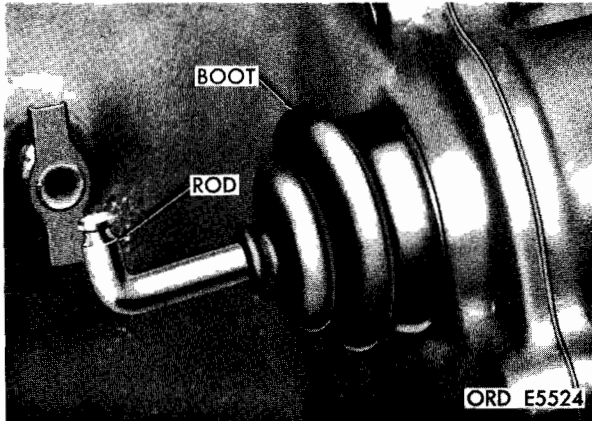
b. Adjustment. Figure 92, steps 1 and 2, show operations for adjusting clutch pedal free travel.

# 110. CLUTCH PRESSURE PLATE, DISK, AND CLUTCH RELEASE BEARING

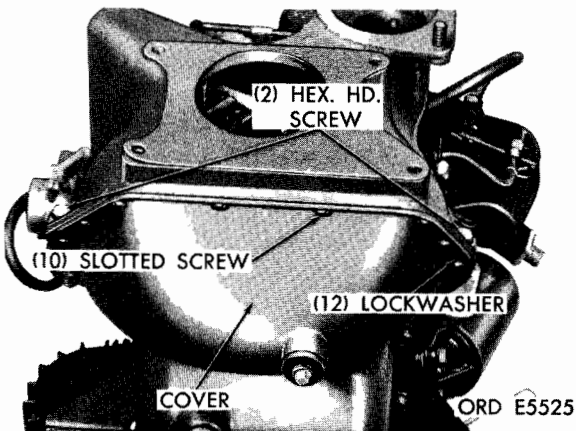
a. General. When it is necessary to install a new clutch pressure plate and driven disk, coordinate with ordnance maintenance personnel.

b. Removal (Power Plant Removed). Refer to figure 93, steps 1 through 7.

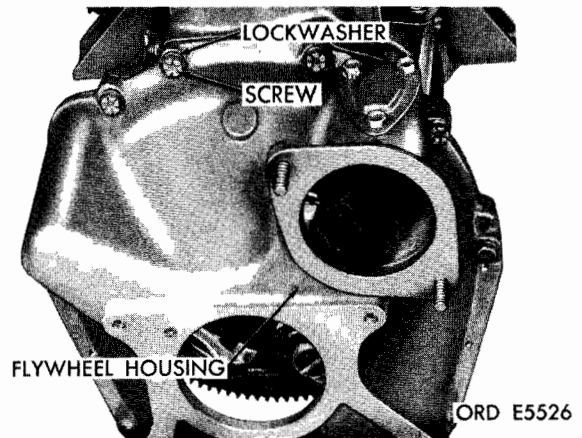
STEP 1 - Remove power plant (par. 27). Remove transmission and transfer (par. 112). Remove starting motor (par. 71).



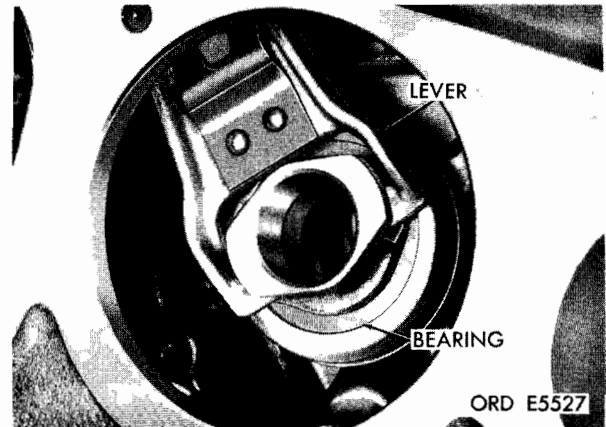
STEP 2 - Slip boot seal off release rod.



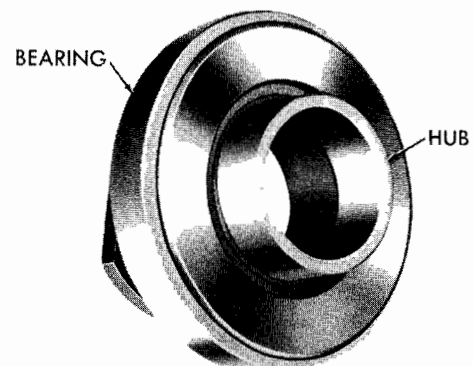
STEP 3 - Remove ten slotted head screws and lockwashers and two hexagon screws and lockwashers securing flywheel housing cover. Remove cover. Discard gasket.



STEP 4 - Remove seven screws and lockwashers securing flywheel housing.

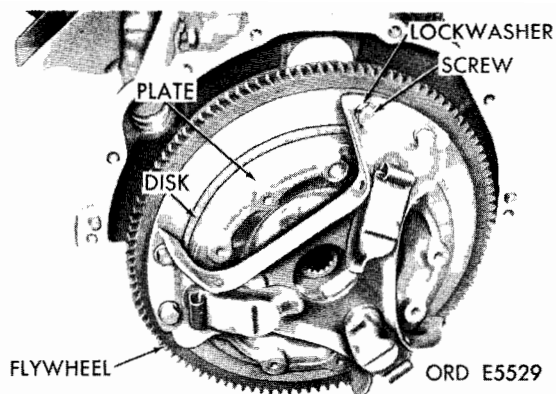


STEP 5 - Slip release lever out of release bearing assembly.



STEP 6 - If bearing is defective, press hub from bearing and install new bearing.

Figure 93. Clutch pressure plate, and clutch release bearing removal (continued)



**STEP 7 -** Remove six screws and lockwashers securing pressure plate to flywheel, and remove pressure plate and driven disk at same time.

Figure 93. Clutch pressure plate, and clutch release bearing removal

**c. Installation (Power Plant Removed).** Refer to figure 93, steps 7 back to 1. At assembly only, use suitable tool to aline driven disk

with pilot bearing before tightening pressure plate screws. Use a new flywheel housing cover gasket and a new flywheel housing to engine gasket when installing flywheel housing cover and flywheel housing. Clean gasket mating surfaces. The following attaching parts should be torqued to the values shown:

Pressure plate to flywheel bolt (5/16-18) — 8-10 lb-ft

Transmission case to flywheel housing bolt (7/16-14) — 37-42 lb-ft

Flywheel housing to cylinder block bolt (3/8-16) — 20-25 lb-ft

Flywheel housing cover to flywheel housing bolt (1/4-20) — 6-9 lb-ft

## Section XVIII. TRANSMISSION AND TRANSFER

### 111. DESCRIPTION AND DATA

**a. Description.** The conventional four-speed, constant-mesh type transmission provides synchro-silent action in second, third, and fourth speeds. All gears are helical except first and reverse. The transmission case is made of cast iron. The gear shift housing assembly is attached to the top of the transmission. A standard commercial gear shift pattern is used plus the addition of the fourth forward speed. Gears within the transmission are shifted by the gear shift lever which extends from the gear shift housing into the driver's compartment. The gear shift lever and housing are sealed by a rubber boot to prevent water from entering the transmission. A pressure type breather valve is located at the base of the gear shift housing. A filler plug is provided on the

left side of the transmission case for filling both the transmission and transfer case. Separate drain plugs are located at the bottom of each case. The transfer case is a one piece cast iron housing, doweled, and attached to the rear face of the transmission case. Transfer gears are directly on the vertical centerline of the vehicle. The transfer input gear, transfer intermediate gear, and transfer output gear are of the constant mesh helical-type. The transmission case and transfer case are machined in matched sets. The speedometer drive gear and the parking brake drum are mounted behind the transfer input gear and are secured to the output shaft. The rear end of the transmission output shaft is supported by a ball bearing mounted in the transfer case. A double lip type oil seal prevents oil leakage past the hub of the parking brake drum.



b. Data.

Type \_\_\_\_\_ Selective synchro-  
mesh  
Speeds \_\_\_\_\_ 4 forward, 1 re-  
verse  
Synchronized  
gears \_\_\_\_\_ 2 d, 3rd, and 4th  
Lubricant  
capacity \_\_\_\_\_ 5.8 pints  
Transmission Gear Ratio  
First \_\_\_\_\_ 5.7 to 1  
Second \_\_\_\_\_ 3.18 to 1  
Third \_\_\_\_\_ 1.67 to 1  
Fourth \_\_\_\_\_ 1 to 1  
Reverse \_\_\_\_\_ 7.5 to 1  
  
Transfer ratio \_\_\_\_\_ 1 to 1

112. TRANSMISSION AND TRANSFER

a. General. When it is necessary to replace a transmission and transfer assembly with a new or reconditioned assembly, coordinate with ordnance maintenance personnel.

b. Removal. Remove power plant (par. 27). Remove transmission transfer assembly from power plant (par. 29).

c. Installation. Clean gasket mating surfaces and use a new transmission to flywheel housing gasket. Install transmission transfer assembly on power plant (par. 29). Install power plant (par. 27).

d. Torque Values. The following attaching parts should be torqued to the values shown:

Transmission input shaft  
retainer to transmission  
case bolt (5/16-18) — 8-10 lb-ft

Transmission gear shift  
cover to transmission  
case bolt (5/16-18) — 8-10 lb-ft

Transmission case to  
flywheel housing bolt  
(7/16-14) — 37-42 lb-ft

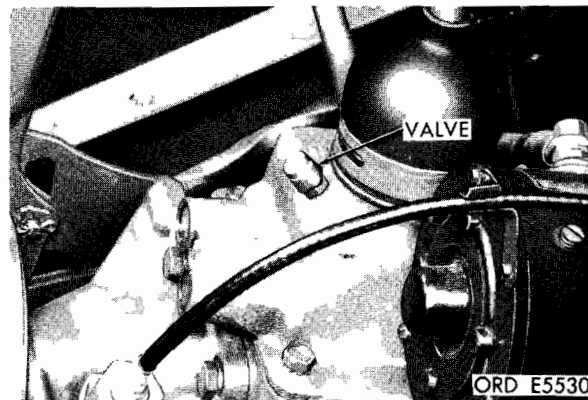
Transfer case to trans-  
mission case bolt  
(3/8-16) — 20-25 lb-ft

Transfer output shaft  
cover to transfer  
housing bolt (5/16-18) — 8-10 lb-ft

113. TRANSMISSION AND TRANSFER  
BREATHER VALVE

a. Removal. Refer to figure 94, steps 1 and 2.

STEP 1 - Remove transmission cover plate.



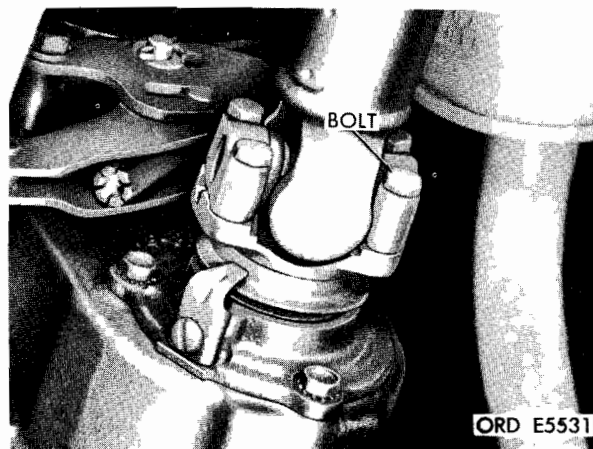
STEP 2 - Unscrew breather valve and remove.

Figure 94. Transmission and transfer  
breather valve removal

b. Installation. Refer to figure 94, steps 2 back to 1.

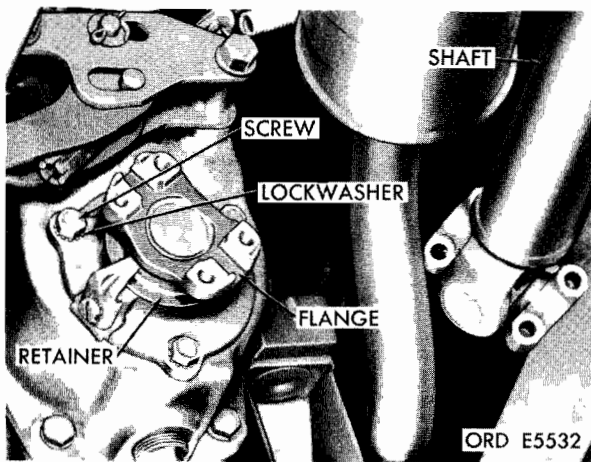
114. TRANSFER OUTPUT SHAFT REAR  
OIL SEAL

a. Removal. Refer to figure 95, steps 1 through 3.

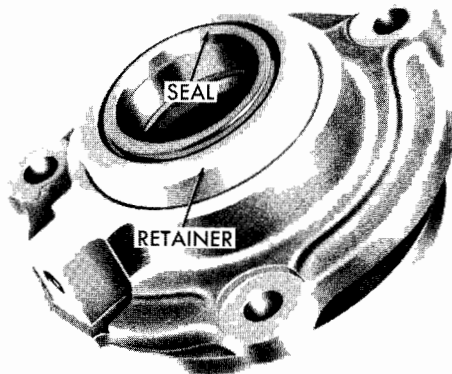


STEP 1 - Remove four bolts from rear pro-  
peller shaft front universal joint.

Figure 95. Transfer output shaft rear oil  
seal removal (continued)



STEP 2 - Position rear propeller shaft away from transfer universal joint flange. Remove three screw and lockwasher assemblies, bearing retainer with seal and gasket, and universal joint flange assembly. Remove screw and lockwasher assembly securing flange assembly to bearing retainer. Remove flange assembly. Discard gasket.



STEP 3 - Use suitable tool and remove defective seal from bearing retainer. Use suitable tool to install a new seal into bearing retainer.

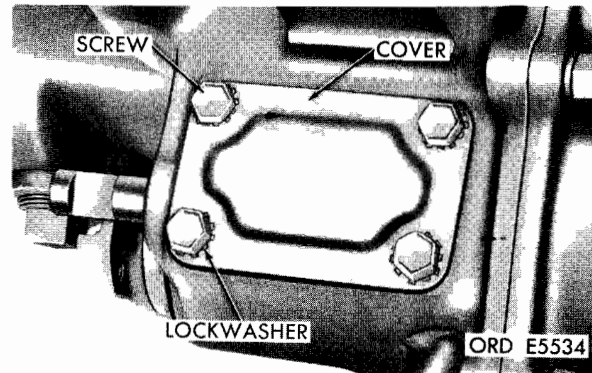
Figure 95. Transfer output shaft rear oil seal removal

b. Installation. Refer to figure 95, steps 3 back through 1.

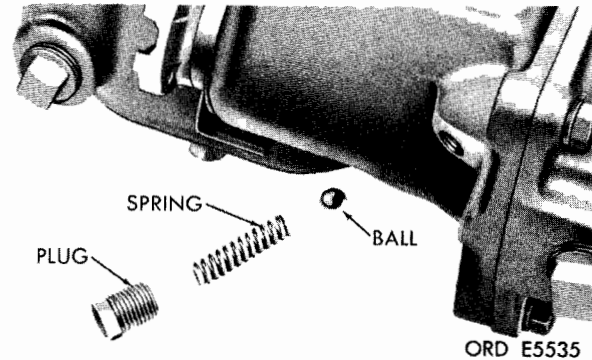
## 115. TRANSFER SHIFTER SHAFT SEAL

a. Removal. Refer to figure 96, steps 1 through 7.

STEP 1 - Remove power plant (par. 27).



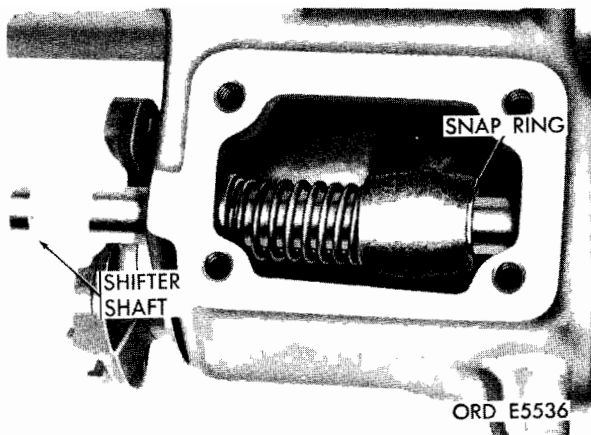
STEP 2 - Remove four screws and four lockwashers and remove transfer clutch cover. Discard gasket. Remove retainer plug.



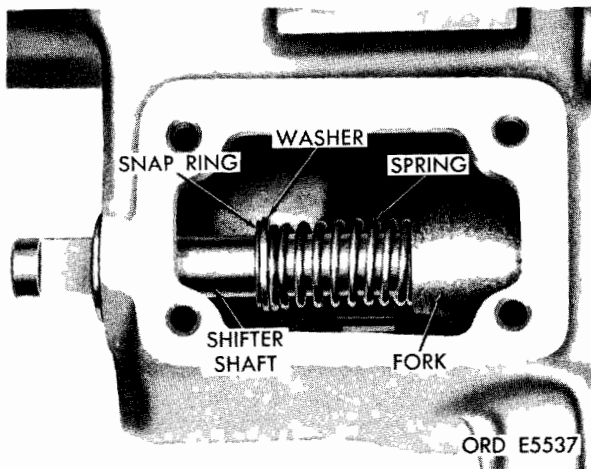
STEP 3 - NOTE. Plunger spring and ball will fall out. For assembly, install in order shown.

Figure 96. Transfer shifter shaft seal removal (continued)

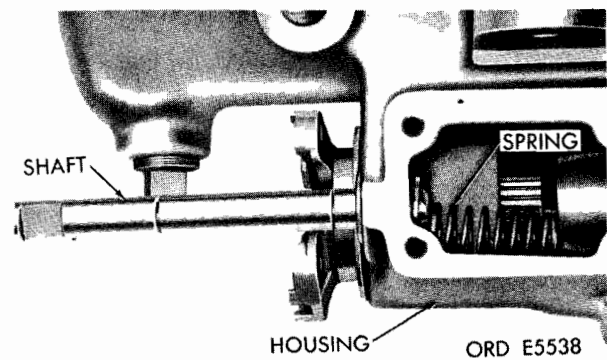




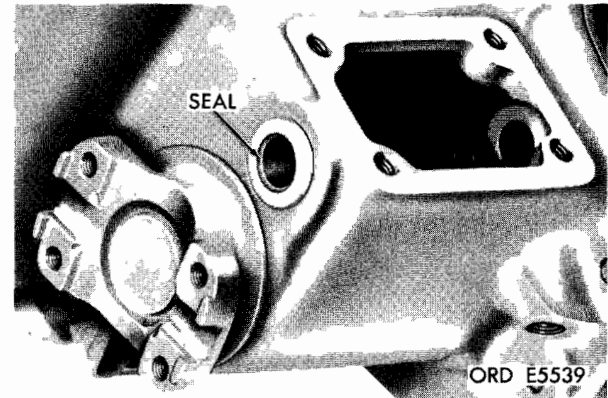
STEP 4 - Slide shifter shaft forward and remove rear "C" type snap ring at assembly. Install snap ring first.



STEP 5 - Slide shifter shaft rearward. Remove front "C" type snap ring, retaining washer, spring, and fork at assembly. Install this snap ring last.



STEP 6 - Pull shifter shaft out of housing. Remove spring from housing.



STEP 7 - Use suitable tool and pry out defective seal. Using replacer-7345225, install new seal. NOTE. Coat OD of seal with sealer MIL-S-45180 prior to installation.

Figure 96. Transfer shifter shaft seal removal

b. Installation. Clean all gasket mating surfaces. Refer to figure 96, steps 7 back through 1.

## Section XIX. PROPELLER SHAFTS AND UNIVERSAL JOINTS

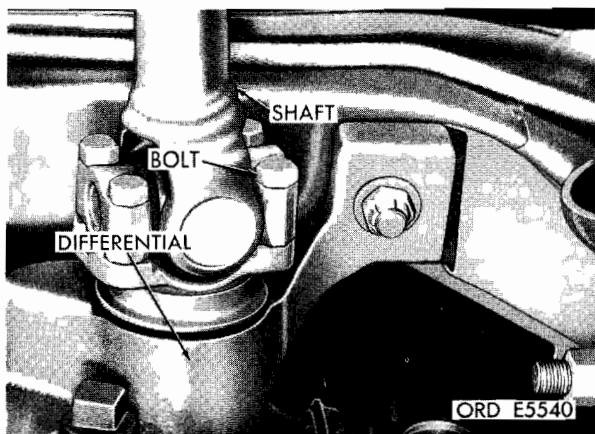
### 116. DESCRIPTION

The vehicle drive system has a front and rear propeller shaft. The shafts are of welded steel tubing, with forged steel yokes at each end. Cardan type universal joints are retained in yokes by snap rings which are in contact with the outer bearing races of the universal joints. The universal joints consist of a cross type

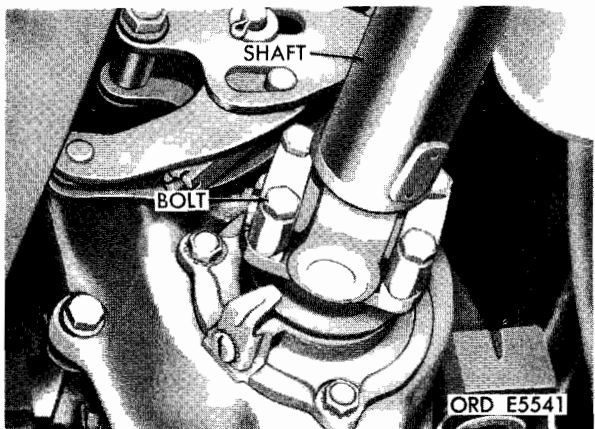
trunnion, needle bearings, outer bearing races, seals, and a lubrication fitting. The needle bearings are retained on the journals of the trunnion by the outer bearing races which are grooved to also retain sleeve type seals. Lubrication passages are drilled in the trunnion to allow lubrication of the bearings from a central fitting. Either end of the propeller shafts can be attached to the differential yoke or transfer yoke.

## 117. FRONT AND REAR PROPELLER SHAFTS

a. Removal. Refer to figure 97, steps 1 and 2.



STEP 1 - Remove four universal joint bolts from the differential end of the propeller shaft.



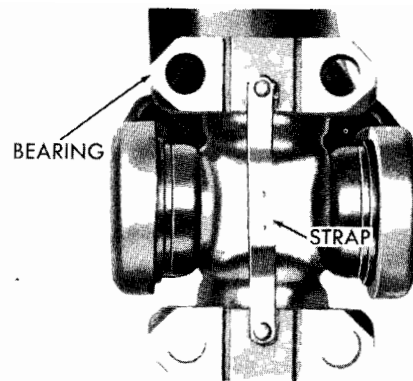
STEP 2 - Remove four universal joint bolts from the transmission end of the propeller shaft and remove shaft.

Figure 97. Front of rear propeller shaft removal

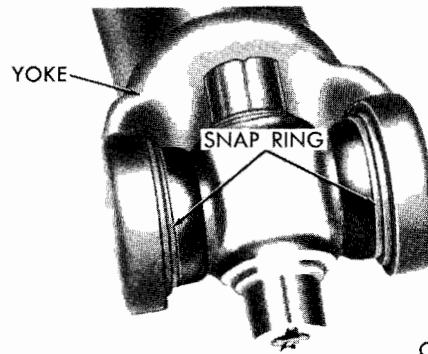
b. Installation. Refer to figure 97, steps 2 back to 1. Torque propeller shaft universal joint bolt to 25-30 lb-ft.

## 118. UNIVERSAL JOINTS (PROPELLER SHAFTS REMOVED)

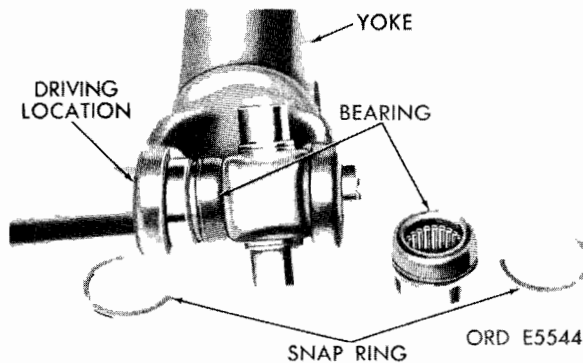
a. Disassembly. Refer to figure 98, steps 1 through 3, and remove propeller shaft.



STEP 1 - Slip two loose cross bearings and oil seals from cross. Do not lose rollers. NOTE. For ease of assembly place tape between loose bearings over original tie strap.



STEP 2 - Pry two cross bearings snap rings from yoke.



STEP 3 - Using brass drift, drive one bearing into yoke until opposite bearing protrudes far enough to pull out. Drive other bearing out using brass drift. Pull oil seals from bearings. Do not lose rollers.

Figure 98. Universal joint removal

b. Assembly. Refer to figure 98, steps 3 back through 1.

## 119. DESCRIPTION

a. Suspension Arms. The suspension arms are of the short-and-long parallel type. Wheel spindle supports are attached to the suspension arms by ball joints located at the outer end of the arms. The inner ends of the arms are mounted on rubber bushings supported by a shaft bolted to the front crossmember assembly.

b. Coil Springs. Each coil spring is supported between a spring seat stamped in the lower arm and a spring seat welded in the front crossmember assembly.

c. Shock Absorbers. The shock absorbers are of the hydraulic, telescopic type and are located inside the coil springs. They are of the double action type with internal hydraulic stops which limit the travel of jounce and rebound.

d. Differential Assembly. The differential assembly is a drive-thru, four-pinion type, and is interchangeable front and rear. The front differential assembly is mounted to the front crossmember by three bolts, flatwashers, and locknuts. The carrier and cover are held together by ten bolts and lockwashers and are sealed with a gasket. Wheel drive shaft universal joint flanges are retained to the differential side gears by a bolt. All shaft openings in the carrier are sealed with double lip seals. The assembly is vented by a pressure type valve. A filler plug is in the cover and a drain plug is in the carrier. Both plugs are magnetized.

e. Wheel Spindle and Spindle Support (Front). The front wheel spindle support is of the semi-floating design and is connected to the suspension arms by ball joints. The cups of the tapered wheel bearings supporting the spindle are pressed into the spindle support. Double lip seals at each end of the support retain lubricant and protect the wheel bearings from mud and water. The shaft section of the universal joint flange at the wheel is splined and the outer end is undercut and threaded. The wheel spindle hub is splined internally and fits over and water. The shaft section of the universal joint flange at the wheel is splined and the out-

er end is undercut and threaded. The wheel spindle hub is splined internally and fits over the shaft of the universal joint flange. A castle nut, washer, and cotter pin hold the spindle to the universal joint flange.

f. Wheel Drive Shafts and Universal Joints. Each wheel drive shaft consists of two pieces: a splined shaft equipped with a universal joint, and a sliding yoke equipped with a universal joint. The shaft is attached to the wheel drive flange through the universal joint, by means of two U-bolt assemblies. The yoke is attached to the differential side gear flanges through the universal joint, by means of four bolts. All universal joints are cardan-type.

## 120. DATA

### Steering Geometry

Wheel toe-in — .06 to .12 in.

Front drive turning  
angle (max.) — 32°

### Front spring

Type — Coil

Spring rate — 497/529 lb /in.

### Shock absorbers

Type — Jounce & rebound

Action — Two-way direct

### Differential

Number of pinions — Four

Drive gear ratio — 4.86 to 1

Gear type — Hypoid

Type — Drive through

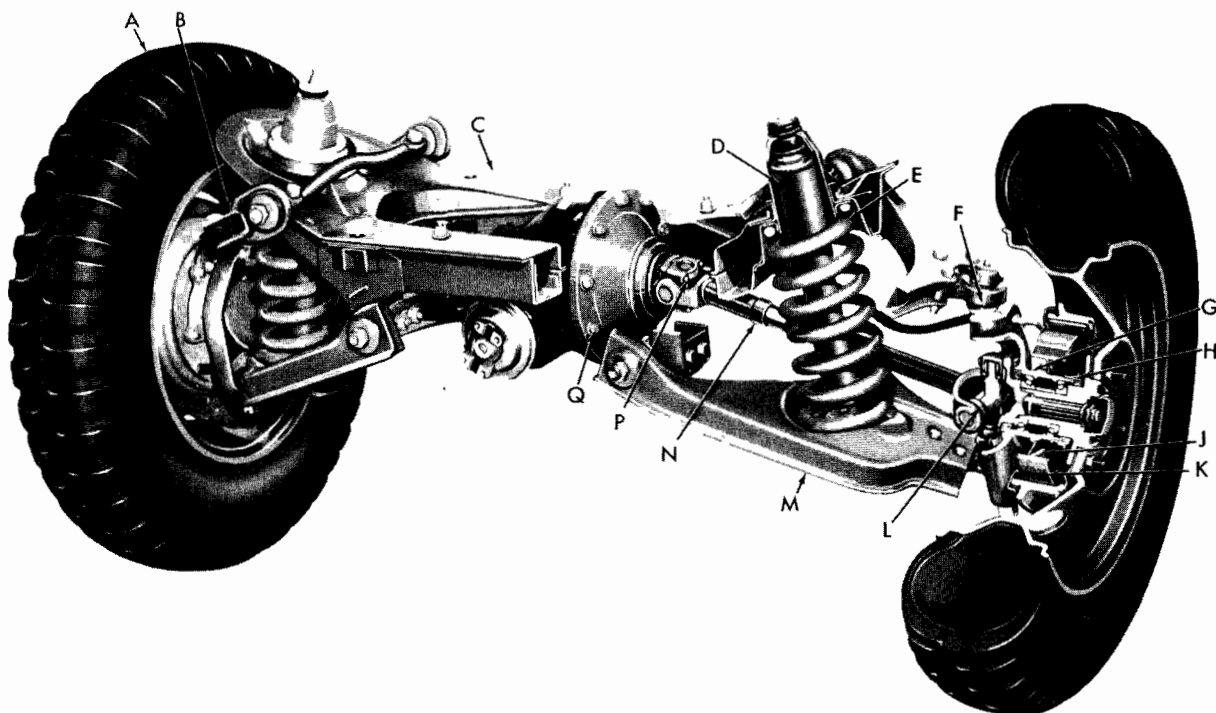
Lubricant capacity — 2 pt

## 121. FRONT SUSPENSION AND DRIVE ASSEMBLY

a. General. The front suspension and drive assembly consists of front crossmember, upper and lower suspension arms, coil springs, shock absorbers, ball joints, differential assembly, wheel drive shafts, cardan type universal joints, wheel support spindles, brake drums, wheel brake mechanisms, and wheel retaining studs.

Figure 99 is a cutaway of the front suspension and drive. The front crossmember is fabricated from metal stampings to form a boxed section. All front suspension and drive assembly parts are assembled to this crossmember. The en-

tire assembly can be removed from the vehicle to facilitate replacement or repair of component parts. Removal of the entire assembly must be coordinated with ordnance maintenance personnel (par. 2).

