TM 9-2320-212-20

TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

FOR

TRUCK, CARGO: 3/4-TON 4x4, M37 AND M37B1

TRUCK, AMBULANCE: 3/4-TON 4x4, M43 AND M43B1

TRUCK, MAINTENANCE: 3/4-TON 4x4, M201 AND M201B1

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1973

Technical Manual
No. 9-2320-212-20

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *30 November 1973*

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* This manual, together with TM 9-2320-212-10, 30 November 1973, supersedes TM 9-8030, 2 May 1955, including all changes.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for organizational maintenance of the following vehicles:

Truck, Cargo:	¾ Ton 4x4, M37, M37B1
Truck, Ambulance:	¾ Ton 4x4, M43, M43B1
Truck, Maintenance:	¾ Ton 4x4, M201, M201B1

The manual also contains information on the operation and organizational maintenance of the materiel cited here above.

b. Chapter 3 contains materiel used in conjunction with major items and instructions for organizational maintenance on the vehicle special purpose kits.

c. Appendix A provides a list of current reference publications, including supply manuals, forms, technical manuals, and other publications applicable to this materiel.

d. Appendix B contains the maintenance allocation chart which lists the maintenance responsibilities allocated to each level of maintenance.

e. TM 9-2320-212-20P contains the repair parts and special tools lists for maintaining the materiel and is the authority for requisitioning replacements.

1-2. Maintenance Forms and Records

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750. Reports of accidents involving injury to personnel or damage to materiel are listed in and prescribed by AR 385-40.

1-3. Destruction of Army Materiel to Prevent Enemy Use

TM 750-244-3 covers procedures concerning destruction of materiel to prevent enemy use.

1-4. Administrative Storage

TM 740-90-1 covers procedures for vehicle storage.

1-5. Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded to: direct to Commander, US Army Tank-Automotive Command, ATTN: AMSTA-MAPT, Warren, MI 48090.

Section II. DESCRIPTION AND DATA

1-6. Description

a. This manual covers Cargo Truck ¾ ton 4x4, M37, M37B1, Ambulance Truck M32, M43B1, and Maintenance Trucks M201, M201B1.

b. All models are equipped with a liquid cooled, six-cylinder, L head type gasoline engine, located in the front of the vehicle. Power is transmitted through the clutch and the four-speed transmission. A short propeller shaft connects the transmission to the two-range transfer unit which then transmits power by propeller shafts to both axles.

c. Front and rear springs are the semielliptic type. Hydraulic type shock absorbers are used to control flexing of both front and rear springs.

d. The steering gear is the worm and sector type.

e. A 24-volt or 28-volt electrical system supplies current for starting, ignition, lights, and horn. The electrical system is completely waterproofed. The lighting system includes service headlights, blackout driving light, marker lights, service and blackout tail and stop lights, and instrument panel lights.

1-7. Identification

A general description of the Cargo Truck M37, M37B1, Ambulance Truck M43, M43B1, and Maintenance Truck M201, M201B1, and their identification plates is in TM 9-2320-212-10. The maintenance paragraphs of this manual contain detailed description of the components in the above-cited materiel.

1-8. Tabulated Data

a. Axles.

Front:
- Capacity ..... 6 pt
- Make ..... Dodge
- Tie-rod ..... Bell and socket
- Type ..... Full floating (hypoid)

Rear:
- Capacity ..... 6 pt
- Make ..... Dodge
- Type ..... Full floating (hypoid)

b. Brakes.

Handbrake:
- Clearance adjustment ..... 0.008 to 0.010 in.
- Lever location ..... Right side of transmission

Service Brakes:
- Make ..... Dodge
- Pedal free travel ..... 3/4 to 1 in.
- Type ..... Tapered woven and molded
- Master cylinder bore ..... 1 1/4 in.
- Type ..... Single cylinder

Wheel cylinder bore:
- Front shoe ..... 1 1/4 in.
- Rear shoe ..... 1 3/8 in.

c. Clutch.

Clutch pedal free travel ..... 1 in.
Make ..... Borg. and Beck
Model 11828
Pilot bearing type ..... Oilite
Release bearing:
- Make ..... Aetna
- Model A-893-4
- Type ..... Ball thrust (prelubricated)

d. Cooling Systems.

Cap ..... Pressure type
Capacity ..... 17 qt
Fan belt tension ..... 1 1/2 in. slack
Model 30-J-161A
Radiator:
- Make ..... Fedders or Blackstone
- Type ..... Fin and tube

Thermostat:
- Fully opened ..... 160° F

Water pump:
- Capacity ..... 26.1 gpm at 2,000 rpm
- Type ..... Centrifugal

e. Controls.

Drag links:
- Adjustment ..... Threaded plug
- Number 2
- Type ..... Tubular

Front wheel (adjustable) ..... 0 to 1/8 in.
Steering gear:
- Bearings:
  - Capacity ..... 12 oz
  - Make ..... Gemmer
  - Model B-60
  - Pitman shaft ..... Bushing-type (bz)
  - Ratio 23.2:1
  - Worm ..... Tapered roller
- Tie rod ..... Full-floating (hypoid)

f. Electrical System.

Batteries:
- Cells (each battery) 6
- Make ..... Auto-lite or Willard
- Model US2HN
- Number of batteries used 2
- Plates (each battery) 11
- Specific gravity at 80° F. (full charge) 1.275-1.300
- Specific gravity at 80° F. (replacement) ..... Below 1.220
- Voltage 12

Flasher 6-Volt
Generator (alternator)
- Manufacturer ..... Leece-Neville Co.
- Manufacturer model number (straight connector) 5300G12P
- Reference number 7954720
- Rate volts 28
- Rated amperes 100
- Speed Range (rpm) ..... 1,650 to 8,000

Generator (rectifier)
- Manufacturer ..... Leece-Neville Co.
- Manufacturer model number 1029-CP
- Reference number 7954343
- Rated volts 28
- Rated amperes 100

Generator (regulator)
- Manufacturer ..... Leece-Neville Co.
- Manufacturer model number 3392-R12P
- Reference number 8699744
- Rated volts 28
- Rated amperes 100

Horn:
- Make ..... Auto-lite, Delco, or Spark-Withington.
- Model ..... HX-40034, 1999881, or D2140A
- Type ..... Vibrator
- Voltage 24

Ignition:
- Distributor and coil assembly:
  - Automatic spark advance ..... 18° to 22° at 2,250 rpm
  - Breaker arm spring tension ..... 17 to 20 oz
  - Breaker point gap ..... 0.018 to 0.022 in.
  - Capacitor ..... 23 to 28 mfd
  - Firing order 1-5-3-6-2-4
  - Make ..... Auto-lite
  - Model ..... IAU-4005-UT or IAU-40007-UT.
  - Timing ..... 2° BTDC

Relay (distribution) Box ..... 24-volt operation
Spark plugs:
- Gap ..... 0.028 to 0.033 in.
- Make ..... Auto-lite
- Size 14-mm
- Tightening torque 30-ft-lb
- Type ..... Resistor (AR 5S)

Starter:
- Clearance between pinion and thrust washer ..... 3/32 to 1/8
- Drive ..... Mechanical shift
- Make ..... Auto-lite

- Model MCZ-4002-UT
- Voltage 24

Instruments:
- Ammeter:
  - Make ..... AC
  - Model 1501244
  - Voltage 24
- Battery-generator indicator:
  - Make ..... Auto-lite
  - Model E0-11218
  - Voltage 24
- Fuel gage:
  - Make ..... AC
  - Voltage:
    - With 95-ohm resistor 6
    - Without resistor 24
- Oil pressure gage:
  - Make ..... AC
  - Voltage:
    - With 95-ohm resistor 6
    - Without resistor 24
- Speedometer:
  - Drive ..... Pinion in transfer
  - Make ..... Auto-lite or AC
- Water pressure gage:
  - Make ..... AC
  - Voltage:
    - With 95-ohm resistor 6
    - Without resistor 24

Light assembly:
- Circuit breaker:
  - Make ..... Spencer or Wilcalator
  - Type ..... Automatic reset
  - Voltage 24
- Dimmer Switch:
  - Make ..... Douglas
  - Voltage 24
- Lamps and lamp units:
  - Make ..... Auto-lite
  - Type:
    - Blackout driving ... Lamp unit (sealed beam)
    - Blackout marker, parking, tail and done lights, (M43, M43B1) .. Lamp (G-6 bulb)
    - Headlight (two) .... Lamp unit (sealed beam)
    - Spotlight (M43, M43B1, M201, and M201B1) ... Lamp unit (sealed beam)
    - Spotlight (blackout and service) ..... Lamp (S-8 bulb)
    - Surgical light (M43, M43B1) ..... Lamp unit (sealed beam)
- Light switch:
  - Make ..... Bendix
  - Voltage 24

g. Engine.

Allowable speed (mph)

	1st	*2nd*	*3rd*	*4th*	*Rev*
Transfer:					
High range	9	18	33	55	7
Low range	4	9	17	28	4

Brake horsepower:
- At 1600 rpm 57
- At 3400 rpm 94

Compression ratio ..... 6.7 to 1
Displacement ..... 230.2 cu in.
Firing order 1-5-3-6-2-4
Make ..... Dodge T245
Torque (cylinder-head capscrew) ..... 65 to 70 ft-lb
Type ..... Gasoline, water cooled
Valve tappet clearance:
- Intake (hot) ..... 0.010 in.
- Exhaust (hot) ..... 0.014 in.

h. Exhaust System.

Exhaust pipes (upper and lower):
- Connections:
  - Inside diameter ..... 2 in.
  - Outside diameter ..... 2.25 in.

Muffler:
- Diameter ..... 5 1/16 in.
- Length (including connections) 20½ in.
- Make ..... Noblitt Sparks
- Type ..... Straight through with restrictor

Tailpipe:
- Connections (inside diameter) 1¾ in.
- Length:
  - M37, M37B1 ..... 42 7/8 in.
  - M43, M43B1, M201, and M201B1 ..... 28 7/8 in.

i. Fuel System.

Air cleaner:
- Make ..... AC
- Model ..... AC D-82072
- Type ..... Oil bath, element, (paper)

Carburetor:
- Adjustments ..... Idle mixture, idle speed
- Make ..... Carter
- Model ETW-1
- Nominal size ..... 1½ in.
- Type ..... Downdraft

Fuel filter:
- Location ..... In fuel tank
- Make ..... Skimmer
- Model R-32-63

Fuel pump:
- Drive ..... Camshaft
- Make ..... AC
- Model ..... GP 21181
- Pressure ..... 4 to 5¼ psi
- Type ..... Mechanical

Governor:
- Factory setting ..... 3,400 rpm
- Type ..... Velocity-integral with carburetor

j. Hubs, Tires, and Wheels.

Hubs:
- Bearings:
  - Method of adjustment ... Locking nut
  - Number 2
  - Type ..... Topered roller cup and cone

Tires:
- Ply 8

Pressure:
Cross-country (mud, snow, or sand) ..... 15 lb
Highway ..... 40 lb
Size ..... 9.00 x 16
Type ..... Truck and bus, mud and snow tread

k. Propeller Shafts.

Length:
Front (all models) ..... 35½ in.
Intermediate (all models) ... 10 in.
Rear:
M37, M37B1 ..... 31¼ in.
M43, M43B1, M201, and M201B1 ..... 45¼ in.
Make ..... Universal Products Company
Model:
Front (all models) 5160-56
Intermediate (all models) ... 5360-120
Rear (M37, M37B1) 5160-57
Rear (M43, M43B1, M201, M201B1 5160-58
Universal joints:
Bearings ..... Cageless roller
Type ..... Journal and roller

l. Springs and Shock Absorbers.

Front springs:
Bearings ..... Bronze, bushing type
Dimensions:
Front eye to center bolt ..... 24 in.
Rear eye to center bolt ..... 22 in.
Width ..... 2 in.
umber of leaves:
All models except M201 7
M201 8
Rear springs:
Bearings ..... Bronze, bushing type
Dimensions:
Eye to center bolt ..... 28 in.
Width ..... 2 in.
Number of leaves:
All models except M37 13
M37, M37B1 11
Shock absorbers:
Make ..... Delco, Gabriel, or Monroe
Size ..... 2 in.
Type ..... Hydraulic, three-stage control

m. Transmission.

Capacity:
Through engine T245-3955:
W / O power take-off .... 9 pt
W / power take-off ..... 10½ pt
After engine T245-3955:
W / O power take-off ..... 7 pt
W / power take-off ..... 6 pt
Make ..... new process
Models 28950, 420
Power take-off:
Gear speed ..... 395 rpm at 1,000 rpm engine speed
Gear ratios:
First 6.68:1
Second 3.10:1
Third 1.69:1
Fourth 1.00:1
Reverse 8.25:1
Lubricant capacity ..... 5.5 pt
Weight (without lubricant) ..... 125 lb approx
Speeds:
Forward 4
Reverse 1
Type ..... Helical gear synchroshift

n. Transfer.

Capacity ..... 5 pt
Make ..... new process
Model 88845
Ratio:
High range 1.00:1
Low range 1.96:1

o. Winch.

Drive shaft:
Make ..... Blood Brothers
Model 4080
Universal joints ..... Cross and trunnion
Winch:
Cable size ..... 7 / 16 in. x 150 ft
Capacity ..... 7,500 lb
Make ..... Braden
Model LU-4
Weight ..... 250 lb

CHAPTER 2

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. General.

a. Refer to TM 9-2320-212-10 for operating instructions, break-in operating precautions, and break-in speeds.

b. In addition, perform a break-in of at least 500 miles on all new or reconditioned vehicles and a sufficient number of miles on used vehicles to completely check their operation according to procedures in related paragraphs.

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

2-2. Inspecting and Servicing the Equipment.

a. General Procedures.

(1) If any exterior surfaces are coated with rust-preventive compound, remove the compound with drycleaning solvent or mineral spirits.

(2) Read Processing and Deprocessing Record for Shipment, Storage, and Issue of Vehicles and Spare Engines (DD Form 1397) and follow all precautions checked therein. A tag bearing the above-cited instruction should be attached to the steering wheel or ignition switch.

CAUTION

Because an excess of preservative oil may be in the combustion chambers or coolant may have leaked into the chamber, step (3) is mandatory. Engine damage could result if this step is not performed.

(3) Before activating the ignition system, crank engine with the starter at least two revolutions to test for hydrostatic lock.

NOTE

If the vehicle has been driven to the using organization, most or all of the foregoing should have been performed.

(4) Follow the operator's preventive maintenance services described in TM 9-2320-212-10.

b. Specific Procedures.

(1) When the engine has thoroughly warmed up to operating temperature, check the tightness of the cylinder head capscrews with a torque-indicating wrench as to the torque and in the sequence prescribed in (2) below.

(2) Tighten cylinder head capscrews to 65-70 foot-pounds torque as indicated in figure 2-1.

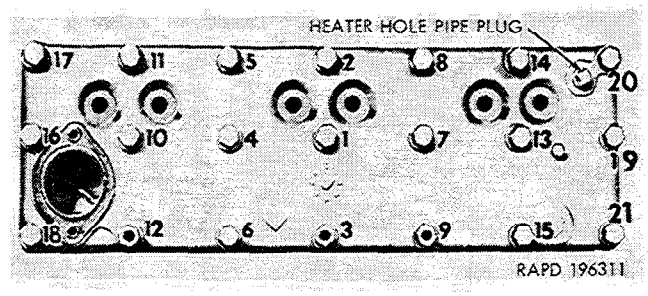


Figure 2-1. Tightening sequence for cylinder head screws.

(3) Perform the S (6 month or 6,000 mile) preventive maintenance service. (See instruction for specific procedures, para. 2-12.)

NOTE

Do not use thread lube on cylinder studs; use engine oil.

(5) Lubricate all points, regardless of interval, except as noted in (6) below. Check the levels of lubricant in all gear housings. If the gear lubricant is known to be of the correct seasonal grade, do not change it; otherwise change it.

(6) Remove hub and wheel bearings. If lubrication appears to be adequate, reinstall; do not clean and repack. Do not adjust brakes unless necessary.

(7) Provided the processing tag on the engine or vehicle states that the engine contains oil that is suitable for 500 miles of operation, and of the correct seasonal viscosity, check the level but do not change the oil.

(8) If the vehicle is delivered with dry-charged battery, activate battery in accordance with TM 9-6140-200-14.

2-3. Correction of Deficiencies

Deficiencies involving unsatisfactory design and/or material are to be reported on DA Form 2407 (Maintenance Request) as an equipment improvement recommendations (EIR) as explained in TM 38-750. The completed DA Form 2407 should be submitted to the Commander, US Army Tank-Automotive Command, ATTN: AMSTA-M, Warren, MI 48090.

Section II. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

2-4. Tools and Equipment

a. Standard and commonly used tools and equipment having general application to this materiel are authorized for issue by tables of allowances (TA) and tables of organization and equipment (TOE).

b. Special tools and equipment (fig. 2-2) especially designed for use by organizational level maintenance personnel are listed in table 2-1.

2-5. Maintenance Repair Parts

Repair parts are supplied to organizational maintenance personnel for replacement of those parts most likely to be worn, broken, or otherwise proven unserviceable, provided replacement of these parts is within organization authorization. Repair parts supplied for materiel covered in this technical manual are listed in TM 9-2320-212-20P.

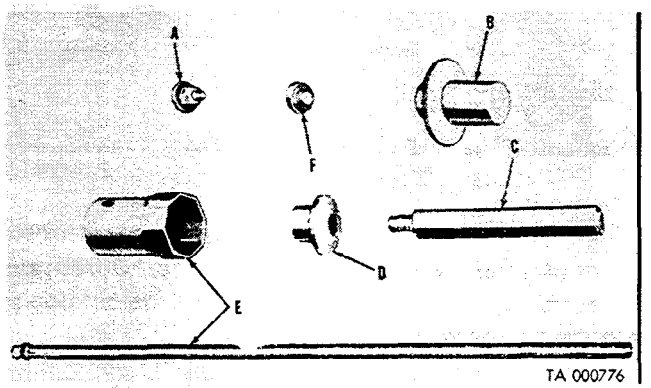


Figure 2-2. Special tools and equipment for operator and organizational maintenance.

Table 2-1. Special Tools and Equipment for Operator and Organizational Maintenance

Code ltr.	Item	References		Use
		Fig.	Para	
A	ADAPTER: Puller.	2-2 and 2-166.	2-147	To remove steering wheel (used with PULLER).
B	REPLACER: Hub bearing oil seal.	2-2 and 2-163.	2-143	To install hub bearing oil seals.
C	HANDLE: Remover and replacer.	2-2 and 2-162.	2-143	Used with DRIFT
D	DRIFT: Oil seal.	2-2 and 2-162.	2-143	To remove hub bearing oil seals.
E	WRENCH: Bearing adjusting nut.	2-2 and 2-135.	2-116 and 2-141.	To remove, install and adjust hub bearing adjusting nuts.
F	ADAPTER: Puller.	2-2 and 2-167.	2-148 and 2-164.	To remove steering idler arm (used with PULLER).

Section III. LUBRICATION INSTRUCTIONS

2-6. Lubrication

a. General. LO 9-2320-212-12 contains instructions for regular lubrication of the vehicles described in this manual. Instructions include the type and grade of lubricants to be used, lubrication locations, and the frequency of lubricating the vehicle components.

b. Special Lubrication. Refer to LO 9-2320-212-12.

c. Service Intervals. Refer to LO 9-2320-212-12.

2-7. Deficiency Reporting

Use DA Form 2407 (Maintenance Request) as an

equipment improvement report (EIR) to report any unsatisfactory vehicle performance resulting from the use of the prescribed fuels, lubricants, or preserving materials. For further information regarding use and disposition of the above cited form, see paragraph 2-3.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-8. General

Preventive maintenance service requirements are outlined in table 2-2. These services are designed to 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 regular preventive maintenance service is performed.

2-9. Responsibility

Organizational maintenance personnel are responsible for performing the semiannual preventive maintenance services outlined in table 2-2.

2-10. Intervals

CAUTION

Do not extend intervals between preventive maintenance services except when authorized to do so.

The preventive maintenance services for the vehicles described in this manual will be performed by organizational mechanics every six months or 6,000 miles operation, whichever occurs first. Under unusual operating conditions, such as extreme temperatures, dust, sand, or extremely wet terrain, it may be necessary to perform certain maintenance services more frequently.

2-11. 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 in the performance of their duties.

b. Operator / Crew Participation. The operator or crew usually accompanies the materiel and assists the organizational mechanics in the performance of periodic services.

CAUTION

Do not steam clean at organizational level.

c. Unwashed Materiel. The operator 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 defects such as loose parts and oil leaks may not be evident immediately after washing.

d. Plates. Steel nameplates, caution plates, and instruction plates 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 9-213.

e. Services. Organizational maintenance services are defined by, and restricted to the following general procedures unless approval has been given by the supporting direct support organization.

(1) *Adjust.* Make all necessary adjustments in accordance with instructions contained in the pertinent section of this technical manual or in technical bulletins.

(2) *Clean.* Clean the unit as outlined in TM 9-2320-212-10 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 order 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. Do not overtighten, since this may strip the threads or cause distortion. Tightening will always be understood to include the correct installation of lockwashers, locknuts, locking wire, or cotter pins to secure the tightened nut. Torque specifications for attaching parts are included with the paragraph containing the maintenance procedure.

(6) *Modification Work Order Application.* At least every six 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 310-7. Refer to DA Form 2408-5 (Equipment Modification Record). If a field modification has not been applied, promptly notify the supporting maintenance 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 be handled in sections. Plan to complete all operations within the week, if possible. All available time at halts and during bivouac must be utilized to insure the completion of maintenance operations.

NOTE

Refer to TM 38-750 for complete information pertaining to preventive maintenance services.

2-12. Specific Procedures

Specific procedures for performing each item in the six months preventive maintenance schedule are outlined in table 2-2. The condition of the vehicle after inspection and checking during preventive maintenance services is authorization to take corrective action to remove the trouble found, by performing the service or repair at the organizational level. If repairs by a higher category of maintenance are required, a DA Form 2407, Maintenance Request, will be prepared and forwarded with the equipment to the supporting maintenance activity.