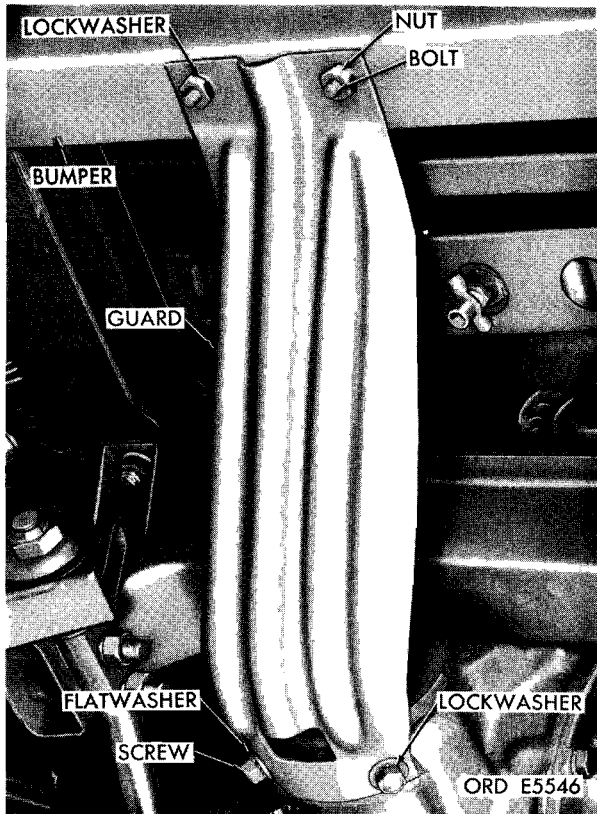


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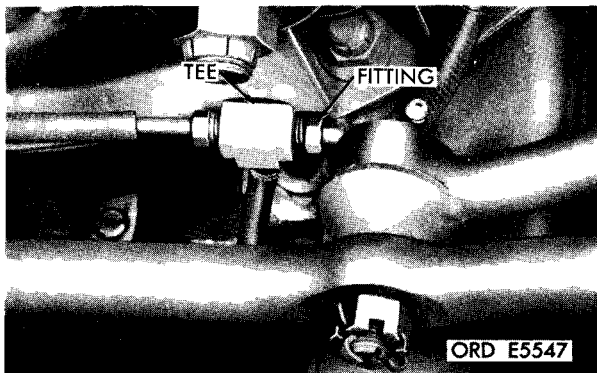
- |                            |  |
|----------------------------|--|
| A. Wheel and tire assembly | J. Brake shoe and lining                   |
| B. Upper suspension arm    | K. Brake drum                              |
| C. Crossmember             | L. Universal joint (shaft to drive flange) |
| D. Shock absorber          | M. Lower suspension arm                    |
| E. Coil spring             | N. Wheel drive shaft                       |
| F. Ball joint              | P. Universal joint (shaft to differential) |
| G. Wheel bearing - inner   | Q. Differential                            |
| H. Wheel bearing - outer   |  |

Figure 99. Cutaway of the front suspension and drive

b. Removal. Refer to figure 100, steps 1 through 6.

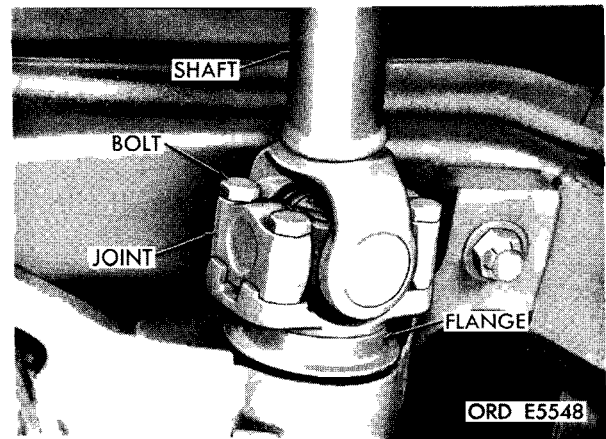


STEP 1 - Remove two nuts, bolts and lockwashers securing flange guard to bumper. Remove two screws, flatwashers and lockwashers securing flange guard to differential. Remove differential flange guard.

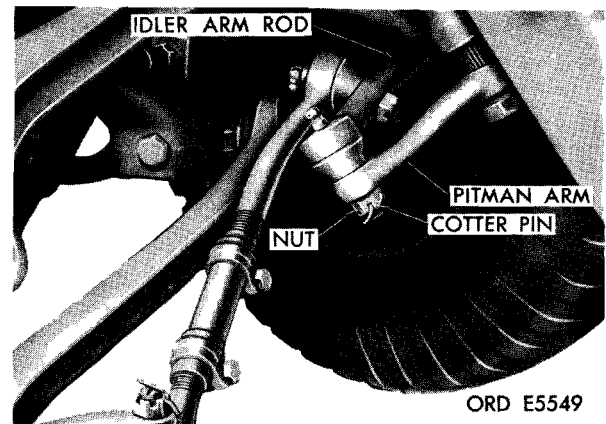


STEP 2 - Remove brake line fitting from tee located at the rear of the crossmember and left of engine at assembly. Bleed brakes (par. 158) after installing fitting to tee.

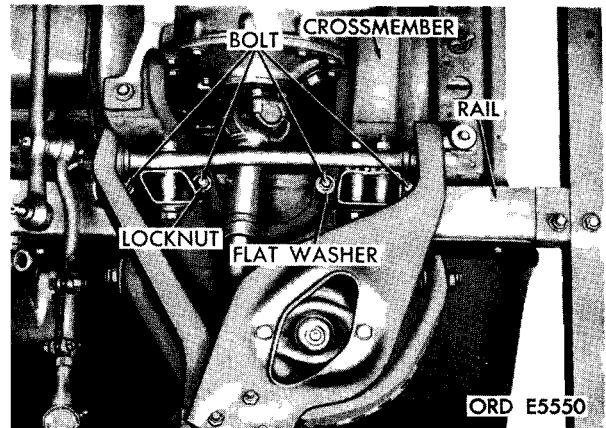
Figure 100. Front suspension and drive assembly removal



STEP 3 - Remove four bolts securing front propeller shaft to universal joint flange.

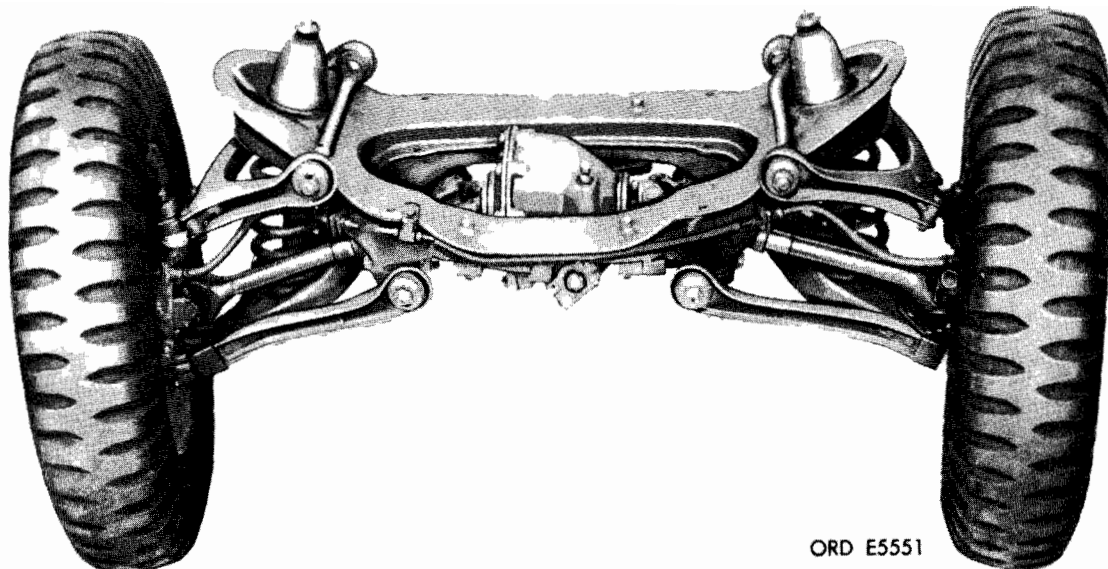


STEP 4 - Remove cotter pin and nut securing pitman arm to idler arm rod.



STEP 5 - Remove eight bolts, flatwashers, and locknuts securing crossmember to body rails (four on each side).

(continued)



STEP 6 - Remove front suspension and drive assembly.

Figure 100. Front suspension and drive assembly removal

c. Installation. Refer to figure 100, steps 6 back through 1. The following attaching parts should be torqued to the values shown:

Crossmember to  
frame mounting  
bolt (7/16-20) — 45-55 lb-ft

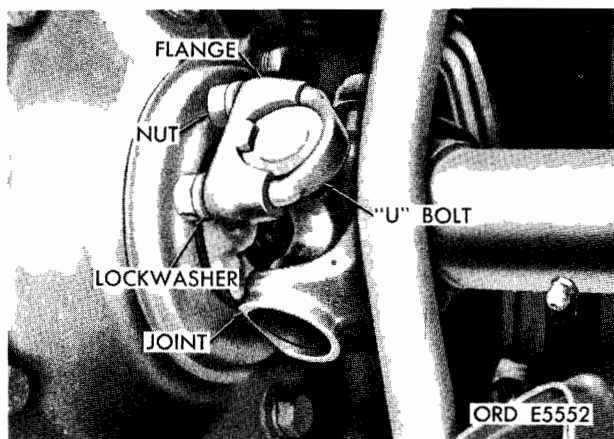
Steering spindle  
arm to spindle  
bolt (7/16-20) — 40-50 lb-ft

Propeller shaft  
universal joint  
bolts (5/16-24) — 15-20 lb-ft

## 122. DIFFERENTIAL ASSEMBLY (FRONT)

a. Removal. Refer to figure 101, steps 1 through 4.

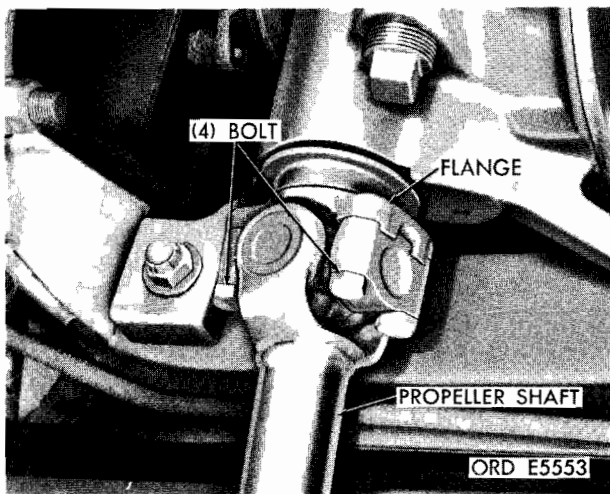
STEP 1 - Refer to figure 100, step 1 for removal of differential flange guard.



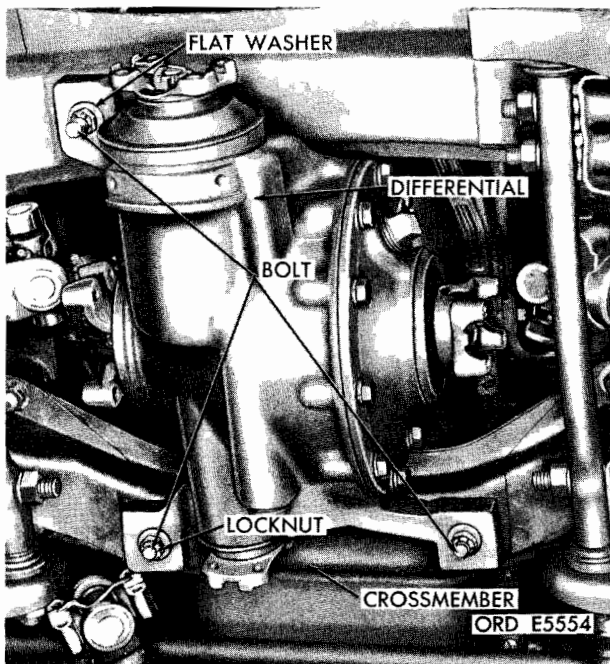
STEP 2 - Remove four nuts and lockwashers and two "U" bolts securing drive-shaft universal joint to differential drive flange at both sides of differential.

Figure 101. Differential assembly removal  
(continued)





**STEP 3 -** Remove four bolts securing front propeller shaft universal joint to differential drive flange.



**STEP 4 -** Remove three bolts, flatwashers and locknuts securing differential assembly to front crossmember. Remove differential assembly.

Figure 101. Differential assembly removal

b. Installation. Refer to figure 101, steps 4 back through 1. The following attaching parts should be torqued to the values shown:

Universal joint  
bolt (5/16-24) — 10-15 lb-ft

Carrier to cross-  
member bolt  
(7/16-20) — 30-40 lb-ft

Coupling flange to  
pinion nut  
(9/16-18) — 60-70 lb-ft

Differential side  
gear to flange  
(7/16-20) — 40-45 lb-ft

## 123. WHEEL DRIVE SHAFTS

a. Removal. Refer to figure 102. Raise front of vehicle. Remove eight nuts and lockwashers from four "U" bolts. Slide driveshaft universal joint yoke toward wheel and remove shaft.

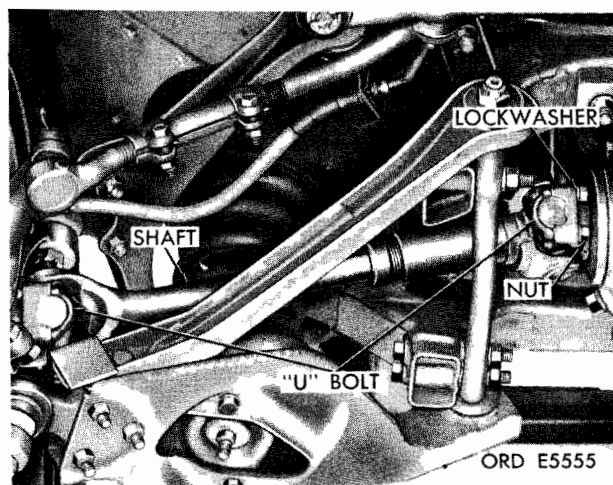


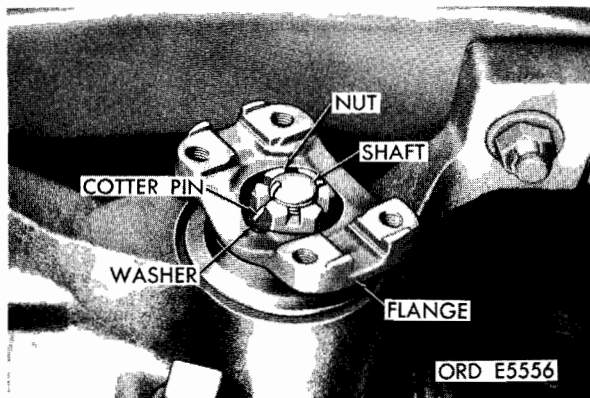
Figure 102. Driveshaft

b. Installation. Refer to figure 102.

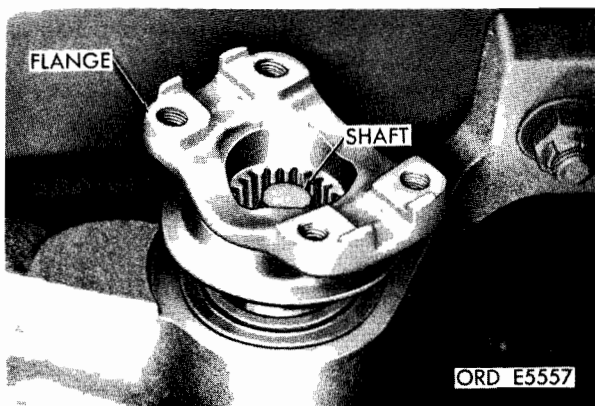
## 124. DIFFERENTIAL CARRIER FLANGE (DRIVE PINION)

a. Removal. Refer to figure 103, steps 1 through 3.

STEP 1 - Remove front propeller shaft (fig. 97, steps 1 and 2).



STEP 2 - Remove cotter pin and nut from pinion shaft.



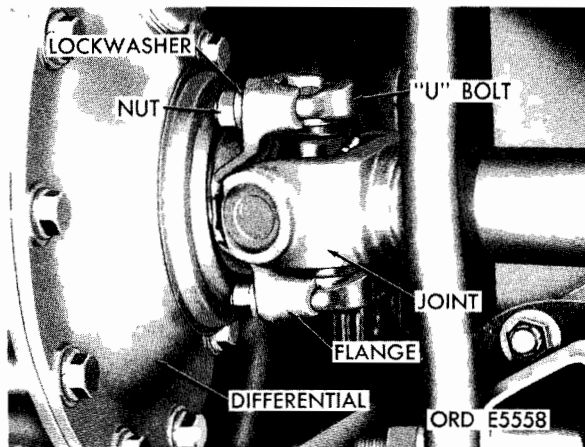
STEP 3 - Remove flange from shaft.

b. Installation. Refer to figure 103, steps 3 back through 1. For installation, the flange to pinion nut should be torqued to 60-70 lb-ft.

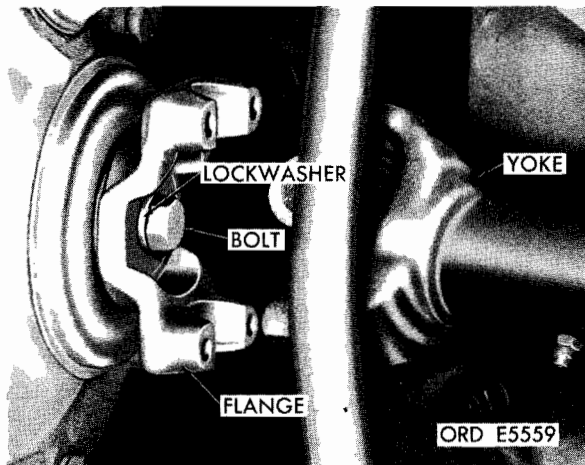
Figure 103. Differential carrier flange (drive pinion) removal

## 125. DIFFERENTIAL CARRIER FLANGE (SIDE GEAR SHAFTS)

a. Removal. Refer to figure 104, steps 1 through 3.



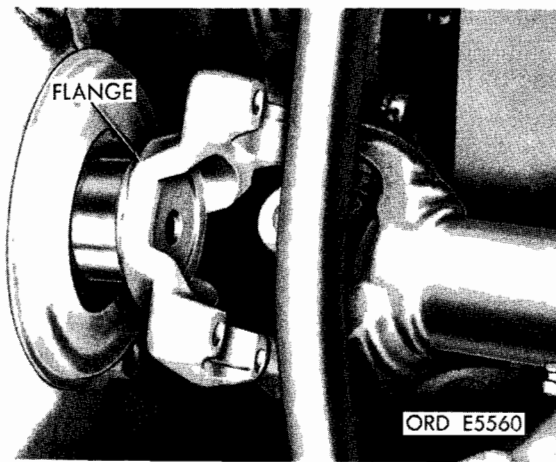
STEP 1 - Remove four nuts and lockwashers and two "U" bolts securing axle driveshaft universal joint to drive flange of differential.



STEP 2 - Slide wheel drive shaft universal joint yoke toward wheel to separate universal joint from flange. Remove flange mounting bolt and washer from differential side gear. Secure loose universal joint bearings with tape to keep them from falling off cross.

Figure 104. Differential carrier flange (side gear shafts) removal  
(continued)





STEP 3 - Pull flange from side gear.

Figure 104. Differential carrier flange (side gear shafts) removal

b. Installation. Refer to figure 104, steps 3 back through 1. For installation, the differential side gear to flange bolts should be torqued to 40-45 lb-ft.

## 126. DIFFERENTIAL BREATHER VALVE

a. General. Upon removal of breather valve, check for proper operation. Valve should allow air to pass out of carrier at approximately 4 lb pressure, but restrict passage of air into it. Leaking seals are good evidence that valve is defective or requires cleaning.

b. Replacement. Refer to figure 105. The differential breather valve is located at the top of the differential (fig. 105). To remove or install the valve, turn out or in.

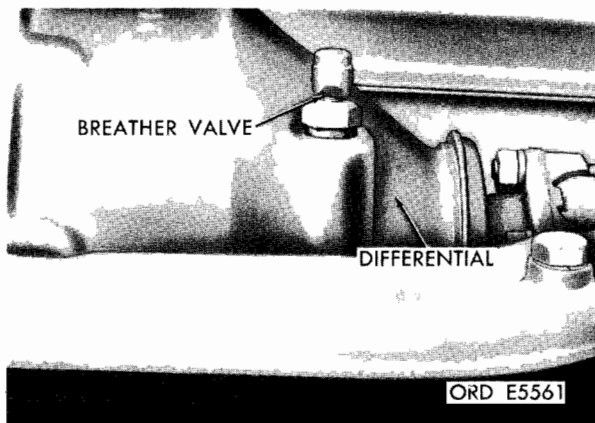
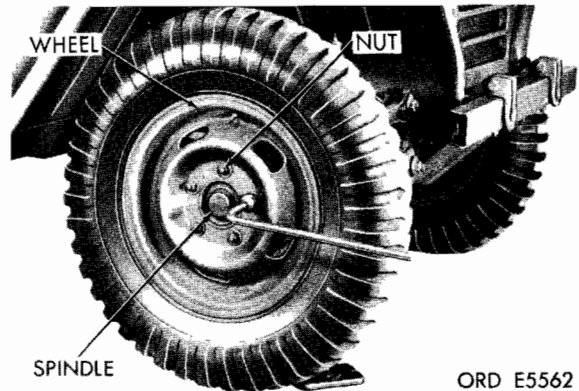


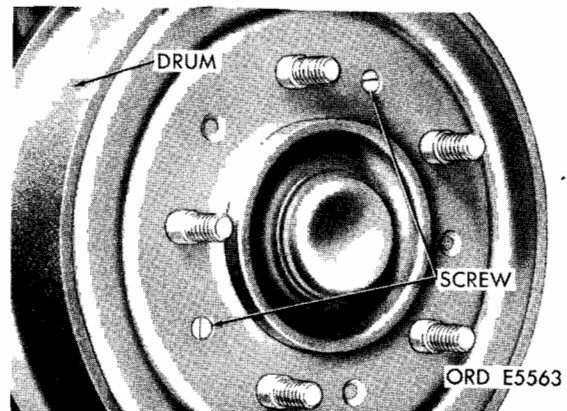
Figure 105. Breather valve

## 127. WHEEL BEARING INNER SEAL

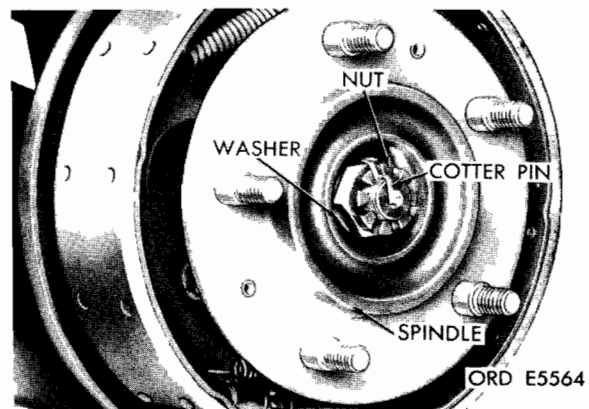
a. Removal. Refer to figure 106, steps 1 through 5.



STEP 1 - Raise vehicle and remove five nut and washer assemblies securing wheel and tire assembly to wheel spindle.

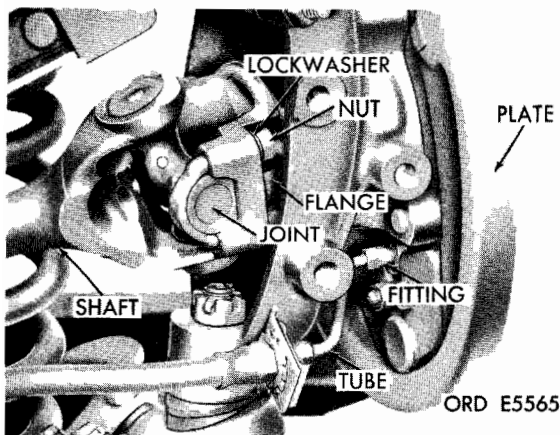


STEP 2 - Remove two screws securing brake drum to wheel spindle.

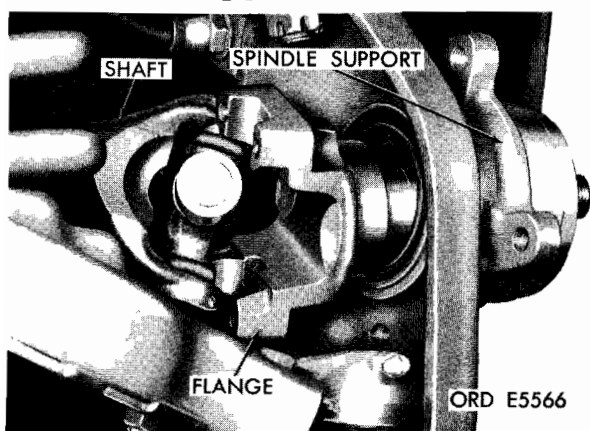


STEP 3 - Remove cotter pin, nut and washer securing wheel spindle on wheel drive flange and remove spindle.

Figure 106. Wheel bearing inner seal removal (continued)



STEP 4 - Remove four nuts and lockwashers securing wheel drive shaft to wheel drive flange at universal joint. Remove brake tube fitting and brake backing plate.



STEP 5 - Position wheel drive shaft aside and pull wheel drive flange from spindle support. NOTE. Using brass drift or wood driver gently tap on inner bearing from wheel side of spindle support until seal is removed.

Figure 106. Wheel bearing inner seal removal

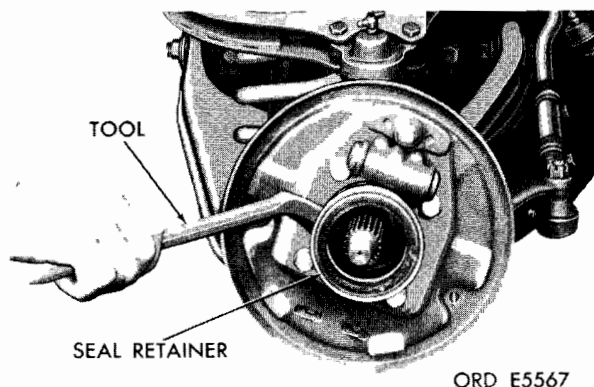
b. Installation. Pack lips of seal with grease (GAA) and coat outer face of seal with sealing compound (MIL-S-54180). Torque attaching parts to values shown:

Wheel spindle to  
drive flange  
nut (3/4-16) — 100-120 lb-ft  
Wheel mounting  
nuts (7/16-20) — 65-70 lb-ft

## 128. WHEEL BEARING OUTER SEAL

a. Removal. Refer to figure 107, steps 1 and 2.

STEP 1 - Refer to figure 106, steps 1 through 3 to remove wheel, brake drum, and wheel spindle.



STEP 2 - Pry seal and retainer loose with suitable tool.

Figure 107. Wheel bearing seal removal

b. Installation. Pack lips of seal with grease (GAA), and coat seating surface of seal with sealing compound (MIL-S-45180). Refer to figure 107, steps 2 and 1 for installation. Use replacer - 7950152 (fig. 108) at installation. Lubricate bearings and universal joint in accordance with lubrication chart. Adjust wheel bearings (par. 11). Torque the attaching parts to the values shown:

Wheel spindle to  
drive flange nut  
(3/4-16) — 100-120 lb-ft  
Wheel mounting  
nut (7/16-20) — 65-70 lb-ft

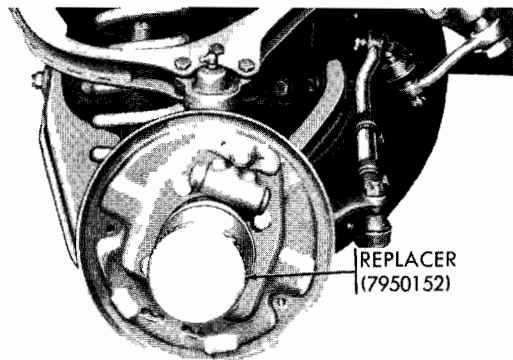


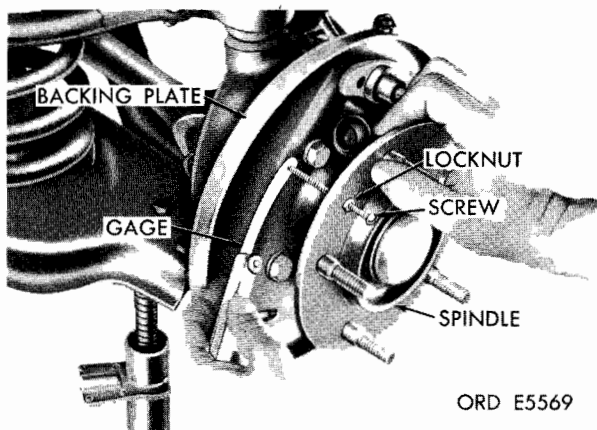
Figure 108. Using special tool, replacer - 7950152

## 129. WHEEL BEARING ADJUSTMENT CHECK

a. General. Wheel bearing adjustment check should be performed each time adjustment has been disturbed for seal replacement or at time of lubrication. Specified clearance is .002 to .006 inches. If clearance is above .006 inches notify ordnance maintenance personnel.

b. Adjustment Check. Refer to figure 109, steps 1 through 3. After adjustment check is completed, install brake shoes, brake drum, and wheel and tire assembly (par. 159). Adjust service brakes (par. 157c) at removed wheel.

STEP 1 - Remove wheel and tire assembly, brake drum and brake shoes (par. 159) and insert a no. 10-32 x 3 screw and assembled lock nut into brake drum retaining screw hole.

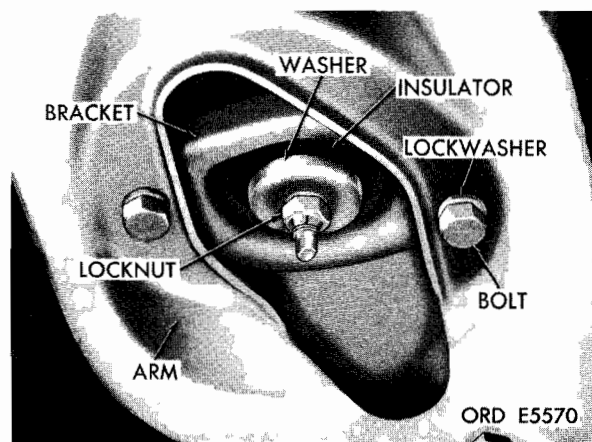


STEP 2 - Press inward on spindle and turn screw in until it contacts brake backing plate. Set locknut. Pull outward on spindle and insert feeler gage between screw and brake backing plate. Clearance should be .002 to .006 inches.

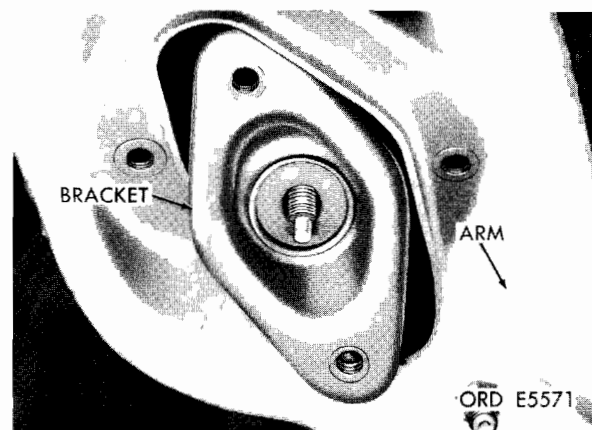
Figure 109. Wheel bearing adjustment check

## 130. FRONT SHOCK ABSORBERS

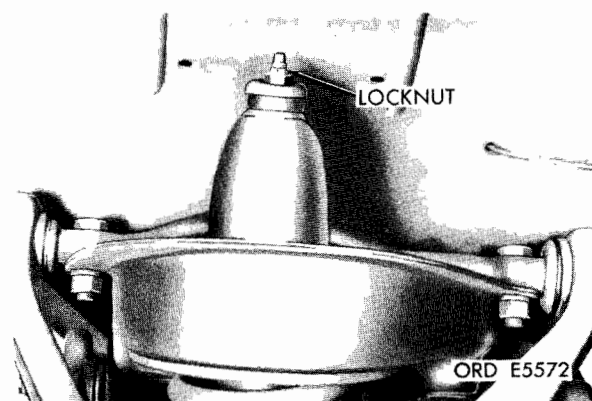
a. Removal. Refer to figure 110, steps 1 through 4.