Table 2-2. Preventive Maintenance Checks and Services

Organizational maintenance category — Monthly schedule (or quarterly)

Interval and sequence number			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
1			TIRES	Gage tires for correct pressure. Remove penetrating objects such as nails or glass. Check for any apparent loss of air, unusual wear, or missing valve caps. If required, rotate and match tires according to thread design and degree of wear.	1-8*j* and 2-142
2			LEAKS	Check under vehicle for any indication of oil, water, fuel, or hydraulic fluid leaks.	2-70, 2-85, 2-98, and 2-133.
3			STEERING	Check steering gear mounting bolts. Inspect steering controls for loose or worn drag links, damaged seals, and lubricant fittings.	2-149 and 2-151
4			SUSPENSION	Inspect springs and spring shackles for damage. Tighten spring U bolts and leaf clips. Check shock absorbers and brackets for damage. Check suspension arms for damage.	2-164, 2-165, and 2-166
5			EXHAUST	Check whether muffler and exhaust pipes are secure and not damaged.	2-90
6			RUNNING GEAR	Tighten axle shaft drive flange bolts to the required torque. Inspect propeller shafts and U joints for loose bearings, damaged seals, damaged lubricant fittings, and bent shafts. Inspect for looseness of bolts and tighten as required.	2-111, 2-119, 2-121, and 2-123.
7			EXTERIOR	Make general inspection of body including glass, panels, top, fenders, bumpers, bows, tarpaulins, curtains, brush guards, hinges, brackets, and fasteners. Examine the condition of the paint and check markings and name, caution, and identification plates for legibility.	2-168 through 2-180 and TM 9-2320-212-10.
8			ENGINE COMPONENTS.	Check belts, connections, and linkage for apparent damage. Check generator and starter for tightness and general condition.	2-96, 2-98, 3-12, 3-13, and 3-14.
9			BATTERIES	Check specific gravity of each cell and record specific gravity. Check electrolyte level. Inspect cables and check for tightness and condition. After test, clean tops of batteries, coat terminals lightly with grease, and if necessary, repaint carrier.	2-63 and 2-65
10			COOLING SYSTEM	Inspect radiator core, hoses, cap, and gaskets. Check core for clogging or bent fins. Check coolant level and fill as warranted. In cold weather, test antifreeze. Add as required. If necessary, drain radiator block. Flush and refill cooling system and add rust inhibitor unless antifreeze containing rust inhibitor is used.	2-92, 2-93, and 2-94
	11		OIL LEVEL AND FILTER.	Check oil level. Add oil as required. If oil change is necessary, change oil and replace filter.	LO 9-2320-212-12
12			FUEL AND AIR FILTERS	Service filters per lubrication order	LO 9-2320-212-12
13			CAB INTERIOR	Inspect inside of vehicle. Check interior of cab for clean condition. Inspect seat frames and upholstery. Check operations of windows and doors. Check condition of mirrors.	2-169, 2-170, and 2-176
14			LIGHT AND REFLECTORS.	Test operation of lights. Clean all vehicle lights prior to operating. Clean and check all reflectors.	2-37, 2-38, 2-39, 2-40, 2-41, and 2-176

Table 2-2. Preventive Maintenance Checks and Services—Continued

Organizational maintenance category — Monthly schedule (or quarterly)

Interval and sequence number			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
15			HANDBRAKE	Release handbrake and check to see that brakeshoes are free and are completely released from drum.	2-130
	16		STARTER AND SWITCH.	Check starter for any unusual noise. Check to insure starter motor engages smoothly and turns engine with normal cranking speed.	2-27 and 2-28
	17		INSTRUMENTS	Check all instrument panel gages for normal readings during test drive.	2-53
18			HORN	Sound horn if tactical situation permits, to determine if signal is normal.	2-55
	19		CLUTCH	Check clutch free travel. Determine if action of pedal return spring is satisfactory. With transmission in neutral, depress clutch pedal and listen for unusual noise which may indicate a defective release bearing. 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.	2-137
	20		ENGINE PERFORMANCE.	After warming engine, notice if idling speed is correct. Listen for any unusual noises at idle and top speeds. Speed up vehicle on level stretch to see if it will reach, but not exceed specified governed speeds.	2-20
	21		STEERING	Check steering for looseness while vehicle is moving straight ahead.	2-146
	22		BRAKES	Check braking effect, feel, side pull, noise, chatter, and hand control.	2-125, 2-129, and 2-130
	23		TRANSMISSION AND TRANSFER.	Note operation in all gears and ease of shifting. Listen for unusual noises. Note any stiffness or tendency to slip out of gear.	2-105, 2-106, and 2-107
	24		UNUSUAL NOISES	During test drive, listen for loud or unusual noises	TM 9-2320-212-10
		25	TEMPERATURE	Cautiously feel temperature of brakedrums, hubs, axles, transmission, transfer, and differential. Overheated parts mentioned above may indicate improper adjustment or excessive friction due to lack of or excess lubricant.	2-105, 2-107, 2-118, 2-119, 2-121, 2-123, 2-129, and 2-143.
		26	TRANSFER	Inspect transfer for signs of malfunction and lubrication leaks. Shift transfer into both ranges, observing any unusual stiffness of shifting lever, unusual noise, or excessive vibration of shifting lever indicative of loose mountings.	2-106 and 2-107
		27	LUBRICATION	Lubricate vehicle in accordance with lubrication order	LO 9-2320-212-12
28			WINCHES, POWER	Inspect transmission power take-off, front winch drum line, drive shaft, and shearpin. Check carefully for broken shearpin. Test operation of front winch.	2-157
	29		FINAL ROAD CHECK	Perform final road test to insure that operational deficiencies have been corrected. Pay particular attention to those items which have just been repaired or adjusted. Correct any remaining deficiencies that show up on this test.	TM 9-2320-212-10
30			PUBLICATION AND FORMS.	Make certain that lubrication order and all required manuals and forms are with vehicle.	1-2

Table 2-2. Preventive Maintenance Checks and Services—Continued

Organizational maintenance category — Monthly schedule (or quarterly)

Interval and sequence number			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
				ITEMS SPECIAL TO WINTERIZATION KITS AND PERSONNEL HEATER	
31			COLD-STARTING AID	Check all attaching components for looseness, dents, and other damage. Repair or replace damaged parts as necessary. Remove any accumulated dirt and insure mountings are secure.	3-24 and 3-28
32			FUEL PUMP AND FUEL LINES.	Remove lower cover, clean, and inspect fuel strainer screen. Replace screen if distorted or collapsed. Inspect all fuel lines for leaks. Make repairs as necessary.	2-83, 2-84, and 2-85
33			FUEL FILTERS	Remove and clean fuel sediment bowls and filter elements. Inspect elements and gaskets and replace if damaged.	2-84
34			HARD TOP CLOSURE	See item 31	3-31 and 3-33 through 3-36
35			HOT WATER HEATER	See item 31	3-38, and 3-41 through 3-45
36			PERSONNEL SHELTER HEATER.	See item 31	3-16, 3-19, and 3-20
37			POWER PLANT HEATER.	See item 31	3-23, 3-27, 3-29, and 3-30.
38			PERSONNEL HEATER ELECTRICAL WIRING.	Inspect complete wiring harness for frayed, cracked, and worn insulation, broken strands, and loose and dirty connections.	3-16
39			EXHAUST TUBES	Examine personnel heater exhaust tubes for breaks, restrictions, leaks, and loose connections.	3-18
40			ENGINE COOLANT CONNECTIONS.	Check for evidence of coolant leaks and damaged hoses	2-94
41			PERSONNEL HEATER AND DEFROSTER CONTROLS.	Check handles for operation and cables for proper attachment	3-18
42			PERSONNEL HEATER CONTROL BOX.	Test operation of indicator light	3-18
43			PERSONNEL HEATER EMERGENCY SWITCH.	Make sure switch is in the ON position	3-18
44			VENTILATOR BLOWER AND SWITCHES.	See item 31.	3-21 and 3-22

Section V. TROUBLESHOOTING THE VEHICLE

2-13. General

This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the vehicle (refer to table 2-3). Each malfunction for an individual component or system is followed by a list of tests or inspections which will help the checker to determine probable causes and corrective actions to take. The checker should perform the tests/inspections and corrective actions in the order listed.

2-14. Procedures

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction either is not listed or is not given corrective action, isolate the system in which trouble occurs and then locate the defective component. Do not neglect the use of any test instruments such as voltmeter, ammeter, test lamp, hydrometer, and pressure and vacuum gages that are available. Standard automotive theories and principles of operation apply in troubleshooting the vehicle. Question the vehicle operator to obtain the maximum number of observed symptoms. The greater the number of symptoms of troubles that can be evaluated, the easier will be the isolation of the defect.

Table 2-3. Troubleshooting the Vehicle

Item No.	Malfunction	Probable Cause	Corrective Action
		BRAKE SYSTEM—HANDBRAKES	
1	Does not hold parked vehicle	*a.* Loose brake linkage	Adjust linkage (para 2-125).
		b. Brake lining worn	Replace brakeshoes (para 2-131).
		c. Grease on lining	Replace brakeshoes and correct grease leak (para 2-131).
2	Brake drags and overheats	*a.* Vehicle operated brake partially applied.	Check hand brake lever for full release position.
		b. Handbrake improperly adjusted	Adjust brake lever (para 2-130).
		c. Brakedrum out-of-round	Replace drum (para 2-131)
		d. Weak brake shoe retractor spring	Replace spring (para 2-131)
		SERVICE BRAKES	
3	Insufficient brakes	Brake linings worn	Adjust brakes (para 2-129) and/or replace brake shoe assembly (para 2-131).
4	Dragging brakes	*a.* Restricted brake lines	Remove and clean brake lines (para 2-133).
		b. Brakeshoe sticking to anchor pin	Lubricate anchor pin (LO 9-2320-212-12).
		c. Shoes adjusted too close to drum	Adjust brake shoes (para 2-131).
		d. Sticking wheel cylinder piston or master cylinder.	Replace wheel cylinder as required (para 2-131).
		e. Insufficient pedal	Adjust brake travel 3/4 to 1 inch, (para 2-125). Inspect brake lines, tighten all connections or replace lines as necessary (para 2-133).
5	Brakes do not apply	Restricted or broken tubing or brake line.	Inspect brake travel 3/4 to 1 inch (para 2-125). Inspect all connections or replace lines as necessary (para 2-133).
6	Brakes grab	*a.* Grease or grit on brake lining	Replace brakeshoe assembly (para 2-131).
		b. Brake linkage binding	Lubricate anchor pins (LO 9-2320-212-12).
		c. Brake drum out-of-round scored or cracked.	Replace drum (para 2-131)
		d. Loose lining on brake shoe	Replace brakeshoe assembly (para 2-131).

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
		SERVICE BRAKES—Continued	
7	One brake grabs	*a.* Improper brake adjustment	Adjust brakes (para 2-125)
		b. Weak or broken brake shoe retractor spring.	Replace spring (para 2-131)
		c. Brakeshoe binding on anchor pin	Lubricate anchor pin (LO 9-2320-212-12).
		d. Wheel bearings (front) defective or out of adjustment.	Adjust or replace (para 2-140).
		e. Rear wheel bearings defective or out of adjustment.	Inspect bearings, adjust and lubricate or replace as necessary (para 2-141).
		f. Restricted brake line	Locate and replace line (para 2-133).
8	Noisy brakes	*a.* Defective brakeshoe assembly	Replace brakeshoe assembly (para 2-131).
		b. Scored or damaged brakedrum	Replace drum (para 2-131)
		c. Bent brakeshoes, pins, plates	Replace parts as required (para 2-131).
9	Uneven braking	*a.* Improper brake adjustment	Adjust brakes (para 2-125)
		b. Insufficient lubrication	Lubricate according to LO 9-2320-212-12.
		c. Worn brake lining	Replace brakeshoe assembly (para 2-131).
		d. Grease on lining	Replace brakeshoe assembly (para 2-131).
		e. Brakeshoe retractor spring weak or broken.	Replace spring (para 2-131)
		f. Brakedrum out-of-round	Replace drum (para 2-131)
		CLUTCH	
10	Clutch slips or drags	Insufficient free pedal travel (less than one inch).	Adjust pedal linkage (para 2-137).
11	Clutch chatters	Loose, broken, or defective clutch mounting bolts, insulators, or brackets.	Inspect transmission attaching bolt, propeller shafts, universal joints, and bearings for improper or loose connections. Tighten as required (para 2-105).
		COOLING SYSTEM	
12	Engine overheats, temperature rises over 200° F.	*a.* Lack of coolant	Replenish water in radiator. Add antifreeze when conditions warrant.
		b. Coolant leaks	Inspect cooling system for leaks. Tighten or replace hose as necessary (para 2-91 and 2-94).
		c. Faulty water pump	Replace pump (para 2-98)
		d. Leaking radiator core	Replace radiator (para 2-97)
		e. Loose fan belt	Adjust belts (para 2-96)
		f. Defective thermostat	Remove and inspect thermostat (para 2-95). Replace.
		g. Clogged radiator	Clean and flush radiator (para 2-93).
		h. Defective or improper radiator pressure caps. Obstruction preventing free air flow through radiator.	Check caps and replace (para 2-92). Remove bugs, leaves and accumulated dirt from radiator, using high pressure air or water.
		i. Inlet or outlet hose collapsed	Check condition of hoses and replace (para 2-94).
		j. Sludge in cylinder block	Drain, flush, and refill cylinder block (para 2-93).
		k. Plugged water jacket	Drain system (para 2-93). Disconnect radiator hose, and reverse flush the radiator. Refer to TM 750-254.
		l. Scale in cylinder block	Clean and neutralize system. Refer to TM 750-254.

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
12	Engine overheats, temperature rises over 200° F.—Continued	COOLING SYSTEM—Continued	
		m. Improper draining at service	Redrain and refill (para 2-92).
		n. Engine compartment side panels open.	Close engine compartment side panels.
13	Overcooling. (Inability to attain engine operating temperature after suitable warmup.)	*a.* Defective thermostat	Replace (para 2-95)
		b. Inaccurate temperature gage	Replace gage (para 2-99)
		ENGINE	
14	Engine will not crank	*a.* Defective batteries, wiring connections, or starting system	Check electrolyte specific gravity. Replace defective batteries (para 2-64).
		b. Starter defective	Replace starter (para 2-27)
15	Engine cranks but fails to start	*a.* Fuel tank empty	Fill tank
		b. Engine flooded	Push choke in, open throttle and crank engine to remove excessive fuel.
		c. Insufficient cranking speed	Recharge batteries
		d. No spark	Refer to ignition circuit tests (para 2-18).
		e. Carburetor choke inoperative	Inspect choke valve for proper operation and adjust choke controls (para 2-79).
		f. Clogged fuel tank ventline, fuel lines, or fuel filters.	Clean lines and/or filters (para 2-85).
		g. Fuel pump inoperative	Test pump; replace if defective (para 2-83).
16	Engine does not attain maximum revolutions per minute.	*a.* Faulty ignition system	Refer to para 2-18
		b. Insufficient or improper grade of oil.	Drain cylinder block and refill to correct level with proper grade of oil (LO 9-2320-212-12).
		c. Improper valve adjustment	Notify direct support maintenance personnel.
		d. Sticking valves	Notify direct support maintenance personnel.
		e. Faulty compression	Test compression (para 2-66)
		f. Increased back pressure due to clogged or collapsed muffler or tailpipe.	Clean or replace muffler or tailpipe (para 2-90).
		g. Clogged fuel filters	Clean filters (para 2-84)
		h. Faulty fuel pump	Refer to item 15*g*
		i. Accelerator linkage improperly adjusted	Check linkage and adjust as necessary (para 2-79).
		j. Clogged air cleaners	Remove and service air cleaners (para 2-78).
		k. Distributor out of time	Adjust timing (para 2-79)
17	Engine misfires at idle speed	*a.* Carburetor idling setting incorrect	Adjust idling setting and throttle linkage (para 2-79).
		b. Choke improperly positioned	Adjust choke control and linkage (para 2-88).
		c. Spark plug gaps improperly set	Adjust spark plug gap (para 2-17).
		d. Faulty distributor operation	Inspect breaker points. If burned or pitted, replace (para 2-22). Adjust point opening (para 2-23).
		e. Vacuum leak	Use engine oil to check for leaks at throttle shaft, carburetor flange and inlet manifolds.
		f. Improper valve clearance	Notify direct support maintenance personnel.
		g. Leaky cylinder head gasket	Notify direct support maintenance personnel, or replace (para 2-69).
		h. Defective or sticky valves	Check engine vacuum (para 2-66). Notify direct support maintenance personnel if gage reading is erratic.

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
		ENGINE—Continued	
18	Engine misfires at high speeds	*a.* Faulty ignition system	Refer to table 2-4, item 3, troubleshooting—electrical system.
		b. Restricted fuel lines or fuel filter	Clean lines and/or filters (para 2-85).
		c. Defective fuel pump	Refer to item 15*g*
19	Engine idles too fast	*a.* Improper carburetor idling adjustment.	Adjust carburetor idling mixture (para 2-79) and adjust throttle adjusting screws (para 2-79).
		b. Improper accelerator linkage adjustment.	Adjust linkage (para 2-88)
		c. Intake manifold gaskets leaking	Inspect gaskets for leakage (para 2-68).
20	Engine overheats	*a.* Low coolant in system	Check coolant level in radiator and fill to slightly below bottom of filler neck; add antifreeze as necessary (para 2-92).
		b. Lean air-fuel mixture	Adjust carburetor (para 2-79). Inspect engine for leaks at manifold and carburetor gaskets.
		c. Late ignition timing	Check ignition timing and adjust (para 2-20).
21	Engine falters	Clogged or worn carburetor parts	Replace carburetor (para 2-82) Notify direct support maintenance personnel if engine still falters.
22	Engine backfires	*a.* Crossed sparkplug cables	Check cables for proper firing order (para 2-17), sequence (1-5-3-6-2-4).
		b. Cracked coil or distributor cap	Inspect distributor cap and coil for cracks or carbonized spots, indicating current leakage. Inspect all carbon tips in cap. Replace cap or coil if there are any cracks or carbonization (para 2-21).
		c. Out of time	Check ignition system timing (para 2-20).
23	Excessive oil consumption	*a.* Oil leaks	Inspect engine, engine components, and ground under engine for oil leaks. Tighten leaking connections and repair or replace broken lines.
		b. Engine overheating	Refer to item 20
		c. Poor compression	Test compression on all cylinders (para 2-66). If variations between cylinders exceeds 10 psi notify supporting maintenance personnel.
24	Engine oil pressure low as indicated by oil pressure gage.	*a.* Inadequate engine oil supply; low level.	Check engine oil for proper level and proper viscosity; replenish oil (LO 9-2320-212-12).
		b. Defective oil pressure gage	Replace gage (para 2-53)
		c. Defective oil pressure sending unit.	Replace sending unit (para 2-55).
		d. Improper oil viscosity	Drain and refill with oil of proper viscosity (LO 9-2320-212-12).
25	Excessive noise on increased acceleration.	Insufficient lubrication	Check for low oil pressure and high oil consumption. Add oil if required (LO 9-2320-212-12). Notify direct support maintenance personnel if these conditions persist.
26	Excessive noise with engine idling	Insufficient lubrication	Refer to item 25
		EXHAUST SYSTEM	
27	Defective exhaust system	*a.* Defective or restricted muffler or exhaust pipe.	Clean or replace muffler or exhaust pipe (para 2-90).

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
27	Defective exhaust system—Continued	EXHAUST SYSTEM—Continued	
		b. Loose or defective manifold and exhaust pipe flange clamps.	Tighten or replace flange clamps as required (para 2-68).
		FRAME	
28	Pintle loose in housing	*a.* Loose slotted nut	Remove cotter pin and tighten nut (para 2-160).
		b. Worn washer	Readjust pintle hook assembly as in *a* above or replace washer (para 2-160).
		c. Dry, needs lubrication	Free pintle and lubricate per LO 9-2320-212-12.
		FRONT AND REAR AXLES	
29	Difficult to turn steering	*a.* Hydraulic power unit inoperative	Check oil level in steering system (LO 9-2320-212-20). Notify supporting maintenance personnel.
		b. Tires under-inflated	Check tire pressure and inflate as specified on servicing data plate affixed to instrument panel.
		c. Lack of lubricant	Lubricate steering knuckle, tie rods, and drag link ends according to LO 9-2320-212-12.
		d. Bind in steering knuckles	Jack up front axle to clear wheels off ground. Disconnect drag link at steering level left end assembly (para 2-149). Turn wheels from side to side. If binding, disconnect one end of tie rod from steering lever. If binding persists and lubrication does not free knuckle, notify supporting maintenance personnel for replacement of front end assembly. If an emergency, replace (paras 2-116 and 2-117).
30	Hard steering; wandering	*a.* Axle shifted	Measure from front spring rear eye to a fixed point on axle. Compare with like measurement on opposite side. If they do not agree, inspect for broken front spring main leaf and center bolt. Check for loose or broken U bolts or springs. Replace defective parts (para 2-119 or 2-123).
		b. Tires unequally inflated	Check tire pressure and inflate as specified on servicing data plate affixed to instrument panel.
		c. Front wheel bearings out of adjustment.	Adjust wheel bearings (para 2-141).
		d. Insufficient toe-in	Adjust toe-in (para 2-114)
31	Continuous noise	*a.* Wheel bearings in need of lubrication.	Lubricate bearings according to lubrication order (LO 9-2320-212-12).
		b. Front or rear wheel out of adjustment.	Check bearings for wear and adjustment (para 2-141).
		c. Tires improperly inflated or damaged.	Inflate tires properly (para 1-8*g*). Replace damaged tires (para 2-144).
32	Excessive backlash	Axle flange nuts loose	Tighten nuts to recommended torque (para 2-119).

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
		FRONT AND REAR AXLES—Continued	
33	Excessive or uneven tire wear	*a.* Improper wheel alinement	Adjust toe-in (para 2-114). If this does not correct deficiency, notify direct support maintenance personnel.
		b. Improper brake adjustment	Adjust brake (para 2-125 or 2-129).
		c. Improper tire inflation	Inflate tires evenly (para 1-8*g*) and refer to item 30*b*.
34	Binding in front axle shafts	*a.* Excessively worn universal joints	Replace worn parts (para 2-112).
		b. Spacer washer not installed in axle shaft.	Check end-plug of shaft by moving shaft in and out of housing. Install spacer if movement is over 1/16 inch (para 2-119).
		HEATING SYSTEM	
35	Heater will not ignite	*a.* Burned out fuel pump	Replace fuel pump (para 2-83)
		b. Shutoff valve closed to gas tank	Open shutoff valve
		c. Restriction in fuel line	Check and clear all fuel lines (para 2-85).
36	Heater stops operating	*a.* Burned out fuel pump	Replace fuel pump (para 2-83).
		b. Restriction in fuel lines	Check and clear all fuel lines (para 2-85).
		c. Restriction in check valve	Check and clear check valve (para 2-85).
		d. Clogged fuel filter screen	Clean or replace filter screen (para 2-84).
		POWER TAKE-OFF	
37	Excessive noise	*a.* Noise from transmission may be transmitted to power takeoff.	Check for loose power takeoff mounting screws and tighten. Continued noise indicates worn gears or bearings in transmission or PTO. Notify direct support maintenance personnel.
		b. Noise from transfer power takeoff may reflect through transfer.	Check for loose mounting screws and tighten. Check oil pump to see that it is operating properly. Continued noise indicates worn gears or bearings. Notify direct support maintenance personnel.
		PROPELLER SHAFTS	
38	Excessive noise or vibration	*a.* Lack of lubrication	Lubricate according to lubrication order (LO 9-2320-212-12).
		b. Worn universal joint parts	Replace worn parts (para 2-111).
		c. Worn slip joints	Remove propeller shaft (para 2-111). Check condition of slip joint splines and replace slip joint (para 2-111).
		d. Loose drive flange	Tighten flange bolts attaching drive flange to propeller shaft and transmission (para 2-111).
		e. Shaft sprung from contact with obstruction.	Replace propeller shaft (para 2-111).
		STEERING SYSTEM	
39	Steering wheel difficult to turn	Bind in steering knuckle	Refer to malfunction 29*d*.
40	Inability to maintain straight course (wandering or weaving).	*a.* Steering gear drag link ends loose, or improperly adjusted.	Inspect and adjust drag link end (para 2-149).
		b. Steering gear tight or worn	Inspect and adjust or aline (para 2-146).

Table 2-3. Troubleshooting the Vehicle—Continued

Item No	Malfunction	Probable Cause	Corrective Action
40	Inability to maintain straight course (wandering or weaving).—Continued	STEERING SYSTEM—Continued	
		c. Shock absorbers inoperative	Disconnect shock absorber links and test action. If little or no resistance is felt, replace shock absorbers (para 2-166).
41	Insufficient flexibility	*a.* Insufficient spring shackle pin lubrication	Lubricate spring shackle LO 9-2320-212-12.
		b. Frozen spring shackles	Free and lubricate shackles (para 2-164, 2-165).
		c. Shock absorbers inoperative	Disconnect shock absorber links and test action. If little or no resistance is felt, replace shock absorbers (para 2-166).
42	Excessive flexibility	*a.* Shock absorbers inoperative	Disconnect shock absorber links and test action. If little or no resistance is felt, replace shock absorbers (para 2-166).
		b. Insufficient fluid in shock absorbers.	Replace shock absorbers (para 2-166).
43	Excessive noise	*a.* Worn spring pins or shackle bolts	Use pry bar to test wear of pins and bolts. Replace (para 2-164, 2-165).
		b. Worn or broken shock absorber	Inspect links for wear, damage or looseness. Replace shock absorbers (para 2-166).
		c. Spring leaf failure at spring eye	Replace spring (para 2-164, 2-165).
		d. Spring leaf failure at center section of spring.	Replace spring. Tighten U bolts to recommended torque (para 2-164, 2-165).
		TRANSMISSION—TRANSFER	
1	Excessive noise	*a.* Insufficient lubrication	Check level and if required, add lubricant according to lubrication order (LO 9-2320-212-12).
		b. Propeller shaft misalined or out of balance.	Check universal joints for worn needle bearings (para 2-111). Replace. Check propeller shaft for alinement and check flanges for loose mounting bolts (para 2-111). Adjust and tighten.
		c. Gears or bearings broken, worn, or loose on shafts.	Notify direct support maintenance personnel. Replace transmission (para 2-105).
	Loss of lubricant	*a.* Loose drain plugs	Tighten drain plugs (para 2-105).
		b. Damaged gaskets, seals, or housing.	Notify direct support maintenance personnel. Replace transmission (para 2-105).
	Excessive lubricant	Overfilled	Check lubricant level and drain to level of filler plug.
	Slipping out of gear	*a.* Excessively worn gears	Notify direct support maintenance personnel. Replace transmission (para 2-105).
		b. Gears do not fully engage	Notify direct support maintenance personnel.
		c. Bent shifting fork	Notify direct support maintenance personnel. Replace transmission (para 2-105).
	Hard shifting; gears clash on engagement.	*a.* Poor shifting technique	Use proper shifting procedure.
		b. Dragging clutch	Adjust clutch (para 2-137)
		WHEELS AND TIRES	
	Excessive or uneven tire wear	*a.* Unequal tire pressure	Inflate tires properly (para 1-8*g*).
		b. Tires of unequal rolling radii used on dual wheel.	Match tires (para 2-142)

Table 2-3. Troubleshooting the Vehicle—Continued

Item No.	Malfunction	Probable Cause	Corrective Action
49	Excessive or uneven tire wear—Continued	WHEELS AND TIRES—Continued	
		c. Uneven vehicle load distribution	Redistribute load properly
		d. Front wheels misalined	Check wheel alinement (para 2-114).
		e. Front wheel bearings damaged or worn.	Adjust or replace bearings (para 2-141, 2-143).
		f. Wheel and tire assembly out of balance.	Rotate wheels and tires (para 2-142). Refer to TM 9-2320-212-10.
50	Wheel pounding	*a.* Front or rear hub bearings damaged.	Replace bearings (para 2-143)
		b. Wheel and tire out of balance	Rotate wheels and tires (para 2-142). Refer to TM 9-2320-212-10.
		c. Wheel bent	Replace wheel (para 2-142)
51	Shimmy	*a.* Tires on front wheels improperly inflated.	Inflate tires properly. See servicing data plate on instrument panel.
		b. Bent wheel or rim	Replace wheel (para 2-142)
		c. Worn, loose, or damaged front wheel bearings.	Replace bearings (para 2-141).
		d. Worn tie rod ends	Replace (para 2-115)
		e. Tire and wheel assembly out of balance.	Rotate wheels and tires. Refer to TM 9-2320-212-10.
		WINCH	
52	Winch does not operate	*a.* Power takeoff not engaged	Engage power takeoff. If power takeoff does not engage, notify direct support maintenance personnel.
		b. Shearpin failure	Replace shearpin (para 2-154).
		c. Drum clutch not engaged	Engage drum clutch. If clutch does not engage, notify direct support maintenance personnel.
53	Winch does not hold	Brake slipping	Adjust brake (para 2-153)
54	Excessive heat at winch brake case	Brake incorrectly adjusted	Adjust brake (para 2-153)
55	Noisy operation	*a.* Lack of lubrication	Lubricate winch (LO 9-2320-212-12).
		b. Worn or damaged internal parts	Replace winch (para 2-157)

Section VI. TROUBLESHOOTING THE ELECTRICAL SYSTEM

2-13. Description

a. General. This section provides information to locate and correct problems in the electrical system. A troubleshooting table (table 2-4) and diagrams showing locations of the various electrical components (fig. 2-3 through 2-6) are included.

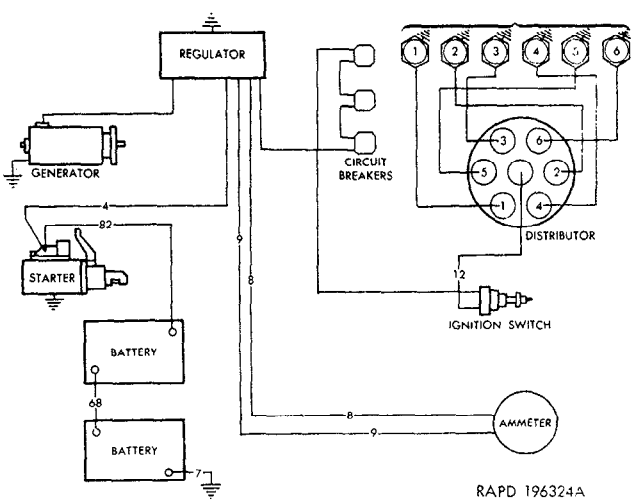


Figure 2-3. Ignition system wiring diagram.

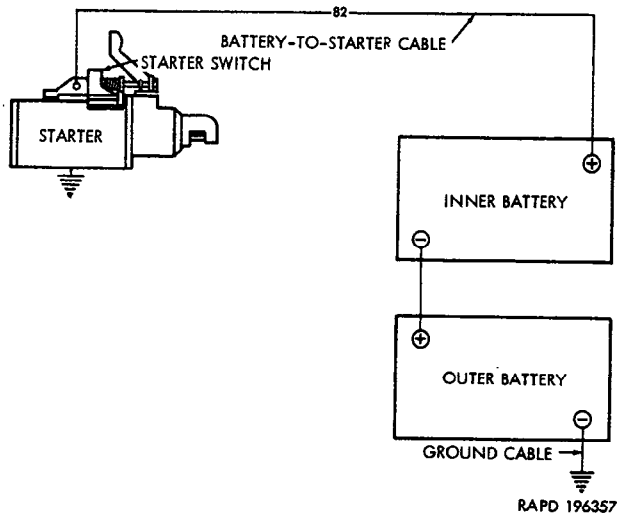


Figure 2-4. Starting system wiring diagram.

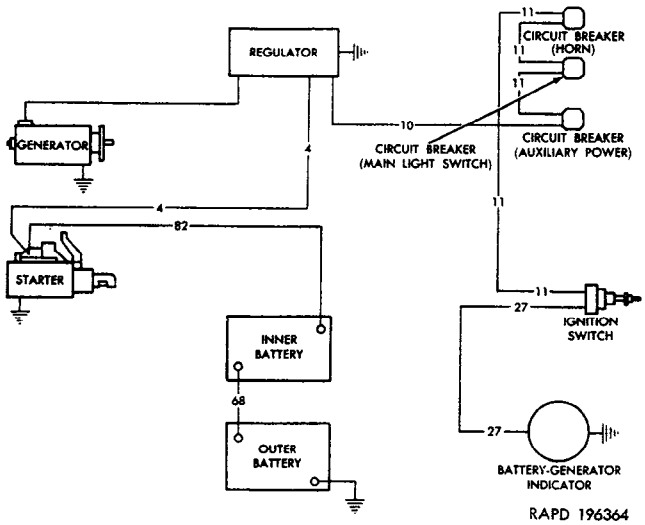


Figure 2-5. Generator system wiring diagram.

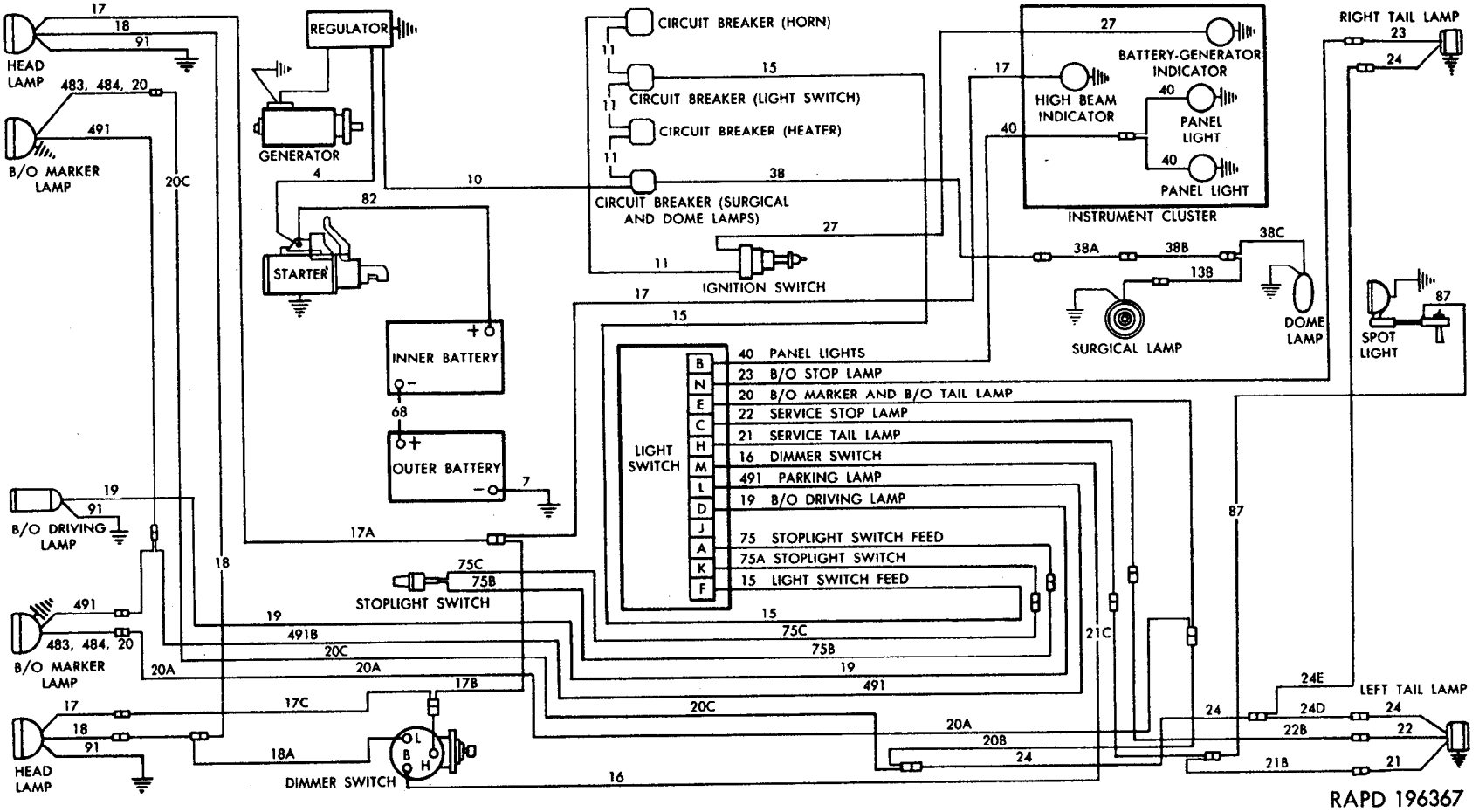


Figure 2-6. Lighting system wiring diagram.

b. Electrical System Circuits. Electrical circuits for this vehicle will be covered under six major categories as listed below:

Ignition
Starter
Generator system
Light
Turn signal
Batteries

c. Test Equipment. The test procedures covered in this section are based on the use of low voltage circuit tester (fig. 2-7), carbon pile resistor and field rheostat (fig. 2-8) and adapter Set (fig. 2-9). Test procedures used may also be made on the vehicle using any suitable voltmeter, ammeter, or ohmmeter having the required electrical range.

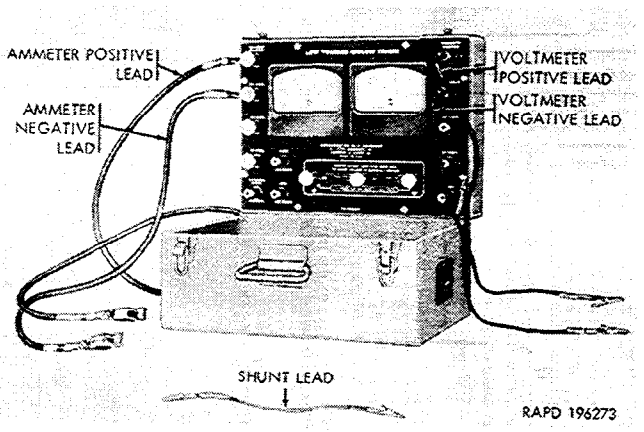


Figure 2-7. Low voltage circuit tester.

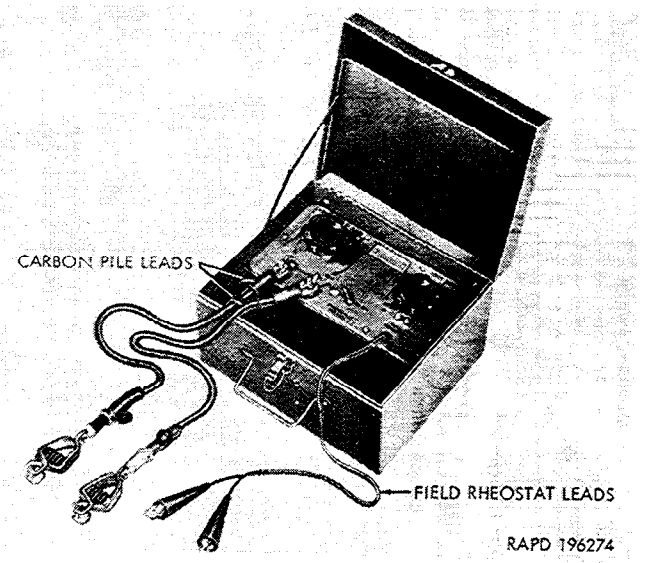
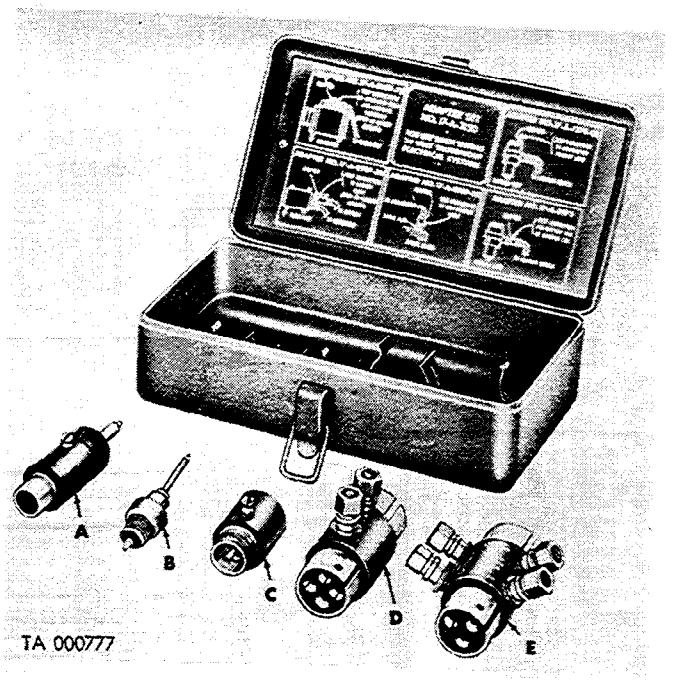


Figure 2-8. Carbon pile resistor and field rheostat.



A Adapter
B Adapter
C Adapter
D Adapter
E Adapter

Figure 2-9. Adapter set.

(1) All leads of the low voltage circuit tester affected by polarity are identified either by a red or black protector over the connecting clip or by the symbols + or — at the end of the test lead. Red indicates a positive (+) connector and black indicates a negative (—) connector.

(2) To insure correct meter readings, the positive (+) test lead clip for either the test voltmeter or the test ammeter must always be connected at the emanating source of current flow. For example, if the current is flowing from the generator to the batteries, the positive (+) test lead must be connected to the generator side of the circuit.

d. General Instructions.

(1) Prior to performing any test with meters, observe the following instructions:

(a) Be sure of test being made. To insure correct testing, sequence listed in individual tests must be followed.

(b) Always select a meter range highter than the expected reading.

(c) Ammeters are always inserted in the current carrying line in series. Breaking ammeter connections opens the line.

(d) Voltmeters are always inserted across a load, in parallel. Breaking voltmeter connections disconnects the voltmeter.

(e) Always connect the negative leads marked (—) first.

(f) Always barely touch positive lead to its post to see if meter movement is in right direction before firmly attaching the lead to its post.

(2) The proper hook-up of the LVCT is very important in order to afford protection to the meters as well as to obtain accurate readings.

WARNING

Remove rings, watches; etc., prior to performing any electrical troubleshooting to prevent accidental short circuits and / or electric shock.

Table 2-4. Troubleshooting—Electrical System, Part 1

Item No.	Malfunction	Probable Cause	Corrective Action
		IGNITION SYSTEM	
1	No spark. (Battery-generator indicator pointer shows low or no reading.)	*a.* Defective ignition switch	Replace switch (para 2-25)
		b. Defective ignition coil or distributor.	Check continuity of primary circuit from ignition switch to distributor. If current does not show from switch to distributor, replace distributor (para 2-19).
		c. Distributor breaker points not opening or faulty.	Inspect breaker points. If burned or pitted, replace (para 2-22). Adjust point opening (para 2-23).
		d. Defective distributor capacitor	Replace capacitor (para 2-22).
2	No spark. (Battery-generator indicator reads normal.)	*a.* Defective distributor rotor	Replace rotor (para 2-22)
		b. Loose electrical connections	Clean and tighten all electrical connections from starter to distributor.
		c. Defective spark plug cables	Test each cable by disconnecting from spark plug and holding it away from cylinder head while cranking engine. Replace any cable not producing good spark (para 2-17).
3	Engine misfires at high speeds	*a.* Spark plugs improperly set	Adjust spark plug gap (para 2-17).
		b. Distributor breaker point opening improperly set.	Check breaker point opening and adjust (para 2-23).
		c. Defective ignition coil	Inspect cables and connections. Test coil and replace coil or install new coil (para 2-24).
		d. Defective ignition wiring	Check spark plug and coil cables for continuity. Replace when non-continuous (para 2-17).
4	Engine does not attain maximum rpm.	Preignition due to defective or improper spark plugs.	With engine temperature at normal operating range (160° F. to 180° F.), accelerate vehicle in high gear. If preignition or spark knock is present, a pinging sound will be heard. After checking ignition system thoroughly, replace spark plugs (para 2-17); if this does not correct condition, notify maintenance personnel.
		STARTING SYSTEM	
5	Starter inoperative	*a.* Batteries discharged	Check electrolyte level and specific gravity (para 2-63). Replace defective batteries (para 2-64).
		b. Loose, corroded, or broken cables	Clean and tighten all electrical connections at battery, ground, and starter. Replace cable if broken, or if terminal clamp is excessively corroded (para 2-64 and 2-28).

Table 2-4. Troubleshooting—Electrical System, Part 1— Continued

Item No	Malfunction	Probable Cause	Corrective Action
5	Starter inoperative—Continued	STARTING SYSTEM—Continued	
		c. Defective starter switch	Check linkage from starter pedal to upper clevis of starter. Energize starter switch for testing purpose. Test defective switch and replace (para 2-28).
		d. Defective starter	Replace defective starter (para 2-27).
6	Noisy starter	a. Loose starter mounting	Tighten starter mounting screws (para 2-27).
		b. Defective drive assembly	Replace starter (para 2-27)
		c. Worn commutator or bushings	Replace starter (para 2-27)
		d. Defective bearing due to lack of lubrication.	Replace starter (para 2-27)
7	Starter sluggish; will not attain full crank speed.	a. Discharged or defective batteries	Check electrolyte level and specific gravity (para 2-63). Recharge or replace batteries (para 2-64).
		b. Dirty or loose terminals	Clean and tighten terminal connections (para 2-27 and 2-28).
		c. Sticking brushes, commutator or armature rubbing field coils.	Replace starter (para 2-27)
		GENERATOR SYSTEM	
8	No output	a. Broken or loose belts	Adjust or replace belts (para 2-96).
		b. Generator seized	Replace generator (para 2-33 and 3-10).
		c. Burned rectifier	Replace rectifier (para 3-11).
		d. Broken wire	Replace or repair as required.
		e. Disconnected wire	Tighten all wires and connections.
		f. Defective regulator	Replace regulator (para 3-10).
9	Low output; less than 27.5 volts	a. Loose belts	Adjust belts (para 2-96)
		b. One or both batteries dead	Replace both batteries (para 2-64).
		c. Loose belts	Adjust belts (para 2-96).
		d. Burned rectifier	Replace rectifier (para 3-11)
		e. Loose connection	Tighten connectors
		f. Regulator out of adjustment	Adjust voltage rheostat (para 3-3), or replace regulator (para 3-10).
		g. One phase shorted on generator	Replace generator (para 3-10)
10	High output; more than 28.5 volts	a. One or both batteries dead	Replace both batteries (para 2-64).
		b. One or both batteries low	Replace both batteries (para 2-64).
		c. Regulator out of adjustment	Adjust voltage rheostat (para 3-3), or replace regulator (para 3-8).
11	Battery-generator indicator stays in red or yellow bank (engine at 1,500 rpm).	a. Wire shorted	Check wiring
		b. Faulty indicator	Connect voltmeter with 50-volt scale across vehicle battery. Check voltage, if between 27.5 and 28 replace indicator.
		c. Broken connection	Check wiring
		d. No output of generating system	Refer to items 1 and 2 above
		e. One or both batteries dead	Replace both batteries (para 2-64).
		f. Low voltage setting	Adjust voltage rheostat (para 3-3).
12	Belt squeal	a. Glazed belts	Install new belt set (para 3-14)
		b. One or more worn or broken belts	Install new belt set (para 3-14).
		c. Generator seized	Replace generator (para 3-10)
		d. Loose belts	Adjust belts tension (para 2-96).
		e. Seized water pump	Replace pump (para 2-98)
13	Battery or batteries use too much water.	a. High voltage setting	Adjust voltage rheostat (para 3-3).
		b. Cracked battery case	Replace defective battery (para 2-64).
14	Battery or batteries do not hold charge.	a. Voltage limiter setting off	Adjust voltage rheostat (para 3-3), or replace regulator (para 3-10).
		b. One or both batteries dead	Replace both batteries (para 2-64).
		c. Charging system failure	Perform tests and adjustments (para 2-35).
		d. Slipping belts	Adjust belt tension (para 2-96).