STEP 1 - Remove two bolts and lockwashers securing bracket to suspension arm. Remove shock absorber mounting locknut, insulator washer and insulator.

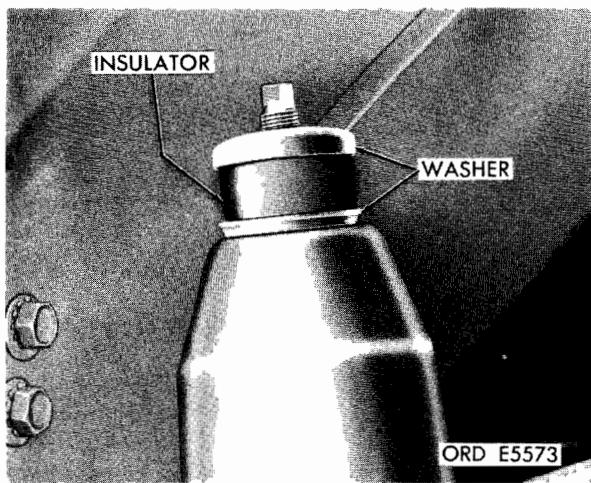


STEP 2 - Raise front of vehicle. Rotate mounting bracket to remove from inside of suspension arm.



STEP 3 - Remove locknut securing top of shock absorber to crossmember.

Figure 110. Front shock absorber removal (continued)



STEP 4 - Lift off top washer, mounting insulator, and lower washer. Remove shock absorber through opening in lower suspension arm.

Figure 110. Front shock absorbers removal

b. Installation. Refer to figure 110, steps 4 back through 1. The following attaching parts should be torqued to the values shown:

Shock Absorber  
Lower Mounting  
Nut (7/16-20) \_\_\_\_\_ 25-30 lb-ft

Shock Absorber  
Upper Mounting  
Nut (7/16-20) \_\_\_\_\_ 25-30 lb-ft

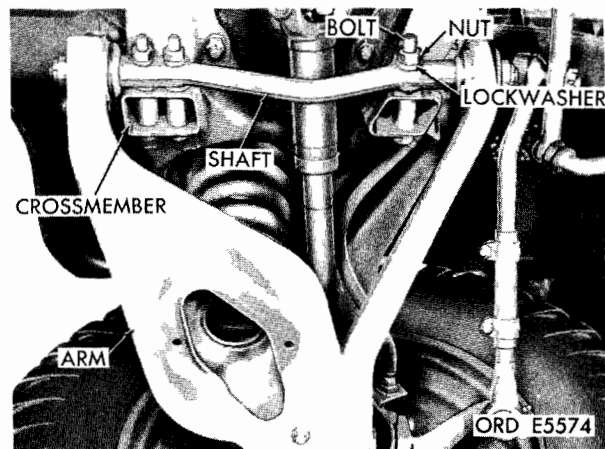
Front Crossmember  
to Shock Absorber  
Support Plate  
Mounting Bolt  
(3/8-24) \_\_\_\_\_ 25-30 lb-ft

NOTE. At installation inspect mounting insulators and washers. Replace damaged or unserviceable parts.

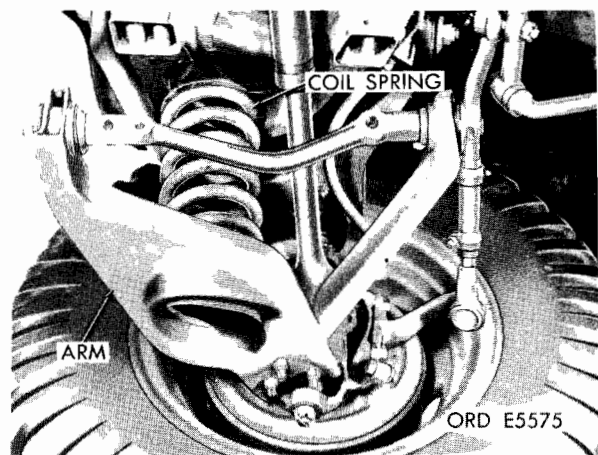
## 131. FRONT SPRING

a. Removal. Refer to figure 111, steps 1 through 3.

STEP 1 - Remove shock absorber (par. 130 and steps 1 through 5, fig. 110).



STEP 2 - Remove three bolts, nuts, and lockwashers securing lower suspension arm shaft to crossmember.



STEP 3 - Swing lower suspension arm down and remove coil spring.

Figure 111. Front coil spring removal

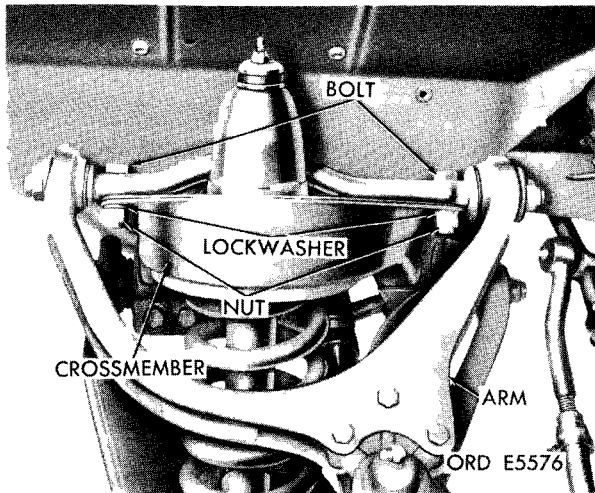
b. Installation. Refer to figure 111, steps 3 back through 1. This procedure applies to either front spring. At installation torque the two front lower suspension arm shaft to crossmember bolts to 45-55 lb-ft and rear bolt to 60-70 lb-ft.

NOTE. Prior to installation, inspect spring insulator. Replace with new part if evidence of wear is found.

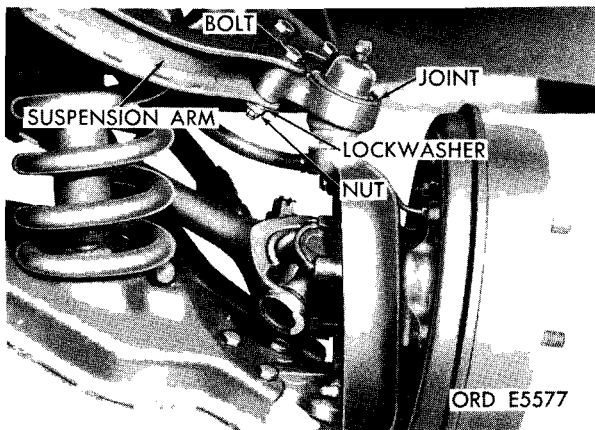
## 132. UPPER SUSPENSION ARMS

a. Removal. Refer to figure 112, steps 1 through 3.

STEP 1 - Raise vehicle and remove five wheel retaining nuts and washer assemblies.



STEP 2 - Remove two bolts, nuts, and lockwashers securing upper arm to front crossmember.



STEP 3 - Remove three bolts, nuts and lockwashers securing upper ball joint to suspension arm and remove suspension arm.

Figure 112. Upper suspension arm removal

b. Installation. Figure 112, steps 3 back through 1, show operations for installing upper suspension arms. After installation, refer to

par. 136 for checking and adjusting toe-in. The following attaching parts are to be torqued to the values shown:

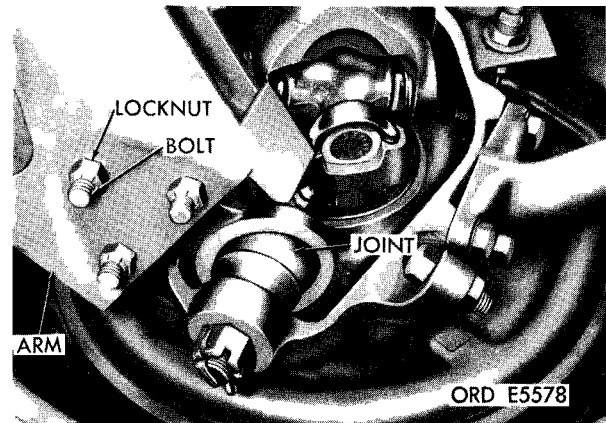
Upper arm shaft to  
crossmember  
mounting bolt  
(1/2-20) \_\_\_\_\_ 60-70 lb-ft

Upper suspension  
arm to ball joint  
nut (7/16-20) \_\_\_\_\_ 25-30 lb-ft

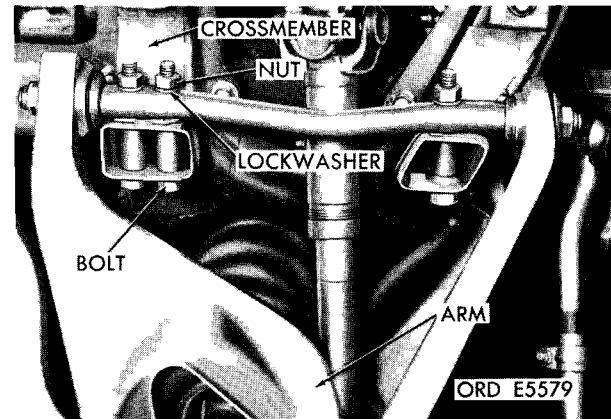
## 133. LOWER SUSPENSION ARM

a. Removal. Refer to figure 113, steps 1 through 3.

STEP 1 - Remove shock absorber (fig. 110, steps 1-4).



STEP 2 - Remove three bolts and locknuts securing suspension arm to lower ball joint.



STEP 3 - Remove three bolts, nuts, and lockwashers securing suspension arm to crossmember.

Figure 113. Lower suspension arm removal



b. Installation. Refer to figure 113, steps 3 back through 1. The following attaching parts should be torqued to the values shown:

Lower arm to ball  
joint mounting  
nut (7/16-20) ————— 25-30 lb-ft

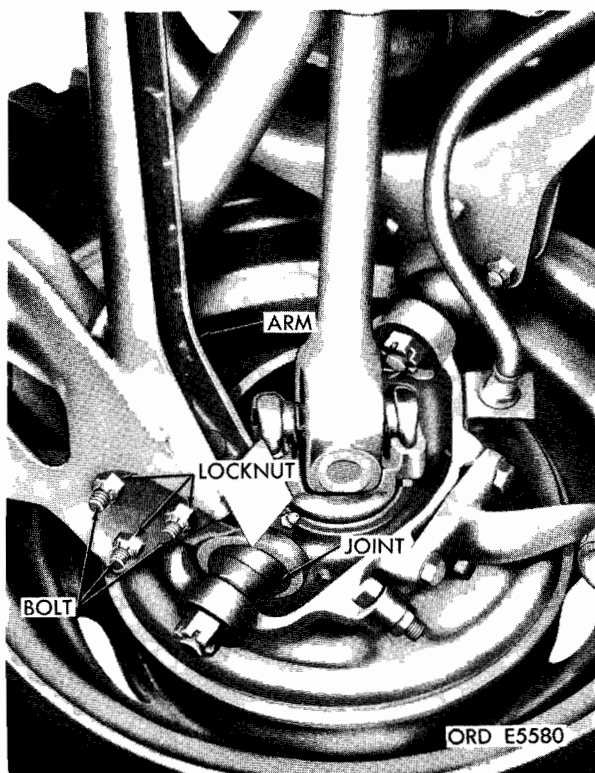
Lower arm shaft  
to crossmember  
mounting bolt front  
(7/16-20) ————— 45-55 lb-ft

Lower arm shaft  
to crossmember  
mounting bolt rear  
(1/2-20) ————— 60-70 lb-ft

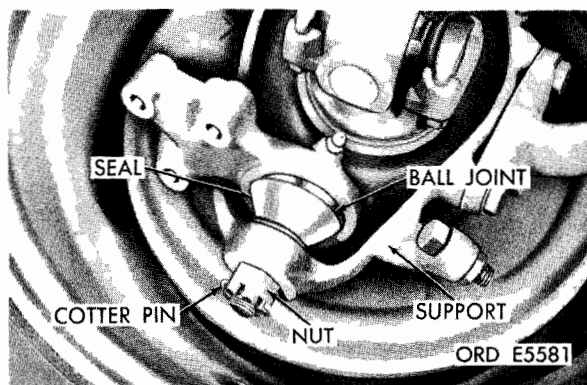
#### 134. FRONT SUSPENSION UPPER AND LOWER BALL JOINTS

a. Removal. Refer to figure 114, steps 1 through 5.

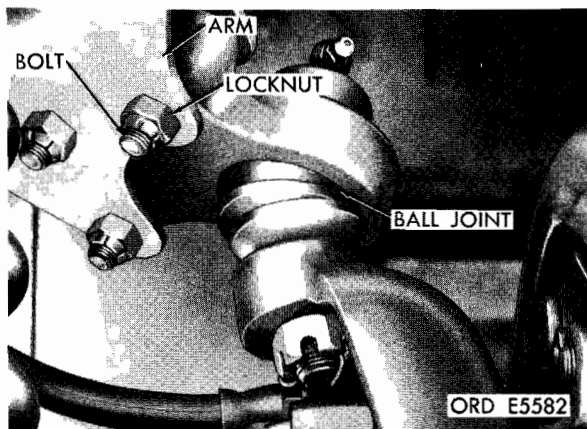
STEP 1 - Remove coil spring (fig. 111, steps 1 through 3).



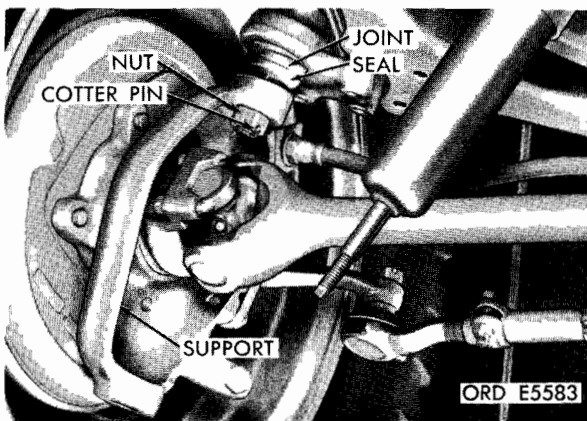
STEP 2 - Remove three bolts and locknuts securing lower arm to lower ball joint.



STEP 3 - Remove cotterpin and nut securing lower ball joint and seals to wheel spindle support. Remove ball joint.



STEP 4 - Remove three nuts and bolts securing upper arm to upper ball joint.



STEP 5 - Remove cotter pin and nut securing upper ball joint and seals to wheel spindle support.

Figure 114. Front suspension upper and lower ball joint removal

b. Installation. Refer to figure 114, steps 5 back through 1. The following attaching parts should be torqued to the values shown:

Lower arm ball  
joint mounting  
nut (7/16-20) ————— 25-30 lb-ft

Upper arm ball  
joint mounting  
nut (7/16-20) ————— 25-30 lb-ft

### 135. BALL JOINT UPPER AND LOWER SEALS

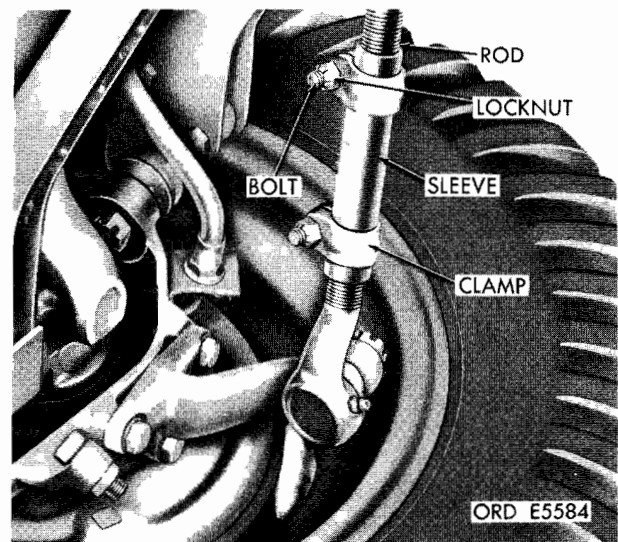
a. Removal. Refer to figure 114, steps 1 through 5.

b. Installation. Refer to figure 114, steps 5 back through 1.

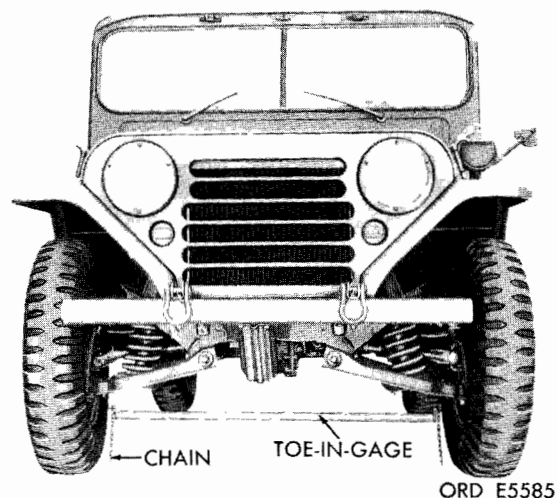
### 136. FRONT WHEEL ALINEMENT

Front wheel alinement adjustments other than toe-in must be coordinated with ordnance maintenance personnel (par. 2). The factors of alinement are inter-related and if one adjustment is made, other adjustments may be affected. After all alinement operations are complete, check if settings previously made are still within limits. Make all adjustments at curb weight. After installing new or reconditioned front end components check and adjust toe-in as shown in fig. 115, and as soon as possible thereafter, report to ordnance maintenance personnel for complete front end wheel alinement.

STEP 1 - Rotate steering wheel to stop. Reverse steering wheel approximately 1-5/6 turns until one spoke of steering wheel is in line with centerline of steering column. In this position, the Pitman arm and front wheel point straight ahead. NOTE. Vehicle must be on a flat smooth surface.



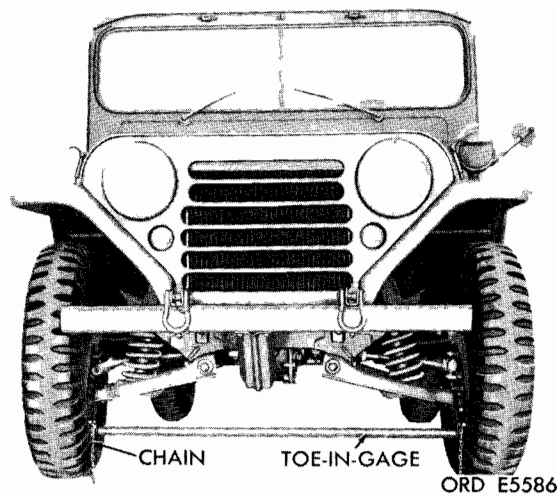
STEP 2 - Loosen locknut on two clamps on both spindle arm tie rod adjusting sleeves.



STEP 3 - Place wheel alinement toe-in gage between front tires, behind the vertical centerline of the wheels. Position the gage so both chains just touch the floor. Move the gage scale to read zero.

Figure 115. Toe-in adjustment (continued)





STEP 4 - Push vehicle rearward until gage is forward of the vertical center-line of the wheels and the chains are just touching the floor. Read gage. Reading should be .03 to .09 inch. Remove gage and turn both adjusting.

sleeves equally and repeat toe-in check until correct adjustment is obtained. Tighten clamps and report to ordnance maintenance personnel as soon as possible for complete front end wheel alignment.

Figure 115. Toe-in adjustment

## Section XXI. REAR DRIVE ASSEMBLY

### 137. GENERAL

The rear drive assembly consists of differential assembly, wheel drive shafts, and universal joints. This section describes those maintenance operations allocated to organizational maintenance on the rear drive assembly. The entire rear drive assembly is the same as the front drive assembly with the exception of the wheel drive shafts.

### 138. DIFFERENTIAL ASSEMBLY

The rear differential assembly is mounted to the three body brackets and secured with three bolts, flatwashers, and locknuts. The front differential is similarly secured to the

front crossmember. Differentials are interchangeable front and rear. For description of the rear differential refer to paragraph 119.

### 139. BREATHER VALVE (DIFFERENTIAL)

Refer to paragraph 126.

### 140. DRIVE SHAFTS AND UNIVERSAL JOINTS

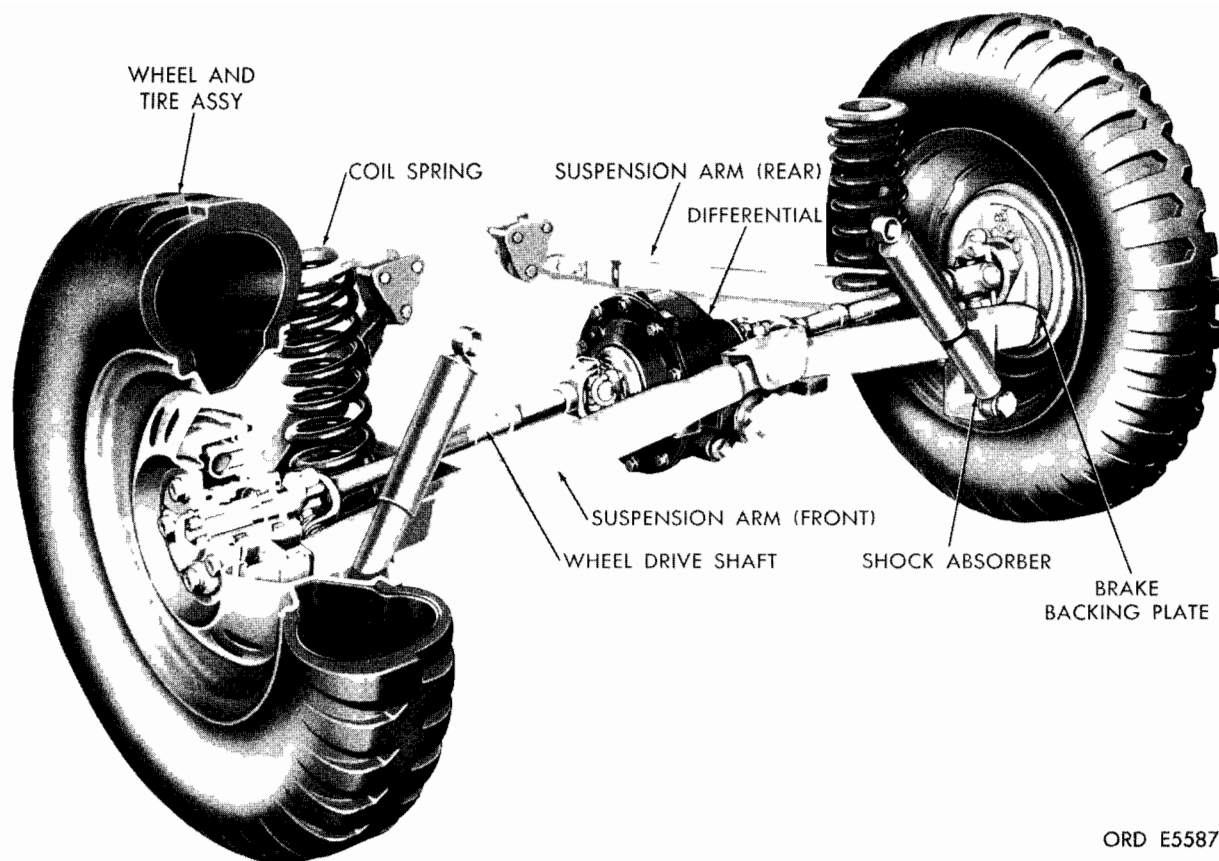
Removal and installation of rear drive shafts and universal joints is similar to removal and installation of front drive shafts and universal joints (par. 123 or par. 118, as applicable).

## Section XXII. REAR SUSPENSION

### 141. GENERAL

The rear suspension is of the swing-arm type of individual wheel suspension utilizing coil springs and hydraulic telescopic shock absorbers. Figure 116 is a cutaway of the rear suspension and drive. The coil springs are mounted

between a spring seat in the suspension arms and a formed seat in the integral frame and body. The shock absorbers are of the telescopic type and control full jounce and rebound. They are located rearward of the coil springs.

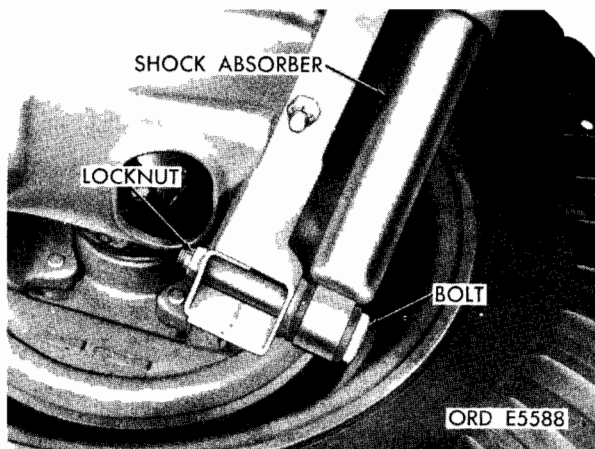


ORD E5587

Figure 116. Cutaway of the rear suspension and drive

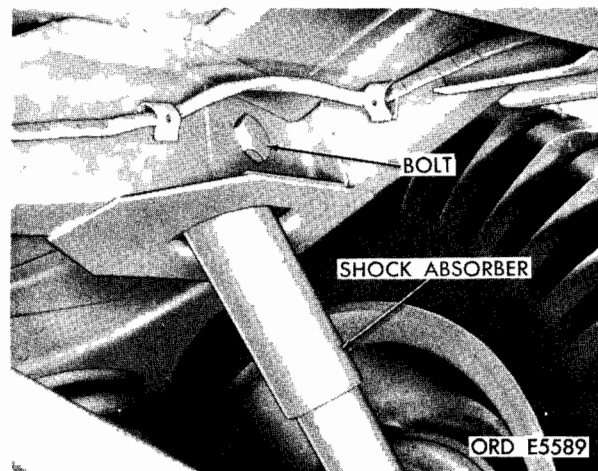
## 142. SHOCK ABSORBERS

a. Removal. Refer to figure 117, steps 1 and 2.



ORD E5588

STEP 1 - Remove bolt and locknut securing shock absorber to suspension arm.



ORD E5589

STEP 2 - Remove bolt and locknut securing shock absorber to frame.

Figure 117. Rear shock absorbers removal

b. Installation. Refer to figure 117, steps 2 back to 1. The following attaching parts should be torqued to the values shown:

Shock Absorber  
Lower Mounting  
Nut (3/8-24) ————— 25-30 lb-ft

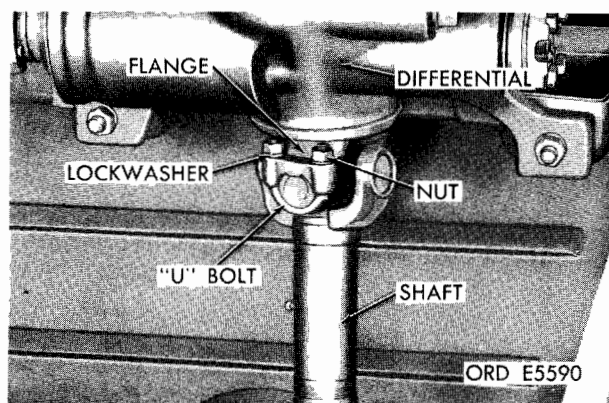
Shock Absorber  
Upper Mounting  
Nut (3/8-24) ————— 25-30 lb-ft

At installation install new bushing when necessary.

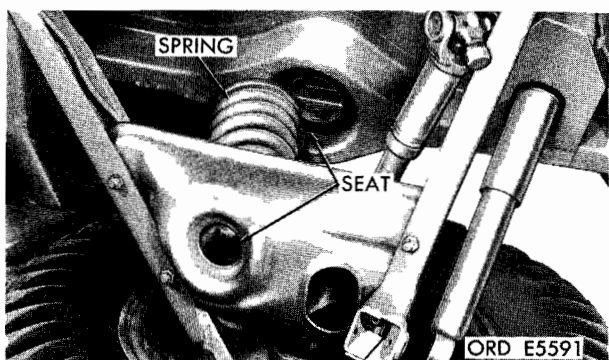
#### 143. REAR SPRINGS

a. Removal. Refer to figure 118, steps 1 through 3.

STEP 1 - Remove bolt and locknut securing shock absorber to suspension arm step 1, fig. 117.



STEP 2 - Remove four nuts, lockwashers, and two "U" bolts securing wheel drive shaft to differential flange.



STEP 3 - Use suitable hoist and raise vehicle until coil spring can be removed from seats. CAUTION. When raising vehicle exercise care not to damage brake lines.

Figure 118. Rear spring removal

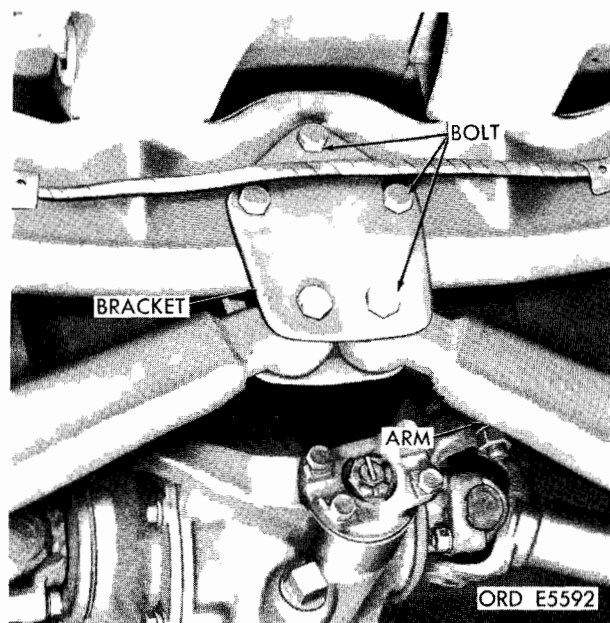
b. Installation. Refer to figure 118, steps 3 back through 1. Universal joint to drive shaft flange nut should be torqued to 15-20 lb-ft.

#### 144. SUSPENSION ARM BUSHINGS

a. General. All rear suspension arm bushings can be removed and installed without completely removing the suspension arms which eliminate disconnecting brake lines.

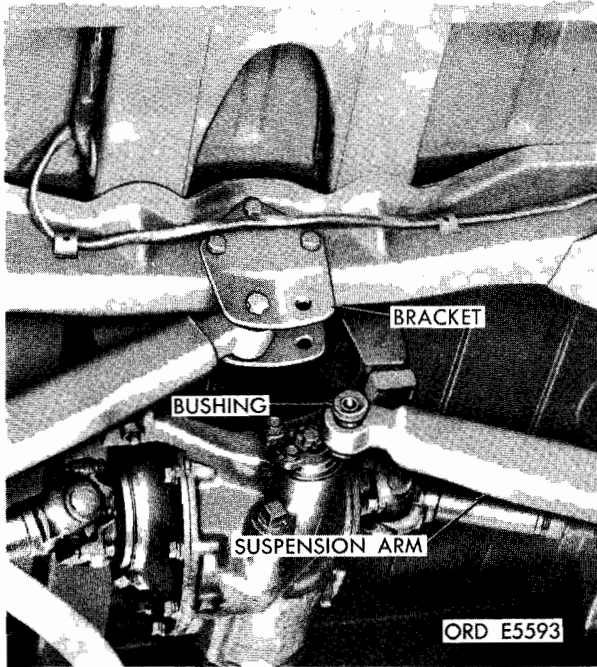
b. Removal. Refer to figure 119, steps 1 through 4, for operations for removing any rear suspension arm bushing.

STEP 1 - Remove bolt and locknut securing shock absorber to suspension arm (fig. 117, step 1).