Table 2-4. Troubleshooting—Electrical System, Part 1— Continued

Item No.	Malfunction	Probable Cause	Corrective Action
		GENERATOR SYSTEM —Continued	
15	Rectifier plates burned (spots larger than 1 inch in diameter).	*a.* Faulty rectifier	Replace rectifier (para 3-11)
		b. Insufficient cooling due to dirt on plates.	Replace rectifier (para 3-11)
		c. Airflow to rectifier blocked by foreign object.	Remove foreign object and replace rectifier (para 3-11).
		d. Voltage too high	Replace rectifier (para 3-11) and regulator.
		LIGHTING SYSTEM	
16	Headlights do not light	*a.* Broken or burned out lamp	Replace lamp (para 2-39)
		b. Defective light switch	Use a jumper wire across switch contacts. If lamp lights, replace switch (para 2-41).
		c. Broken light cable.	Refer to lighting circuit diagram. Locate break and repair cable as necessary.
		d. Circuit breaker	
17	Frequent lamp failures. High battery-generator indicator reading.	*a.* Generator-regulator out of adjustment.	Replace regulator (para 3-10).
		b. Poor battery connection	Clean and tighten battery and lamp ground connections (para 2-65).
18	Insufficient light. Low battery-generator indicator reading.	*a.* Poor lamp or battery ground connections.	Clean and tighten battery and lamp ground connections (para 2-65).
		b. Loose lamp connections	Locate and tighten loose terminal connections.
		c. Discharged batteries	Check electrolyte level and specific gravity (para 2-63). Change or replace batteries (para 2-64).
19	Floodlights do not respond to light switch.	*a.* Lamps burned out or faulty switch.	Replace lamps (para 2-39) or switch (para 2-41).
		b. Faulty circuit or wiring or defective light assembly.	Notify direct support maintenance personnel.
		c. Brush slipring assembly defective	Notify direct support maintenance personnel.
		INSTRUMENTS, GAGES AND SENDING UNITS	
20	Speedometer or tachometer noisy	Binding or kinked flexible shaft	Replace flexible shaft (para 2-53).
21	Water temperature gage inoperative	*a.* Temperature sending unit faulty	Replace sending unit (para 2-53).
		b. Gage and wiring faulty	Replace gage (para 2-53)
22	Fuel level gage inoperative	*a.* Fuel tank sending unit faulty	Replace sending unit (para 2-87).
		b. Gage and wiring faulty	Replace gage (para 2-87)
23	Oil pressure gage inoperative	*a.* Sending unit faulty	Replace gage (para 2-87)
		b. Gage and wiring faulty	Replace gage (para 2-53)
24	Horn inoperative	Electrical circuit broken in horn system.	Check for continuity to horn button. Replace horn switch (para 2-54).
		RADIO INTERFERENCE SUPPRESSION	
25	Interference while vehicle is in motion with engine not operating.	Loose cables, bonding, or connections; frayed insulation in vehicle wiring.	Inspect all wiring and replace as warranted. Clean and tighten all connections.
26	Interference only when engine is running.	Generator system	Accelerate engine and turn ignition switch off with engine at high speed. If noise continues after switch is shut off, cause is in the generator system. Replace generator (para 2-33).
27	Variable pitch whining noise which varies with engine rpm.	*a.* Loose or dirty regulator connections.	Check ground straps and mounting to determine if connections are free from dirt, paint, or other foreign material that could impair conductivity. Check for tightness (para 2-44).

Table 2-4. Troubleshooting—Electrical System, Part 1— Continued

Item No.	Malfunction	Probable Cause	Corrective Action
27	Variable pitch whining noise which varies with engine rpm.—Continued	RADIO INTERFERENCE SUPPRESSION—Continued	
		b. Defective generator-regulator capacitor.	Check generator system (para 2-35, 3-6, and 3-8).
		c. Loose or frayed fan drive belts	Tighten or replace belts (para 2-96).
		d. Defective generator bearings	Replace generator (para 2-33 and 3-10).
28	Variable clicking noise which varies with engine rpm.	*a.* Ignition system	Accelerate engine and turn ignition switch off with engine at high speed. If noise stops immediately, the cause is in the ignition system.
		b. Improper spark plug gap	Adjust gap (para 2-17)
		c. Improper breaker points	Adjust points (para 2-22)
		d. Defective spark cables	Replace cables (para 2-17)
		e. Defective spark plugs	With engine running, disconnect cables from plugs one at a time. If noise is reduced or eliminated, the cause is the spark plug. Replace plug (para 2-17).
		TURN SIGNAL SYSTEM	
29	Right and left turn signals not working (front and rear).	*a.* Vehicle light switch not in correct position.	Place vehicle light switch in either STOPLIGHT or SERVICE DRIVE position (fig. 2-60).
		b. Defective flasher	Connect jumper wire between minals D and H of the relay l . Make sure turn signal lever on steering column is in a turn position (right or left) and light switch is correctly positioned (item *a*, above). If one of the turn signal lights lights continuously, replace the flasher unit in the relay box (para 2-48). If lights do not come on, refer to *c* below.
		c. Wiring from light switch to relay box defective (circuits 460-461A and 151).	Determine if power is available for turn signal operation. Connect voltmeter or test lamp between terminal A and M at the relay box. If no voltage is indicated, connect lead between terminal J of the main light switch and ground (vehicle body). If voltage is present, check wiring between the light switch and the relay box. Repair or replace harness as necessary.
		d. Defective main light switch (circuit 151).	If no voltage is indicated in the above test, place leads between terminal F of the main light switch and ground (vehicle body). If voltage is present, replace vehicle light switch. If no voltage is present, troubleshoot current feed wiring back to the generator regulator.
30	Turn signals remain on (do not flash).	*a.* Defective or missing turn signal control indicator (pilot) lamp.	Test lamp. Replace if defective (para 2-50). Install lamp if missing (31*b* below.
		b. Defective flasher	Replace flasher (para 2-48)
		c. Defective relay or paralleling resistor, in relay coil.	Replace relay box (para 2-47*a*)

Table 2-4. Troubleshooting—Electrical System, Part 1— Continued.

Item No.	Malfunction	Probable Cause	Corrective Action
		TURN SIGNAL SYSTEM —Continued	
31	Turn signals flash too slowly or too rapidly.	*a.* Defective flasher	Replace flasher (para 2-48)
		b. Incorrect control indicator (pilot) lamp.	Install correct size lamp
		c. Defective relay or paralleling resistor in relay coil.	Replace relay box (para 2-47)
32	Right rear turn signal lamp does not light.	*a.* Defective signal / stop light lamp (circuit 22-460E / B).	Test rear lamp by depressing brake pedal with turn signal lever in neutral position. Make certain the selector lever of the vehicle light switch is in STOPLIGHT or SERVICE DRIVE position. If service stoplight does not light, lamp is probably defective. Replace lamp (para 2-50) with one known to be serviceable and repeat test. If lamp still does not light, check for corroded lamp socket or terminals, or damaged wiring harness.
		b. Open circuit (circuit 22-460E / B).	Refer to *a* above. Use test lamp or voltmeter to isolate open in circuit and make necessary repairs.
		c. Control switch defective.	Connect jumper wire(s) to terminals A, D, and C of the relay box. If the right turn signals flash, repair or replace turn signal control switch (para 2-49). If right turn signal does not flash, perform voltage test in *d* below.
		d. Relay box defective	Using voltmeter or test lamp between terminals E and M of the relay box, determine if voltage is present. If no voltage is present, repair or replace relay box (para 2-47). Repair of relay box at organizational category of maintenance level is limited to resoldering or connecting loose wires in the box or replacing the flasher. If voltage is present, recheck circuit for defective lamp, corroded lamp socket or terminals, or damaged wiring (*a* and *b* above).
33	Right front turn signal lamp does not light.	*a.* Defective signal lamp in right front blackout marker and parking light assembly (circuit 460-J).	Connect jumper lead between terminals A and J of the relay box. If right front signal lamp fails to light continuously, the problem is either a defective lamp, corrosion in lamp socket or terminals, or faulty wiring. Remove and test lamp and replace if defective (para 2-50*a*).
		b. Open circuit (circuit 460-J).	If lamp is serviceable in test performed in *a* above, perform voltage check or use test lamp to isolate open circuit and make necessary repairs.
		c. Control switch defective.	Refer to item 32*c*.
		d. Relay box defective	Refer to item 32*d* except use terminals J and M for voltage check at relay box.

Table 2-4. Troubleshooting—Electrical System, Part I—Continued.

Item No.	Malfunction	Probable Cause	Corrective Action
		TURN SIGNAL SYSTEM —Continued	
34	Left rear turn signal lamp does not light.	*a.* Defective signal / stop light lamp (circuit 22-461K / B / D).	Refer to item 32*a* above.
		b. Open circuit (circuit 22-461K / B / D).	Refer to item 32*b* above.
		c. Control switch defective.	Connect jumper wire(s) to terminals A, D, and F of the relay box. If the left turn signals flash, repair or replace control switch (para 2-49). If left turn signal does not flash, perform voltage test in *d* below.
		d. Relay box defective	Refer to item 32*d*, except use terminals K and M for voltage check at relay box.
35	Left front turn signal lamp does not light.	*a.* Defective signal lamp in right blackout marker and parking light assembly (circuit 461-L).	Refer to item 33*a*, except connect jumper wire between terminals A and L.
		b. Open circuit	Refer to item 33*b*
		c. Control switch defective.	Refer to item 34*c*
		d. Relay box defective.	Refer to item 32*d*, except use terminals L and M for voltage check at relay box.

Section VII. IGNITION SYSTEM

2-16. General

The ignition system (fig. 2-3) includes the distributor and coil assembly, the spark plugs, ignition switch, and the necessary connecting cables and wiring. A 24-volt system operates on current from the two 12-volt batteries. The ignition switch, when turned on, completes the circuit to the ignition system. All components of the ignition system are waterproofed for fording operation.

2-17. Spark Plugs and Spark Plug Cables

a. Spark Plug Cables. Replace spark plug cables if rubber or metallic shielding is damaged in anyway.

b. Remove Spark Plug Cables.

(1) Unscrew the spark plug cable elbow nuts, and remove the cables from the spark plugs.

(2) Remove the nut, lockwasher, and bolt from the spark plug conduit clamp, and remove the clamp.

(3) Unscrew the spark plug cable nuts at the distributor cap cover, and remove the cables.

c. Inspect Spark Plug Cables. Inspect cables (fig. 2-10) for frayed conduits, broken or missing terminal sleeve springs, missing or deteriorated terminal sleeve grommets, damaged nut threads, or other visual damage. Replace cables as necessary.

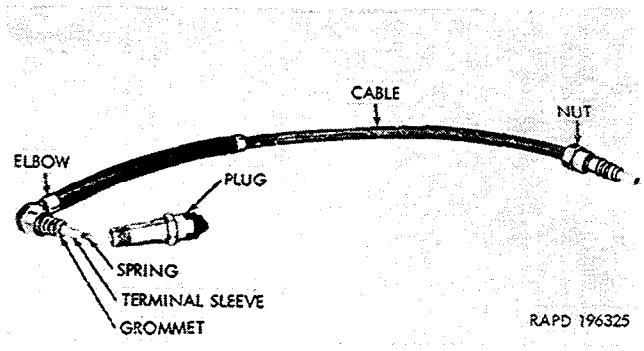
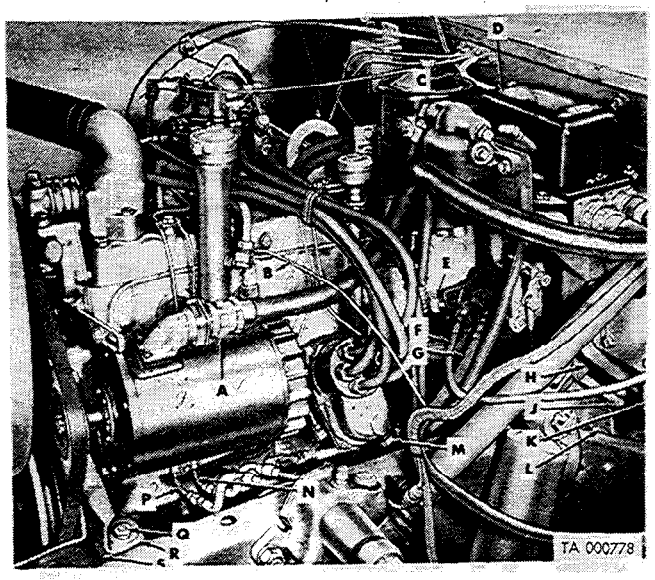


Figure 2-10. Spark plug and cable.

d. Install Spark Plug Cables.

(1) Insert the straight end of each spark plug cable terminal in the distributor cap cover and tighten the nuts fingertight.

(2) Aline the cable elbows so that all are facing opposite the distributor cap cover plug (fig. 2-11).



A Generator to regulator cable
B Oil pressure gage sending unit cable.
C Priming system inlet line
D Temperature gage sending unit cable.
E Battery-to-starter cable
F Starter-to-regulator cable
G Starter-to-slave receptacle cable.
H Accelerator bellcrank lever
J Accelerator pedal rod clevis
K Clutch release fork lever
L Slotted nut
M Distributor primary cable
N Master cylinder vent line
P Fuel tank vent line
Q Front mounting screw
R Front support plate
S Support plate bracket

Figure 2-11. Disconnect points at left side of engine.

(3) Insert each spark plug cable elbow terminal in its spark plug. Be sure to connect each cable to the correct plug, following the firing order shown in figure 2-3. Tighten cable elbow nuts.

(4) Install the conduit clamp around the cables and install bolt, lockwasher, and nut.

(5) Tighten the nut.

e. Remove Spark Plugs.

NOTE

All plugs are removed in the same manner.

(1) Unscrew the spark plug cable elbow nut and remove the cable from the spark plug.

(2) Unscrew the spark plug with a deep socket wrench. Remove the spark plug and gasket. Discard the gasket.

f. Clean, Inspect, and Adjust Spark Plugs.

(1) Clean the spark plugs, using spark plug cleaning equipment.

(2) Inspect the plugs for burned or damaged electrodes, broken insulation or damaged threads. Replace spark plugs if any of the above conditions are evident.

(3) Measure the gap between the two electrodes with a spark plug gage. Increase or decrease the gap as required by bending the outer electrode until the gap is 0.028 to 0.033 inch.

g. Install Spark Plugs.

NOTE

All plugs are installed in the same manner.

(1) Install a new gasket on the spark plug and install the plug in the cylinder head. Tighten the plug to 30 foot-pounds torque.

(2) Connect the spark plug cable (*d* (3) above).

2-18. Ignition Circuit Tests

NOTE

Prior to making ignition circuit checks, voltage check must be made on starter circuit to determine if 18 volts are present when cranking engine.

a. Check Engine.

(1) *Adjust spark plug.* Remove one of the spark plug cables (para 2-17 *b*). Crank engine with starter (ignition switch on), while holding the spark plug cable one-fourth inch from the cylinder head. If the spark jumps the gap between the cable and cylinder head, remove all plugs, clean, and inspect. Adjust the gap. Install the plugs, replacing defective plugs, clean, and inspect. Adjust the gap. Install the plugs, replacing defective plugs (para 2-17 *d*). If spark does not jump the gap, proceed with check outlined in (2) through (12) below.

(2) *Adjust breaker points.* Adjust breaker points (para 2-23).

NOTE

Servicing the distributor requires its removal (par 2-19 *a*).

(3) *Clean breaker points.* Clean or replace breaker points and capacitor (para 2-22).

NOTE

Oxidation of breaker points is caused by high charging voltage, or oil.

Refer to paragraph 2-35 *i* for checking charging voltage. If distributor parts are oily, clean parts or replace distributor as required (para 2-19).

(4) *Ignition coil.* Check the ignition coil with the distributor removed from the engine (para 2-24 *a*), and held in a vise. Remove the cap cover and connect a test lead from the positive (+) terminal of the coil to the positive (+) terminal of one of two 12-volt batteries connected in series. Connect a second test lead from the negative (—) post of the opposite battery to a suitable ground on the distributor base. Insert a third test lead in the high tension terminal of the coil and hold the end of the lead one-fourth inch from the distributor base while rotating the distributor shaft. If a spark jumps the ¼-inch gap, the coil is satisfactory. If a spark does not jump the gap, replace the coil (para 2-24).

(5) *Rotor.* Check the rotor for burred or broken parts. Replace if defective (para 2-22).

(6) *Cap spring.* Replace or install spring (para 2-28 *c*).

(7) *Cap.* Remove cap and check for cracks or other damage. Replace a defective cap (para 2-21).

(8) *Ignition switch.* Check ignition switch (*b* (7) below). Replace defective switch (para 2-25).

(9) *Check resistance in primary circuit or through breaker points.* Check resistance in primary circuit (*b* below) and breaker points (*c* below) and correct as necessary.

(10) *Fuel system.* Refer to table 2-3.

(11) *Valve.* Refer to table 2-3.

NOTE

If cause of trouble cannot be located by performing (1) through (11) above, notify direct support maintenance personnel.

b. Check Primary Circuit Resistance (Fig. 2-12). Primary circuit resistance check is to determine the resistance through the ignition switch and the primary circuit.

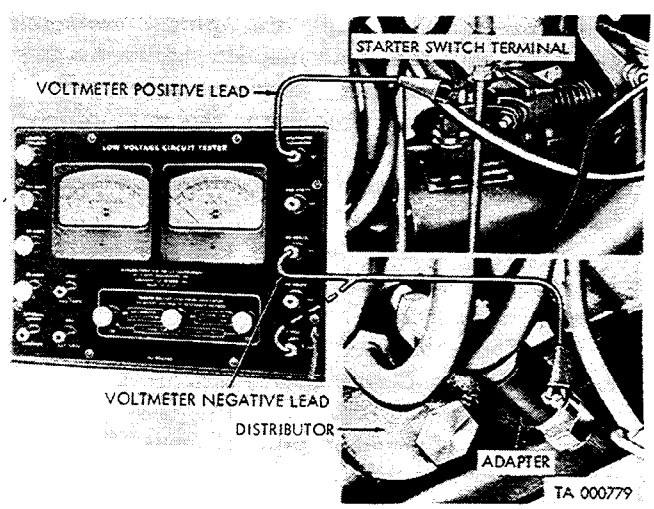


Figure 2-12. Checking ignition primary circuit resistance.

(1) *Install adapter 17-A-2975 in distributor receptacle.* Disconnect the primary cable from the distributor at the receptacle. Install the adapter (C, fig. 2-9) in the receptacle and connect the cable to the adapter.

(2) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the battery-to-starter cable at the starter switch terminal.

(3) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the terminal of the adapter in the distributor.

(4) *Start engine.* Start the engine and operate at idle speed.

(5) *Change voltmeter negative (—) test lead connection.* Change the voltmeter negative (—) test lead from the 50 VOLTS terminal on the tester to the 1 VOLT terminal.

(6) *Read voltmeter.* Observe the voltage reading on the voltmeter upper scale. This reading should not exceed 0.2 volt.

(7) *Check ignition switch.* If voltage reading exceeds 0.2 volt, check for loose or corroded connections at the starter switch terminal, ignition switch, and the cable connector at the left splash shield or at the filter on the dash (vehicles so equipped). If the connections are clean and tight, eliminate the switch from the circuit and repeat the test. To do this, remove the instrument cluster far enough to provide access to the ignition switch. Disconnect the two cables (11 and 12) at the cable connectors and connect cable (11) to cable (12). Start the engine and observe the voltage reading on the upper scale of the voltmeter. If voltage reading is satisfactory with the ignition switch by passed, replace the switch (para 2-25).

(8) *Remove testing equipment.* When the test has been completed, remove the testing equipment. When the test has been completed, remove the testing equipment and connect the cable to the distributor.

c. Check Breaker Points Resistance (Fig. 2-13). Breaker points resistance check is to determine whether excessive resistance exists through the breaker points because of oil, burning, or oxidation.

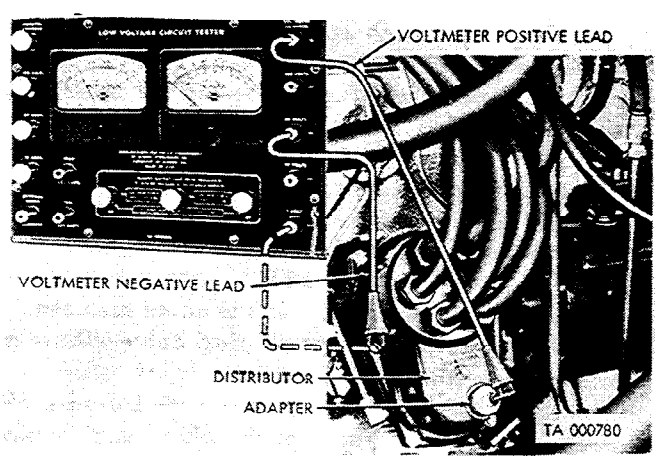


Figure 2-13. Checking resistance through breaker points.

(1) *Install adapter in cap cover.* Remove the cap cover plug and the O ring packing and install adapter (B fig. 2-9) in the plug opening.

(2) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage

circuit tester and attach the clip end of the lead to the terminal on the adapter in the cover.

(3) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal on the tester and attach the clip end of the lead to one of the cap cover screws.

(4) *Check voltage.* Turn the ignition switch on and observe the voltmeter. If the voltmeter shows a battery voltage reading (approximately 24 volts) on lower scale, engage the starter momentarily to close the breaker points (voltmeter reading practically zero).

(5) *Change voltmeter negative (—) test lead.* Change the voltmeter negative (—) test lead from the 50 VOLTS terminal on the tester to the 1 VOLT terminal.