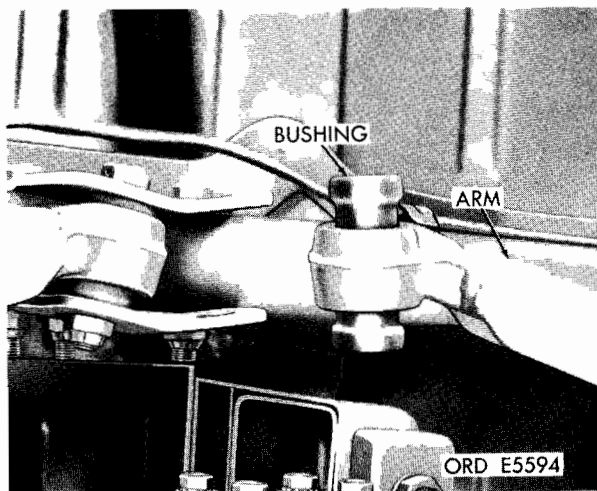


STEP 2 - Loose four locknuts at the mounting bracket. Remove bolt and locknut from arm with defective bushing.

Figure 119. Suspension arm bushing removal (continued)



**STEP 3 -** Pull suspension arm out of bracket.  
Remove bushing.



**STEP 4 -** Remove defective bushings.

Figure 119. Suspension arm bushing removal

c. Installation. Refer to figure 119, steps 4 back through 1 for installing any rear suspension arm bushing. When replacing bushings, always replace both bushings in one arm,

even if only one is defective. The following attaching parts should be torqued to the values shown:

**Front Arm**

Support Bushing

Bolt (7/16-20) ————— 40-50 lb-ft

**Rear Arm**

Support Bushing

Bolt (7/16-20) ————— 40-50 lb-ft

**Front Arm Bracket**

to Body Mounting

Bolt (3/8-24) ————— 25-30 lb-ft

**Rear Arm Bracket**

to Body Mounting

Bolt (3/8-24) ————— 25-30 lb-ft

**Shock Absorber**

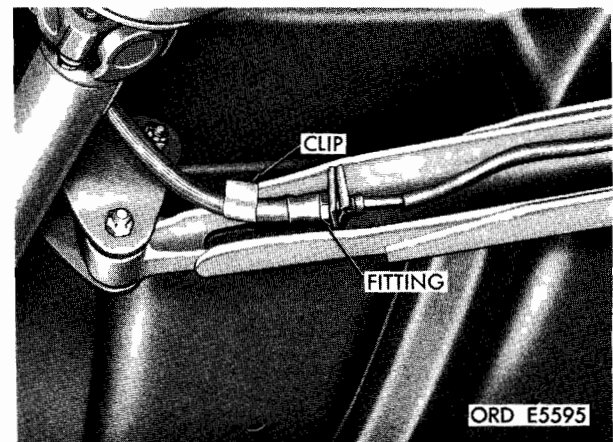
Lower Mounting

Nut (3/8-24) ————— 25-30 lb-ft

## 145. SUSPENSION ARM ASSEMBLY

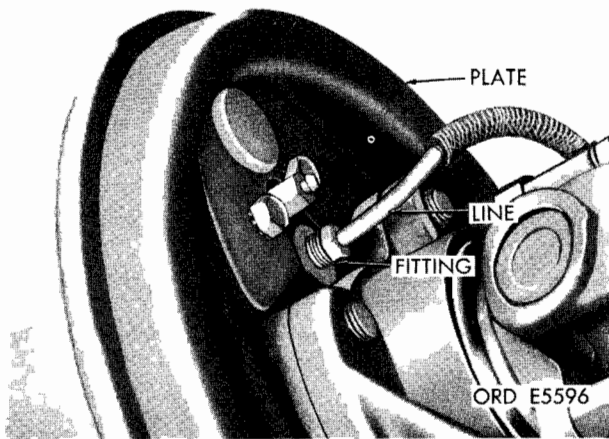
a. Removal. Refer to figure 120, steps 1 through 7.

**STEP 1 -** Remove wheel spindle (par. 127).  
Remove coil spring (par. 143)

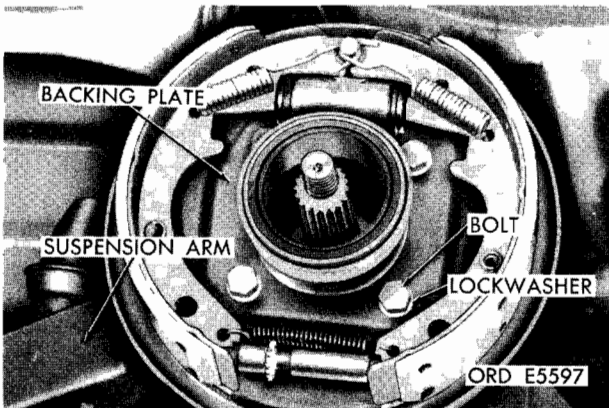


**STEP 2 -** Unscrew brake hose fitting and remove from clip.

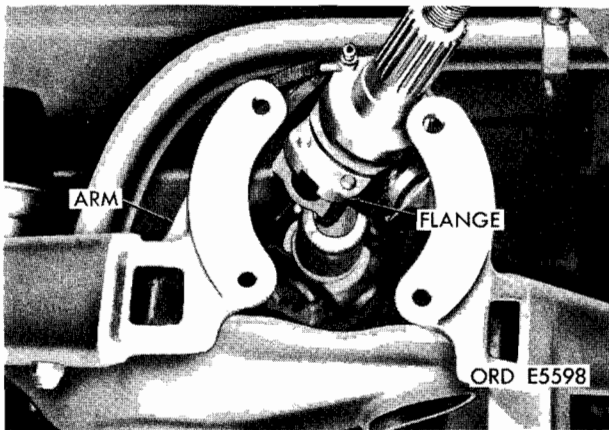
Figure 120. Suspension arm assembly removal



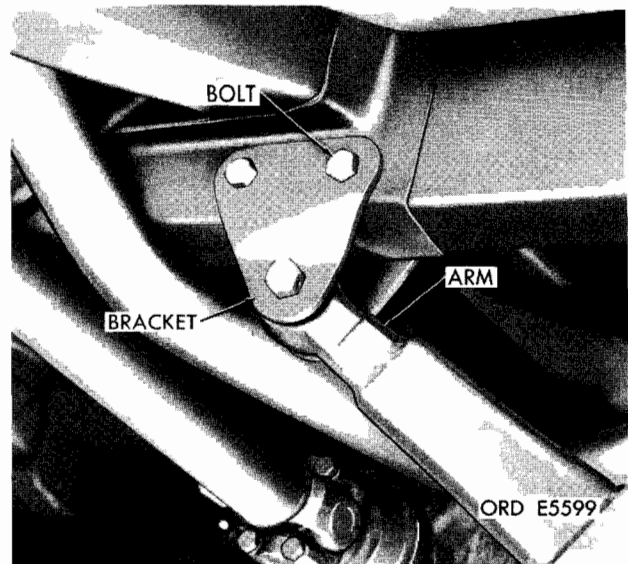
**STEP 3** - Remove brake line fitting from wheel cylinder at inner side of brake backing plate.



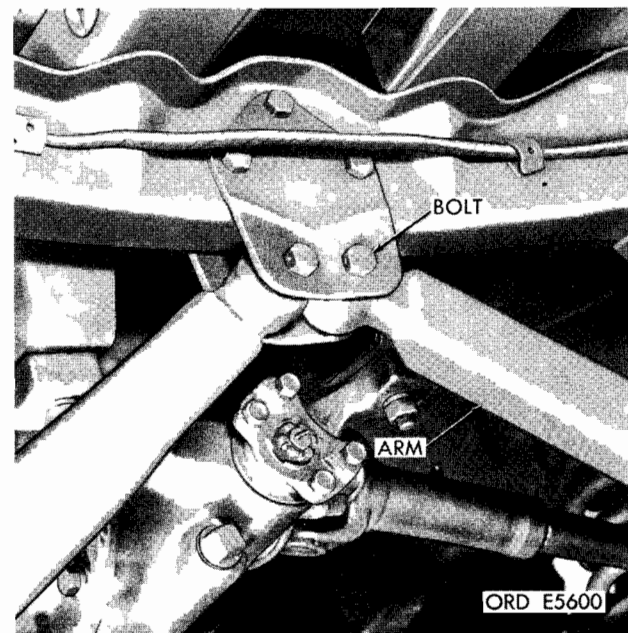
**STEP 4** - Remove four bolts and lockwashers securing the brake assembly and spindle support to the suspension arms.



**STEP 5** - Remove wheel drive shaft with universal joint and wheel drive flange.



**STEP 6** - Loosen locknuts on two bracket bolts. Remove support bolt securing suspension arm (front) to bracket.



**STEP 7** - Loosen four bolts and remove bolt and locknut from defective suspension arm and remove suspension arm assembly.

Figure 120. Suspension arm assembly removal

b. Installation. Refer to figure 120, steps 7 back through 1. The following attaching parts should be torqued to the values shown:

Front Arm Bracket  
Mounting Bolt  
(3/8-24) \_\_\_\_\_ 25-30 lb-ft

Rear Arm Bracket  
to Body Mounting  
Bolt (3/8-24) \_\_\_\_\_ 25-30 lb-ft

Front Arm Support  
Bushings Bolt  
(7/16-20) \_\_\_\_\_ 40-50 lb-ft

Rear Arm Support  
Bushings Bolt  
(7/16-20) \_\_\_\_\_ 40-50 lb-ft

Arm to Spindle  
Support Bolt  
(7/16-20) \_\_\_\_\_ 40-50 lb-ft

Shock Absorber  
Lower Mounting  
Nut (3/8-24) \_\_\_\_\_ 25-30 lb-ft

## Section XXIII. STEERING SYSTEM

### 146. DESCRIPTION AND DATA

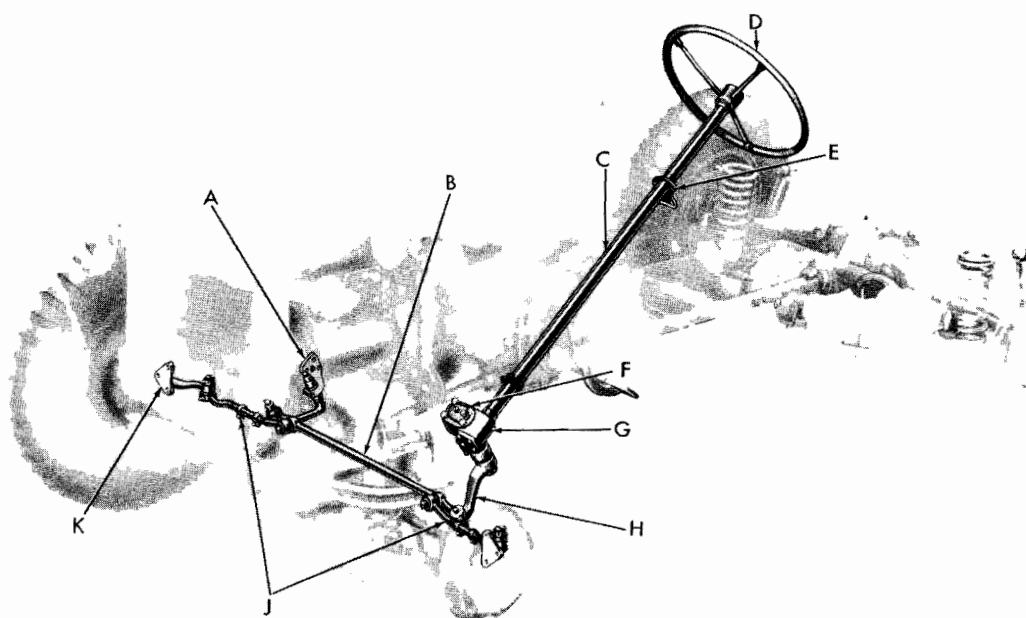
a. Steering Gear. The steering gear assembly is of the worm and double roller type and is mounted on the left body frame side rail. Figure 121 is a phantom view of the steering system. The steering column is supported by a bracket attached to the instrument panel. The steering gear worm is integral with the steering shaft and is supported at each end by opposed tapered roller bearings. A double-tooth roller is attached to the sector shaft by a steel trunnion. The sector is mounted in anti-friction bushings which are pressed into the housing. The sector shaft cover is attached to the steering gear housing. An adjusting screw is mounted in the cover, and controls both sector shaft end play and worm-and-sector adjustment. Double lip seals are provided at top, bottom, and sector shaft sides of the steering gear housing. The pitman arm and steering wheel have fluted serrations with one serration being double width which match those on sector shaft and steering shaft to insure correct installation.

b. Steering Linkage. The steering linkage is of the parallelogram type and consists of all parts necessary to transmit steering effort from the steering sector shaft to front wheels. The linkage includes pitman arm, pitman-to-idler arm rod assembly, steering spindle arm tie rod assemblies, steering idler arm, and bracket, and steering spindle arms. The tie rod ends are equipped with non-adjustable, spring-loaded, ball sockets which compensate for wear of the ball studs. Grease fittings are located in each tie rod end and idler arm bushings.

#### c. Data.

Steering gear  
Manufacturer \_\_\_\_\_  
Ratio \_\_\_\_\_ 16.4 to 1  
Type \_\_\_\_\_ worm and  
double roller

Steering wheel  
Size \_\_\_\_\_ 17.25 in. dia  
Type \_\_\_\_\_ 3 spoke



ORD E5601

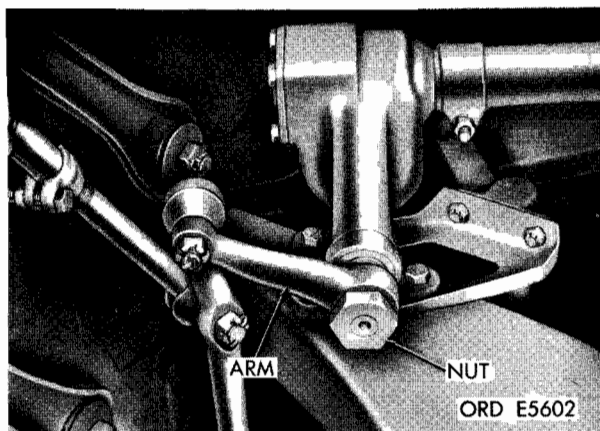
- |  |                                 |
|--|---------------------------------|
| A. Idler arm mounting bracket            | F. Adjusting screw              |
| B. Pitman to idler arm rod               | G. Steering gear assembly       |
| C. Steering column                       | H. Steering pitman arm          |
| D. Steering wheel                        | J. Spindle arm tie rod assembly |
| E. Steering column to dash panel bracket | K. Spindle arm                  |

Figure 121. Steering system

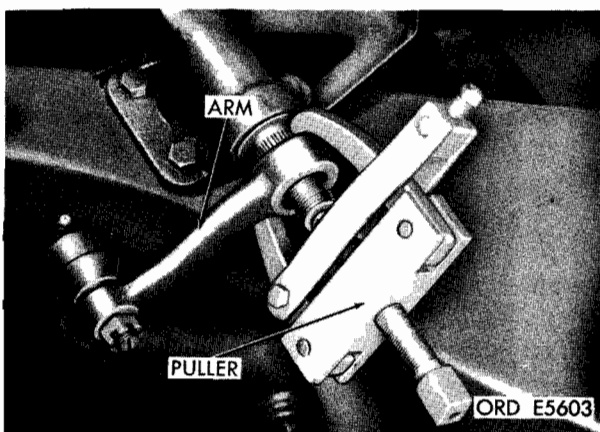


## 147. PITMAN ARM

a. Removal. Refer to figure 122, steps 1 and 2.



STEP 1 - Remove nut securing pitman arm to sector shaft.



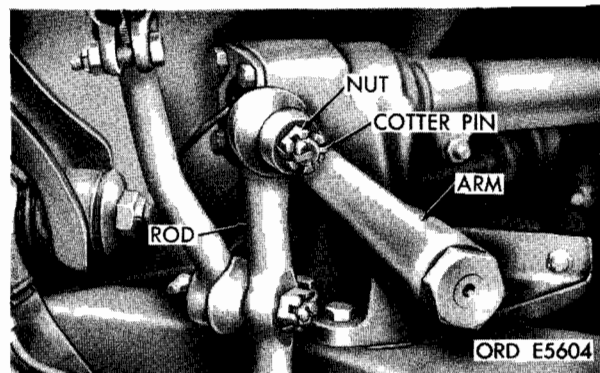
STEP 2 - Use suitable puller and remove pitman arm.

Figure 122. Pitman arm removal

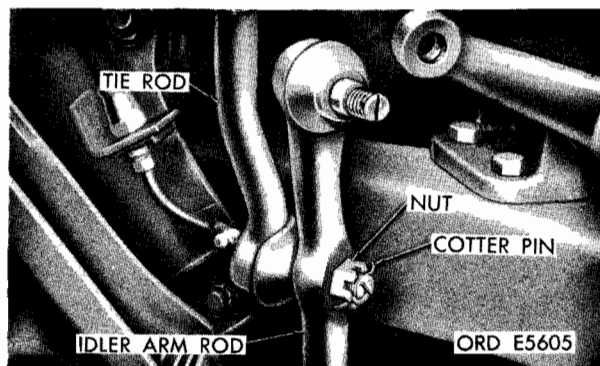
b. Installation. Refer to figure 122, steps 2 back to 1. Before installing pitman arm, rotate steering wheel to maximum turn. Reverse rotation approximately  $1 \frac{5}{6}$  turns until one spoke of steering wheel is in line with center-line of steering column. Point wheels in straight ahead position. Point pitman arm straight ahead, align fluted serrations on arm and sector shaft and install pitman arm. Tighten steering pitman arm to sector shaft nut to 100-110 lb-ft. torque.

## 148. IDLER ARM ROD

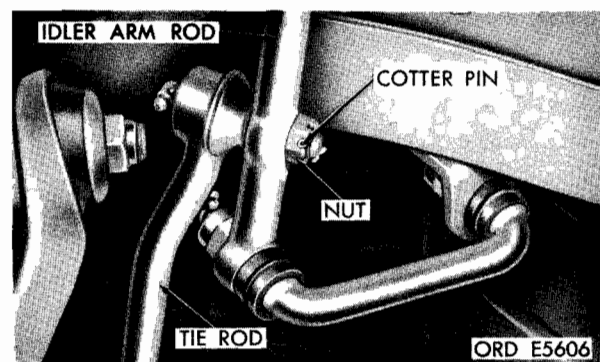
a. Removal. Refer to figure 123, steps 1 through 4.



STEP 1 - Remove cotter pin and nut securing idler arm rod to pitman arm. Remove idler arm rod ball stud from pitman arm with suitable tool.



STEP 2 - Remove cotter pin and nut securing spindle arm tie rod to idler arm rod. Remove tie rod ball stud from idler arm rod.



STEP 3 - Remove cotter pin and nut securing right spindle arm tie rod to idler arm rod. Remove tie rod ball stud from idler arm rod.

Figure 123. Idler arm rod removal (continued)

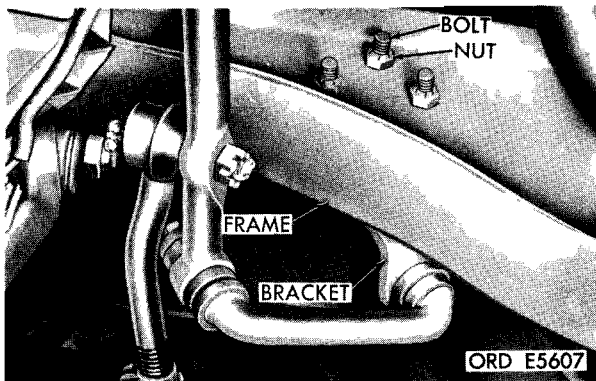
STEP 4 - Remove three nuts and bolts securing idler arm bracket to frame. Unscrew (clockwise) idler arm bracket from idler arm. Unscrew (clockwise) idler arm from idler arm rod. (Refer to fig. 134, idler arm bracket, idler arm, and idler arm bushing removal.) Remove idler arm rod. **NOTE. Do not hammer on tie rod ends.**

Figure 123. Idler arm removal

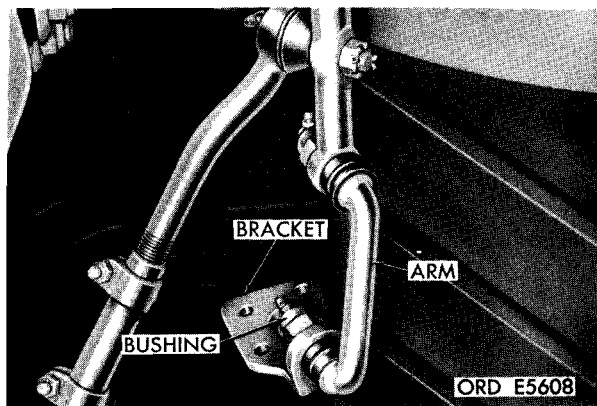
b. **Installation.** Refer to figure 123, steps 4 back through 1. Inspect seals and replace with new seals where necessary. Torque ball stud nuts to 50-60 lb-ft. After completing installation, adjust toe-in (par. 136).

#### 149. IDLER ARM BRACKET, IDLER ARM, AND IDLER ARM BUSHING

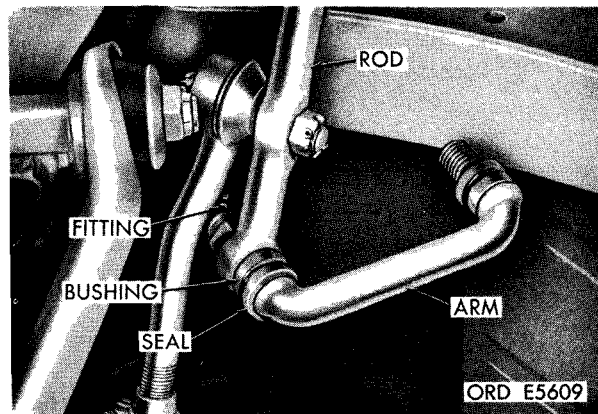
a. **Removal.** Refer to figure 124, steps 1 through 4.



STEP 1 - Remove three bolts securing idler arm bracket to frame.



STEP 2 - Turn idler arm bracket and bushing clockwise (facing idler arm) to remove it from idler arm.



STEP 3 - Turn idler arm clockwise to remove it from the idler arm rod assembly. Remove seals. Inspect and replace with new seals as necessary. Remove lubrication fittings.

STEP 4 - Idler arm bushings at both ends of idler arm have standard R. H. outside threads. Remove bushings, inspect, and replace with new bushings as necessary. **NOTE. To assemble idler arm in rod assembly, install bushing assembly, then turn idler arm in until all threads are completely engaged. Then back off one to one and one half turns and place in car position. Follow same procedure to assemble bracket to idler arm.**

Figure 124. Idler arm bracket, idler arm, and idler arm bushing removal

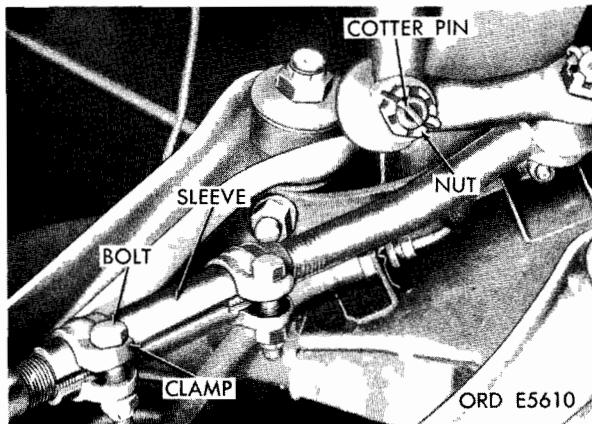
b. **Installation.** Refer to figure 124, steps 4 back through 1. **NOTE. Lubrication fittings must be removed to torque idler arm to bracket and idler arm to idler arm rod. At installation, the following attaching parts should be torqued to the values shown:**

Idler arm bracket to frame nut (3/8-24)	25-30 lb-ft
Idler arm bushing to idler arm rod (special)	100-110 lb-ft
Idler arm bushing to idler arm bracket (special)	100-110 lb-ft

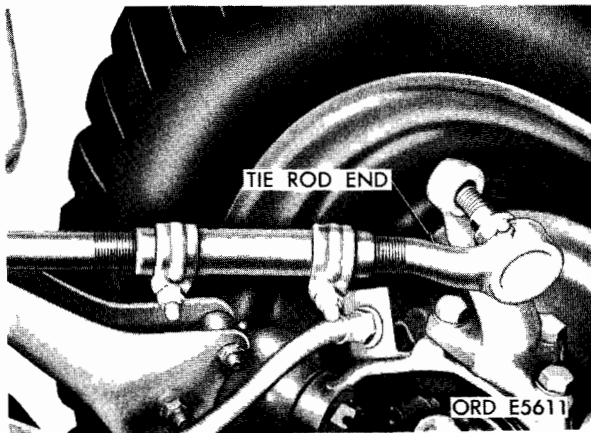
## 150. SPINDLE ARM TIE ROD END ASSEMBLIES

a. General. Each spindle arm tie rod with end assemblies has a right hand thread end and a left hand thread end. The ends are threaded into an adjusting sleeve onto which are fitted two clamps which serve to lock any adjustments made. The procedure for removal and installation of all four rod end assemblies are the same.

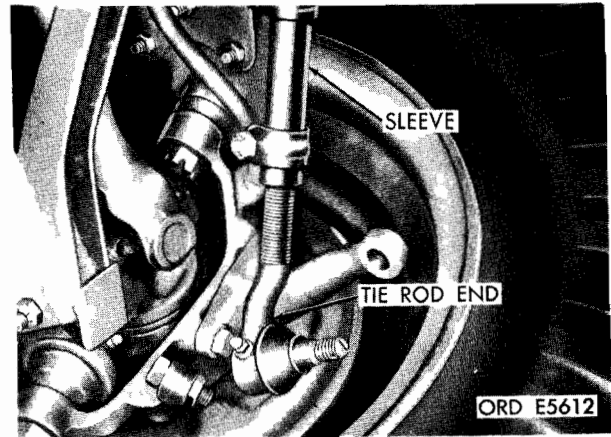
b. Removal. Refer to figure 125, steps 1 through 3.



STEP 1 - Remove cotter pin and nut securing tie rod end joint to steering spindle arm. Loosen sleeve clamp locknut and bolt securing tie rod end to sleeve.



STEP 2 - Use suitable puller and separate end from joint. **WARNING.** Do not hammer on tie rod ends.



STEP 3 - Unscrew and remove end from tie rod sleeve.

Figure 125. Spindle arm tie rod end assembly removal

c. Installation. Refer to figure 125, steps 3 back through 1. The following attaching parts should be torqued to the values shown:

Steering spindle arm  
to tie rod end ball  
stud nut (1/2-20) — 50-60 lb-ft

Steering spindle tie  
rod clamp nut  
(5/16-24) — 12-15 lb-ft

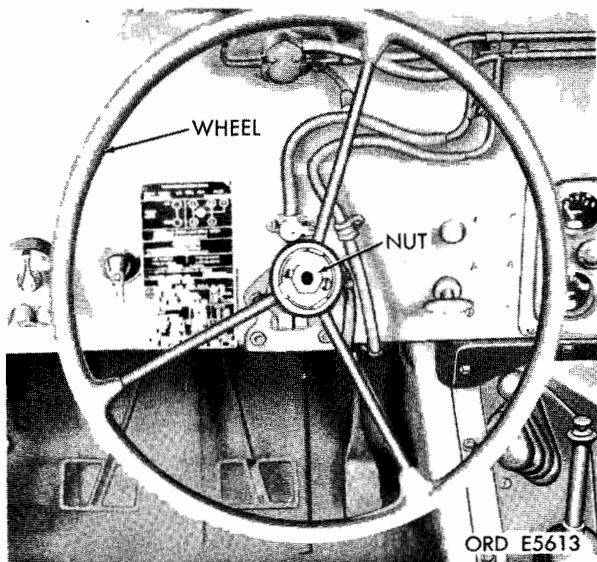
NOTE. Before installation, inspect all seals and replace with new seals as required. Adjust toe-in (par. 136).

## 151. STEERING WHEEL

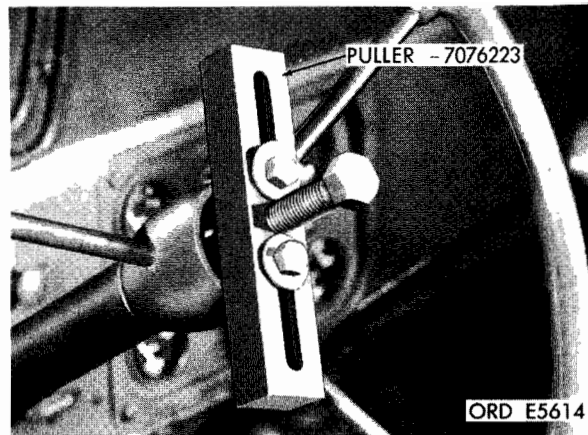
a. Removal. Refer to figure 126, steps 1 through 3.

STEP 1 - Remove horn switch assembly (par. 95 and fig. 81).

(continued)



STEP 2 - Remove steering wheel shaft nut.



STEP 3 - Use puller and remove steering wheel.

Figure 126. Steering wheel removal

b. Installation. Refer to figure 126, steps 3 back through 1. The steering wheel shaft nut should be torqued to 15-20 lb-ft.

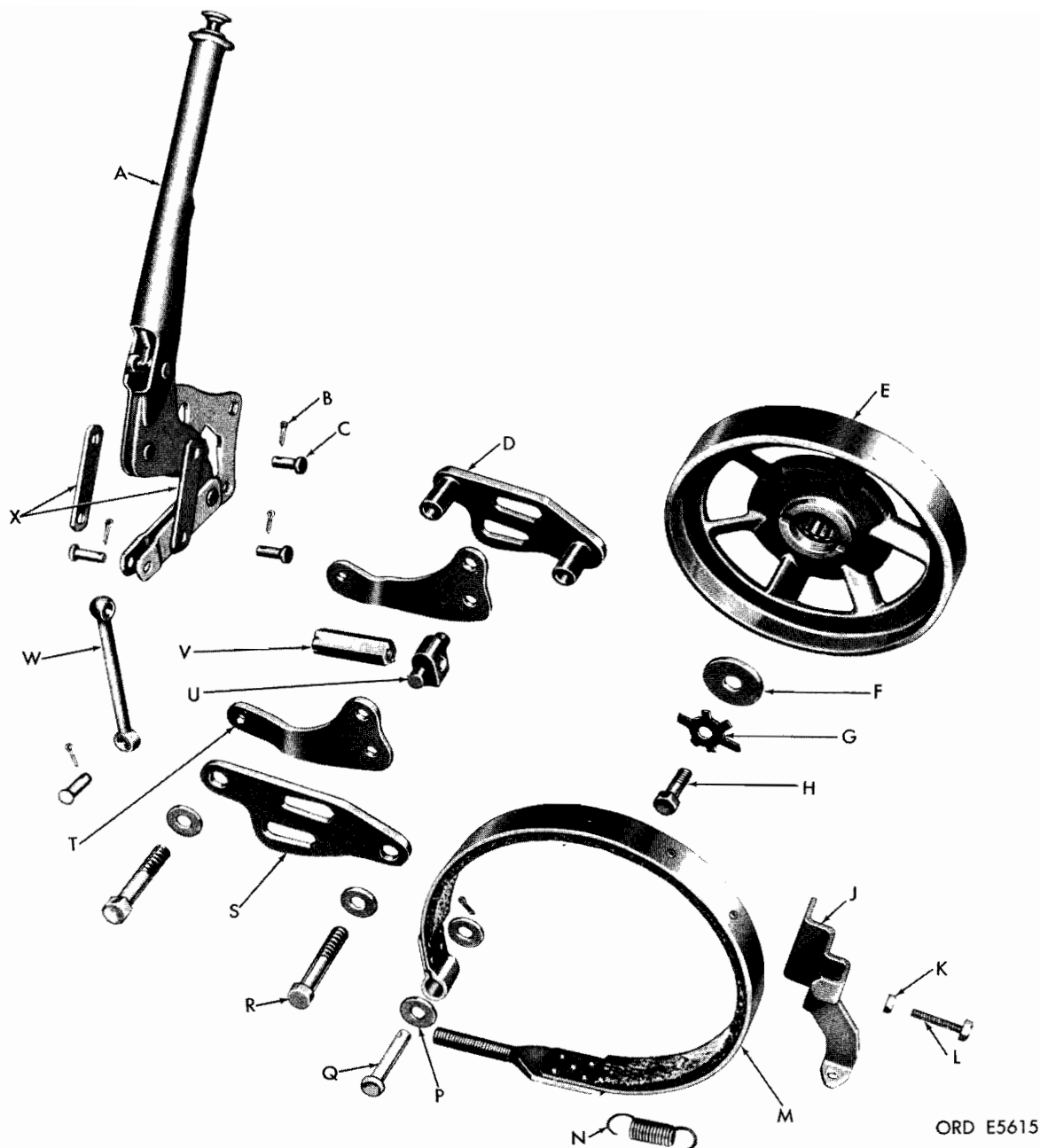
## Section XXIV. BRAKE SYSTEM

### 152. DESCRIPTION AND DATA

a. Parking Brake. The parking brake is a transmission drum-type with an external contracting band. Figure 127 is an exploded view of the parking brake. It is actuated through linkage from a lever mounted on the left side of the transfer case extending into the driver's compartment. The brake has 300 degrees of effective lining contact, in either forward or reverse braking. The lining is woven material riveted to a steel band. An adjusting nut and screw and a spring are provided for band adjustment. The brake drum is cast iron with an integral hub. It is mounted on the rear end of the transmission output shaft. The parking brake, when applied, prevents the transmission output shaft from turning. The output shaft is connected with a set of constant mesh gears. The gears control the rotation of the propeller shafts, wheel drive shafts, and wheels.

b. Service Brakes. The service brakes are of the hydraulic type with full braking action at

all four wheels. They are fully energized in forward and reverse. Brake shoes are full floating and self-centering and use the wheel cylinder for the anchor point. A reservoir and cylinder type master cylinder is mounted in the vehicle cowl. The brake pedal is a suspended type and is mechanically connected to the master cylinder. All brake parts except wheel cylinders are interchangeable left to right and front to rear. The front wheel cylinders are .87 inch in diameter, the rear .62 inch in diameter, and differ in size to properly balance brake load. Each brake has one double piston wheel cylinder located near the top of the backing plate. The upper ends of the two brake shoes are held against the pistons by a retracting spring attached to the brake shoe webs. The lower ends of the shoes are connected and held against an adjustable link by a helical spring. The adjustable link is an adjusting screw threaded into a pivot nut. The outer ends of the adjusting screw and pivot nut are slotted to engage the web of the brake shoes. The spring is connected from one shoe web to the other and crosses over the notched head of the adjusting



ORD E5615

- A. Handle assembly
- B. Cotter pin
- C. Headed pin
- D. Support assembly
- E. Drum
- F. Washer
- G. Lockwasher
- H. Bolt
- J. Support
- K. Nut
- L. Screw

- M. Band and lining assembly
- N. Spring
- P. Washer
- Q. Headed pin
- R. Bolt
- S. Support
- T. Lever
- U. Trunnion
- V. Adjusting nut
- W. Rod
- X. Link

Figure 127. Parking brake

screw. This spring bears against one of the notches in the head and acts as a detent for the adjusting screw. An opening with cover is provided in the backing plate for brake adjustment. Molded brake linings are riveted to the shoes. The brake mechanism is protected from dirt and mud by the channeled form of the outer edge of the backing plate that the brake drum recesses into when assembled. The wheel cylinder ends are sealed with rubber boots to keep out dust and moisture.

### c. Data.

#### Parking Brake

Type \_\_\_\_\_ Transmission drum  
 Operated \_\_\_\_\_ Mechanically  
 Diameter \_\_\_\_\_ 6.00 in.  
 Width \_\_\_\_\_ 1.00 in.  
 Location \_\_\_\_\_ Rear of transmission  
 output shaft

#### Service Brakes

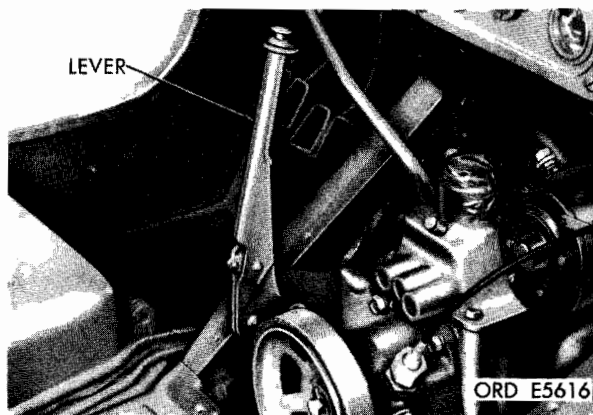
Type \_\_\_\_\_ Hydraulic  
 Anchor \_\_\_\_\_ Wheel cylinder  
 Diameter \_\_\_\_\_ 8.00 in.  
 Width \_\_\_\_\_ 2.00 in.  
 Lining area  
 per brake \_\_\_\_\_ 3.15 sq. in.  
 Fluid capacity (system) \_\_\_\_\_ 8.0 fluid oz

#### Wheel Cylinders

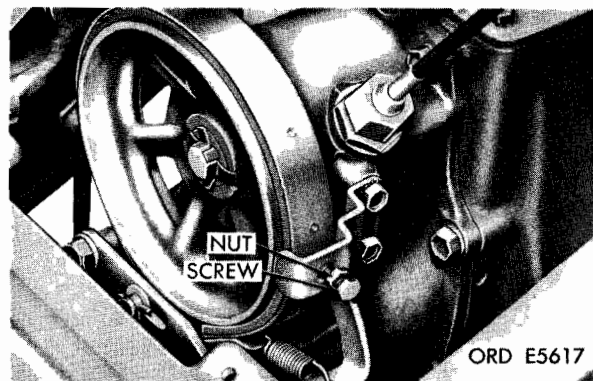
Type \_\_\_\_\_ Straight bore  
 Diameter  
 (front) \_\_\_\_\_ .875 in.  
 Diameter  
 (rear) \_\_\_\_\_ .620 in.

#### Master Cylinder

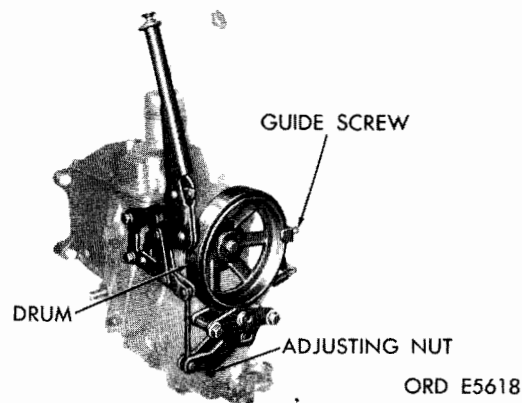
Type \_\_\_\_\_ Reservoir and  
 Cylinder  
 Location \_\_\_\_\_ Cowl



STEP 2 - Move parking brake lever forward to fully released position.



STEP 3 - Loosen jam nut on guide screw.



STEP 4 - Adjust guide screw and adjusting nut alternately using feeler gage until a clearance of .010 inch is obtained between brake lining and drum. Tighten jam nut and place vehicle on incline and test parking brake. Install cover plate (fig. 11, steps 9 and 10).

Figure 128. Parking brake adjustment

## 153. PARKING BRAKE ADJUSTMENT

Refer to figure 128, steps 1 through 4.

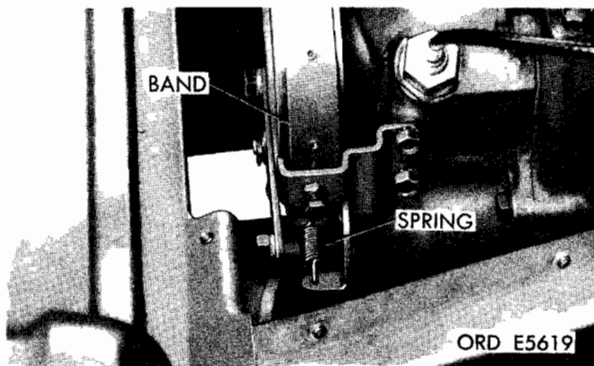
STEP 1 - Remove transmission tunnel cover (fig. 11, steps 9 and 10).



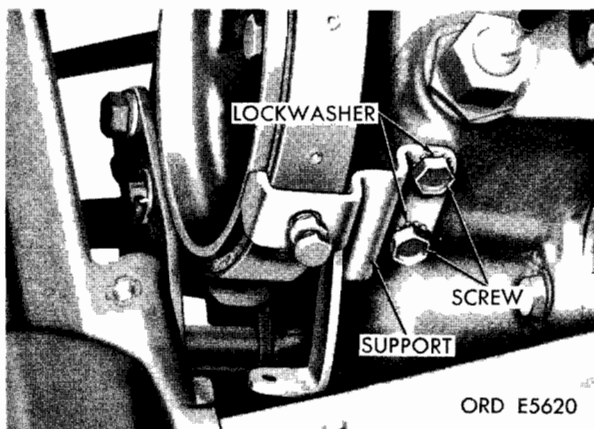
## 154. PARKING BRAKE BAND

a. Removal. Refer to figure 129, steps 1 through 6.

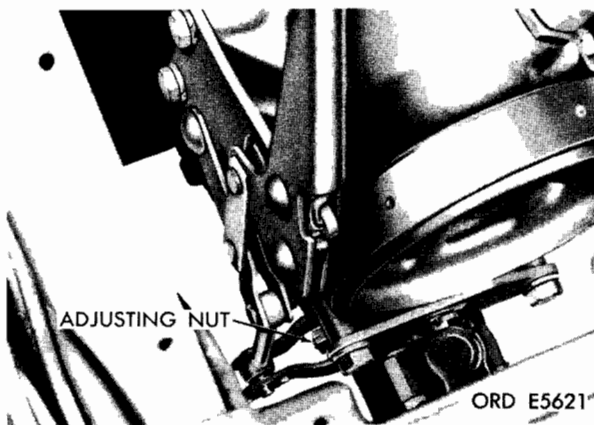
STEP 1 - Remove transmission cover plate (fig. 10, steps 9 and 10).



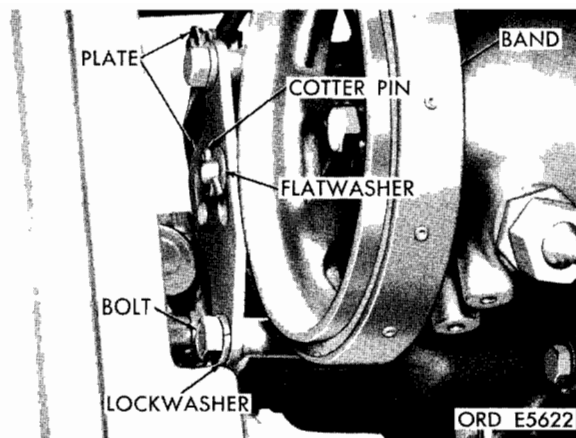
STEP 2 - Unhook and remove parking brake retracting spring.



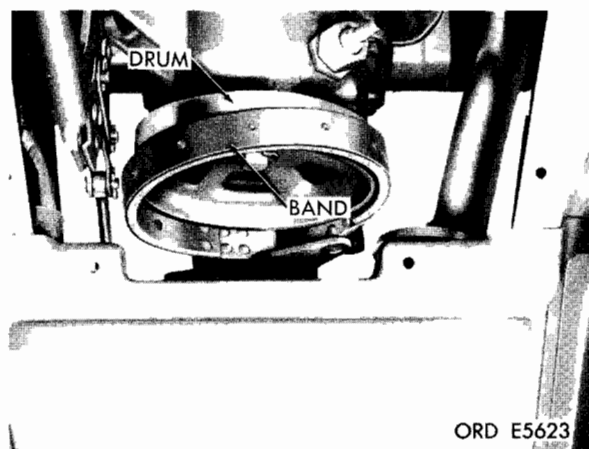
STEP 3 - Remove two screw and lockwasher assemblies securing guide screw support assembly to transfer.



STEP 4 - Remove adjusting nut.



STEP 5 - Remove cotter pin and washer and two bolts and lockwashers securing band to anchor support plates and lever plates (fig. 127).



STEP 6 - Withdraw band and lining from parking brake drum.

Figure 129. Parking brake band removal

b. Installation. Refer to figure 129, steps 6 back through 1. The following attaching parts should be torqued to the values shown:

Parking brake band retracting spring to transfer bolt (3/16-18) — 8-10 lb-ft

Parking brake anchor bracket to transfer case bolt (7/16-14) — 37-42 lb-ft

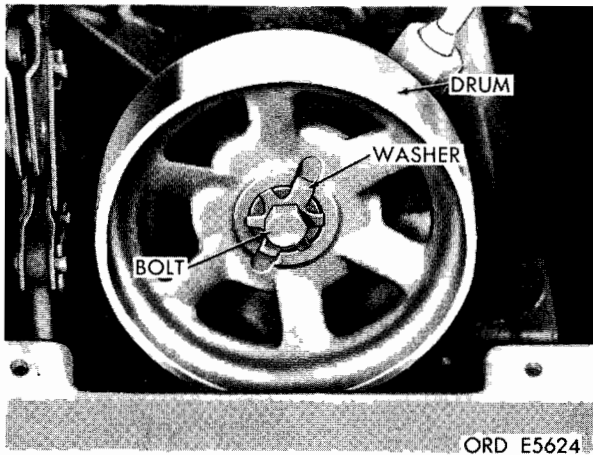
After installation adjust parking brake (par. 153).



## 155. PARKING BRAKE DRUM

a. Removal. Refer to figure 130, steps 1 and 2.

STEP 1 - Remove parking brake band (par.154),



STEP 2 - Remove tab washer and bolt securing parking brake drum to transmission output shaft.

Figure 130. Parking brake drum removal

b. Installation. Refer to figure 130, steps 2 back to 1. When installing new drum use new lining. After installation adjust brake (par. 153). The following attaching parts should be torqued to the values shown:

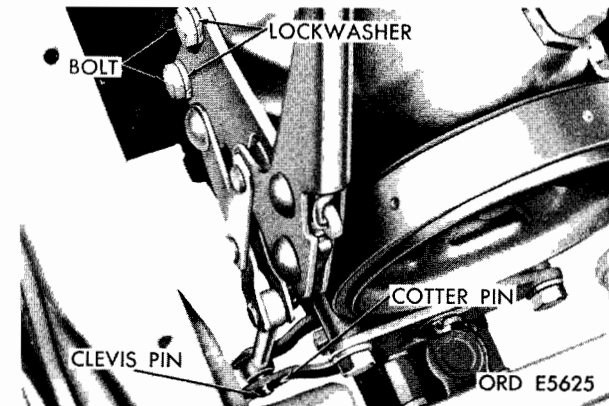
Parking brake drum  
to transmission  
output shaft bolt  
(7/16-20) \_\_\_\_\_ 40-45 lb-ft

Parking brake handle  
bracket to trans-  
mission case bolt  
(3/8-16) \_\_\_\_\_ 12-15 lb-ft

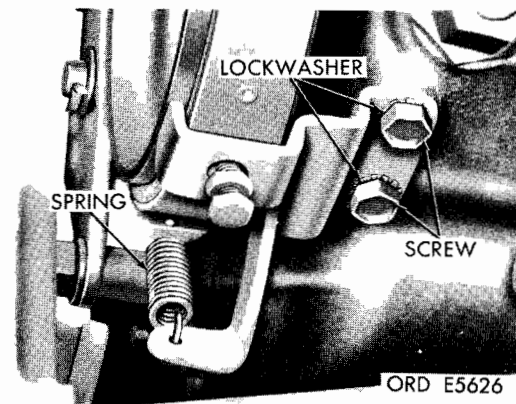
## 156. PARKING BRAKE LINKAGE

a. Removal. Figure 131, views A, B, C, and D, show all disconnect points for the parking brake linkage. To remove a damaged part, disconnect at points indicated in appropriate view and remove.

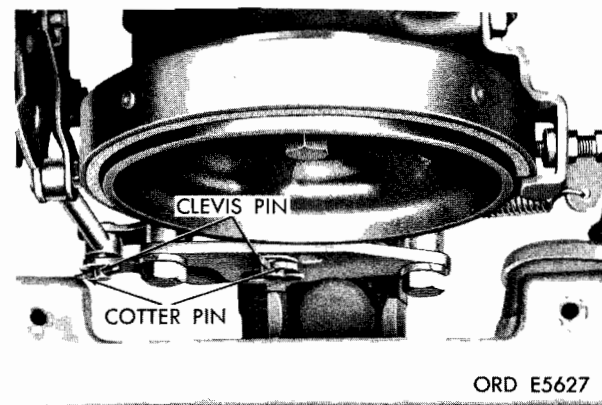
b. Installation. To install a new part in the brake linkage, refer to figure 131 to determine method of connection. Adjust parking brake (par. 153).



VIEW A. Handle assembly

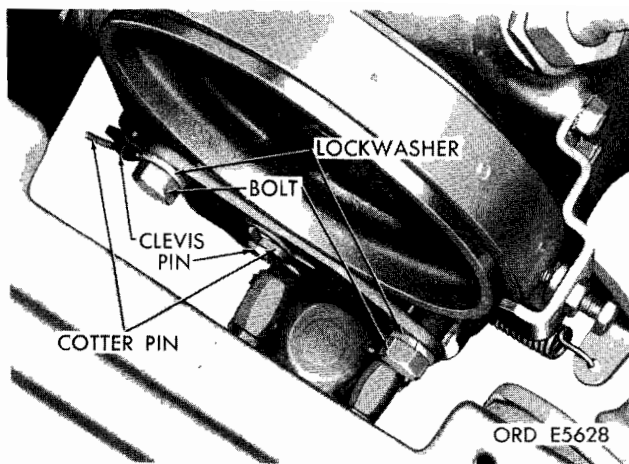


VIEW B. Guide support assembly



VIEW C. Linkage connector rod

Figure 131. Disconnect points - parking  
brake linkage (continued)



VIEW D. Anchor support assembly

Figure 131. Disconnect points - parking brake linkage

## 157. SERVICE BRAKE

### a. General

- (1) Maintain fluid level in master cylinder at 1-7/16 inch from top of fill nipple.
- (2) Keep vent hole in master cylinder filler plug open.
- (3) Make sure all brake line connections are securely tightened and leakproof.
- (4) Replace scored brake drums (fig. 135, steps 1 and 2).
- (5) Replace worn or oil saturated brake band and lining assemblies (par. 159).
- (6) Adjust service brakes (b below) when pedal pad travel is within 2 inches of floor pan when brake pedal is in applied position.

**b. Brake Pedal Free Travel Adjustment.** Brake pedal free travel of from .19 to .32 inch must be maintained. To check brake pedal free travel, depress brake pedal by hand until resistance is encountered. The resistance indicates engagement of the push rod in the master cylinder. Brake pedal free travel is measured from this point to the position of the brake pedal at rest. To adjust, loosen locknut on eccentric adjusting bolt (fig. 132). Turn eccentric bolt until brake pedal free travel is from .19 to .32 inch. Tighten eccentric bolt locknut securely and again check distance of free travel.

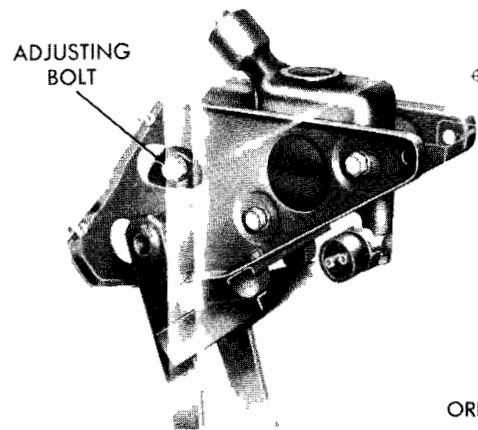
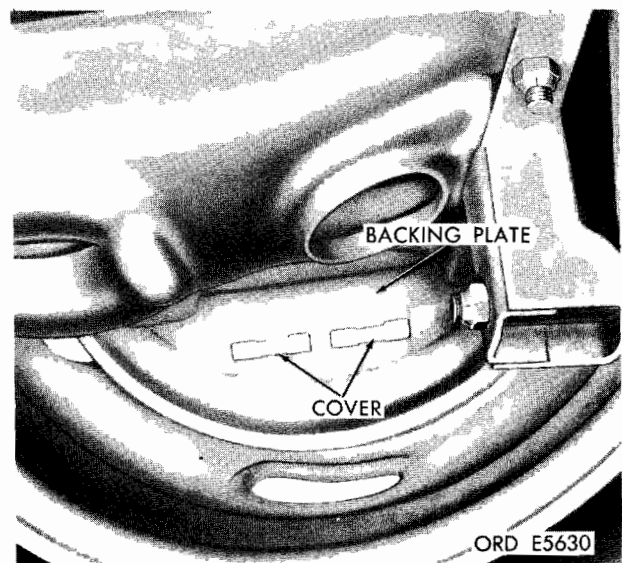


Figure 132. Position of eccentric adjusting bolt

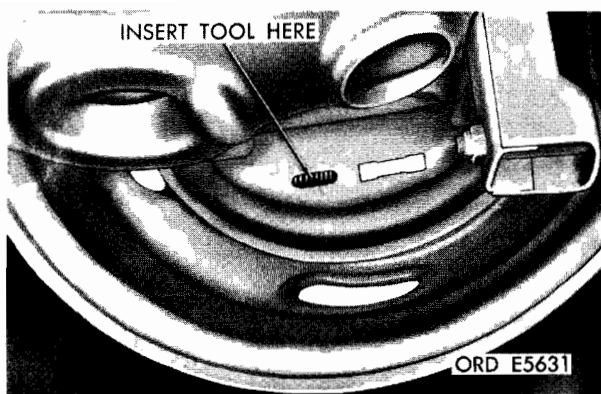
c. Brake Shoe Adjustment. Refer to figure 133, steps 1 through 4.

STEP 1 - Raise vehicle until wheel clears ground.



STEP 2 - Pry cover from adjusting hole in backing plate. NOTE. Remove only the cover toward front of vehicle for access to brake adjustment star wheel. The second hole in backing plates make possible backing plate interchangeability, right to left.

Figure 133. Adjusting service brakes  
(Continued)



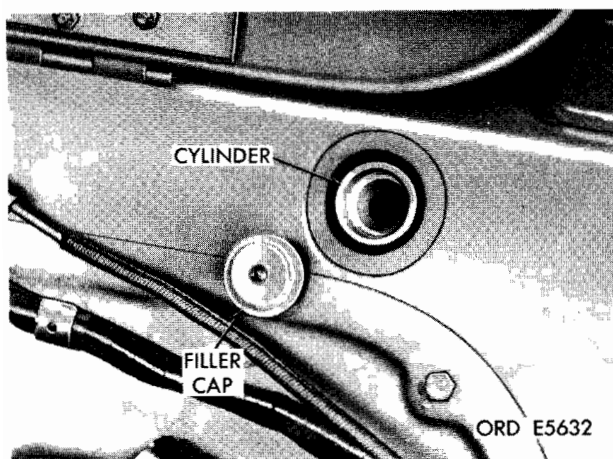
**STEP 3** - Insert suitable adjusting tool through opening and engage star wheel of adjusting screw assembly. Rotate adjusting screw until wheel cannot be rotated with one hand. Back adjusting screw off 11 clicks. Install adjusting hole cover.

**STEP 4** - Repeat brake adjustment on remaining wheels. Check fluid level in master cylinder, and add if required. Road test vehicle to determine that braking is equal at all wheels.

Figure 133. Adjusting service brakes

## 158. BLEEDING BRAKE SYSTEM

Bleed brake system by following steps 1 through 4, figure 134. Bleed complete brake system. Bleeding should be started at the brake farthest away from the master cylinder.



**STEP 1** - Check hydraulic fluid level in master cylinder and fill with proper fluid until fluid reaches bottom of thread level.



**STEP 2** - Clean bleeder screw. Attach a bleeder hose to the screw and submerge lower end of hose in hydraulic fluid in a transparent bottle. **WARNING.** Discard contaminated brake fluid.

**STEP 3** - Unscrew bleeder screw one half turn. Depress brake pedal by hand with slow even pressure and allow pedal to slowly return to released position. Continue to pump pedal slowly until no air bubbles appear from end of tube. **NOTE.** Two men are necessary to do this operation.

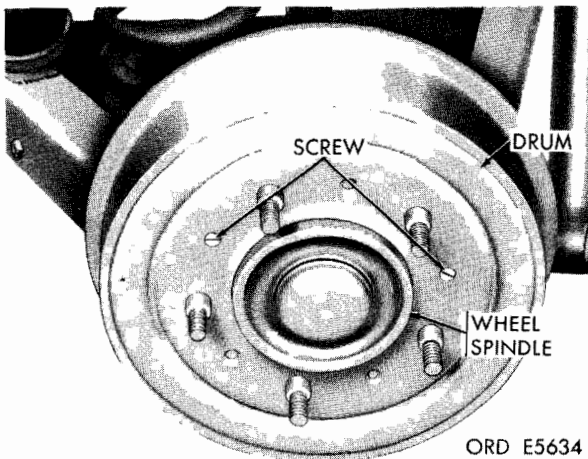
**STEP 4** - Depress pedal and retain it in the depressed position while tightening bleeder screw. Check fluid level in master cylinder and fill to correct level with proper hydraulic fluid. Refer to lubrication chart.

Figure 134. Bleeding brake system

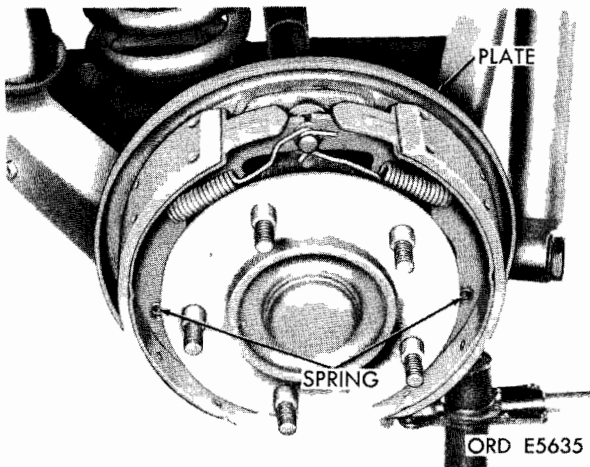
## 159. SERVICE BRAKE DRUM AND SHOE AND LINING ASSEMBLY

a. Removal. Refer to figure 135, steps 1 through 6.

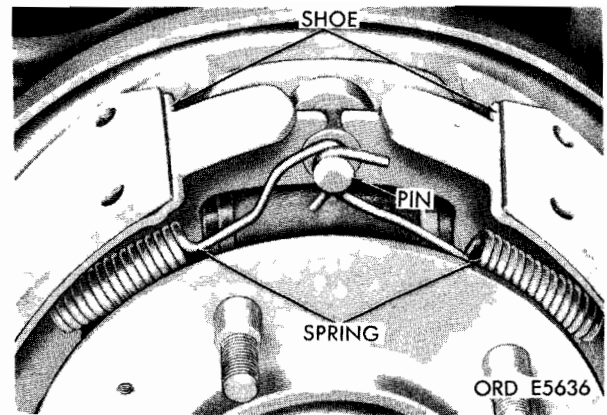
STEP 1 - Raise vehicle and remove five nut and washer assemblies securing wheel and tire assembly to wheel spindle.



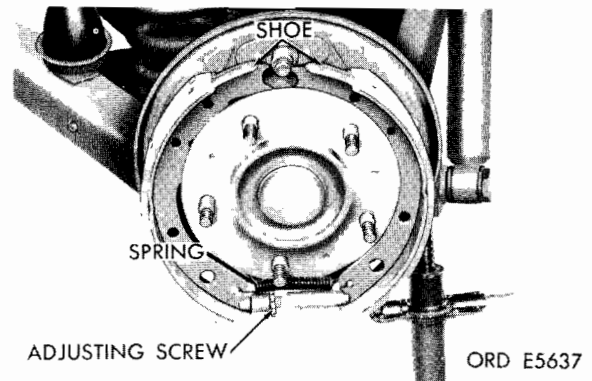
STEP 2 - Remove two screws securing brake drum to wheel spindle and remove brake drum. NOTE. It may be necessary to retract shoe assemblies by backing off the brake adjusting screw.



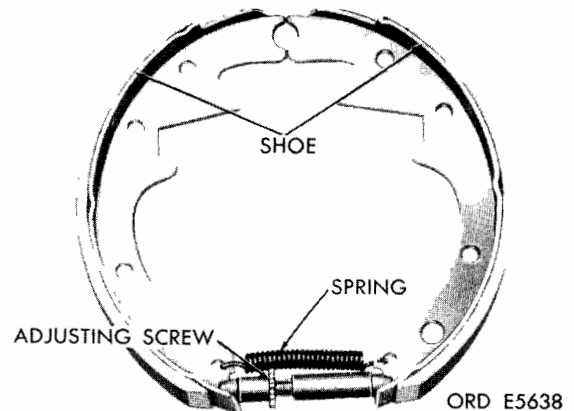
STEP 3 - Insert suitable tool in conical brake shoe hold down spring. Push spring through backing plate and force to one side until free of hold down anchor.



STEP 4 - Unhook and remove brake shoe retracting spring from anchor pin and brake shoes.



STEP 5 - Remove both brake shoes with adjusting screw assembly and adjusting spring intact from backing plate. Lift off entire assembly.



STEP 6 - Remove brake shoe adjusting screw assembly and spring from brake shoes.

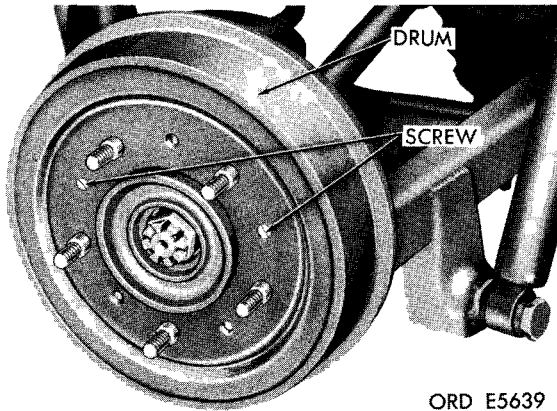
Figure 135. Service brake drum and shoe and lining assembly removal

b. Installation. Refer to figure 135, steps 6 back through 1. After installation, adjust brakes (par. 157c).

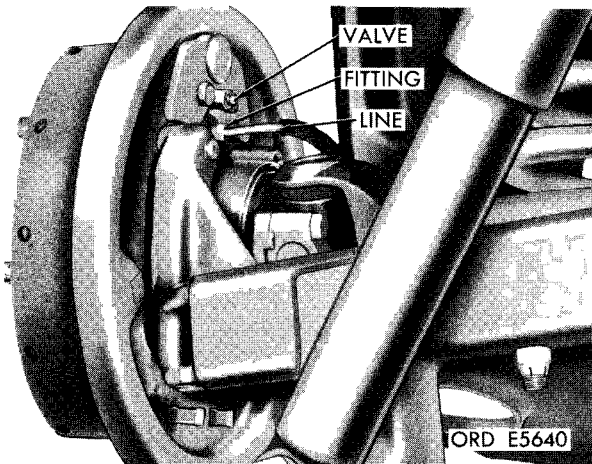
## 160. WHEEL CYLINDER ASSEMBLY

a. Removal. Refer to figure 136, steps 1 through 5.

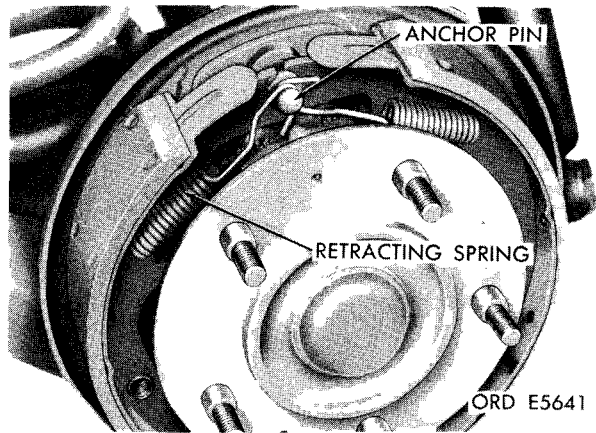
STEP 1 - Raise vehicle and remove five nuts and washers securing the wheel and tire assembly to the spindle.