(6) *Observe voltmeter reading and perform necessary repairs.* Observe the voltage reading on the upper scale of the voltmeter. The reading should not exceed 0.2 volt. If the voltage reading exceeds 0.2 volt, remove the distributor (para 2-19 *a*) and clean or replace breaker points, as required (para 2-22).

d. Engine Acceleration.

(1) *Spark plugs.* Remove spark plugs. Inspect spark plugs for incorrect gap and cracked porcelain. Clean, adjust, or replace spark plugs (para 2-17).

(2) *Spark plug cables.* Disconnect spark plug cables from spark plugs and check each cable for electrical leakage by holding each cable terminal one-fourth inch from the cylinder head. Turn on ignition switch, crank engine with starter and, if missing is evident, replace faulty cables (para 2-17).

(3) *Distributor breaker points.* Remove distributor (para 2-19 *a*) and inspect breaker points. If breaker points are faulty, replace points (para 2-22).

(4) *Cap.* Remove distributor (para 2-19 *a*) for cracks and burning Replace or install new cap (para 2-21).

(5) *Coil.* Refer to (*a* (4) above).

(6) *Fuel system.* Refer to table 2-3.

(7) *Valves.* Refer to table 2-3.

NOTE

If cause of trouble cannot be located by performing (1) through (7) above, notify direct support maintenance personnel.

e. Check Engine For Full Power.

(1) *Ignition timing.* Check ignition timing with timing light and adjust (para 2-20).

(2) *Automatic advance.* Check automatic advance with a timing light. Accelerate engine and note if pointer at fan drive pulley indicates advance as engine speed is increased. If no advance is noted, replace distributor (para 2-19).

(3) *Fuel sytem.* Refer to table 2-3.

(4) *Valves.* Refer to table 2-3.

(5) *Exhaust system.* Refer to table 2-3.

NOTE

If cause of trouble cannot be located by performing (1) through (5) above, notify direct support maintenance personnel.

f. Check Engine At High Speed.

(1) *Spark plugs.* Refer to (*d* (1) above).

(2) *Spark plug cables.* Refer to (*d* (2) above).

(3) *Breaker points.* Refer to (*D* (3) above).

(4) *Coil.* Refer to (*a* (4) above).

(5) *Fuel system.* Refer to table 2-3.

(6) *Valves.* Refer to table 2-3.

NOTE

If cause of trouble cannot be located by performing (1) through (6), notify direct support maintenance personnel.

2-19. Distributor and Vent Lines

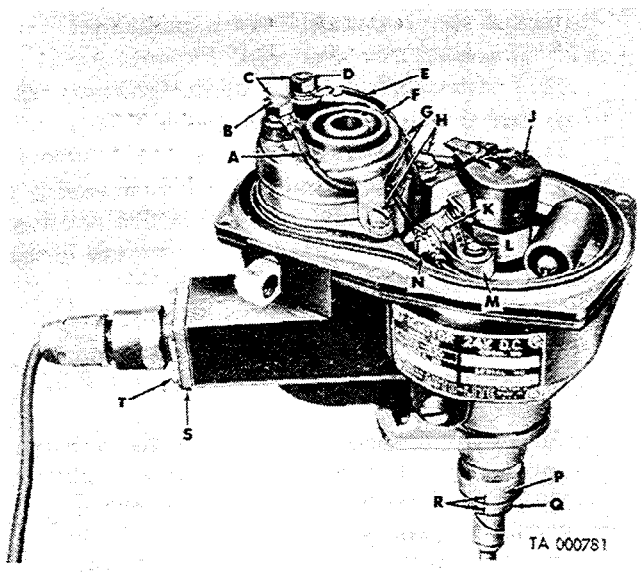
a. Remove Distributor.

(1) Disconnect all spark plug cables at the spark plugs and remove the No. 1 spark plug. Apply sufficient pressure to the fan belt and turn the fan drive pulley by moving the fan. Turn the fan until the timing indicator points to DC on the drive pulley (on compression stroke).

(2) Disconnect the two vent lines at the elbows in the distributor base.

(3) Remove the lockwasher screw that attaches the spark advance arm to the cylinder block. Withdraw the distributor sufficiently to disconnect the primary cable at the distributor. Remove the distributor and mounting gasket.

(4) Scribe alining marks on the distributor base and the drive shaft collar (P and Q, fig. 2-14) to insure proper engagement of the drive shaft end with the distributor drive gear slot when installing the distributor.



A Breaker plate cable
B Coil negative terminal
C Terminal nuts
D Coil positive terminal
E Receptacle or filter cable.
F Ignition coil
G Cable cups
H Coil bracket screws
J Rotor
K Breaker spring cup
L Pivot pin
M Breaker point spring
N Spring cup screw
P Base
Q Drive shaft collar
R Alining marks
S Receptacle
T Receptacle screws

Figure 2-14. Alining marks on distributor.

b. Install Distributor.

(1) With the timing indicator pointing to DC on the drive pulley (*a* (1) above), connect the primary cable at the distributor, exercising extreme care to prevent breakage of the connector nut.

(2) Install a new distributor mounting gasket on the distributor base. Aline the scribe marks (*a* (4) above) and insert the distributor in the cylinder block.

(3) Install the spark advance arm screw through the slot in the spark advance arm and into the tapped hole in the cylinder block. Tighten the screw fingertight.

(4) Connect the two vent lines at the elbows in the distributor base, tightening the vent line nuts.

(5) Install the No. 1 spark plug. Insert the spark plug cable elbow terminals in the spark plugs. Be sure to connect each cable to the correct plug, following the firing order shown in figure 2-3. Tighten the cable elbow unts. Adjust the ignition timing (para 2-20).

c. Remove Distributor Vent Lines.

(1) Remove the bolt and lockwasher that secure the distributor vent line tension clip to the cylinder head capscrew.

(2) Disconnect the distributor vent lines at the elbows in the distributor base and the air cleaner elbow by unscrewing the vent line nuts. Remove vent lines. Separate the vent lines from the tension clip.

d. Inspect Distributor Vent Lines and Related Parts.

(1) Inspect distributor vent lines for cracks, kinks, damaged threads, and other visual damage. Replace lines as necessary.

(2) Inspect the two vent line elbows at the air cleaner elbow and the two vent line elbows at the distributor base for damaged threads and other visual damage. If either of the elbows in the distributor require replacement, remove the damaged elbow and install a new 3 / 16-inch, 90°, ⅛-inch male pipe end, inverted flared tube elbow. If the elbows in air cleaner elbow require replacement, replace them (para 2-80 *d*). Tighten.

e. Install Distributor Vent Lines.

(1) Install the two distributor vent lines, connecting them to the elbows in the distributor base and the air cleaner elbow (fig. 2-100 or 2-102). Tighten the vent line nuts.

(2) Engage the two vent lines in the tension clip, position the clip over the cylinder head capscrew, and install the lockwasher and bolt. Tighten the bolt.

2-20. Ignition Timing

a. General. Efficient performance of the engine depends upon correct ignition timing. Under ideal conditions, the spark should occur at two degrees after top dead center on the compression stroke of the piston. However, in extremely high or extremely low altitudes, ignition timing may be changed to occur as early as two degrees before top dead center, or as late as six degrees after top dead center. Under no conditions should these limits be exceeded.

b. Connect Timing Light. Remove the spark plug cable from the No. 1 spark plug and install the timing light adapter (A, fig. 2-9) on the threaded end of the spark plug. Connect the spark plug cable to the adapter. If the timing light is of the two-lead type attach one of the leads to the adapter terminal (fig. 2-15) and the other lead to one of the cylinder head cap screws for a ground.

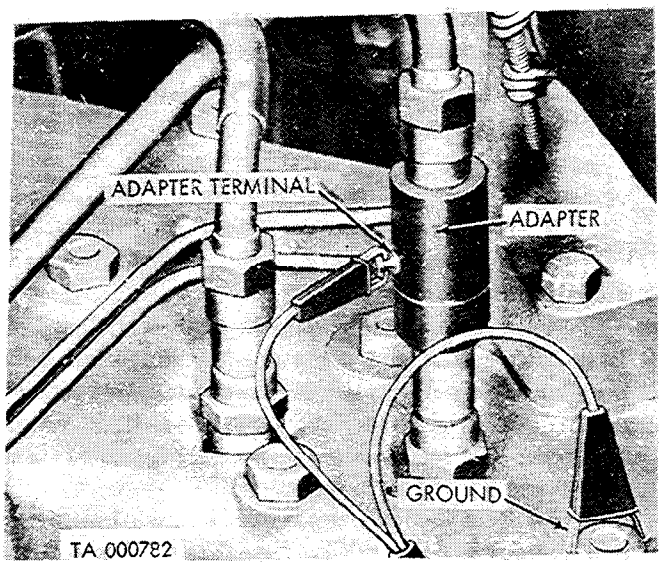


Figure 2-15. Timing light adapter installed.

NOTE

If the timing light is of the three-lead type, connect the primary lead of the light to an outside 6- or 12-volt battery and connect the secondary leads as described above.

c. Time Ignition. With the timing light (fig. 2-16) connected (b. above), make a narrow chalk mark 2 degrees before the DC mark on the fan drive pulley.

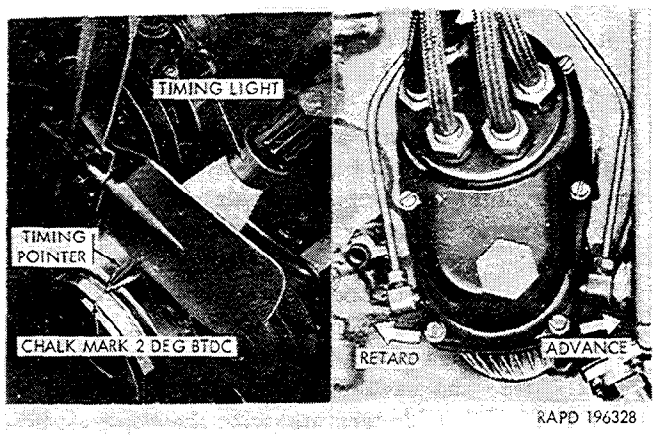


Figure 2-16. Checking ignition timing.

NOTE

If the fan drive pulley does not have a TDC mark, refer to paragraph 2-98 *b*.

(1) Start the engine and run at idle speed.

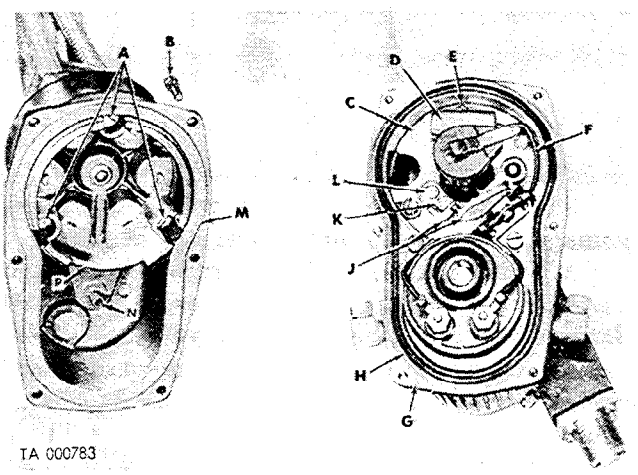
(2) Aim the timing light at the timing pointer (fig. 2-16). Observe the chalk mark on the fan drive pulley with respect to the timing pointer at the instant the timing light flashes. The light should flash the instant the chalk mark is directly under the timing pointer. If the timing light indicates adjustment is necessary, loosen the screw that secures the spark advance arm to the cylinder block, and rotate the distributor clockwise to retard the spark, or counterclockwise to advance the spark. Tighten the spark advance arm screw after correct adjustment has been made.

d. Check Automatic Spark Advance. Accelerate the engine and observe the chalk mark on the fan drive pulley. As the engine speed increases, the timing light flash should occur before the chalk mark is opposite the pointer, indicating that the automatic spark advance is satisfactory. If the spark advance is not satisfactory, replace the distributor (para 2-19).

2-21. Distributor Cover and Cap

NOTE

The key letters noted in parentheses are in figure 2-17.



A Cap lockwasher screws
B Cover lockwasher screws
C Breaker plate
D Capacitor
E Capacitor lockwasher screw
F Capacitor cable
G Base
H Cover O ring packing
J Breaker points
K Breaker point lockwasher screw
L Breaker point adjusting screw
M Cap cover
N Cap spring
P Cap

Figure 2-17. Distributor base and cover.

a. Removal.

(1) Remove the distributor (para 2-19 *a*).

(2) Remove the six cap cover lockwasher screws (B) and separate the cover (M) from the base (G). Remove the cover O ring packing (H). Remove the cover plug and the plug O ring packing.

(3) Unscrew the spark plug cable nuts from the cover and remove the cables.

(4) Remove the three distributor cap lockwasher screws (A) and remove the cap (P) from the cover. Remove the cap spring (N) and the six cap sealing washers (fig. 2-18).

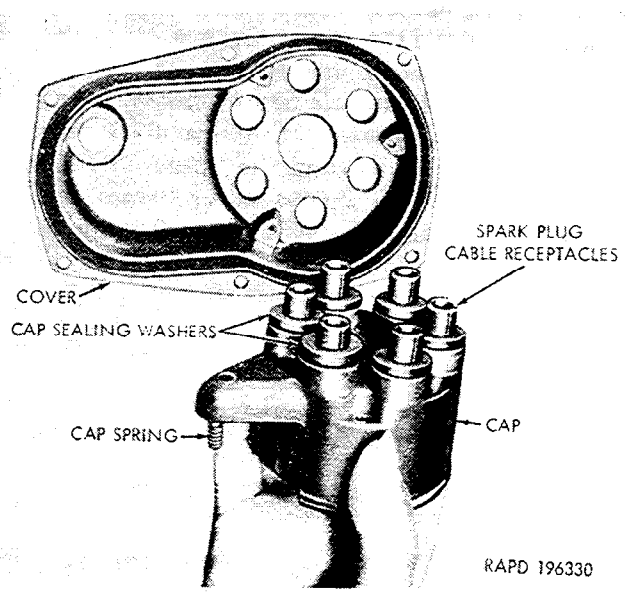


Figure 2-18. Installing distributor cap in cover.

b. Inspection.

(1) Inspect the cap cover for cracks or damaged threads. Replace cover as necessary.

(2) Inspect the cap for cracks, excessively burned rotor contact surfaces, or other visual damage. Inspect the cap sealing washers for damage or deterioration. Replace the washers and cap as necessary.

(3) Inspect the cap spring for breaks or distortion. Replace spring as necessary.

(4) Inspect cover O ring packing for deterioration or other visual damage. Replace packing as warranted.

(5) Inspect the cap cover plug for damaged threads. Replace cover plug and O ring packing as warranted.

c. Installation.

NOTE

The key letters noted in parentheses are in figure 2-17, except where otherwise indicated.

(1) Install the cap spring (N) on the spring retainer.

(2) Place a cap sealing washer on each of the six spark plug cable receptacles (fig. 2-18). Install the cap cover over the distributor cap. Invert the cover and install the three lockwasher screws (A) in the cap (P). Tighten the screws.

(3) Install spark plug cables in distributor cap cover (para 2-16*d* (1)).

(4) Position the cover O ring packing (H) on the base (G).

(5) Position the cap cover (M) on the base and install the six cover lockwasher screws (B). Tighten the screws evenly.

(6) Install the cap cover plug O ring packing and plug. Tighten the plug.

(7) Install distributor (para 2-19*b*).

(8) Adjust ignition timing (para 2-20).

2-22. Distributor Rotor, Breaker Points, and Capacitor

a. Removal.

(1) Remove distributor (para 2-19*a*).

(2) Remove cap cover (para 2-21*a*(2)).

(3) Pull the rotor (J, fig. 2-14) from the distributor shaft.

(4) Remove the spring clip screw (N, fig. 2-14), lockwasher, and plain washer that secure the breaker spring clip to the breaker plate, and remove the breaker spring clip (K, fig. 2-14). Remove the breaker point lockwasher screw (K, fig. 2-17) and remove the breaker points.

(5) Remove the capacitor lockwasher screw and capacitor (D and E, fig. 2-17). Discard the capacitor.

b. Inspection.

(1) Inspect the rotor for cracks, broken contact, or excessive burning. Replace the rotor as necessary.

(2) Inspect the breaker points for pitting, burning, or oxidation. Recondition the points or replace as necessary.

c. Installation.

(1) Position the capacitor as shown in figure 2-17, and install a lockwasher screw. Tighten the screw.

(2) Install the adjustable breaker point with elongated hole over the breaker point adjusting screw (L, fig. 2-17). Install a lockwasher screw. Tighten the screw.

(3) Apply a drop of light engine oil to the pivot pin (L, fig. 2-14) and install the stationary breaker point on the breaker plate pivot pin, with the spring at the inner side (rotor-cam side) of the clip post.

(4) Position the breaker spring clip (K, fig. 2-14) over the breaker point spring (M, fig. 2-14) alining the holes in the clip, the spring, and the clip post. Aline the capacitor cable terminal and the breaker point cable terminal with the clip post hole. Install a lockwasher on a screw followed by a flat washer. Install the spring clip screw (N, fig. 2-14) with washers through the cable terminals, clip post hole of the breaker spring clip (K), and the breaker point spring; and tighten the screw into the clip.

(5) Install the rotor (J) on the distributor shaft.

(6) Adjust breaker point gap (para 2-22).

(7) Install cap cover (para 2-21*c*(5)).

(8) Install distributor (para 2-19*b*).

(9) Adjust ignition timing (para 2-20*c*).

2-23. Distributor Breaker Point Adjustment

a. General. Whenever adjustment of the

ignition distributor breaker points is necessary, remove the distributor (para 2-19 *a*).

b. Adjustment (Fig. 2-19).

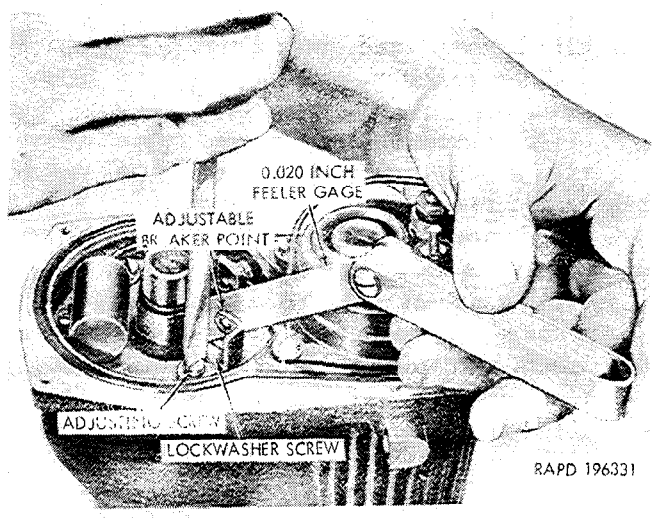


Figure 2-19. Adjusting distributor breaker points.

(1) Remove distributor (para. 2-19 *a*).

(2) Remove cap cover (para 2-21 *a* (2)).

(3) Rotate the distributor drive shaft until the points are at maximum open position. Loosen the adjustable breaker point lockwasher screw enough to permit movement of the adjustable breaker point. Insert a 0.020-inch thickness gage between the breaker point contacts. Turn the breaker point adjusting screw in either direction to obtain the 0.020-inch clearance. Tighten the breaker point lockwasher screw.

(4) Install cap cover (para 2-21 *c* (5)).

(5) Install distributor (para 2-19 *b*).

(6) Adjust ignition timing (para 2-20 *c*).

2-24. Ignition Coil, and Receptacle (Fig. 2-20.)

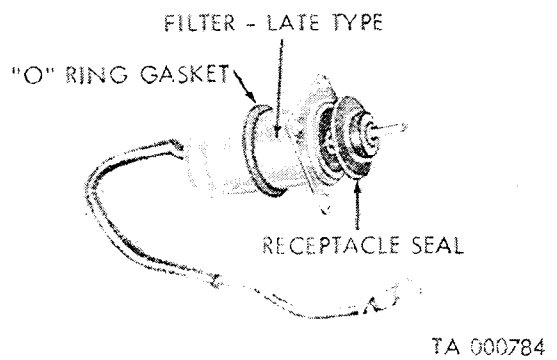


Figure 2-20. Ignition filter (late type).

a. General. The following service information includes removal and installation of the filter which is assembled into the distributor.

b. Remove Ignition Coil (Fig. 2-20).

(1) Remove the distributor (para 2-19 *a*).

(2) Remove cap cover (para 2-21 *a* (2)).

(3) Remove the two nuts and lockwashers from the ignition coil positive (+) and negative (—) terminals (B and D). Remove the two cables (A and E) from the terminals.

(4) Remove the two lockwasher screws that secure the coil. Remove the two cable clips (if provided) and the ignition coil (F).

c. Remove Receptacle and Filter.

(1) Remove the four lockwasher screws attaching the receptacle to the distributor base (P, fig. 2-14). Remove the receptacle. On vehicles equipped with the ignition filter on the dash, remove the receptacle gasket.

(2) Remove the ignition filter, if vehicle is so equipped. Remove the receptacle seal and the O ring gasket from the filter (fig. 2-20).

d. Inspect Ignition Coil, Receptacle, and Filter.

(1) Inspect the ignition coil for cracked or damaged casing, loose or damaged bracket, damaged terminal threads, or corrosion damage. Clean the terminals or replace coil as necessary.

(2) Inspect the receptacle for cracks, damaged threads, or other visual damage. Inspect the cable and insulation for breaks or deterioration. Replace receptacle.

(3) On vehicles so equipped, inspect the filter cable and insulation, and receptacle seal and gasket for breaks or deterioration. Inspect the filter for damaged casing or distorted flange. Replace filter, gasket, or seal as necessary.

(4) Inspect the cable clips (on vehicles so equipped) for distortion or other visual damage. Replace clips.

e. Install Ignition Coil, Receptacle, and Filter.

(1) On vehicles with the filter in the distributor (fig. 2-14), install the O ring gasket and receptacle seal on the filter. Insert the filter cable into the distributor base and position the filter flange on the base. Install the receptacle and the four lockwasher screws. Tighten the screws.

(2) On distributors without the filter, position the receptacle gasket on the distributor base, insert the receptacle cable in the base, and position the receptacle and gasket. Install the four lockwasher screws (1) above).

(3) Arrange the cable in the base so that it will not interfere with installation of the coil.

(4) Install the coil in the base, alining the

screw holes in the bracket with those in the distributor base (P, fig. 2-14). Connect the cable from the filter or receptacle to the positive (+) terminal of the coil (D, fig. 2-14) and connect the breaker plate cable to the negative (—) terminal of the coil (B, fig. 2-14). Install a lockwasher and nut on each terminal.

(5) Position a cable clip (G, fig. 2-14) over each cable, alining the clips with the screw holes in the coil bracket. Install the two lockwasher screws through the holes in the cable clips and coil bracket. Tighten the screws.

(6) Install distributor cap cover (para 2-21 *c*).

(7) Install distributor (para 2-19 *b*).

2-25. Ignition switch

a. General.