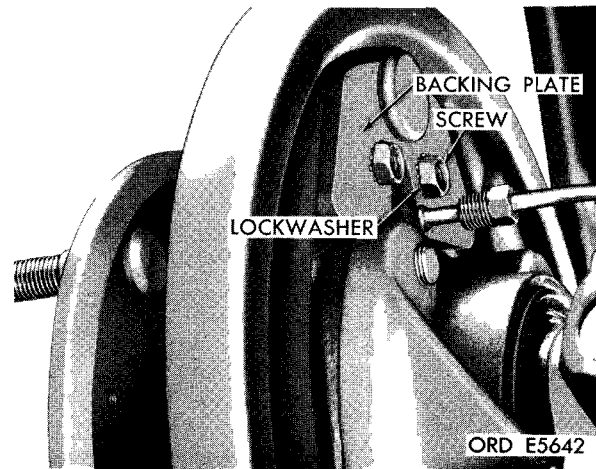
STEP 2 - Remove two screws securing brake drum to wheel spindle.



STEP 3 - Unscrew hydraulic brake line fitting from wheel cylinder - remove bleed-valve.



STEP 4 - Remove brake shoe assemblies (par. 159).



STEP 5 - Remove two screw and lockwasher assemblies securing wheel cylinder assembly to backing plate.

Figure 136. Wheel cylinder assembly removal

b. Installation. Refer to figure 136, steps 5 back through 1. The wheel cylinder to backing plate mounting bolts should be torqued to 11-19 lb-ft.

## 161. MASTER CYLINDER

a. Filling. Remove filler cap and fill with proper fluid until fluid reaches bottom of thread level.

b. General. Figure 137 is a locational view of the pedal assembly showing brake pedal, clutch pedal, master cylinder, spotlight switch, and eccentric adjusting bolt.



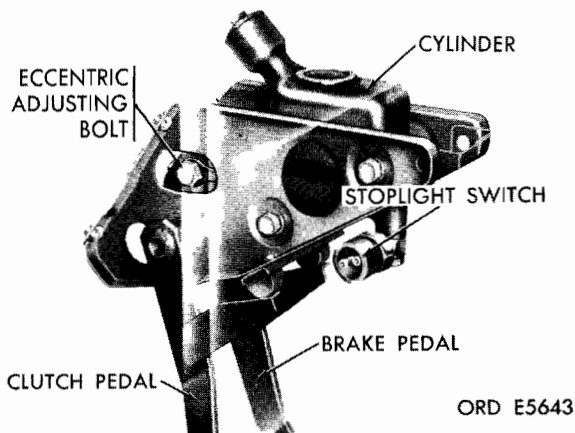
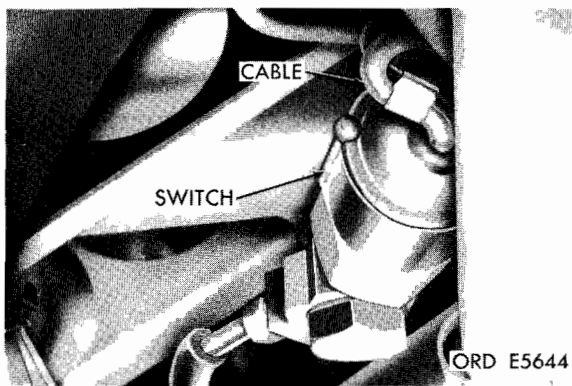
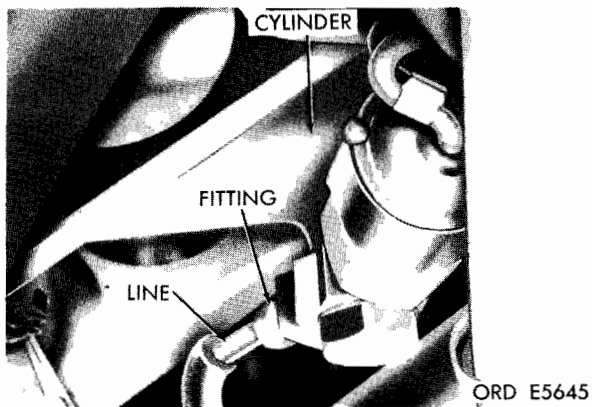


Figure 137. Master cylinder and pedal assembly

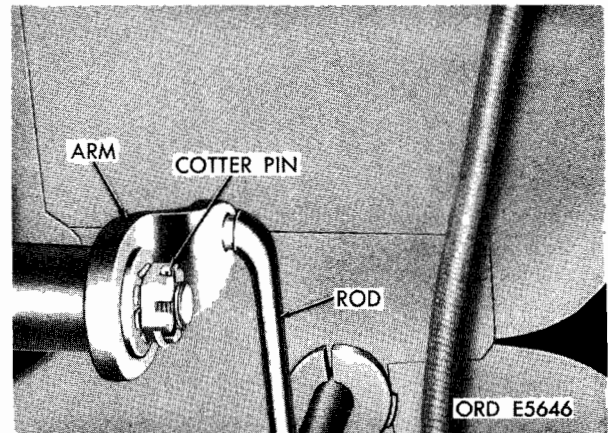
c. Removal. Refer to figure 138, steps 1 through 6.



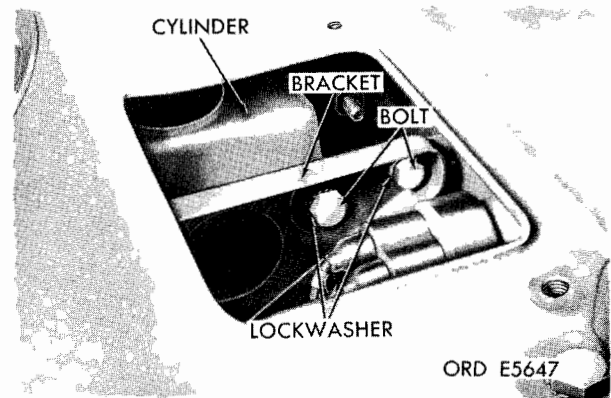
STEP 1 - Grasp cables and pull, separating male and female connectors at stop light switch, located under dash panel.



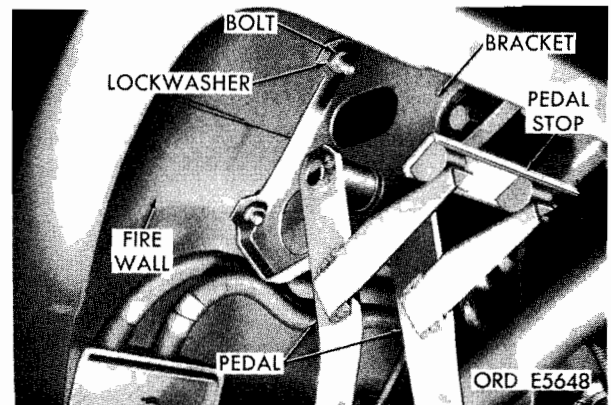
STEP 2 - Unscrew brake line fitting from master cylinder.



STEP 3 - Remove cotter pin and nut securing clutch rod to clutch arm.



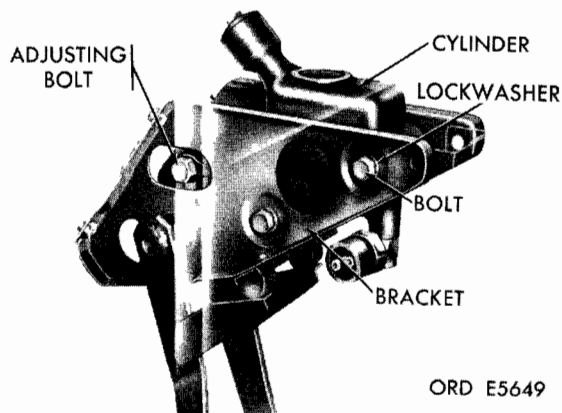
STEP 4 - Remove two bolts and lockwashers securing master cylinder bracket to master cylinder mounting bracket mounted on dash panel.



STEP 5 - Remove four bolts and lockwashers securing master cylinder, bracket and pedal assembly to firewall and remove assembly.

Figure 138. Master cylinder removal

(continued)



ORD E5649

STEP 6 - Remove adjusting bolt and two bolts and lockwasher securing master cylinder to bracket. After installation, fill master cylinder. Refer to lubrication chart (TM 9-2320-218-10). Bleed brake system (par. 158).

Figure 138. Master cylinder removal

d. Installation. Refer to figure 138, steps 6 back through 1. The following attaching parts should be torqued to the values shown:

Master Cylinder  
Bracket Mounting  
Bolt (3/16-24) — 12-18 lb-ft

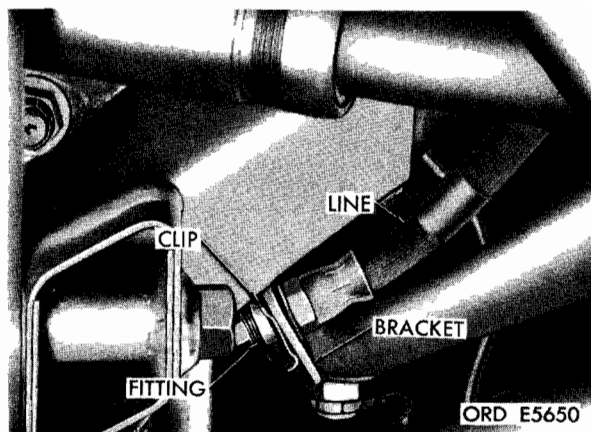
Master Cylinder  
Bracket to Body  
Mounting Bolt  
(5/16-24) — 8-10 lb-ft

Master Cylinder  
to Brake Pedal  
Connecting Bolt  
(3/8-24) — 20-24 lb-ft

Master Cylinder  
Outlet Fitting  
(1/2-20) — 20-24 lb-ft

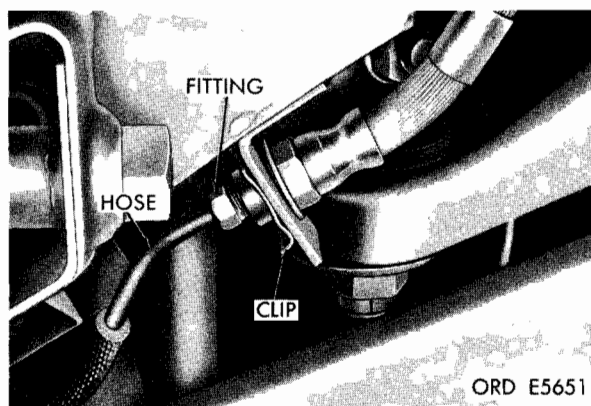
## 162. LINES, FITTINGS AND HOSES

a. Removal. Refer to figure 139, steps 1 through 3.



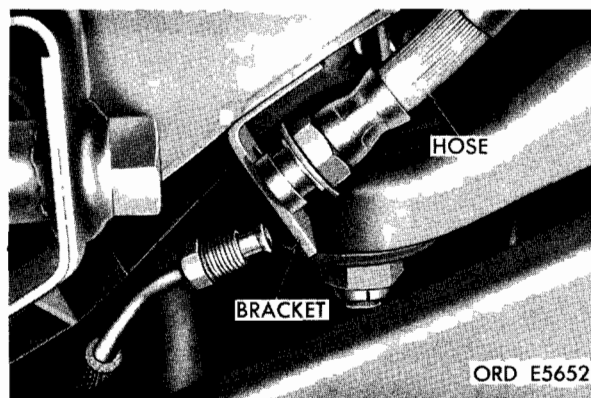
ORD E5650

STEP 1 - Unscrew connector fitting from hydraulic line at hose clip bracket.



ORD E5651

STEP 2 - Slip clip off hose.



ORD E5652

STEP 3 - Pull hose out of bracket. Disconnect opposite end of line to be removed from tee or backing plate.

Figure 139. Lines, fittings, and hoses removal

b. Installation. Refer to figure 139, steps 3 back through 1.



## Section XXV. WHEELS AND TIRES

### 163. DESCRIPTION AND DATA

a. Description. Each vehicle is equipped with four cast magnesium alloy wheels of a safety rim drop center type, and one spare. Each wheel is secured to the wheel spindle flange by five special nut and washer assemblies. The nut and washer assembly cannot be normally disassembled. All wheel retaining nuts have right hand threads and therefore are interchangeable from left to right sides on the vehicle. Tires are low pressure type, cross-country tread (non-directional) design, size 7.00 x 16, with a 6-ply rating.

#### b. Data

##### Wheels

Bolt circle

Diameter \_\_\_\_\_ 4.50 in.

Bolt number \_\_\_\_\_ 5

Material \_\_\_\_\_ Magnesium-Alloy

Size \_\_\_\_\_ 16.00 x 4.50 EO

Type \_\_\_\_\_ Safety Rim-Drop  
Center

##### Tires

Number \_\_\_\_\_ 5

Number of plies \_\_\_\_\_ 6-ply rating

Size \_\_\_\_\_ 7.00 x 16

Tread \_\_\_\_\_ Cross-Country  
Design

Type \_\_\_\_\_ Low Pressure

Tire Inflation              Front    Rear

Cross-Country \_\_\_\_\_ 12 lb — 18 lb

Highway \_\_\_\_\_ 15 lb — 25 lb

Mud, Sand, Snow \_\_\_\_\_ 10 lb — 12 lb

### 164. MAINTENANCE

a. Wheels. Inspect all wheels at regular intervals for bent or cracked and worn or elongated mounting stud holes. Pay particular attention to edges of rims and mounting stud holes. Inspect mounting studs and nuts for worn or stripped threads. Replace any defective wheel or wheel nut immediately.

b. Tires. Inspect all tires and check pressures daily.

- (1) Replace any tire with noticeable cut on tread or side wall. Return tire to ordnance maintenance unit for repair. If uneven wear is indicated, check toe-in adjustment (par. 136). If incorrect toe-in is not the cause, report to ordnance maintenance personnel.

- (2) Check pressures when tires are cold. Dismount any tire showing unusual pressure loss and examine tire and tube for cause. Replace tube or tire as necessary.

- (3) Inflate all tires to equal pressures, as unequal pressures will affect steering and braking adversely. Inflate tire to pressures designated in paragraph 163. Underinflated tires are easily damaged. Install all valve caps to prevent air loss.

c. Tire Rotation. To maintain equal wear, rotate tires in accordance with the tire rotation plan shown in figure 140 at intervals of approximately 2,000 miles, if the tactical situation permits.

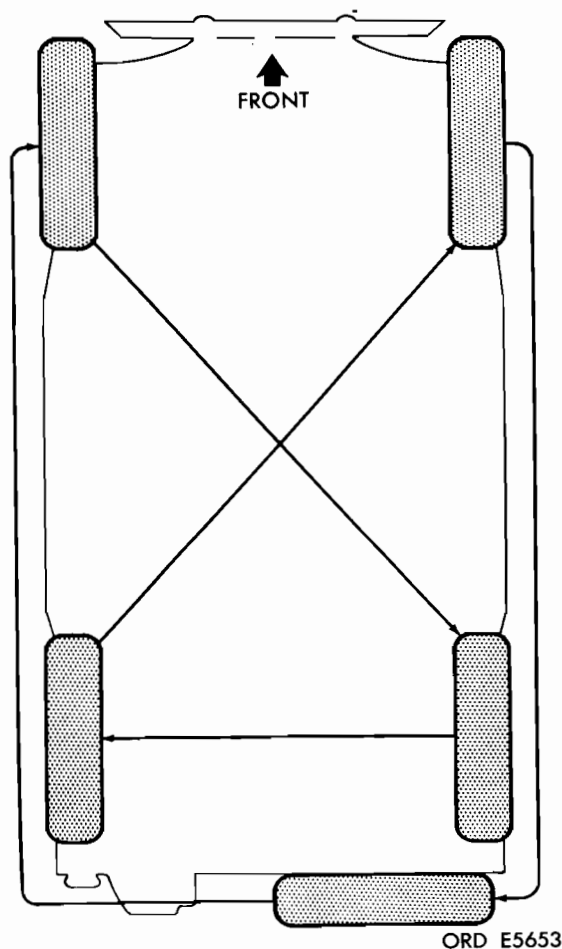


Figure 140. Tire rotation plan

d. Tire or Tube Replacement. Make certain that replacement tire is of same design, size, and tread as tires on vehicle. Tires of different design or tread sometimes have different rolling diameters, causing excessive

scuffing in use. Refer to TM 31-200 for removal and installation of tires and tubes. Refer to TM 9-2320-218-10 for removal and installation of spare wheel and tire assembly.

## Section XXVI. BODY AND MISCELLANEOUS COMPONENTS

### 165. DESCRIPTION

a. Body and Frame. The body is of the integral body and frame design. Body panels, reinforcement, braces, and underbody frame are all welded to form an integral unit, figure 141.

b. Seats. Two seats are provided in the front section of the body and a single two passenger seat is provided in the rear section of the body. Seat frames are of a tubular steel, onto which are assembled formed wire type springs. Seat cushion trim and seat back trim are removable from the seat frame and are made of foam rubber, sisal, and burlap covered with a water repellant canvas material. Seat trim can be removed or installed without use of any tools. A map compartment is incorporated into the seat

back trim of the drivers seat only. All seat assemblies are removable and the two front seats are adjustable fore and aft. The rear seat back can be folded forward onto the rear seat cushion. The rear seat snaps into mounting bars extending from the seat ends. (Refer to TM 9-2320-218-10).

c. Windshield and Windshield Wipers. A folding type windshield is provided onto which are mounted two windshield wiper vacuum motors, wiper arms, and blades. The vacuum motors are driven by the vacuum pump mounted at right front of the engine, (fig. 143), and controlled by the vacuum valve which is mounted on the dash panel directly to the right of the steering column. In case of vacuum motor failure, the wipers can be hand operated. Defroster passages are incorporated into the windshield and cowl.

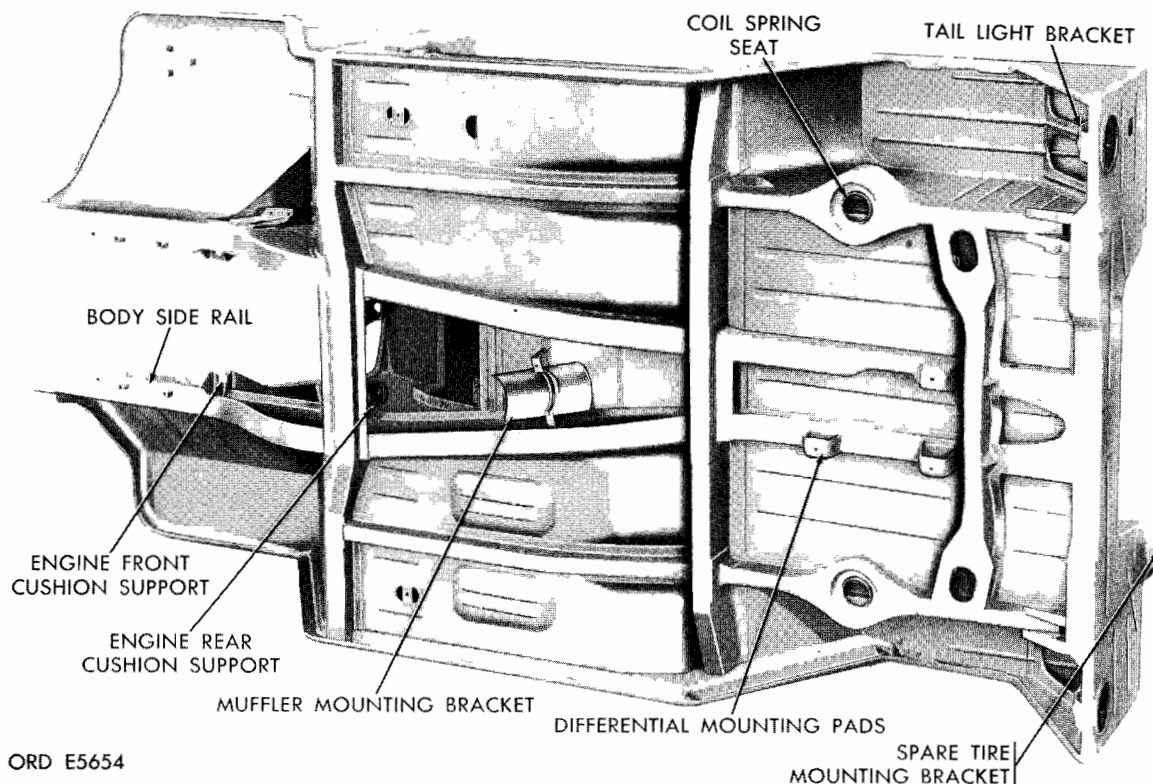


Figure 141. Unitized body and frame

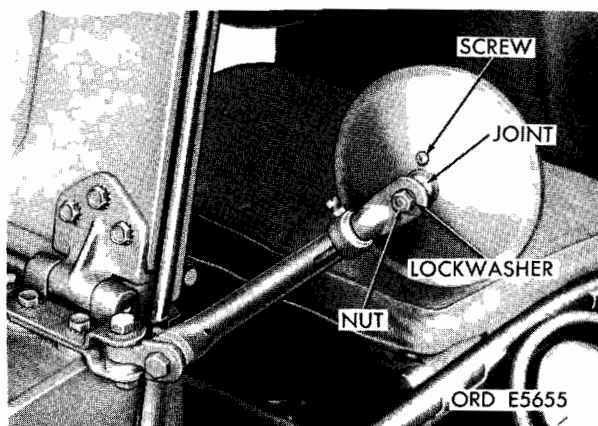
d. Front Bumper and Bumperettes. The front bumper is bolted to the body frame inner side rails and provides additional rigidity to the body front section.

e. Miscellaneous Accessories. The vehicle is equipped with a side view mirror mounted on the left side cowl panel. Reflex reflectors are provided at the rear and rear side of the rear fender housings. Drain valves are provided in the passenger compartment floor panel for drainage. The body closure being of open type, protection against weather is provided by means of a windshield, canvas top, rear curtains, and side door curtains. Canvas top bows are of a folding tubular construction and are folded rearward for storage. They are retained to the body by retaining straps. Roof bows are of a removable type. The canvas top is stored under the rear passenger seat. The battery compartment is located under the front passenger seat. The tool compartment is located directly behind the battery compartment and is also under the front passenger seat.

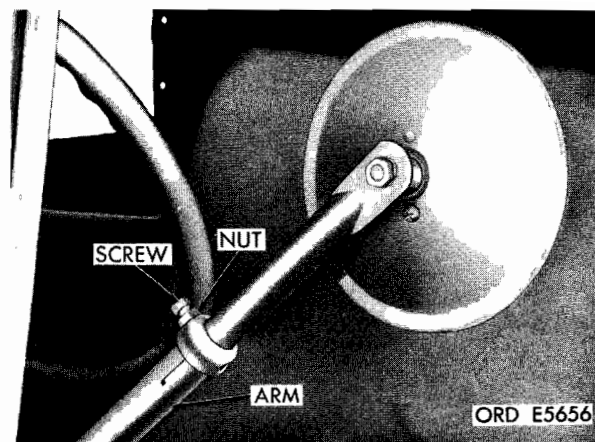
## 166. SIDE VIEW MIRROR

a. General. The side view mirror assembly includes a mirror with ball joint, an extension arm, main mirror arm, bracket wing hinge, and mirror mounting bracket. The mirror assembly is attached to the vehicle body by two bolts which also attach the windshield hinge to the body cowl. The entire mirror assembly can be disconnected from the vehicle body by removing these two bolts (fig. 142, view C, ).

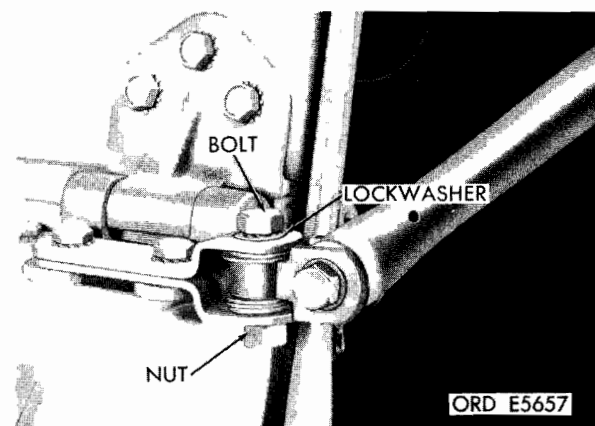
b. Mirror Adjusting Points. The mirror has four adjusting points which are shown in figure 142, views A, B, C, and D.



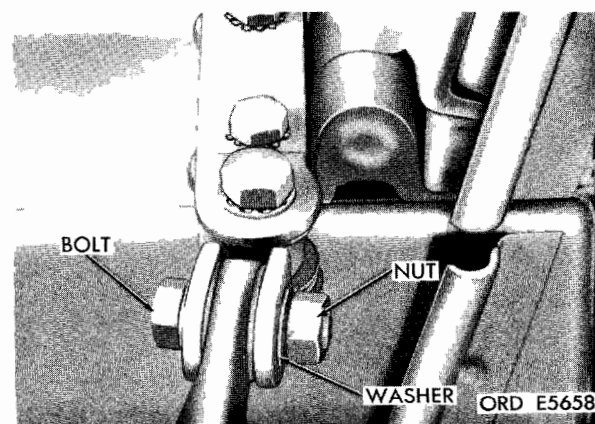
VIEW A - Ball joint mirror adjustment and ball joint friction adjusting screw.



VIEW B - Mirror extension arm friction adjustment.



VIEW C - Mirror universal friction adjustment.

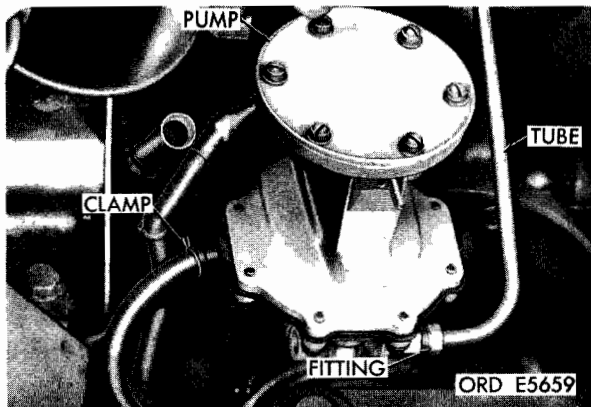


VIEW D - Mirror horizontal adjustment.

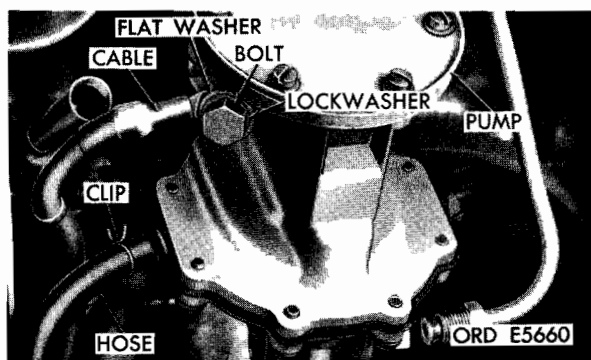
Figure 142. Mirror adjustments

## 167. VACUUM PUMP

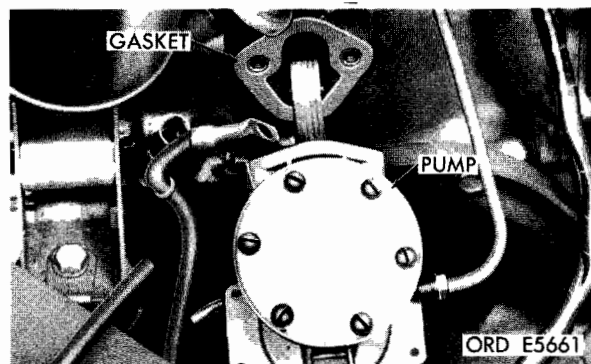
a. Removal. Refer to figure 143, steps 1 through 3.



STEP 1 - Remove tube fitting outlet from vacuum pump.



STEP 2 - Remove two bolts, flatwashers and lockwashers securing vacuum pump and engine to body ground cable to engine. Remove clip securing rubber hose to pump inlet.



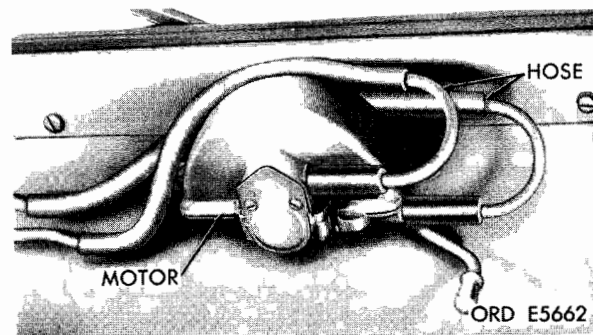
STEP 3 - Lift vacuum pump off engine. Remove and discard gasket.

Figure 143. Vacuum pump removal

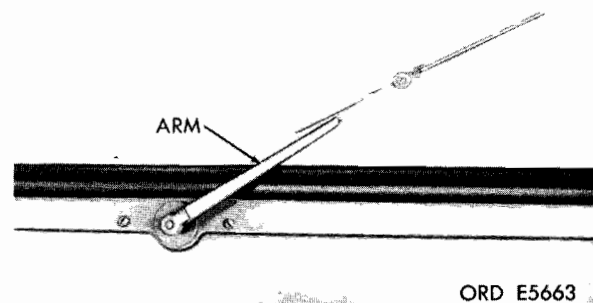
b. Installation. Refer to figure 143, steps 3 back through 1. At installation use new gasket.

## 168. WINDSHIELD WIPER MOTOR AND WIPER ARMS

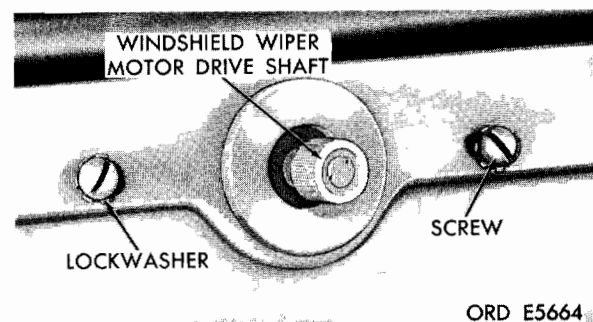
a. Removal. Refer to figure 144, steps 1 through 3.



STEP 1 - Remove rubber hoses at windshield wiper motor.



STEP 2 - NOTE. Separate wiper arm from motor shaft by pulling apart with hand or suitable tool. Wiper arms should be parallel to manual operating levers on windshield wiper motor.



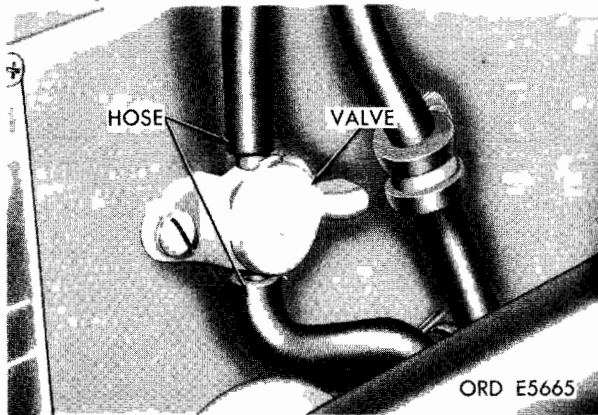
STEP 3 - Remove two screws and pull motor out.

Figure 144. Windshield wiper motor and wiper arm removal

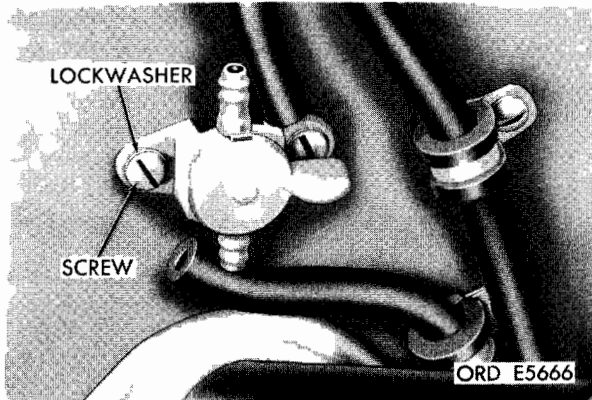
b. Installation. Refer to figure 144, steps 3 back through 1.

## 169. WINDSHIELD WIPER CONTROL VALVE

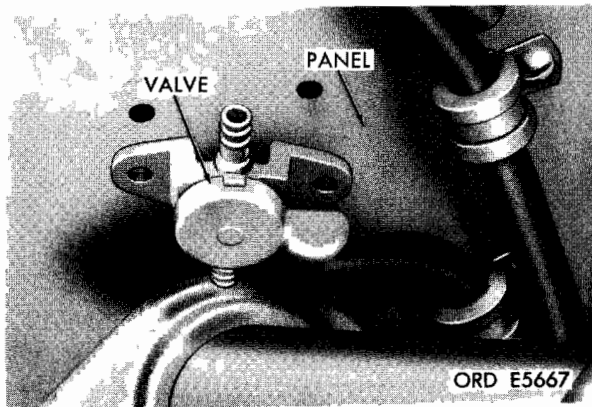
a. Removal. Refer to figure 145, steps 1 through 3.



STEP 1 - Pull rubber hoses from wiper control valve.



STEP 2 - Remove screws securing control valve.



STEP 3 - Remove control valve from dash panel.

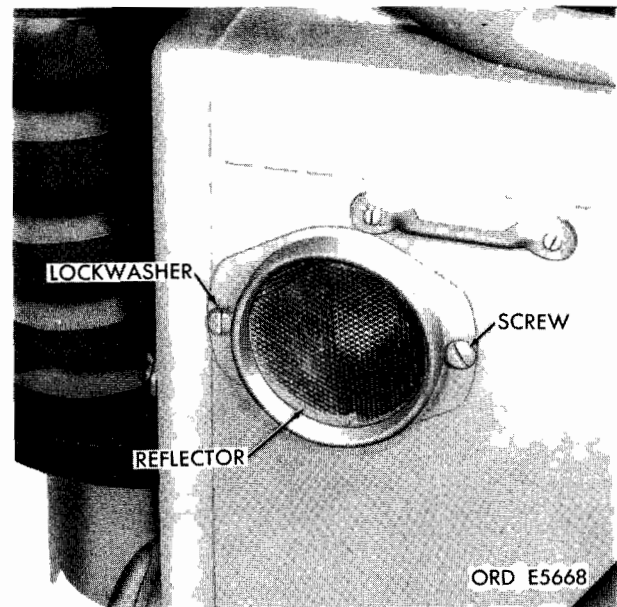
Figure 145. Windshield wiper control valve removal

b. Installation. Refer to figure 145, steps 3 back through 1. Exercise care in starting threads to prevent cross threading. Do not over-tighten, and do not use a wrench to start threads. Replace entire hose assemblies and line or tube assemblies. Do not alter design of lines with assembled fittings by cutting, splicing or making temporary repairs.

## 170. SIDE AND REAR REFLEX REFLECTOR

a. General. A total of four red reflex reflectors are attached to the vehicle, two on the rear wheel housing assemblies and two on the rear of the vehicle.

b. Replacement. Each of the four reflectors is secured to the vehicle body with two screws and lockwashers (fig. 146).



Remove two screws and lockwasher assemblies and pull reflector from vehicle body.

Figure 146. Reflex reflector replacement

## 171. VEHICULAR DATA AND OPERATING INSTRUCTION PLATES

a. Location. Refer to TM 9-2320-218-10 for location of data and instruction plates.

b. Replacement. Plates are secured with cross recess head self tapping screws.

## 172. BRUSH GUARD

a. Removal. Refer to figure 10, steps 23 through 24.

b. Installation. Refer to figure 10, steps 24 back through 23.

## 173. TOWING PINTLE

a. Removal. Refer to figure 147.

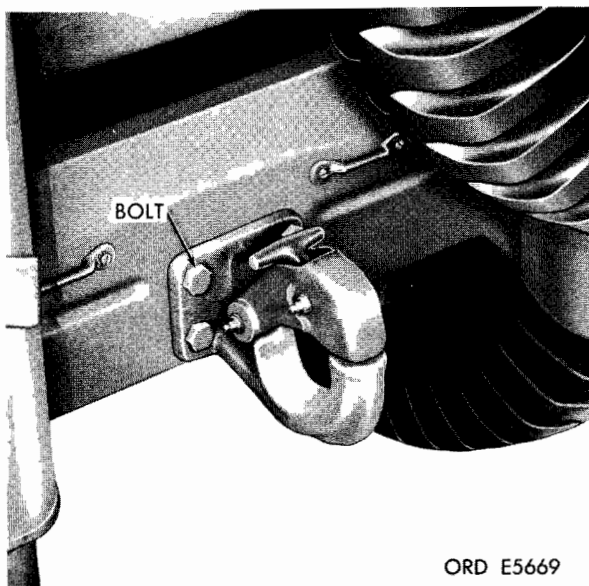
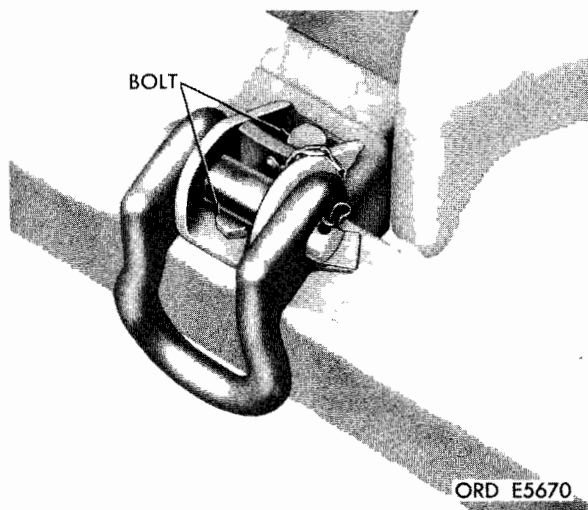


Figure 147. Towing pintle

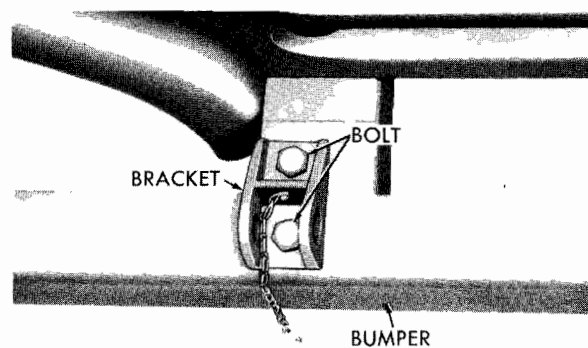
b. Installation. Refer to figure 147. At installation the towing pintle to body mounting bolts (1/2-20) are to be torqued to 65-75 lb-ft.

## 174. LIFTING EYE

a. Removal. Refer to figure 148, steps 1 and 2.



STEP 1 - Remove pin retainer and pin securing lifting eye to bracket. Lift off lifting eye.



STEP 2 - Remove two nuts, bolts and lockwashers securing lifting eye bracket to bumper.

Figure 148. Lifting eye removal

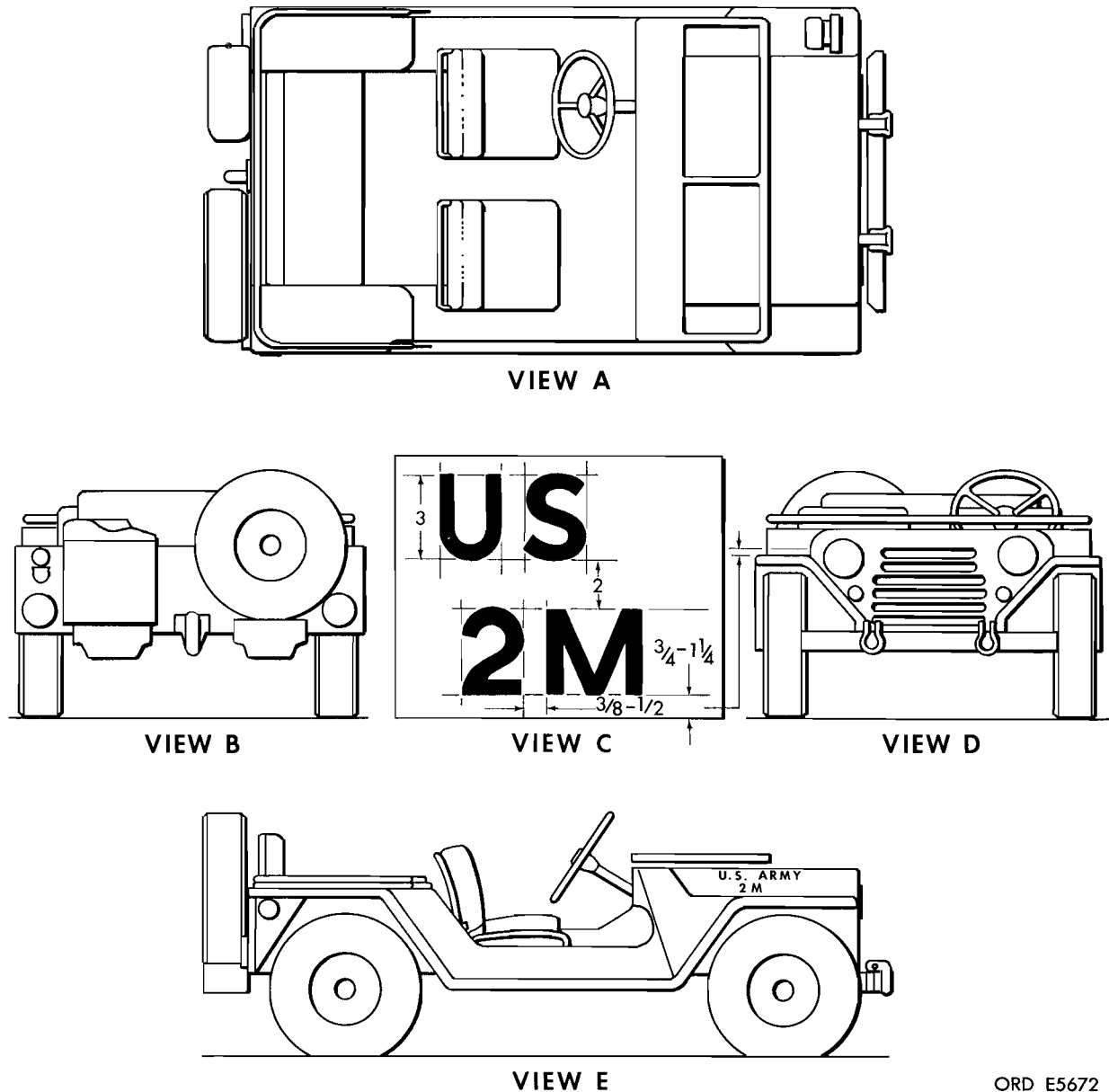
b. Installation. Refer to figure 148, steps 2 back to 1. At installation the lifting eye bracket to bumper nuts (7/16-20) should be torqued to 40-50 lb-ft.

### 175. VEHICLE MARKING

Marking applied to the vehicle shall consist of service identification and the assigned registration number. Type and color of paint used in marking shall conform to MIL-STD-642A (ORD). Letters and numerals will be the block type gothic style, 3 inches high, and will be

placed from  $\frac{3}{8}$  to  $\frac{1}{2}$  apart. The marking will consist of two lines spaced 2 inches apart with the service identification US ARMY on the top line and the assigned registration centered on the second line. Figure 149, views A through E, show the location for 1/4 ton, 4 x 4, utility truck, M151.

NOTE. ALL DIMENSIONS SHOWN ARE IN INCHES.



ORD E5672

Figure 149. Vehicle marking



## Section XXVII. RADIO INTERFERENCE SUPPRESSION

### 176. GENERAL

Radio interference suppression is the elimination or minimizing of the electrical disturbances which interfere with radio reception, or disclose the location of the vehicle to sensitive electrical detectors. It is important that vehicles with, or without radios be properly suppressed to prevent interference with radio reception of neighboring vehicles.

### 177. DESCRIPTION

The ignition and generating system have been designed to suppress radio interference. The ignition system interference suppression is effected by a primary capacitor in the distributor wiring harness receptacle, a resistor suppression in the spark plugs, and by shielded spark plug cables. Radio interference suppression in the generating system is effected by a choke, capacitor, filter, and rectifier in the generator regulator assembly. The primary capacitor is housed in the distributor wiring harness re-

ceptacle figure 48, and is an integral part of the primary circuit. Spark plugs are shielded individually by metallic braid beneath the rubber insulation figure 52. The generator regulator assembly houses the capacitor, choke, filter, and rectifier.

### 178. MAINTENANCE

Radio interference may be corrected by replacing one or more of the following parts:

a. Replacement of primary capacitor: the responsibility of ordnance maintenance personnel.

b. Replacement of spark plugs, as outlined in paragraph 69 and figure 52.

c. Replacement of spark plug cables as outlined in paragraph 69 and figure 52.

d. Replacement of capacitor, choke, filter, and rectifier: the responsibility of ordnance maintenance personnel.

# CHAPTER 3

## DOMESTIC SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

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### Section I. DOMESTIC SHIPMENT AND LIMITED STORAGE

#### 179. GENERAL

This section contains instructions pertaining to the preparation of the vehicle for shipment and limited storage within the scope of the operator for the zone of interior. Included are detailed instructions pertaining to domestic shipment, limited storage, loading and blocking on or in railroad cars, and necessary safety precautions that must be observed.

#### 180. DOMESTIC SHIPPING INSTRUCTIONS

a. Preparation for Shipment. When shipping the 1/4 ton, 4x4, utility truck, M151 the officer in charge of preparing the shipment will be responsible for furnishing the vehicle in a serviceable condition, properly cleaned, and processed.

b. Removal of Preservatives Prior to Shipment. Personnel withdrawing the 1/4 ton, 4x4, utility truck, M151 from storage for shipment must not remove preservatives other than to insure that the vehicle is complete and serviceable. If it has been determined that preservatives have been removed, they must be restored to the prescribed level prior to shipment.

NOTE. Removal of preservatives is the responsibility of the organizations receiving the shipment.

c. Army Shipping Documents. Prepare all army shipping documents in accordance with TM-38-705.

#### 181. LIMITED - STORAGE INSTRUCTIONS

##### a. General

- (1) A 1/4 ton, 4x4, utility truck, M151 received for storage and already processed for domestic shipment, as indicated in DA Form 9-3, must not be reprocessed, unless inspection performed on receipt of materiel reveals corrosion, deterioration, etc.

- (2) Completely process the 1/4 ton, 4x4, utility truck, M151 upon receipt directly from manufacturing facilities or if the processing data on the tag indicates that preservatives have been rendered ineffective by operation or freight shipping damage.

- (3) A 1/4 ton, 4x4, utility truck, M151 to be prepared for limited storage must be given a limited technical inspection and processed as prescribed in SB 9-4. The results of the inspection and classification will be entered on DA Form 641-5.

##### b. Receiving Inspections

- (1) Immediately upon receipt of the 1/4 ton, 4x4, utility truck, M151 for storage, it must be inspected and serviced as prescribed in paragraphs 7 through 11.

Perform a systematic inspection and replace or repair all missing or broken parts. If repairs are beyond the scope of the unit and materiel will be inactivated for an appreciable length of time, place materiel in limited storage and attach tags specifying the repairs needed. The reports of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

- (2) When materiel is inactivated, it will be processed in accordance with SB 9-4.

- (3) Prepare a DD Form 6 for all shipments received in a damaged or otherwise unsatisfactory condition, due to deficiencies in preservation, packaging, packing, marking, handling, loading, or storage and for apparently excessive preservation.

c. Storage Site. The preferred storage site for the 1/4 ton, 4x4, utility truck, M151 is under cover in dry, covered sheds. When it is necessary to store materiel outdoors, protect it against the elements as prescribed in TB ORD 379.

d. Inspection During Storage. Perform a visual inspection periodically to determine a general condition. If corrosion is found, remove it and clean, paint, and treat with the prescribed preservatives.

NOTE. Touch-up painting will be in accordance with TM 9-2851.

e. Removal From Limited Storage

- (1) If the 1/4 ton, 4x4, utility truck, M151 is not shipped or issued upon expiration of the limited storage period, process as applicable in accordance with SB 9-4.
- (2) If the 1/4 ton, 4x4, utility truck, M151 to be shipped will reach its destination within the limited storage period, it need not be reprocessed upon removal from storage, unless inspection reveals it to be necessary according to anticipated in-transit weather conditions.
- (3) When it has been ascertained that the 1/4 ton, 4x4, utility truck, M151 is to be placed into immediate service, deprocess it in accordance with SB 9-4. Inspect and service it as prescribed in paragraphs 7 through 11.

## 182. ON-VEHICLE EQUIPMENT (OVE) REQUIREMENTS

a. General. Preserve and package all OVE individually, except items used in sets or in quantities greater than one. On-vehicle equipment will be thoroughly cleaned, preserved, packed (boxed or crated), and securely stowed in or on the vehicle as prescribed below.

b. Publications. Place technical manual in type 1, grade A, class B bags and heat seal the opening (Method IC-3, TM 9-1005). Pack in the OVE container. Publications provided by separate technical services will be packaged similarly and packed in the same exterior OVE containers as the items to which they are applicable.

c. Unit Packages. Unit packages that are not water-resistant and are impracticable for intermediate packaging will be overwrapped in flexible waterproof barrier-material (method IC-2, TM 9-1005) and sealed with waterproof, water-resistant adhesive.

NOTE. Weatherproofing of container tops will not be necessary if containers are to be stowed within the vehicle (if the vehicle is covered).

d. Intermediate Packages. Whenever possible, unit packages of related items will be grouped together, into intermediate packages in fiberboard cartons. Container closure will be made by sealing all seams with water-resistant, gummed paper tape. When the gross weight exceeds 20 pounds, the container will be sealed with water-resistant adhesive (for sealing fiberboard boxes), in addition to being sealed with tape (TM 9-1005).

e. Exterior Containers

- (1) Keep the number of exterior containers to a minimum. The size will be governed by the cubic displacement of the packaged OVE. Dimensions will be such that, when assembled in sets as required and stowed on vehicles, the overall cubage of the vehicles will not be increased and lifting devices will not be obstructed.
- (2) Place heavy materiel or equipment in the bottom of exterior containers and block and brace, as necessary, so they will not damage other contents. Pack fragile materiel and canvas items above other OVE items, at the top of the containers; in addition, pack canvas covers for OVE items in the same exterior containers with the items for which they are intended.
- (3) Pack unit and intermediate packages in style 2, unlined, snug-fitting, nailed wood boxes, for a type III load (see TM 9-1005), modified as prescribed in (a) through (e) below.
  - (a) Exterior containers over 200 pounds gross weight will have nominal 2 x 4 end cleats. Also, beveled end skids of nominal 2 x 4 lumber will be placed flat, parallel to the ends of the containers, and spaced approximately 6 inches from each end, with span between skids not to exceed 36 inches.
  - (b) The skids will be fastened to the bottom with nails driven through the floor into the skids. Nails will be of sufficient length and size to achieve maximum holding power.

- (c) Additional battens, when required, will be fastened to the inside faces of the top and side panels; additional battens will be fastened to the inside face of bottom panel, when skids are not required.
- (d) Construct the container top of matched lumber and nail to the side and end panels. The container will be weather-proofed, strapped, and marked in accordance with TM 9-1005.
- (e) Cover exterior surfaces of all OVE exterior containers (except tops) with one coat of quick-drying lusterless enamel.

NOTE. OVE containers stowed within the vehicle will not require painting if the vehicle is covered.

#### f. Stowage

- (1) Stow all OVE containers inside the body of vehicle, when practical. Containers stowed outside the vehicle must be placed so as not to increase the cubic displacement of the vehicle. Strap, block, or brace all OVE containers to prevent free movement.

NOTE. OVE containers must receive maximum protection against corrosion, deterioration, and mechanical damage during shipment and prolonged periods of storage.

- (2) OVE containers constructed without skids, which are to be stowed in exposed locations in contact with platforms, floors, or other boxes, will be placed on nominal 1 x 4 wood cleats to minimize surface contact. Secure cleats in a manner that will prevent shifting or damage to contact surfaces.

### 183. MARKING

Marking and identification of the 1/4 ton, 4x4, utility truck, M151 will be accomplished according to TM 9-1005.

### 184. LOADING AND BLOCKING INSTRUCTIONS

#### a. Preparation

- (1) Prepare vehicles for rail shipment in accordance with SB 9-4.

- (2) If the materiel is to be shipped within the continental limits of the United States, except directly to ports of embarkation, disconnect the battery cables from battery, clean ((3) below), if necessary, coat cable terminals and battery posts with automotive and artillery grease (GAA) and wrap with nonhygroscopic adhesive tape. Secure terminals away from battery.

- (3) If materiel is to be shipped directly to ports of embarkation, except, when it is to be combat-loaded, disconnect battery cables and remove batteries. Plug vents and clean outside of batteries with a solution containing one-half pound of commercial grade baking soda (sodium carbonate) to one gallon of water. Rinse with cool water and remove vent plugs. Scrape or wire-brush and clean cable terminals and battery box (holder) with this cleaning solution, rinse with cool water, coat terminals with automotive and artillery grease (GAA) and wrap with nonhygroscopic adhesive tape. Paint battery boxes, if required, with black acid-resisting paint. Battery and electrolyte will be packed in accordance with TM 9-2857 and shipped in vehicle separate from other OVE.

- (4) Increase tire pressure slightly higher than normal except when vehicle is to be shipped to hot weather areas.

#### b. Loading

- (1) When vehicles are shipped by rail, every precaution must be taken to see that they are properly loaded and securely fastened and blocked to floor of flatcar.
- (2) Load vehicles on flatcars so they will not form an unbalanced load.
- (3) After each vehicle has been finally spotted on flatcar, apply parking brakes and wire or block lever.
- (4) For method of loading and general loading rules pertaining to rail shipment of ordnance vehicles, see TB 9-OSSC-G.

WARNING. The height and width of vehicles, when prepared for rail transportation, must not exceed the limitations indicated by the loading table in TM 9-1005. Whenever possible, local trans-

portation officers must be consulted about the limitations of the particular railroad lines to be used for the movement in order to avoid delays, dangerous conditions, or damage to equipment.

- (5) When suitable hoisting equipment is not applicable, and other methods of loading and pivoting materiel into balanced position on flatcar are necessary, refer to flatcar loading in TM 9-1005.

NOTE. The spare tire for the utility truck is attached to the rear of the vehicle. If these vehicles are to be lifted, rather than driven onto the flatcar, the attached spare tires may interfere with lifting devices, and they should be removed and secured with metal strapping at some other suitable location on the vehicle.

c. Blocking

- (1) General. All blocking instructions specified herein are minimum and are in accordance with Pamphlet No. MD-7, Rules Governing the Loading of Defense Materiel on Open Top Cars of the Association of American Railroads. Additional blocking may be added, as required, at the discretion of the officer in charge. Double-headed nails may be used, except in the lower piece of two piece cleats. All item reference letters in (2) through (5) below refer to details and locations shown in figures 150 and 151. The number of vehicles to be loaded will depend upon the length of flatcar.

- (2) Brake Wheel Clearance "A". Load vehicles on flatcars, with a minimum clearance of at least 4 inches below and 6 inches above, behind, and to each side of the brake wheel. Any increase in clearance must be consistent with proper location of load.

NOTE. Three methods of blocking are given herein; the method to be used will depend on dimensions of flatcars and availability of required blocking materials. These instructions are for vehicles single-loaded.

(3) Method I

- (a) Chock blocks "B" (6 x 9 x 12, six required per truck, constructed as shown

in detail 1, fig. 151). Locate the 53 degree surface of blocks against the front and rear of each outside wheel, against the front of each inside wheel and against the rear of each inside rear wheel. Nail heel of each block to car floor with three fortypenny nails and toenail both sides of blocks to car floor with one fortypenny nail each.

NOTE. Alternate type B-1 or B-2 chock blocks may be constructed as shown in details 2 and 3, figure 151 and located against tires as shown in details 1 and 2, figure 150. Vehicles require chock blocks at the front and rear of all four wheels.

- (b) Inside wheel blocks "C" (6 x 9 x 12, four required per truck, constructed as shown in detail 1, figure 151). Locate the 6 x 9 surface of block flush against the inside of each wheel, as shown in figure 150. Nail heel of each block to car floor with fortypenny nails and toenail each side to floor with one fortypenny nail.

NOTE. Alternate type inside wheel blocks C-1 may be constructed as shown in detail 4, figure 151, and located against tires as shown in detail 2, figure 150. When inside wheel blocks C-1 are used, cushioning material "D" (waterproof paper or burlap) will be placed between blocks C-1 and inside of tire. The materiel should extend 2 inches beyond block on car floor and 2 inches above block against side of tire.

- (c) Vehicle strapping "E" (1-in. No. 14 BW gage, hot-rolled steel, length to suit, two required per truck). Locate strapping "E" over front bumper of vehicle and through rear pulling hook of vehicle, as shown in figure 150. Pass strapping "E" over front bumper of vehicle and through and nail anchor plates to car floor with eight twentypenny nails. Substitute, if desired, four strands of No. 8 gage, black annealed wire, "E-1", twisted to form cables. Pass the cable over the bumper or through the pulling hook underneath and around random 2 x 4 x 18 cleat "F", with shim

"F-1", (detail 6, figure 151). Nail cleat lengthwise to car floor and twist-tighten cables to remove all slack.

(4) Method II

(a) Wheel cleats "N" (4 in. wide, 6 in. high, 8 inches longer than width of truck, four required for every truck). Locate a cleat "N" across the front and rear of front and rear wheels as shown in detail 3, figure 150, and toenail each to car floor with four thirtypenny nails.

(b) Wheel cleats "J" (2 x 4 in. 4 inches longer than distance between front and rear faces of cleats "N", four required per truck). Locate cleat "J" across top cleats "N" with sides of cleats "J" flush against inside of tires, as shown in detail 3, figure 150. Nail end of each cleat "J" to cleats "N" with three twentypenny nails.

(c) Support cleats "P" (2 x 4 x 18 in., eight required per truck). Locate four cleats "P" 24" from ends of "N" with ends flush against cleats "N", as shown in detail 3, figure 150. Nail cleat to car floor with four thirtypenny nails. Locate one cleat on top of each lower cleat and nail with four thirtypenny nails.

(5) Method III

(a) Wheel cleats "H" (2 x 4 in., length to suit, eight required for every truck). Locate a cleat "H" across flatcar close to front and rear of front and rear wheels and nail to car floor with ten thirtypenny nails as shown in detail 4, figure 150.

(b) Wheel side cleats "J" (2 x 4 in., length 4 inches longer than distance between

front and rear faces of cleats "H", four required per vehicle). Locate a cleat "J" against inside or outside of wheels as shown in detail 4, figure 150, and nail each end to cleats "H" with three twentypenny nails.

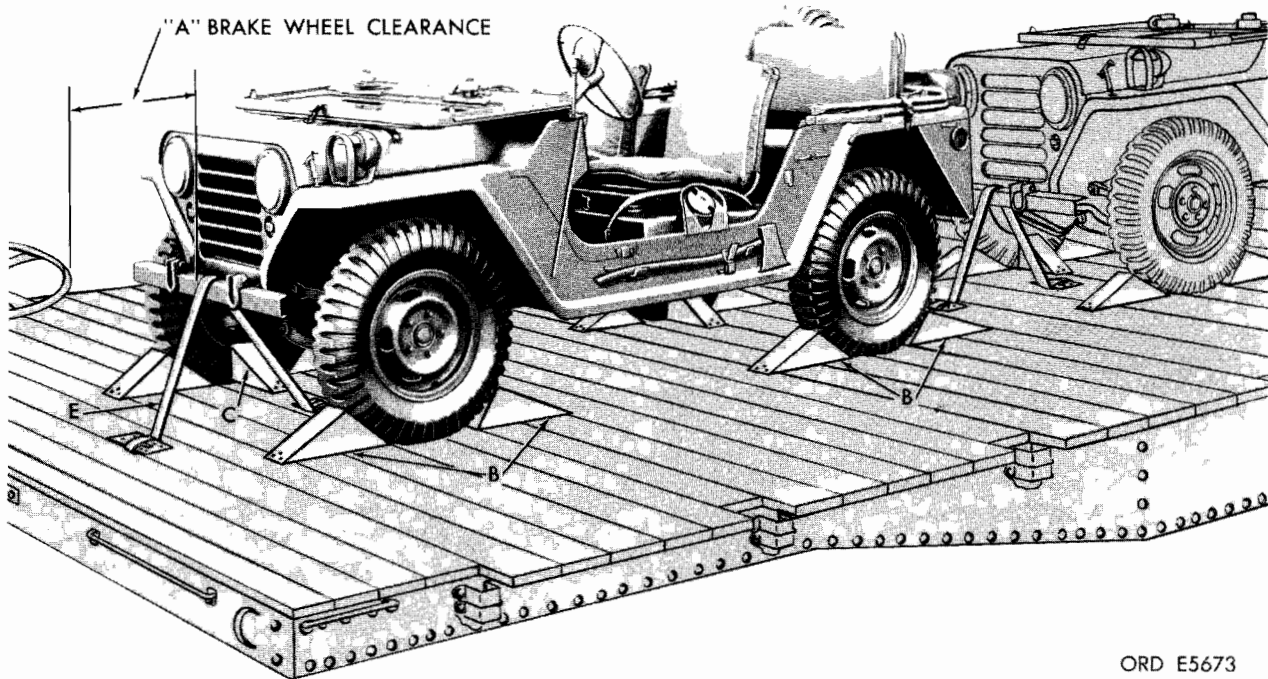
(c) Intermediate cleats "K" (2 x 4 in., eight required per vehicle). Locate a cleat "K" on top of cleats "H" with end flush against cleat "J" and nail to cleats "H" with two twentypenny nails as shown in detail 4, figure 150.

Cleats "J" will be on the outside of wheels and cleats "K" will be on the inside of cleats "J".

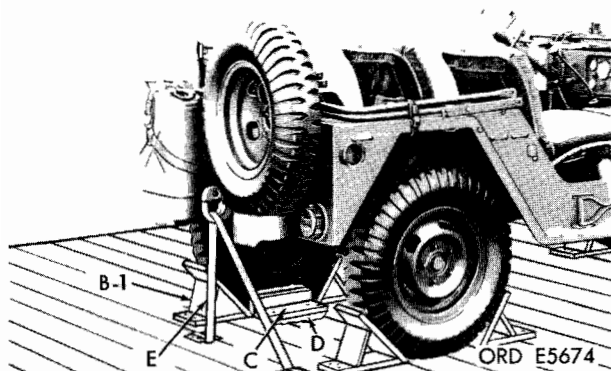
(d) Upper cleats "L" (2 x 4 in., length to equal cleats "H", four required per truck). Locate a cleat "L" across cleats "J" and nail to cleats "J" and "K" with three twentypenny nails at each end as shown in detail 4, figure 150.

(e) End cleats "M" (2 x 4 x 18 in., total of eight required). Locate a cleat "M" on car floor near each end of "H", with end flush against cleat "H", near each side of car, and secure with four thirtypenny nails. Locate one cleat "M" on top of each lower cleat and secure with four thirtypenny nails as shown in detail 4, figure 150.