(1) Ignition switch (early type) made with potting material, which was used on M37, M43, and M201 vehicles, is subject to moisture penetration. When moisture penetrates the potting material it causes oxidation within the switch which results in short circuiting and ultimate burning of the switch body. This kind of switch has been replaced in production. Upon inspection, if it is evident that potting material is cracked, switch must be replaced with the latest switch.

(2) Removal and installation of ignition switch (later type) is indicated in *b* and *c* below.

b. Removal.

(1) Disconnect battery ground cable.

(2) Remove screw from center of switch handle and remove handle.

(3) Remove hex-head nut and lockwasher securing switch to instrument panel.

(4) Disconnect wires No. 11, 12, 27, and 85 at the disconnect point located seven inches from the switch. Discard early production switch.

c. Installation.

(1) Connect components of switch wiring kit to ignition switch (later type). Make sure cables marked A, C, D, and B (fig. 2-21) are connected to the corresponding lettered posts of the ignition switch.

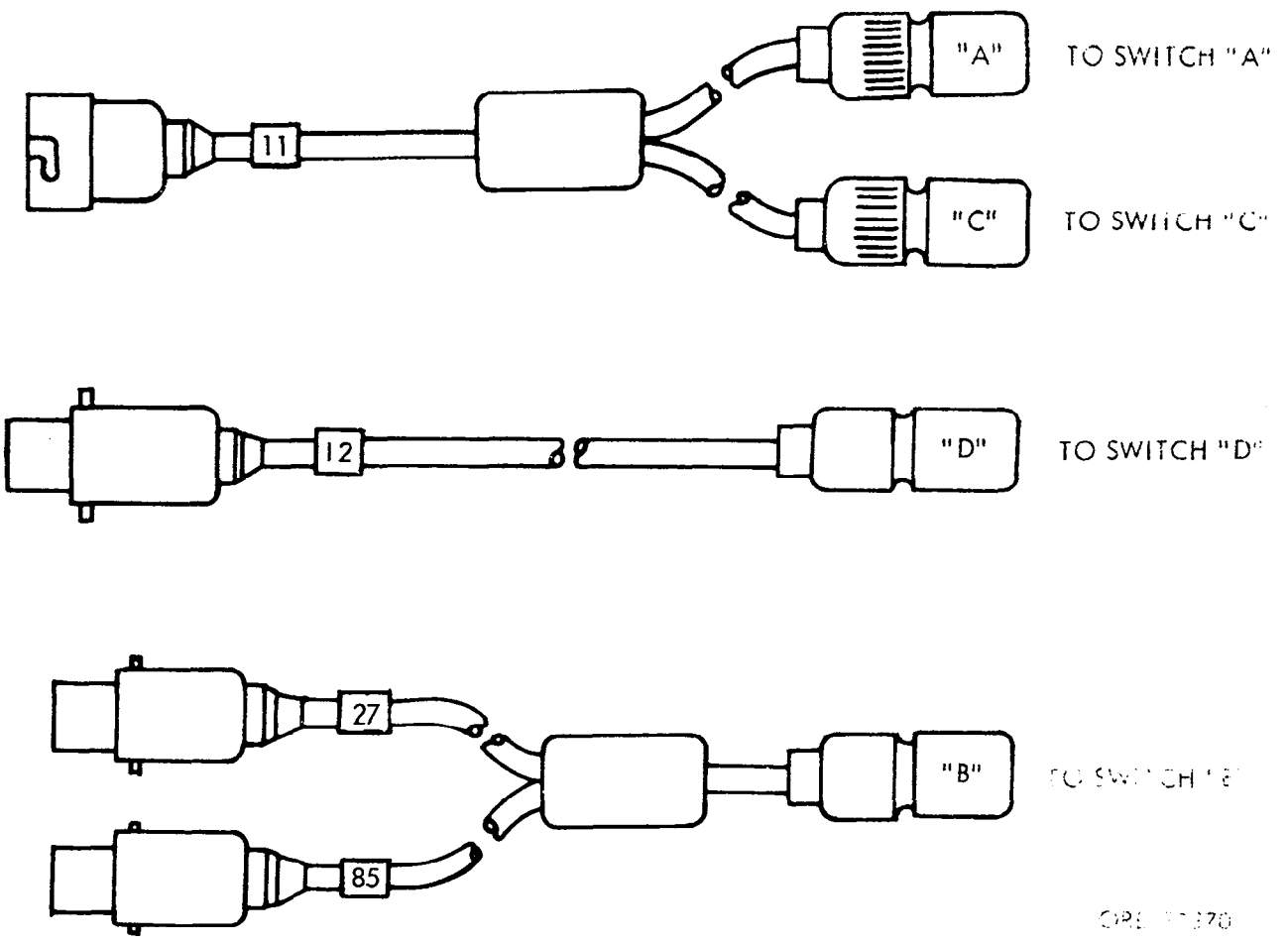


Figure 2-21. Wiring harness identification details.

(2) Remove screw from control handle and remove handle.

(3) Remove ignition switch retaining hex-head nut and lockwasher from switch.

(4) Position ignition switch in instrument panel and secure with hex-head nut and lockwasher removed in (3) above.

(5) Position handle on ignition switch and secure with screw removed in (2) above.

(6) Connect wiring cables No. 11, 12, 27, and 85 (fig. 2-21) from ignition switch to corresponding cable connectors.

(7) Connect battery ground cable.

NOTE

Bracket assembly contained in wiring kit is not used on wheeled vehicles and is discarded.

Section VIII. STARTING SYSTEM

2-26. General

a. The starting system (fig. 2-4) includes the starter, starter switch, and battery-to-starter cable. Current is supplied by two 12-volt batteries. Engagement of the starter is effected by depressing the starter switch pedal (X, fig. 2-22).

b. Organizational maintenance of the starting system includes replacement of the starter, starter switch, starter cable, slave receptacle and cable (on vehicles so equipped, and adjustment of the starter pinion.

2-27. Starter (fig. 2-22)

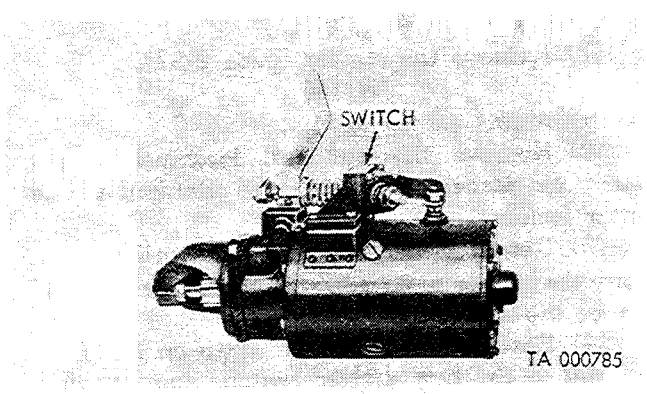


Figure 2-22. Starter (late type).

a. Removal.

(1) Remove the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-23).

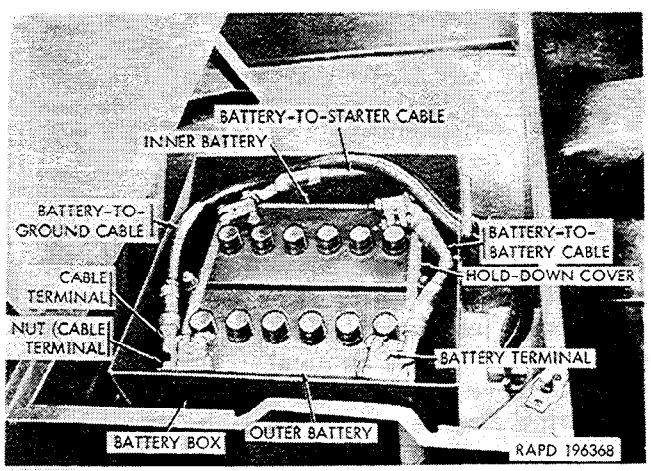


Figure 2-23. Battery box location (all models except early production ambulance truck M43).

(2) Remove the distributor (para 2-19 *a*).

(3) Unscrew the oil level gage pipe (fig. 2-24) from the cylinder block, and remove the pipe and gage.

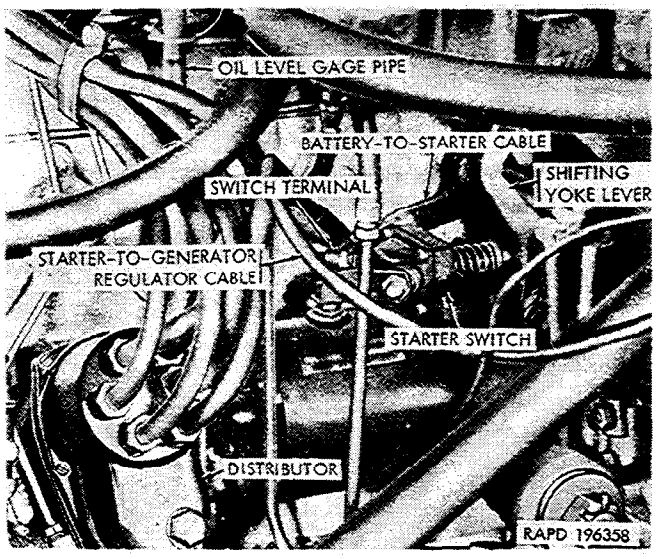


Figure 2-24. Starter installed.

(4) Remove the nut from the starter switch terminal (fig. 2-24) and remove the battery-to-starter cable, starter-to-regulator cable, and the starter-to-slave receptacle cable (if so equipped) from the starter switch terminal.

(5) Remove the two nuts and lockwashers that secure the starter to the studs in the clutch housing and remove the starter. Remove and discard the starter mounting seal (fig. 2-25).

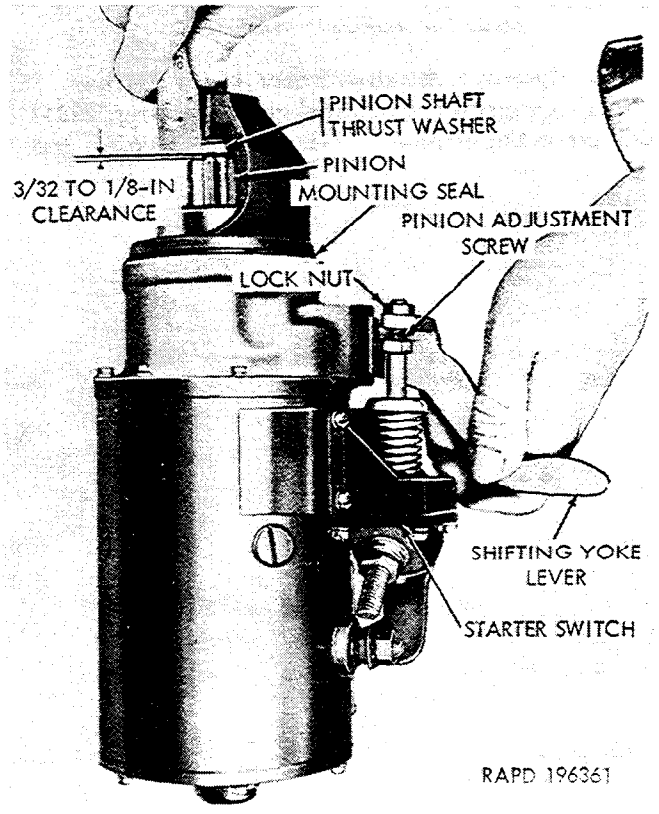


Figure 2-25. Pinion adjustment for starter.

b. Installation. Before installing the starter, check the starter pinion clearance and adjust as necessary (para 2-29).

(1) If the two starter mounting studs were removed (*a* (6) above), install new studs in the clutch housing with the coarse thread end in the housing. Tighten the studs.

(2) Install a new starter mounting seal (fig. 2-25) and place the starter (fig. 2-25) in position on the clutch housing. Install the two lockwashers and nuts. Tighten the nuts.

(3) Connect the battery-to-slave receptacle cable (if so equipped), the starter-to-regulator cable, and battery-to-starter cable to the front terminal of the starter switch (fig. 2-24) and install the terminal nut. Tighten the nut.

(4) Install the oil level gage and gage pipe through the pipe support and screw the pipe into the opening in the cylinder block.

(5) Install the distributor (para 2-19 *b*).

(6) Connect the battery-to-ground cable to the negative (—) post of the outer battery (fig. 2-23).

2-28. Starter Switch

a. General. When replacing the starter switch, be sure to install the same type of switch as was removed.

b. Replacement (Fig. 2-25).

(1) Remove the starter (para 2-27).

NOTE

Disconnect all wiring.

(2) Remove the nut and lockwasher that secure the connector strap to the terminal in the starter frame.

(3) Remove the nut and lockwasher that secure the connector strap to the starter switch, and remove the strap.

(4) Position the connector strap on the short terminal of the new starter switch, and install a lockwasher and special nut.

(5) Install the four lockwashers and four screws to secure the switch to the bracket. Install a lockwasher and special nut on the terminal in the starter frame. Tighten the four screws and the two terminal nuts.

(6) Adjust the starter pinion clearance (para 2-29 *b*).

(7) Install the starter (para 2-27 *b*).

2-29. Starter Pinion Adjustment

a. General. Proper clearance between the starter pinion and the pinion shaft thrust washer must be established before installing the starter to insure satisfactory engagement and disengagement of the pinion and the flywheel ring gear and proper performance of the starter switch.

b. Adjust Starter Pinion. Place the starter in a vertical position and push the shifting yoke lever (fig. 2-23) to the forward (engaged) position. While

holding the lever firmly, measure the distance between the starter pinion and the pinion shaft thrust washer. This measurement should be from 3 / 32 to ⅛ inch. If the clearance at this point is not within the specified limits, loosen the locknut on the pinion adjustment screw, and turn the screw as required until correct clearance is obtained. Turning the screw clockwise decreases the clearance and turning it counterclockwise increases the clearance. Tighten the adjusting screw nut after making the adjustment.

2-30. Auxiliary Power Receptacle (Vehicles so Equipped

a. Removal.

(1) Disconnect the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Remove the rear splash shield from the left front fender (para 2-180).

(3) Disconnect the slave receptacle cable (G, fig. 2-11) from the starter switch terminal, and disengage the cable from the cable clip on the cowl near the dimmer switch.

(4) Remove the nut, two lockwashers, and bolt that attach the receptacle ground cable to the left running board front hanger.

(5) Remove the two screws that secure the grommet retainer to the inner side of the cowl panel, and slide the retainer and the grommet off the cables.

(6) Remove the four bolts and lockwashers that secure the receptacle to the spacer on the cowl panel (fig. 2-26) and remove the receptacle with cables.

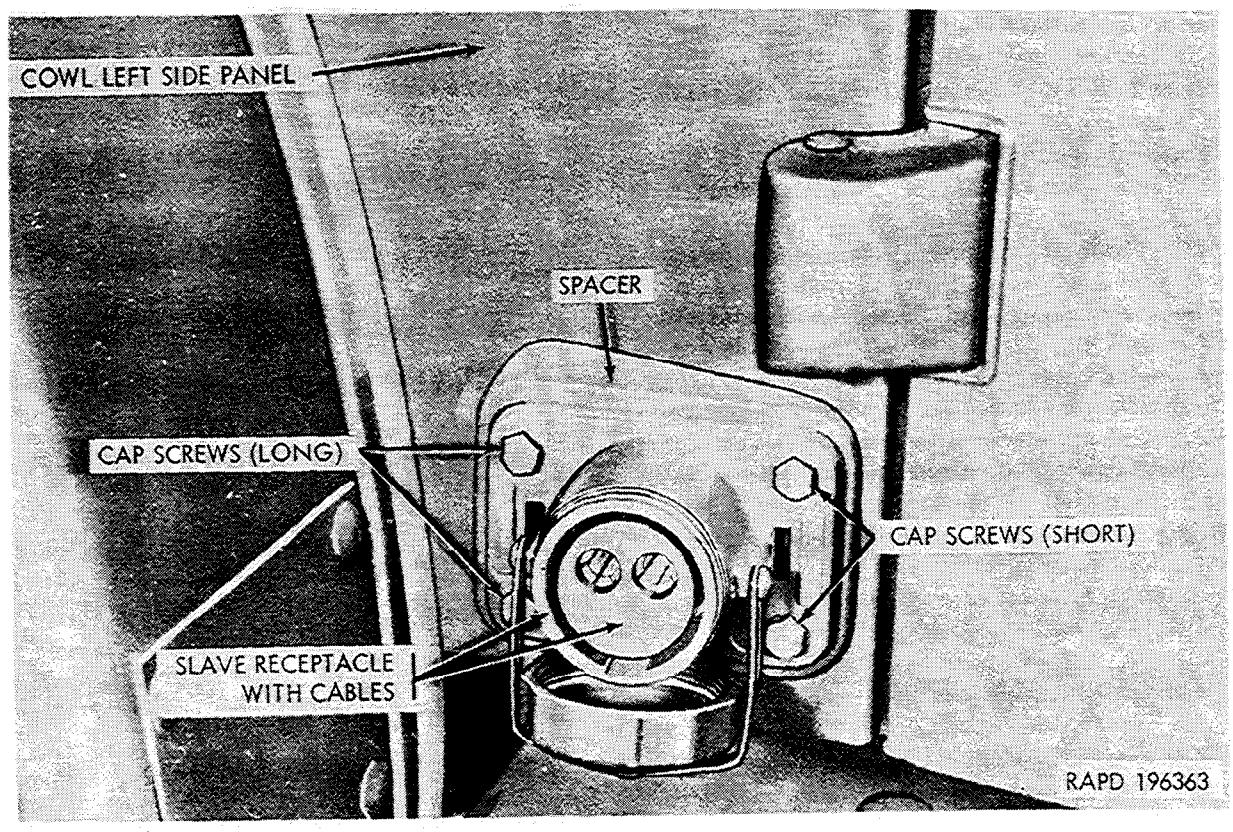


Figure 2-26. Auxiliary power receptacle installed.

b. Installation.

(1) Insert the receptacle cables through the opening in the spacer and the cowl panel, with the short (ground) cable toward the rear of the vehicle. Position the receptacle on the spacer, and install the two lockwashers and capscrews in the two rear holes, and two lockwashers and capscrews in the two front holes (fig. 2-26). Tighten the screws.

(2) Install the grommet over the cables, and thread the cables through the grommet retainer with the dished side of the retainer toward the grommet. Position the grommet and retainer on the inner side of the cowl panel and install the two capscrews. Tighten the screws.

(3) Attach the receptacle ground cable to the left running board front hanger. Place a ⅜-inch, internal-external-teeth lockwasher at each side of the cable terminal, position the parts over the screw hole in the hanger, and install the capscrew and nut. Tighten the nut.

(4) Connect the receptacle cable to the starter switch terminal (fig. 2-11), and tighten the terminal nut. Engage the cable in the cable clip near the dimmer switch.

(5) Install the left front fender rear splash shield (para 2-180).

(6) Connect the battery-to-ground cable to the negative (—) post of the outer battery (fig. 2-23).

2-31. Starting System Circuits

a. Starter Switch Faulty. Connect a suitable jumper cable from the battery to starter cable terminal to the outer starter switch terminal to bypass the starter switch. Scrape lacquer from the switch terminal to insure a good connection. If the starter runs, it indicates that the starter switch is defective. Replace the starter switch (para 2-28).

b. Starter Faulty. If starter is inoperative after checking or replacing switch, replace starter (para 2-27).

c. Starter Spins but Does Not Crank Engine.

(1) *Flywheel ring gear broken.* Remove the starter (para 2-27 *a*), and inspect flywheel ring gear teeth. If teeth are broken or damaged, report to direct support maintenance personnel.

(2) *Starter pinion damaged.* Replace starter (para 2-27).

d. Starter Cranks Engine Slowly (Batteries Satisfactory). Check voltage drop (resistance) in circuits between starter and battery with starter cranking engine (para 2-62). If voltage drop is not excessive, replace starter (para 2-27).

e. Check Battery-to-Starter Cable Resistance (Fig. 2-27). Check for excessive resistance (voltage drop in the battery-to-starter cable to determine cause of malfunction of the starting system. The engine must be at normal operating temperature.

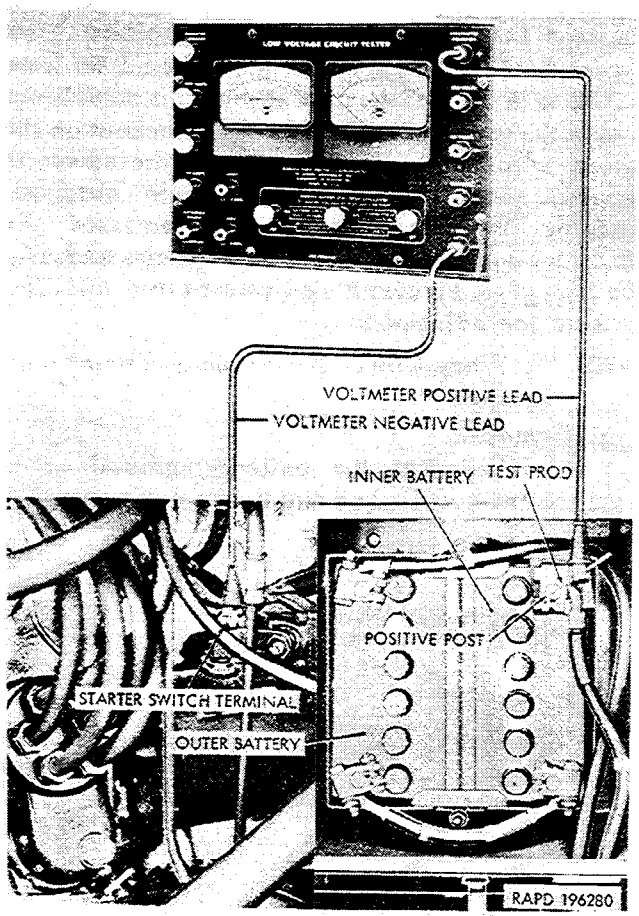


Figure 2-27. Checking battery-to-starter cable resistance.

(1) *Install test prod in battery post.* Drive a test prod into the positive (+) post of the inner battery (para 2-62).

(2) *Connect voltmeter positive (+) test*

lead. Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the test prod.

(3) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 1 VOLT terminal of the tester and attach the clip end of the lead to the starter switch terminal.

(4) *Crank engine and read voltmeter.* Crank the engine with the starter (ignition switch off) and observe the reading on the upper scale of the tester voltmeter. The reading should not exceed 0.2 volt.

(5) *Clean connections or replace battery-to-starter cable.* If reading exceeds 0.2 volt, check for loose or dirty connections at the starter switch and battery, a corroded battery terminal, and a loose cable in cable terminals. Clean and tighten connections. Replace a defective battery-to-starter cable (para 2-65*f* and *g*).

(6) *Remove testing equipment.* After completing the check, remove the testing equipment and the prod from the battery post.

f. Check Starting System Ground Circuit Resistance (Fig. 2-28). The resistance check of the starting system ground circuit is to determine cause of malfunction of the starting system. The engine must be at normal operating temperature.