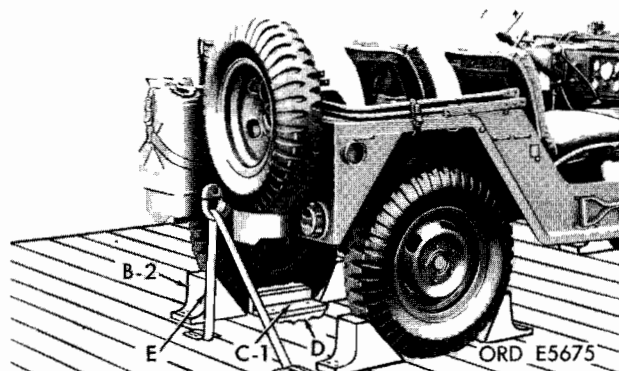
NOTE. Any other loading methods or instructions, regardless of source, which appear to be in conflict with this publication or existing loading rules of the carriers, must be submitted for approval to the Commanding Officer, Raritan Arsenal, Metuchen, N. J., ATTENTION: ORDJR-OPRA.



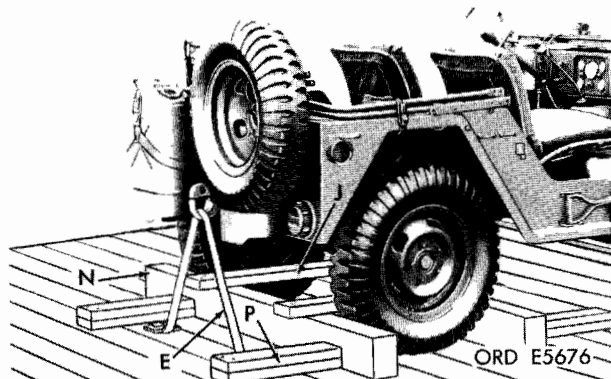
Basic method of blocking



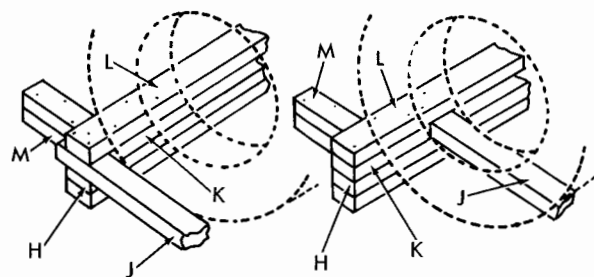
Detail 1



Detail 2



Detail 3

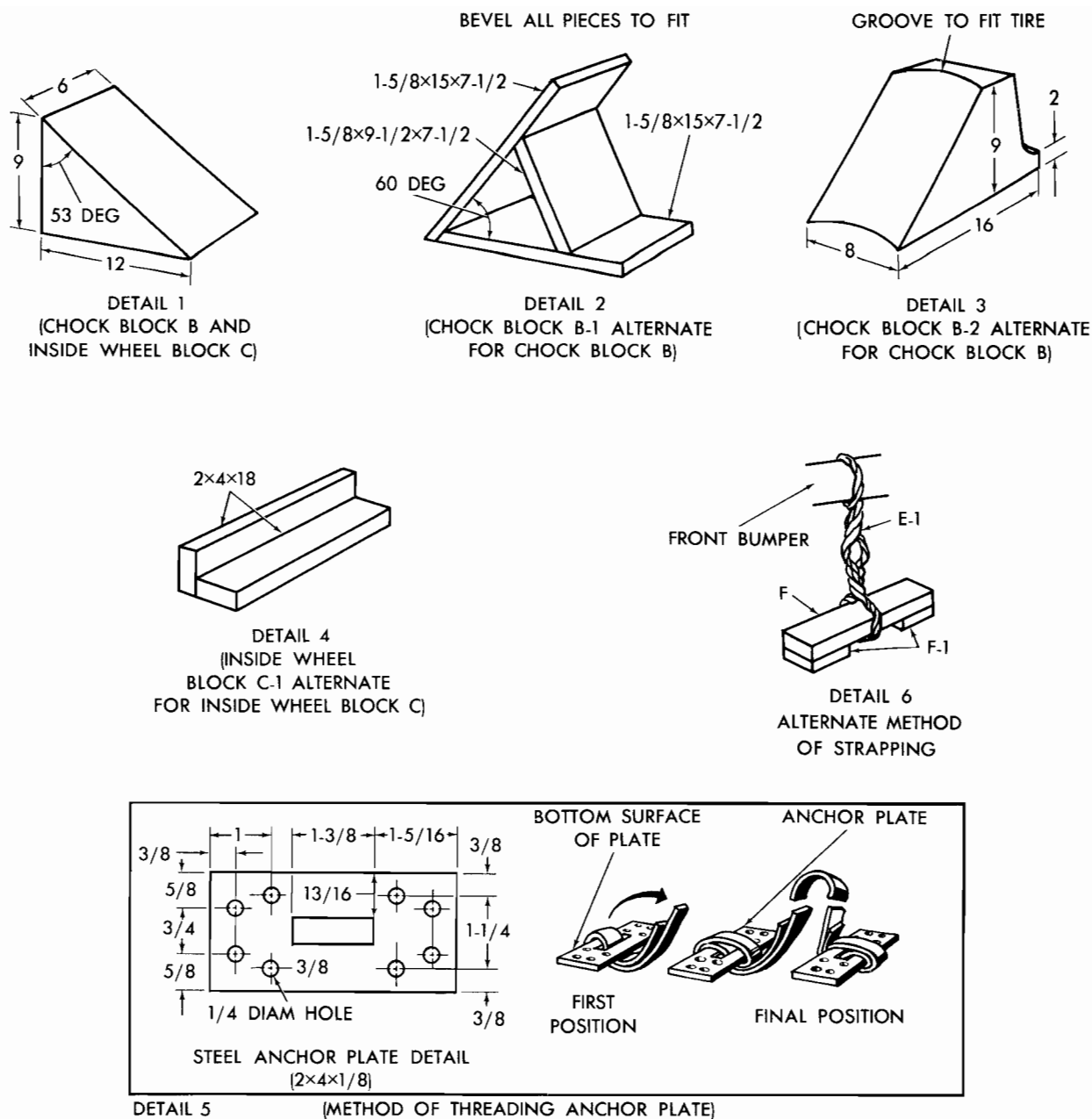


OUTSIDE WHEEL BLOCKING INSIDE WHEEL BLOCKING  
ORD E5677

Detail 4

Figure 150. Methods of blocking the 1x4 ton, 4x4, M151 on flatcars





ORD E5678

Figure 151. Materials for blocking the 1/4 ton, 4x4, M151 on flatcars.

## SECTION II. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

### 185. DEMOLITION OF MATERIEL

Refer to TM 9-2320-219-10 for demolition of materiel to prevent enemy use.

## APPENDIX I.

### REFERENCES

#### 1. Publication Indexes and General References

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

##### a. Military Publications Indexes.

Index of Army Motion Pictures, Television Recordings, and Film Strips . . . . .	DA Pam 108-1
Index of Administrative Publications . . . . .	DA Pam 310-1
Index of Blank Forms . . . . .	DA Pam 310-2
Index of Graphic Training Aids and Devices . . . . .	DA Pam 310-5
Index of Supply Manuals - Ordnance Corps . . . . .	DA Pam 310-29
Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders . . . . .	DA Pam 310-4
Index of Training Publications. . . . .	DA Pam 310-3

##### b. General References.

Authorized Abbreviations . . . . .	SR 320-50-1
Dictionary of United States Army Terms . . . . .	SR 320-50-1
Military Symbols . . . . .	FM 21-30
Military Training . . . . .	FM 21-5
Techniques of Military Instruction. . . . .	FM 21-6

#### 2. Supply Manuals

The following Department of the Army Supply Manuals pertain to this materiel:

##### a. Demolition of Materiel to Prevent Enemy Use.

Explosives, Bulk, Propellants, and Explosive Devices . . . . .	SM 9-5-1375
Land Mines and Components . . . . .	SM 9-5-1345
Pyrotechnics, Military, All types . . . . .	SM 9-5-1370

b. Maintenance and Repair

Engine Fuel System Components, Nonaircraft . . . . .	SM 9-1-2910
Engine Cooling System Components, Nonaircraft . . . . .	SM 9-1-2930
Engine Air and Oil Filters, Strainers, and Cleaners, Nonaircraft . . . . .	SM 9-1-2940
Miscellaneous Engine Accessories, Nonaircraft . . . . .	SM 9-1-2990
Tires and Tubes, Pneumatic . . . . .	SM 9-1-2600
Tool Set, General Mechanics (41-T-3534-30) . . . . .	ORD 6 SNL J-10, Sec. 4
Tool Set, Organizational Maintenance (2nd echelon), No. 1, Common (5180-754-0654) . . . . .	SM 9-4-5180-J7-1
Tool Set, Organizational Maintenance (2nd echelon), No. 1, Supplemental (41-T-3538-865) . . . . .	ORD 6 SNL J-7, Sec. 2
Tool Set, Organizational Maintenance (2nd echelon), No. 2, Common (41-T-3538-855) . . . . .	ORD 6 SNL J-7, Sec. 3
Tool Set, Organizational Maintenance (2nd echelon), No. 2, Supplemental . . . . .	SM 9-4-5180-J7-4

c. Vehicle

Organizational Repair Parts and Special Tool List - Truck, Utility, 1/4 ton, 4x4, M151 . . . . .	TM 9-2320-218-20P
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3. Forms

The following forms pertain to this materiel (Refer to DA Pamphlet 310-2 for index of blank forms).

Standard Form 46, United States Government Motor Vehicle Operators Identification Card
Standard Form 91, Operators Report of Motor-Vehicle Accident (Card)
Standard Form 94, Statement of Witness
DA Form 5-31, Job Order Register
DA Form 9-1, Materiel Inspection Tag
DA Form 9-3, Processing Record for Shipment and Storage of Vehicles and Boxed Engines (Tag)
DA Form 9-4, Vehicular Storage and Servicing Record (Card)
DA Form 9-68, Spot Check Inspection for Wheeled and Half Tracked Vehicles
DA Form 9-75, Daily Dispatching Record of Motor Vehicles
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 285, Accident Report (Supervisor's)

DA Form 446, Issue Slip

DA Form 447, Turn-In Slip

DA Form 460, Preventive Maintenance Roster

DA Form 461, Quarterly Maintenance or Spot Check for Wheeled Vehicles -  
Wheeled Trailers

DA Form 461-5, Limited Technical Inspection

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 Receipt (Set)

DA Form 865, Work Order

DA Form 1089, Claim for Personal Property

DA form 2147, Current Work File

DA Form 2148, Equipment Status and Deadline Report

DD Form 6, Report of Damaged or Improper Shipment

DD Form 110, Vehicle and Equipment Operational Record (Motor scooters,  
not trailer)

DD Form 317, Preventive Maintenance Service Due (Sticker)

DD Form 518, Accident Identification Card

#### 4. Other Publications

The following publications contain information pertinent to major item materiel and associated equipment;

##### a. Vehicle.

Operation - Truck, Utility, 1/4 ton, 4x4, M151 . . . . . TM 9-2320-218-10

##### b. Camouflage.

Camouflage, Basic Principles . . . . . FM 5-20

Camouflage of Vehicles . . . . . FM 5-20B

c. Decontamination.

Decontamination . . . . .	TM 3-220
Defense Against CBR Attack . . . . .	FM 21-40

d. General.

Basic Arctic Manual . . . . .	FM 31-70
Cleaning and Black Finishing of Ferrous Metals . . . . .	TM 9-1861
Cooling Systems: Vehicle and Power Ground Equipment . . . . .	TM 9-2858
Driver's Manual . . . . .	TM 21-305
Driver Selection and Training . . . . .	TM 21-300
Fording Kits for Combat and Transport Vehicles . . . . .	MIL F-3201
Inspection of Ordnance Materiel in Hands of Troops . . . . .	TM 9-1100
Operation and Maintenance of Ordnance Materiel in Extreme Cold (0° to -65° F) . . . . .	TM 9-207
Military Training Aids . . . . .	FM 21-8
Military Vehicles (Ordnance Corps Responsibility) . . . . .	TM 9-2800-1
Motor Transportation, Operations . . . . .	FM 25-10
Mountain Operation . . . . .	FM 70-10
Operations in the Arctic . . . . .	FM 31-71
Ordnance Maintenance and General Supply in the Field . . . . .	FM 9-10
Precautions in Handling Gasoline . . . . .	TM 10-1101
Preparation of Ordnance Materiel for Deep-Water Fording . . . . .	TM 9-2853
Preservation, Methods of . . . . .	MIL-P-116
Principles of Automotive Vehicles . . . . .	TM 9-8000
Safety: Prevention of Motor Vehicle Accidents . . . . .	AR 385-55
Safety: Reports of Accident . . . . .	AR-385-40
Spark Plugs . . . . .	TM 9-8638
Storage Batteries, Lead-Acid Type . . . . .	TM 9-6140-200-15
Supplies and Equipment (Motor Vehicles) . . . . .	AR 700-2300-1
Supplies and Equipment: Unsatisfactory Equipment Report . . . . .	AR 700-38

e. Maintenance and Repair.

- Materials Used for Cleaning, Preserving, Abrading, and  
Cementing Ordnance Materiel and Related Materials  
Including Chemicals, Lubricants, Indicators, and  
Hydraulic Fluids . . . . . TM 9-1007
- Automotive Vehicles with 24-volt Electrical system;  
Operating Precautions and Maintenance and Storage  
of New 12-volt Lead-Acid Storage Batteries 2HN and 6TN . . TM 9-6140-200-15
- Emergency Repair of Cracks in Cylinder Heads,  
Cylinder Blocks, Radiators, Fuel Tanks, and  
Liquid Containers . . . . . TB ORD 607
- General Supply: Winterization Equipment for  
Automotive Materiel . . . . . SB 9-16
- Instruction Guide: Care and Maintenance of Ball  
and Roller Bearings . . . . . TM 37-265
- Welding Theory and Application . . . . . TM 9-237
- Lead-Acid Type Storage Batteries: Restoration of  
Sulfated Batteries to Serviceable Condition . . . . . TM 9-6140-200-15
- Lubrication . . . . . TM 9-2835
- Maintenance: General Supplies . . . . . ORDM 3-3
- Maintenance and Care of Hand Tools . . . . . TM 9-867
- Maintenance of Supplies and Equipment: Maintenance  
Responsibilities and Shop Operation . . . . . AR 750-5

f. Vehicular Maintenance.

- Care and Maintenance of Pneumatic Tires . . . . . TM 9-1870-1
- Painting Instructions for Field Use . . . . . TM 9-2851
- Preparation of Ordnance Materiel for Deep-Water Fording . . . TM 9-2853
- Preventive Maintenance - Supply, Inspection, and  
Training Procedures - Tactical Motor Vehicle . . . . . TM 9-2810

g. Shipment and Limited Storage.

- Instruction Guide: Ordnance Preservation, Packaging,  
Packing, Storage, and Shipping . . . . . TM 9-1005
- Marking and Packing of Supplies and Equipment: Marking  
of Oversea Supply . . . . . SR 746-30-5
- Ordnance Storage and Shipment Chart Group G: Major  
Items and Major Combinations of Group G . . . . . TB 9-0SSC-G

Packaging and Shipping of Materiel: Army Shipping Document . . . . .	AR 725-0
Packing and Shipping of Materiel: Preservation, Packaging, and Packing of Military Supplies and Equipment . . . . .	TM 38-230
Packaging of Small Arms Materiel with Volatile Corrosion Inhibitor (VCI) . . . . .	TB ORD 623
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
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel Other than Ammunition and Army Aircraft . . . . .	TB ORD 385



## APPENDIX II.

### MAINTENANCE ALLOCATION CHART

#### 1. EXPLANATION

The Maintenance Allocation Chart designates overall responsibility for the maintenance function on an end item or assembly. Repair and/or rebuild of major assemblies is designated by authority of the Army Commander representative, except for the specific sub-functions listed in the Maintenance Allocation Chart. Deviation from maintenance operations allocated in the Maintenance Allocation Chart are authorized only upon approval of the Army Commander representative.

#### 2. DEFINITIONS

The following definitions explain the various terms used in the Maintenance Allocation Chart.

a. Adjust. To regulate periodically to prevent malfunction.

b. Replace. To substitute serviceable assemblies, subassemblies and parts for unserviceable components.

c. Repair. To restore to a serviceable condition by replacing unserviceable parts or by any other action required; utilizing tools, equipment and skills available, to include welding, grinding, riveting, straightening, adjusting etc.

d. Second Echelon "C" and "D". "C" and "D" column refer to those maintenance operations authorized to be performed at separate company and separate battery, battalion and/or regimental level. "C" and "D" columns are intended as a guide for unit commander and motor pool officers in the performance of organizational maintenance. Deviation from this guide from second echelon is authorized where considered appropriate by the unit commander.

e. Symbol "X". The symbol "X" placed in the appropriate column indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by "X" are authorized to perform the indicated operation. Symbol "X" used with a repair operation requiring no parts indicates overall responsibility for performance; however, authority for performing less complex repairs will be governed by time, tools and skills available.

f. Symbol "%%". This symbol indicates that the second echelon can perform that maintenance operation when authorization is obtained from the supporting ordnance officer.

#### MAINTENANCE ALLOCATION CHART

For

Truck, Utility, 1/4 ton, 4x4, M151

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
0100.1	<u>GROUP 01 ENGINE</u>					
	Power, plant remove and install . . . . .		X			
	Cushions, engine mounting replace . . . . .		X			

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 01 ENGINE (continued)</u>					
0100.2	Engine replace . . . . .		%%	X		
0101	Cylinder head replace . . . . .		X			
0102	Bearing, crankshaft replace . . . . . Crankshaft replace . . . . . Pulley, drive replace . . . . .				X  X	
0103	Flywheel replace . . . . . Gear, ring replace . . . . .			X  X		
0104	Bearing, connecting rod replace . . . . . Rod, connecting replace . . . . . repair . . . . . Pistons replace . . . . . Pins, piston replace . . . . . Rings replace . . . . .			X	  X X  X X X	
0105.1	Springs, valve replace . . . . . Valve, exhaust and intake grind . . . . . replace . . . . .			X  X X		
0105.2	Arm, rocker replace . . . . . Tappet, valve replace . . . . . Rod, push replace . . . . . Shaft, rocker arm replace . . . . .			X  X  X X		

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 01 ENGINE (continued)</u>					
0105.3	Bearing, camshaft replace . . . . .				X	
	Camshaft replace . . . . .				X	
0105.5	Gears, timing replace . . . . .			X		
0106.1	Pump, Oil replace . . . . .			X		
0106.2	Element, oil filter replace . . . . .	X				
	Filter, oil replace . . . . .		X			
	repair . . . . .			X		
0106.6	Lines and fittings (ventilation) replace . . . . .		X			
	Pan, oil replace . . . . .			X		
	repair . . . . .			X		
0108	Manifold, intake and exhaust replace . . . . .		X			
	<u>GROUP 02 CLUTCH</u>					
0200	Housing, clutch replace . . . . .			X		
	Bearing, starting motor (in housing) replace . . . . .			X		
0201	Bearing, pilot (bushing type) replace . . . . .			X		
	Disk, driven, clutch reline . . . . .			X		
	replace . . . . .		%%	X		
	Plate, pressure replace . . . . .		%%	X		
	repair . . . . .			X		

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 02 CLUTCH (continued)</u>					
0202	Bearing, release, clutch replace . . . . .		%%	X		
	Shaft, cross and equalizer components replace . . . . .		%%	X		
	Hub, release bearing replace . . . . .		%%	X		
	<u>GROUP 03 FUEL SYSTEM</u>					
0301	Carburetor adjust . . . . . replace . . . . . repair . . . . .	X X		X		
0302.3	Pump, fuel (in tank) (electric) replace . . . . . repair . . . . .	X		X		
0304.1	Cleaner, air service . . . . . replace . . . . . repair . . . . . Hose, carburetor to air cleaner replace . . . . .	X X		X		
0304.5	Lines and fittings, vent replace . . . . .	X				
0306.1	Tank, fuel replace . . . . . repair . . . . .	X		X		
0306.2	Lines and fittings replace . . . . .	X				
0309	Filter, fuel (in tank) service . . . . . replace . . . . .	X X				
0312	Accelerator pedal and linkage replace . . . . . repair . . . . . Controls, choke replace . . . . . repair . . . . .	X X X X				

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 04 EXHAUST SYSTEM</u>					
0401	Muffler replace . . . . .	X				
	Pipe exhaust replace . . . . .	X				
	<u>GROUP 05 COOLING SYSTEM</u>					
0501	Radiator replace . . . . . repair . . . . .	X		X		
0502	Shroud, fan repair . . . . .			X		
0503	Hoses, radiator replace . . . . . Thermostat replace . . . . .	X X				
0504	Pump, water replace . . . . . repair . . . . .		X	X		
0505	Belt, fan drive replace . . . . . Blade, fan replace . . . . . Pulley, water pump and fan replace . . . . .	X	 X X			
	<u>GROUP 06 ELECTRICAL SYSTEM</u>					
0601	Generator replace . . . . . Armature replace . . . . . repair . . . . . Bearings replace . . . . . Brush replace . . . . . Coil, field replace . . . . . Seals replace . . . . .		X	 X X X X X X	  X	

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 06 ELECTRICAL SYSTEM (continued)</u>					
0602	Regulator replace . . . . . repair . . . . .		X	X		
0603	Starter replace . . . . . Armature replace . . . . . repair . . . . . Bearing (bushing type) replace . . . . . Brush replace . . . . . Drive, starter replace . . . . . Coil, field replace . . . . . Seal replace . . . . . Switch, starter replace . . . . .	X		X X X X X X X X X X X	X	
0604.1	Distributor replace . . . . . Cap, distributor replace . . . . . Capacitor (condenser) replace . . . . . Point, set replace . . . . . Rotor, distributor replace . . . . . Shaft, distributor replace . . . . .	X X X X X X X		X		
0604.3	Lines and fittings, ventilation system replace . . . . .	X				
0605	Coil, ignition replace . . . . . Plugs, spark replace . . . . . clean . . . . . Wiring, ignition replace . . . . . repair . . . . .	X X X X X X	X			

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 06 ELECTRICAL SYSTEM (continued)</u>					
0607	Instruments					
	replace . . . . .		X			
	Breaker, circuit					
	replace . . . . .		X			
	Lamps					
	replace . . . . .	X				
	Light, panel					
	replace . . . . .		X			
	Switch, ignition					
0608.1	replace . . . . .	X				
	Switch, light					
	replace . . . . .	X				
0609.1	Switch, safety, fuel pump					
	replace . . . . .	X				
	Lamps and lamp units					
0610	replace . . . . .	X				
	Lights					
	replace . . . . .	X				
0611	repair . . . . .			X		
	Unit, sending					
	replace . . . . .		X			
0612	Horn					
	adjust . . . . .	X				
	replace . . . . .	X				
	repair . . . . .			X		
	Switch, horn					
0613.1	replace . . . . .	X				
	Battery					
	service . . . . .	X				
	recharge. . . . .		X			
	replace . . . . .	X				
0613.1	repair . . . . .			X		
	Cables, battery					
	replace . . . . .	X				
	Harness, wiring, chassis					
	replace . . . . .			X		
0613.1	repair . . . . .		X			
	Harness, generator to regulator					
	replace . . . . .		X			
	repair . . . . .		X			



MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 06 ELECTRICAL SYSTEM (continued)</u>					
0615	Coupling, trailer, electrical replace . . . . . repair . . . . .	X		X		
	<u>GROUP 07 TRANSMISSION</u>					
0700	Transmission replace . . . . .		%%	X		
0702.1	Input shaft replace . . . . . Seal, input shaft replace . . . . .			X	X	
0702.3	Output shaft, gears, bearings replace . . . . .				X	
0702.5	Countershaft, gears, bearings replace . . . . . Reverse idler, shaft, gears, bearing replace . . . . .				X X	
0704	Cover, shifter repair . . . . . Valve, breather replace . . . . .	X		X		
	<u>GROUP 08 TRANSFER</u>					
0802.1	Seal, oil, input bearing replace . . . . . Input bearings and gears replace . . . . .		X		X	
0802.3	Intermediate shaft, bearing and gear replace . . . . .				X	
0802.5	Seal, oil, output (front) replace . . . . . Front output shaft, bearing, and clutch replace . . . . .		X		X	

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 08 TRANSFER (continued)</u>					
0802.7	Seal, oil transfer (rear) replace . . . . .				X	
0804	Seal, clutch shifter shaft replace . . . . . Transfer clutch shifter components replace . . . . .		X		X	
	<u>GROUP 09 PROPELLER SHAFT</u>					
0900	Shaft, propeller replace . . . . . Joint, universal replace . . . . . repair . . . . .	X  X	  X			
	<u>GROUP 10 FRONT AXLE</u>					
1002	Carrier, differential replace . . . . . repair . . . . . Flanges, universal joint replace . . . . . Seals, carrier replace . . . . .		%%  X X	X   X	  X	
1004	Ball joint replace . . . . . Spindle, wheel replace . . . . . Seals, support replace . . . . . Support replace . . . . .		X   X	  X  X		
1005	Valve, breather replace . . . . .	X				
1006	Joint, universal repair . . . . . Drive shaft and bearing replace . . . . .			X  X		

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 11 REAR AXLE</u>					
1102	Carrier, differential					
	replace . . . . .		%%	X		
	repair . . . . .				X	
	Flanges, universal joint					
	replace . . . . .		X			
	Seals, carrier					
	replace . . . . .		X			
1104.1	Spindle, wheel					
	replace . . . . .			X		
	Support, wheel					
	replace . . . . .			X		
	Seals					
	replace . . . . .		X			
	Joint, universal					
	repair . . . . .			X		
1104.01	Drive shaft and bearing					
	replace . . . . .			X		
1105	Valve, breather					
	replace . . . . .	X				
	<u>GROUP 12 BRAKES</u>					
1201	Band, brake, emergency					
	replace . . . . .	X				
	reline . . . . .			X		
	Drum, brake, emergency					
	replace . . . . .		X			
	repair . . . . .			X		
	Linkage					
	replace . . . . .		X			
	repair . . . . .			X		
1202	Shoe, brake service					
	replace . . . . .	X				
	reline . . . . .			X		
1204.1	Cylinder, master					
	replace . . . . .	X				
	repair . . . . .			X		

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
1204.3	<u>GROUP 12 BRAKES (continued)</u>					
	Cylinder, wheel					
	replace . . . . .	X				
	repair . . . . .			X		
1311	Lines and fittings, hydraulic					
	replace . . . . .	X				
	<u>GROUP 13 WHEELS, HUBS, DRUM</u>					
	Bearings					
1311	replace . . . . .			X		
	Drums, brake service					
	replace . . . . .	X				
	repair . . . . .			X		
1313	Seals, oil					
	replace . . . . .	X				
	Studs, wheel and hub					
	replace . . . . .	X				
1313	Wheels					
	replace . . . . .	X				
	Tires					
	replace . . . . .	X				
1401	Tubes					
	replace . . . . .	X				
	repair . . . . .	X				
	<u>GROUP 14 CONTROLS</u>					
1401	Arm, pitman					
	replace . . . . .		X			
	Rod, idler arm					
	replace . . . . .	X				
1401	repair . . . . .		X			
	Rod, arm connecting					
	adjust . . . . .	X				
	replace . . . . .	X				
1401	repair . . . . .		X			
	Gear, steering					
	adjust . . . . .			X		
	replace . . . . .			X		
1401	repair . . . . .				X	
	Wheel, steering					
1401	replace . . . . .		X			

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
1503	<u>GROUP 15 FRAME &amp; BRACKETS</u>					
	Pintle					
	replace . . . . .	X				
	repair . . . . .	X				
	Shackle lifting					
	replace . . . . .	X				
	<u>GROUP 16 SPRINGS AND SHOCK ABSORBERS</u>					
1601.1	Arms, suspension, upper and lower					
	replace . . . . .	X				
	repair . . . . .		X			
	Shafts, arm					
	replace . . . . .	X				
	repair . . . . .	X				
1601.3	Springs, coil, (front)					
	replace . . . . .	X				
	Arm, suspension					
	replace . . . . .	X				
	repair . . . . .		X			
	Spring, coil (rear)					
	replace . . . . .	X				
	Seat					
1604.1	replace . . . . .	X				
	Absorbers, shock					
	replace . . . . .	X				
	<u>GROUP 17 HOOD</u>					
1701	Fender					
	repair . . . . .			X		
1703	Hood					
	repair . . . . .			X		
1804	<u>GROUP 18 BODY</u>					
	Windshield					
	replace . . . . .	X		X		
	repair . . . . .					

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 18 BODY (continued)</u>					
1806	Seat repair . . . . .			X		
1808	Boxes, brackets and straps replace or repair . . . . .			X		
	<u>GROUP 21 BUMPER GUARDS</u>					
2101	Bumper repair . . . . .			X		
	Guard, brush repair . . . . .			X		
	<u>GROUP 22 MISCELLANEOUS ACCESSORIES</u>					
2201	Bows replace . . . . . repair . . . . .	X	X			
	Cover, top repair . . . . .			X		
	Curtains repair . . . . .			X		
2202	Arm and blade, windshield wiper replace . . . . .	X				
	Motor, windshield wiper replace . . . . . repair . . . . .	X		X		
	Mirror, rear view replace . . . . .	X				
	Valve, control, windshield wiper replace . . . . .	X				
	Pump, vacuum, windshield wiper (on engine) replace . . . . . repair . . . . .	X		X		
	Lines and fittings, vacuum replace . . . . .	X				
2208. P	Speedometer replace . . . . .		X			
	Core, flexible shaft replace . . . . .	X				
	Housing, flexible shaft, speedometer replace . . . . .	X				

MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 18 BODY (continued)</u>					
2210	Plate, vehicle data replace . . . . .	X				
SUPPLEMENT NO. 1. This supplement pertains to special purpose kits for deep water fording, -25° and -65° winterization and hard top closure, and must be used in conjunction with the basic allocation chart.						
	<u>GROUP 03 FUEL SYSTEM</u>					
0302.5	Pump, fuel, personnel heater (electric) replace . . . . . repair . . . . .		X		X	
0311.1	Pump, primer replace . . . . . repair . . . . .		X	X		
0311.3	Lines and fittings, priming replace . . . . .			X		
	<u>GROUP 33 REGULATED ITEMS</u>					
3301	Kit, deep water forwarding install . . . . .				X	
3302	Kit, heater (-25°) install . . . . .				X	
3303	Kit, arctic heater (-65°) install . . . . .				X	
3304	Kit, hardtop closure install . . . . .				X	
	<u>GROUP 50 WINTERIZATION EQUIPMENT</u>					
5011.11	Heater, personnel replace . . . . . repair . . . . .			X	X	
5011.13	Controls, winterization replace . . . . . repair . . . . .		X	X		



MAINTENANCE ALLOCATION CHART (continued)

GROUP NO.	COMPONENT AND RELATED OPERATION	ECHELONS				
		2nd		3rd	4th	5th
		C	D			
	<u>GROUP 50 WINTERIZATION EQUIPMENT</u>					
5011.21	Motor, blower (-25° heater) replace . . . . .			X		
5011.5	Electrical system, winterization repair . . . . .			X		
5011.8	Hoses, winterization equipment replace . . . . .		X			
	<u>GROUP 60 DEEP WATER FORDING SYSTEM</u>					
6001	Deep water fording system repair . . . . .		X			
	<u>GROUP 70 HARD TOP CLOSURE</u>					
7001	Hardtop, closure repair . . . . .				X	
SUPPLEMENT NO. 2. This supplement pertains to the special purpose kit for the al- ternator (100 amp generating system) and must be used in conjunction with the basic allocation chart.						
0601	Alternator replace . . . . . repair . . . . .		X	X		
	Rectifier replace . . . . .		X			
0602	Regulator replace . . . . . repair . . . . .		X	X		
0613.3	Harness replace . . . . .		X			
3307	Kit, alternator install . . . . .			X		

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