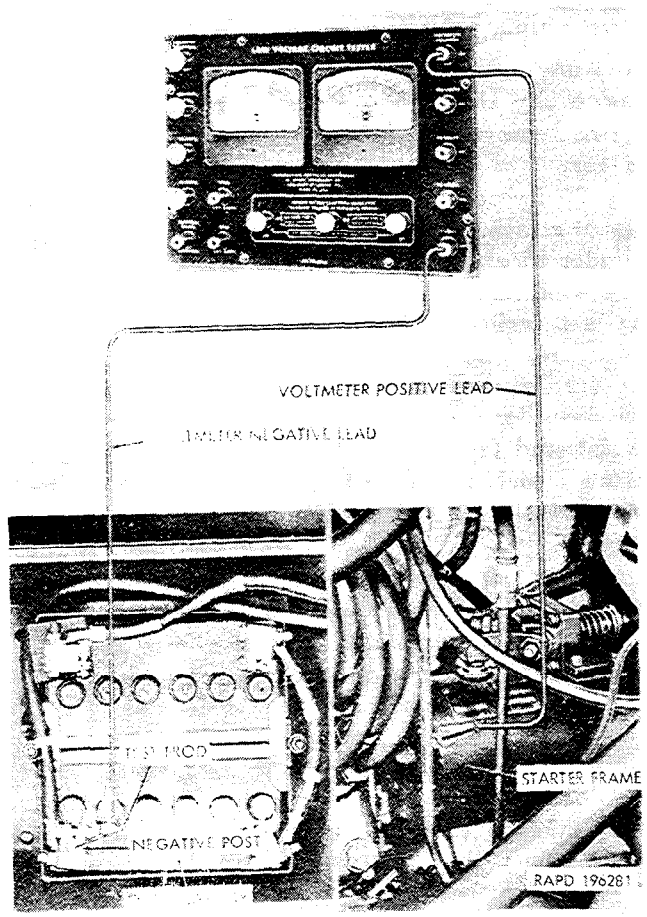


Figure 2-28. Checking starting system ground circuit resistance.

(1) *Install test prod in battery post.* Drive a test prod into the negative (—) post of the outer battery (para 2-62*f*).

(2) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester, and connect the clip end of the lead of the starter frame.

(3) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 1 VOLT terminal of the tester, and attach the clip end of the lead to the prod in the negative (—) post of the outer battery.

(4) *Read voltmeter.* Crank the engine with the starter (ignition switch off) and observe the reading of the upper scale of the tester voltmeter. The reading should not exceed 0.1 volt. If voltage reading exceeds 0.1 volt, check for a loose starter, a loose or damaged ground strap, a loose or corroded ground cable connection at frame, a loose or corroded cable terminal at the battery, and a loose cable in cable terminal. If all connections are clean and tight and the cables are in good condition, it indicates that the starter is at fault. Replace defective starter (para 2-27).

(5) *Remove testing equipment.* After completing the check, remove the testing equipment the the test prod from the battery post.

2-32. General

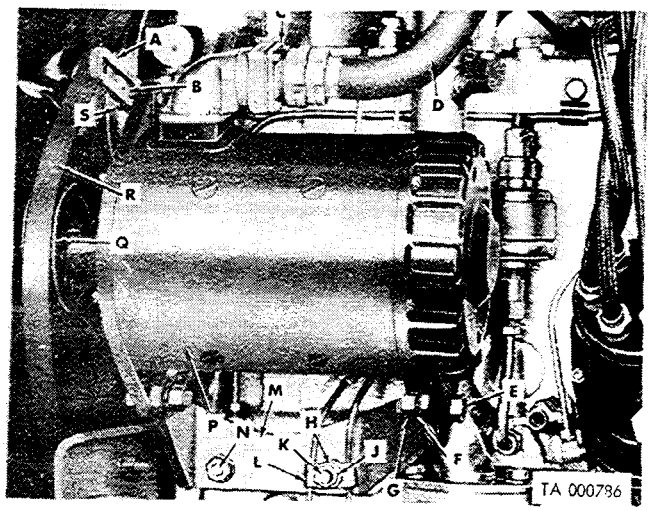
a. The 24-volt generating system (fig. 2-5) includes the generator, generator regulator, batteries, and necessary connecting cables and wiring. The ammeter, or battery-generator indicator, on the instrument panel is connected to the generator regulator. Current from the generator flows to the regulator and then to the batteries. The generator regulator controls current output to the batteries according to operation requirements, and prevents overcharging. The system is completely sealed against the entrance of water to provide for efficient performance during fording operations.

b Organizational maintenance includes replacement of the generator, generator pulley, generator mounting bracket, generator regulator, generator regulator mounting bracket, ground straps, and generator-to-generator cable.

2-33. Generator, Generator Mounting Bracket, and Cable

NOTE

The key letters in parentheses are in figure 2-29.



A Adjusting arm
B Plain washer
C Receptacle
D Generator-to-generator regulator cable
E Bolt
F Lockwasher
G Nut
H Lockwasher
J Stud nut
K Stud type screw
L Tension clip
M Mounting bracket
N Bracket bolt
P Generator
Q Pulley
R Drive belt
S Adjusting arm bolt

Figure 2-29. Generator and mounting bracket.

a. Remove Generator.

(1) Disconnect the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-29).

(2) Disconnect the generator-to-generator regulator cable (D) from the generator nut in receptacle (C) by unscrewing the cable connector end nut with a suitable spanner wrench.

(3) Remove the adjusting arm bolt (S) and plain washer (B) and lockwasher that secure the adjusting arm (A) to the generator (P). Push the generator toward the engine, and remove the drive belt (R) from the pulley (Q).

(4) Remove the two nuts (G), lockwashers (F), and bolts (E) that secure the generator to the mounting bracket (M), and remove the generator.

b. Remove Generator Pulley. Remove the cotter pin, castellated nut, and lockwasher that secure the generator pulley (Q) to the armature shaft.

NOTE

On some generators, the pulley is attached with a safety nut and plain washer.

With a suitable puller, remove the pulley from the shaft. Remove the Woodruff key.

c. Remove Generator Mounting Bracket.

(1) Remove the stud nut (J) and lockwasher (H) from the stud type screw (K), and remove the tension clip (L) with the two vent lines from the screw. Remove the stud type screw (K) and lockwasher.

(2) Remove the bracket bolt (N) and lockwasher attaching the mounting bracket (M) to the cylinder block, and remove the bracket.

(3) Removal of the generator adjusting arm (A) is described in paragraph 2-98 *d.*

d. Install Generator Mounting Bracket.

(1) Position the mounting bracket (M) on the cylinder block and install lockwasher and the special stud type screw (K) in the rear bolt hole. Install a lockwasher and bracket bolt (N) in the front bolt hole. Tighten the bolt and stud type screw.

(2) Position the vent line tension clip (L) with vent lines on the stud type screw, and install the lockwasher (H) and stud nut (J) to secure the clip. Be sure the two vent lines are properly engaged in the clip, and tighten the nut.

(3) If the adjusting arm (A) was removed (*c* (3) above), install the arm (para 2-98 *f*).

e. Install Generator Pulley. Install the Woodruff key in the armature shaft and install the pulley (Q) on the shaft (hub extension toward generator), alining the keyway in the pulley with the key. Install the lockwasher, castellated nut and cotter pin, or the special washer and safety nut (Refer to note in *b* above.)

f. Install Generator.

NOTE

Before installing the generator, see that the generator mounting bolts and nuts are thoroughly clean and that the contacting surfaces of the bracket and generator heads are clean to insure a good ground connection.

(1) Mount the generator in position on the mounting bracket (M) and install the two bolts (E), 7 / 16-inch lockwashers (F), and nuts (G). Do not tighten the nuts until the generator has been positioned ((3) below).

(2) Attach the adjusting arm (A) to the generator with the adjusting arm bolt (S) and plain washer (B). Push the generator toward the engine, and fit the drive belt (R) on the pulley (Q).

(3) Position the generator to provide ½-inch deflection of the drive belt, and tighten the adjusting arm bolt (S). Then tighten the two mounting bolt nuts (G).

(4) Connect the battery-to-ground cable to the negative (—) post of the outer battery (fig. 2-23).

(5) Polarize the generator (*g* below).

(6) Connect the generator-to-regulator cable, turning the connector end nut securely into place with a suitable spanner wrench.

WARNING

Prior to placing adapter in generating system, the vehicle ground cable (battery negative cable) must be disconnected.

WARNING

Hold insulated portion of cable. Do not touch terminal contact portion of cable while performing test.

WARNING

Always wear gloves when handling wire cable. Never let cable run through the hands. Broken wires can cause painful injuries.

g. Polarize the Generator.

NOTE

If a new or rebuilt generator has been installed, the generator must be polarized before the engine is started. This is necessary in order to insure correct polarity of the generator with respect to the batteries.

(1) Disconnect the generator-to-generator-regulator cable and insert the adapter of the adapter set (fig. 2-9) in the generator receptacle.

(2) Connect a jumper wire to one of the FIELD terminals of the adapter (link between the adapter field terminals closed).

(3) Touch the other end of the jumper wire momentarily to the terminal of the starter switch. A flash connection is sufficient to polarize the generator.

(4) Remove the adapter from the generator receptacle and connect the generator-to-generator-regulator cable (D).

h. Replace Generator-To-Generator-Regulator Cable.

(1) Remove the four lockwasher screws which secure the left fender-to-hood panel and remove the panel.

(2) Disengage the cable from the cable clip on the left front fender. Unscrew the generator-to-generator-regulator cable connector end nuts from the receptacle (C) and the front receptacle of the generator regulator (fig. 2-30), and remove the cable.

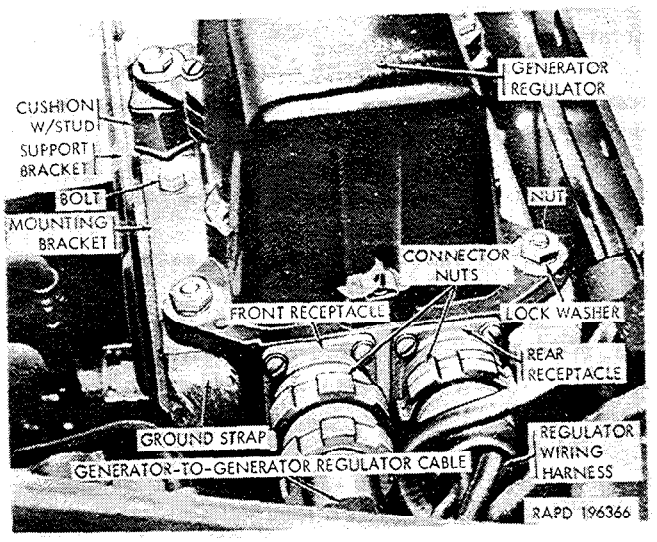


Figure 2-30. Generator regulator installed.

(3) Connect the cable to the generator receptacle (C) and the front receptacle of the generator regulator (fig. 2-30), screwing the connector end nuts to the receptacles. Engage the cable in the cable clip on the left front fender.

(4) Position the left fender-to-hood panel and install the four lockwasher screws. Tighten the screws.

2-34. Generator Regulator and Bracket

a. Remove Generator Regulator (Fig. 2-30).

(1) Disconnect the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Remove the left fender-to-hood panel (para 2-33 *h* (1)).

(3) Disengage the generator-to-regulator cable from the cable clip on the left front fender. Disconnect the generator-to-regulator cable and the regulator wiring harness from the generator regulator receptacles, using a suitable spanner wrench.

(4) Remove the four nuts and lockwashers that secure the regulator, and remove the regulator.

b. Remove Cushions, Regulator Brackets, and Ground Straps (Fig. 2-30).

(1) Unscrew the four cushions with studs from the mounting brackets and remove the cushions and ground straps.

(2) Remove the four nuts, lockwashers, and bolts that secure the two mounting brackets to the regulator support bracket, and remove the two brackets.

c. Inspection.

(1) Inspect the support bracket attaching screws for damage, looseness, and missing screws and lockwashers. Tighten loose screws and replace damaged and missing screws and lockwashers.

(2) Inspect the four ground straps for corrosion and other damage. Replace the straps as warranted.

(3) Inspect the four cushions with studs for damage, deterioration, and damaged threads on the studs. Replace damaged cushions.

(4) Inspect the two mounting brackets for cracks, distortion, and damaged bolt or stud holes. Replace the brackets as warranted.

d. Install Regulator Brackets, Cushions, and Ground Straps (Fig. 2-30).

(1) Make certain that the contacting surfaces of the mounting brackets and the ground straps are thoroughly clean to insure a good ground connection.

(2) Position the two mounting brackets on the support bracket and install the two bolts (from the upper side of the brackets), lockwashers, and nuts for each bracket. Tighten the nuts.

(3) Place one end of a ground strap over each cushion stud opening in the two mounting brackets. Install the four cushions, screwing the short end of each stud into the support bracket hole.

e. Install Generator Regulator.

(1) Place the outer end of each ground strap on the upper end of its cushion stud, position the regulator on the four cushion studs with the two receptacles to the left side of vehicle, and install the four lockwashers and nuts (fig. 2-30). Tighten the nuts.

(2) Connect the regulator wiring harness to the rear receptacle and the generator-to-generator-regulator cable to the front receptacle, screwing the connector end nuts to the receptacles. Engage the generator-to-generator-regulator cable in the cable clip on the left front fender.

(3) Install the left fender-to-hood panel (para 2-33 *h* (4)).

2-35. Charging Circuits

a. Ammeter or Battery Generator Indicator Does Not Indicate Charge. Check generator operating voltage (*d* below).

b. Excessive Evaporation of Water in Batteries. Generator voltage regulator setting too high. Check voltage at generator regulator (*h* below).

c. Batteries Require Frequent Recharging. Generator voltage regulator setting too low. Check voltage at generator regulator (*h* below).

d. Check Generator and Generator Regulator for No-Charge (Fig. 2-31). The generator and generator-regulator check is to determine the cause of a no-charge reading of the ammeter or battery-generator indicator. In order to obtain accurate readings, the engine must be at normal operating temperature to idle properly during the test.

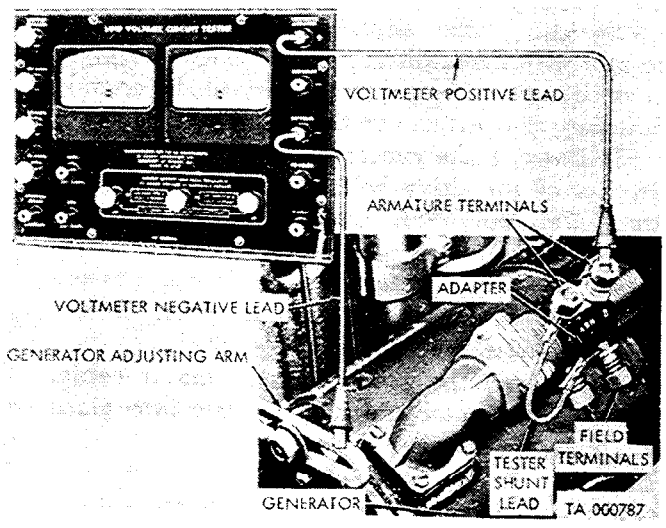


Figure 2-31. Troubleshooting generator.

(1) *Warm up engine.* Start the engine and run it until normal operating temperature is reached. Stop the engine.

(2) *Disconnect generator-to-regulator cable and install adapter.* Disconnect the generator-to-regulator cable from the receptacle on the generator by unscrewing the cable connector nut with a spanner wrench. Install adapter (E, fig. 2-9) in the generator receptacle. Close both links of the adapter.

NOTE

Do not connect the cable to the adapter.

(3) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to one of the adapter ARM terminals.

(4) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the generator adjusting arm.

(5) *Connect tester shunt lead.* Connect the tester shunt lead to the other ARM terminal of the adapter and to one of the adapter FIELD terminals.

CAUTION

Do not perform any tests while the shunt lead is connected between the ARM and FIELD terminals of the generator adapter and the generator is connected to the battery, since the resulting high voltage is detrimental to the entire electrical system and will cause failure of parts.

(6) *Run engine and read voltmeter.* Start the engine and operate at idle speed. Observe the voltmeter lower scale reading. The voltage reading should be 30 volts with the engine at idling speed or slightly faster.

(7) *Source of trouble.* If voltage reading is low or no reading is shown on voltmeter, the generator is probably at fault. Replace the generator (para 2-33). If the voltage reading is 30 volts or more, the generator is functioning properly, and a faulty generator regulator is probably the cause of the no-charge condition. Replace the generator regulator (para 2-33).

(8) *Remove testing equipment and connect generator-to-regulator cable.* Remove testing equipment. Connect generator-to-regulator cable to receptacle on generator and tighten nut with a spanner wrench.

e. Check Maximum Charge (Fig. 2-32). Checking the maximum charge is to determine whether the current regulator of the generator regulator is functioning properly.

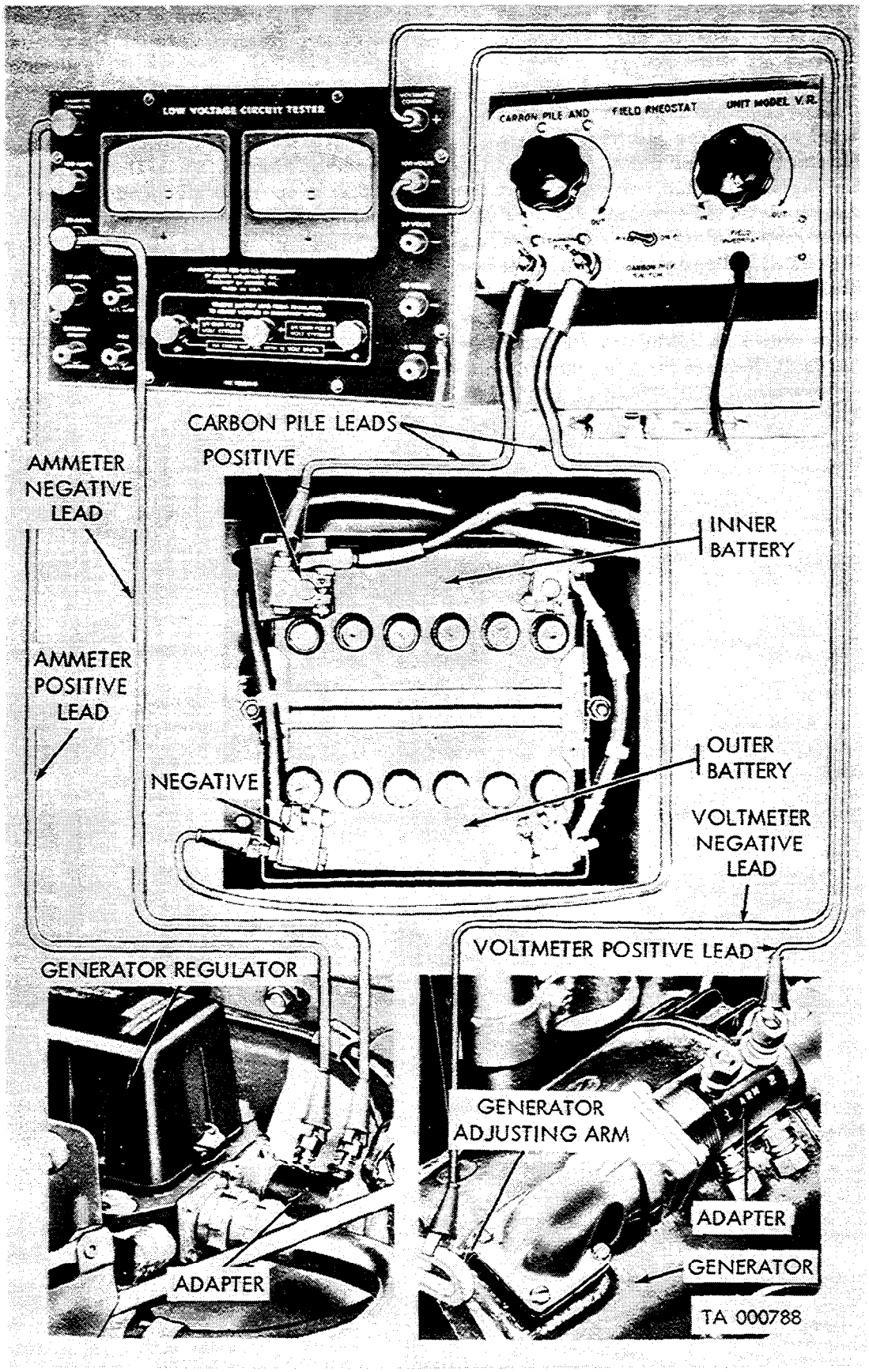


Figure 2-32. Checking maximum charge.

(1) *Disconnect battery-to-ground cable.* Disconnect the battery-to-ground cable from the negative (—) post of the outer battery to prevent an accidental ground while connecting test leads.

(2) *Install adapter in generator terminal receptacle.* Disconnect the generator to regulator cable from the receptacle on the generator and install adapter (E, fig. 2-9) in receptacle. Make certain that the link between adapter ARM terminals is closed. Insert the cable in the adapter.

(3) *Connect voltmeter test leads.* Connect tester voltmeter positive (+) and negative (—) test leads as instructed in *e* (3) and (4) above.

NOTE

Do not connect the tester shunt lead.

(4) *Install adapter at generator regulator.* Unscrew the cable connector nut from the generator regulator rear receptacle and remove the cable. Install adapter (D, fig. 2-9) in the receptacle and connect the cable to the adapter. Open the link on the adapter.

(5) *Connect ammeter positive (+) test lead.* Connect the ammeter positive (+) test lead to the AMMETER COMMON terminal of the low voltage circuit tester and attach the clip end of the lead to the inner terminal of the adapter in the generator regulator.

(6) *Connect ammeter negative (—) test lead.* Connect the ammeter negative (—) test lead to the 50 AMPS terminal of the tester and attach the clip end of the lead to the outer terminal of the adapter in the generator regulator.

CAUTION

Insert clean wiping cloth or other suitable insulation between the two ammeter lead clips and around each clip to prevent accidental grounding when the battery is connected to the circuit.

(7) *Connect battery-to-ground cable.* Connect the battery-to-ground cable to the negative (—) post of the outer battery.

(8) *Position carbon pile resistor and field rheostat in vehicle.* Place the carbon pile resistor and field rheostat (fig. 2-8) in the driver's compartment convenient to the batteries (on ambulance truck M43 with batteries under the left litter rack, place the resistor in the patient compartment).

(9) *Connect carbon pile resistor leads to battery.* Connect one of the carbon pile resistor leads to the positive (+) terminal of the inner battery and the other lead to the negative (—) terminal of the outer battery.

(10) *Start engine and read test meters.* Start the engine and operate at a speed equivalent to 20 mph for 15 minutes. Observe the reading on the lower scale of the tester ammeter. If the ammeter reading is less than 24 amperes, hold the carbon pile switch in the ON position and turn the carbon pile knob clockwise until the tester voltmeter lower scale shows a reading of not less than 25 volts. Observe the ammeter lower scale reading of not less than 25 volts. Observe the ammeter lower scale reading. The ammeter should indicate a charge of 24 to 27 amperes.

NOTE

Avoid turning the cabon pile knob clockwise further than is necessary to produce the full charging rate.

(11) *Stop engine and perform necessary repairs.* Stop the engine. If the ammeter reading is less than 24 amperes, replace the generator regulator (para 2-34) or notify direct support maintenance personnel.

(12) *Remove testing equipment.* When the check has been completed, disconnect battery-to-ground cable from the negative (—) post of the outer battery, and remove the testing equipment. Connect battery-to-ground cable to battery. Connect generator and generator regulator.

f. Check Charging System Insulated Cables Resistance (Fig. 2-33). Checking resistance in the charging system insulated cables is to determine malfunctions which affect the operation of the voltage regulator. With the exception of the voltmeter test leads, all connections are the same as those described in *e* above.

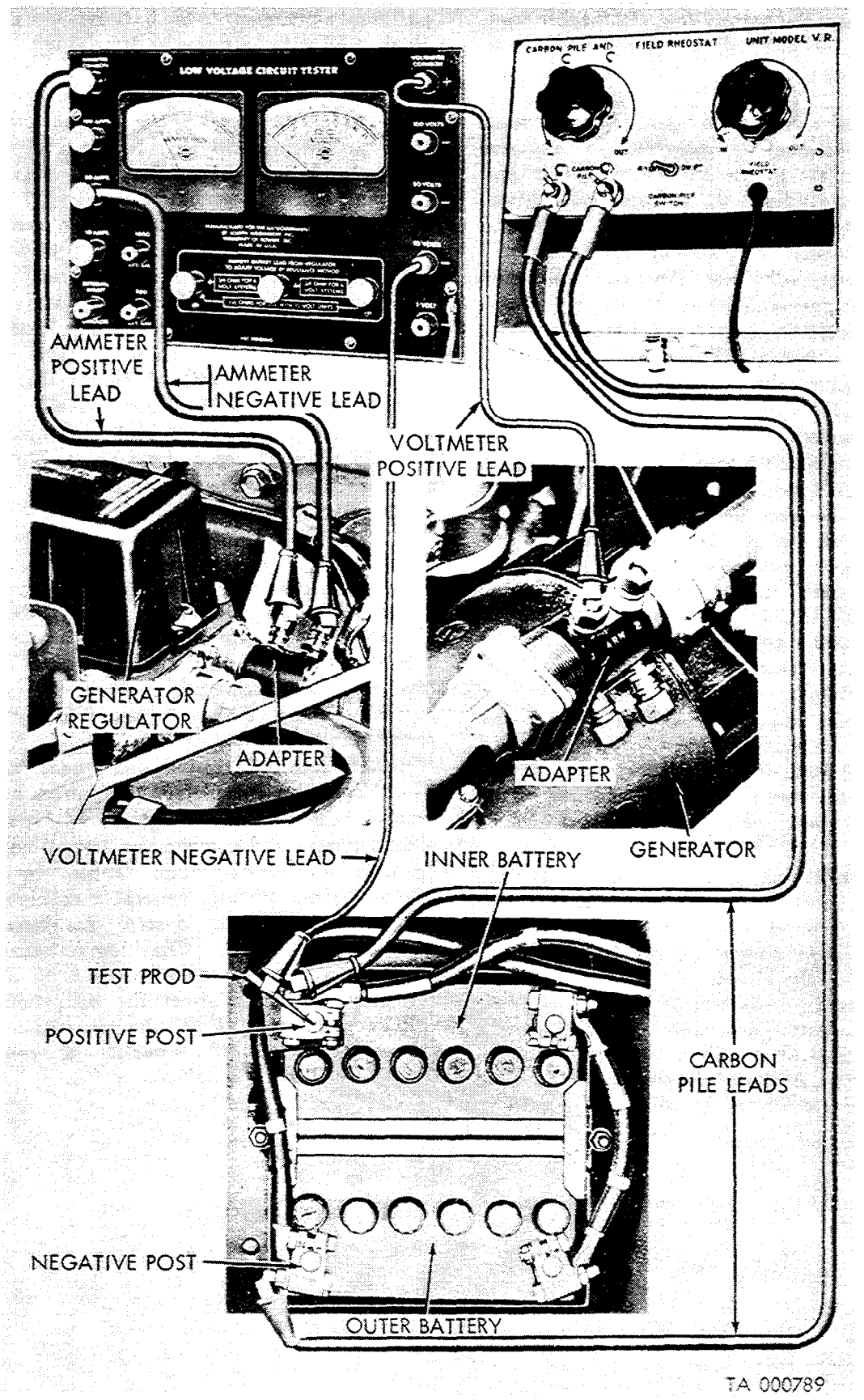


Figure 2-33. Checking charging system insulated cables resistance.

(1) *Disconnect battery-to-ground cable.* Remove the battery-to-ground cable from the negative (—) post of the outer battery.

(2) *Install test prod in battery post.* Drive a test prod into the positive (+) post of the inner battery.

(3) *Connect voltmeter positive (+) lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to one of the ARM terminals of the adapter in the generator receptacle.

(4) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 1 VOLT terminal of the tester.

NOTE

Do not attach the clip end of the lead at this time.

(5) *Start engine.* Start the engine and operate at a speed equivalent to 20 mph.

(6) *Connect voltmeter negative (—) test lead to battery.* Attach the clip end of the voltmeter negative (—) lead to test prod in the positive (+) post of the inner battery.

CAUTION

Do not attach the voltmeter negative (—) test lead to the battery until the engine is running, to prevent full battery voltage from being impressed across the voltmeter of the low voltage circuit tester, causing an inaccurate scale reading or damage to the tester.

(7) *Operate carbon pile resistor and read voltmeter.* Operate the carbon pile switch and knob (*e* (10) above) and observe the upper scale of the voltmeter. The voltage reading should not exceed 1 volt when the generator is charging 24 to 27 amperes.

(8) *Remove testing equipment and perform necessary repairs.* If voltage reading exceeds 1 volt, check for loose or corroded connections at the starter switch and battery terminal, and check for loose or damaged terminals on the battery-to-starter cable. Clean and tighten connections. Replace a damaged cable (para 2-65 *f* and *g*). Repeat the test. If resistance in the cable is satisfactory, remove the testing equipment (*e* (12) above) and test prod. Connect the cable to the generator regulator.

g. Check Charging System Ground Circuit Resistance (Fig. 2-34). Checking the charging system ground circuit resistance is to determine malfunctions which affect the operation of the voltage regulator. The generator must be operating properly and the engine must be at normal operating temperatures. With the exception of the voltmeter test lead connections, the testing equipment connections are the same as those described in *e* above.

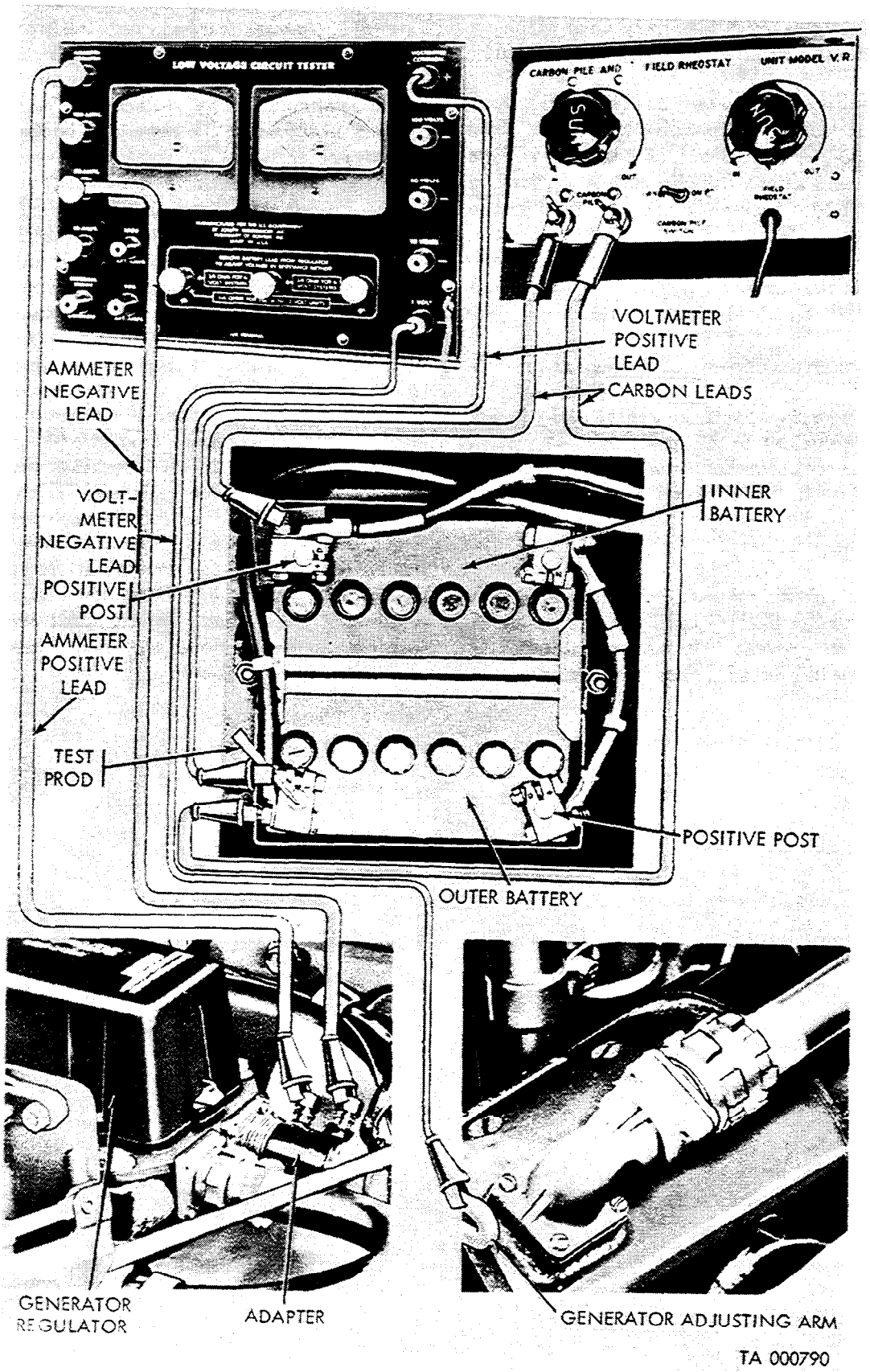


Figure 2-34. Checking charging system ground circuit resistance.

(1) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the negative (—) post of the outer battery.

(2) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 1 VOLT terminal of the tester and attach the clip end of the lead to the generator adjusting arm.

(3) *Connect ammeter test leads.* Connect the ammeter test leads (*e* (5) and (6) above).

(4) *Connect carbon pile resistor leads to battery.* Connect the carbon pile resistor leads (*e* (9) above).

(5) *Start engine and read test meters.* Start the engine and operate at a speed equivalent to 20 mph to obtain an ammeter reading of 24 to 27 amperes. Operate the carbon pile switch and knob (*e* (10) above) and observe the reading on the upper scale of the voltmeter. The reading should not exceed 0.1 volt. Stop the engine after noting the voltage.

(6) *Perform necessary repairs.* If voltage reading exceed 0.1 volt, check for loose generator or generator mounting bracket, corroded battery terminal, or a loose or dirty battery ground cable connection at the frame. Tighten generator bolts and generator mounting bracket bolts. Clean and tighten connections.

(7) *Remove testing equipment.* Remove the testing equipment (*e* (12) above) and connect the cables to the generator and generator regulator.

h. Check Voltage Regulator Setting (Fig. 2-35). The purpose of checking the setting of the voltage regulator is to determine the cause of inadequate battery charge and/or excessive evaporation of water from the batteries.

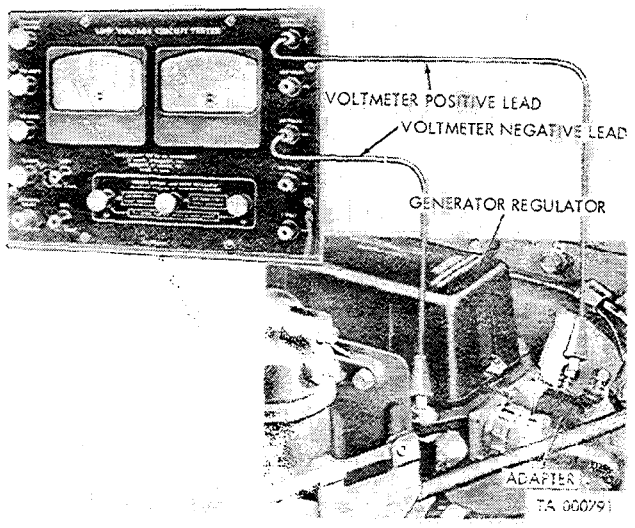


Figure 2-35. Checking voltage regulator setting.

(1) *Warm up engine and disconnect battery-to-ground cable.* Run the engine until normal operating temperature is reached, stop the engine, and disconnect the battery-to-ground cable from the negative (—) post of the outer battery.

(2) *Install adapter in generator regulator.* Remove the cable from the generator regulator rear receptacle and install the adapter (D, fig. 2-9) in the receptacle.

NOTE

Do not connect the cable to the adapter.

(3) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the inner terminal of the adapter.

(4) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the regulator mounting stud nut.

(5) *Connect battery-to-ground cable.* Connect the battery-to-ground cable to the negative (—) post of the outer battery and start the engine.

(6) *Cycle voltage regulator.* Operate the engine at a speed equivalent to 20 mph for several seconds; then reduce the engine speed to cycle the voltage regulator.

(7) *Read voltmeter.* Repeat (6) above three or four times, then increase engine speed to the equivalent of 20 mph and read the voltage on the lower scale of the voltmeter. Voltage reading should be from 27 to 28 volts for hot climate or summer months, and 28 to 29 volts for cold climates or winter months.

(8) *Perform necessary repairs.* If the voltage is not within the specified limits, replace the generator regulator (para 2-34) or notify direct support maintenance personnel.

(9) *Remove testing equipment.* After completing the test, remove the testing equipment (*e* (12) above), and connect the cable to the generator regulator rear receptacle.

i. Check Circuit Breaker Unit Closing Voltage (Fig. 2-36). The circuit breaker unit check is to determine whether the circuit breaker unit in the generator regulator functions properly. In order to obtain an accurate diagnosis of circuit breaker unit performance, the generator voltage regulator must be functioning properly (*h* above).

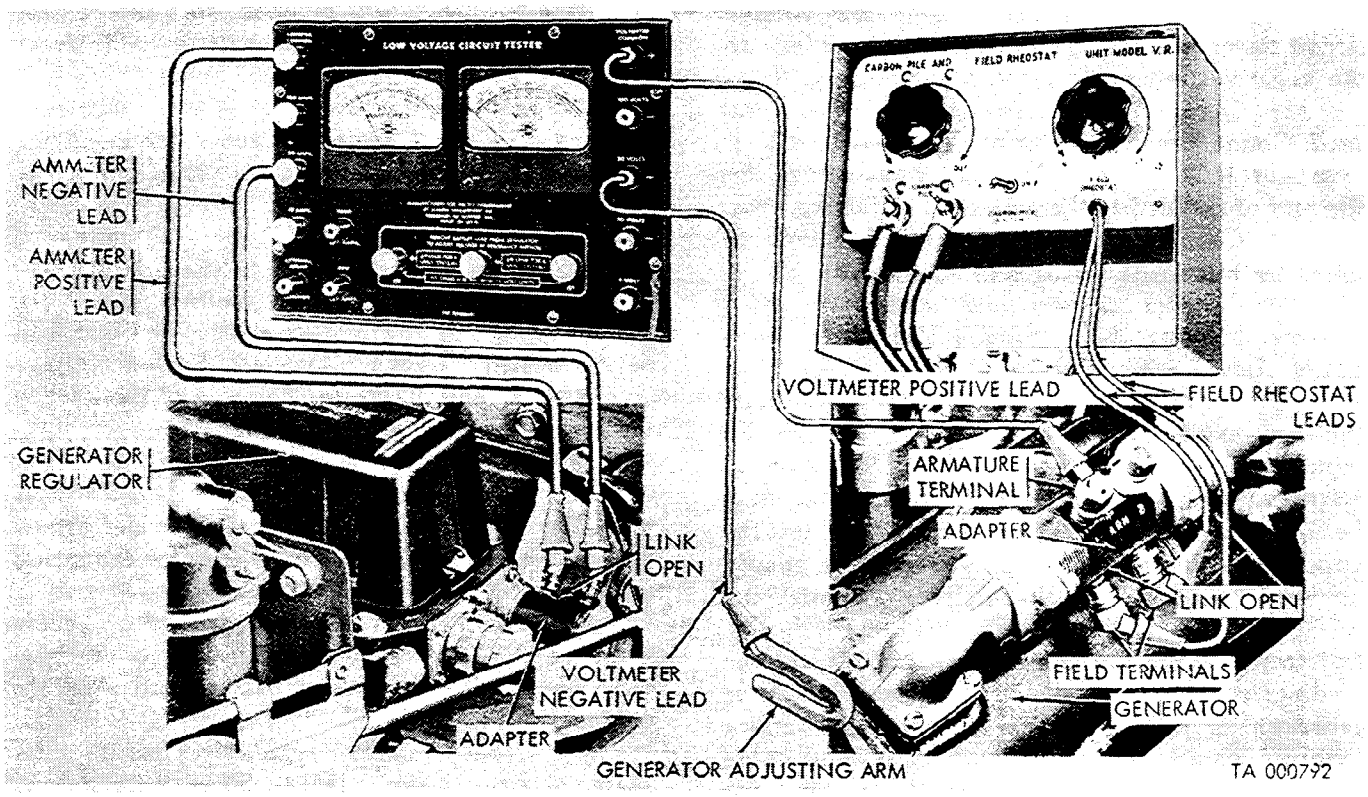


Figure 2-36. Checking circuit breaker unit.

(1) *Disconnect battery-to-ground cable.* Disconnect the battery-to-ground cable from the negative (—) post of the outer battery.

(2) *Install adapter in generator terminal receptacle.* Disconnect the generator-to-generator regulator cable from the generator receptacle and install adapter (E, fig. 2-9) in the generator receptacle. Connect the cable to the adapter, close the link between the adapter ARM terminals and open the link between the adapter FIELD terminals. Tighten the terminal nuts.

(3) *Connect voltmeter positive (+) test lead.* Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to one of the ARM terminals of the adapter in the generator terminal receptacle.

(4) *Connect voltmeter negative (—) test lead.* Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the generator adjusting arm.

(5) *Install adapter in generator regulator.* Disconnect the generator to regulator cable from the regulator rear receptacle. Install adapter (D, fig. 2-9) in the receptacle, and connect the cable to the outer end of the adapter. Open the link between the two adapter terminals and tighten the terminal nuts.

(6) *Connect ammeter test leads.*

(7) *Connect field rheostat.* Connect the field rheostat leads of the resistor to the two FIELD terminals of the adapter in the generator receptacle.

(8) *Connect battery-to-ground cable and start engine.* Connect the battery-to-ground cable to the negative (—) post of the outer battery and start the engine. Set the throttle control at fast idle.

(9) *Cycle circuit breaker unit.* Turn the field rheostat knob clockwise until the ammeter indicates that the generator is charging. Turn the field rheostat back and forth two or three times to cycle the circuit breaker unit.

NOTE

If the circuit breaker unit points do not open (ammeter hand returns to zero) when the field rheostat knob is turned counterclockwise as far as it will go, reduce the engine speed. Adjust engine speed so that the circuit breaker points open and close when the knob is turned back and forth.

(10) *Operate field rheostat and read test meters.* Turn the field rheostat knob clockwise slowly until the ammeter hand just flickers, indicating that the circuit breaker unit points are closing. Observe the voltage reading on the voltmeter lower scale. The voltage reading should be not less than 24.5 volts, or at least 1 volt under the voltage regulator setting (*h* (7) above).

(11) *Perform necessary repairs.* If the voltage reading is not within the specified limits, replace the generator regulator (para 2-33) or notify direct support maintenance personnel.

(12) *Remove testing equipment.* When the test has been completed, remove the testing equipment (*e* (12) above) and connect the cables to the generator and generator regulator.

Section X. LIGHTING SYSTEM

2-36. General

Troubleshooting of the lighting system includes checking of the various lamps, lamp units, light switch, circuit breaker, dimmer switch, and connecting cables.

2-37. Lighting Circuit Tests

a. All Lights Out (Engine Starts). If no vehicle lights are operative when the light switch is at SER DRIVE position and the batteries are known to be fully charged, proceed with (1) below.

(1) *Check for current at blackout marker light (fig. 2-37).*

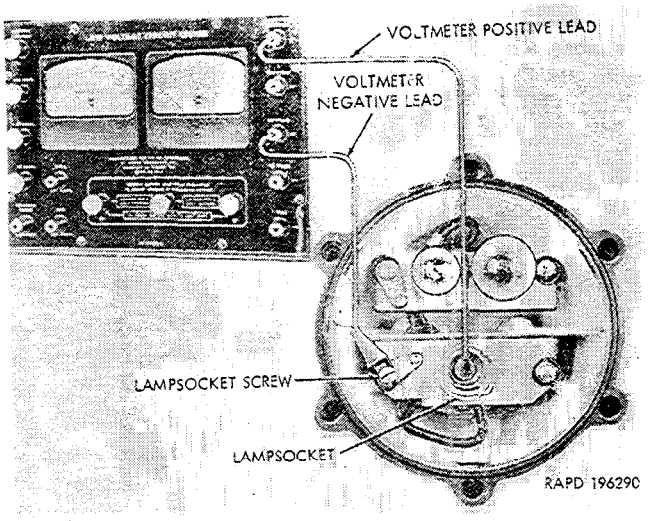


Figure 2-37. Checking for current at blackout marker light.

(a) Remove the lower lamp (para 2-39 *c)* from one of the marker lights.

(b) Connect the voltmeter positive (+) test lead to the positive (+) terminal if the low voltage circuit tester.

(c) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to one of the lamp socket screws.

(d) Turn the light switch to BO MARKER position.

(e) Touch the clip end of the positive (+) test lead to the terminal in the lamp socket, being careful not to touch any metal parts of the light body with the lead, since contact with such parts will cause the circuit breaker to open.

(f) Observe the lower scale of the tester voltmeter. If the voltmeter shows battery voltage (approximately 24 volts), current is reaching the light. Replace the lamp. If no voltage reading is indicated, the difficulty may be in the light switch circuit breaker, or the light switch. Proceed with (2) below.

(g) Remove testing equipment and install the lamp and blackout marker light door (para 2-39 *c).*

NOTE

All other lights on the vehicle, with the exception of the headlights, may be checked in the same manner as the blackout marker light.

(2) *Check for current through light switch circuit breaker (fig. 2-38).*

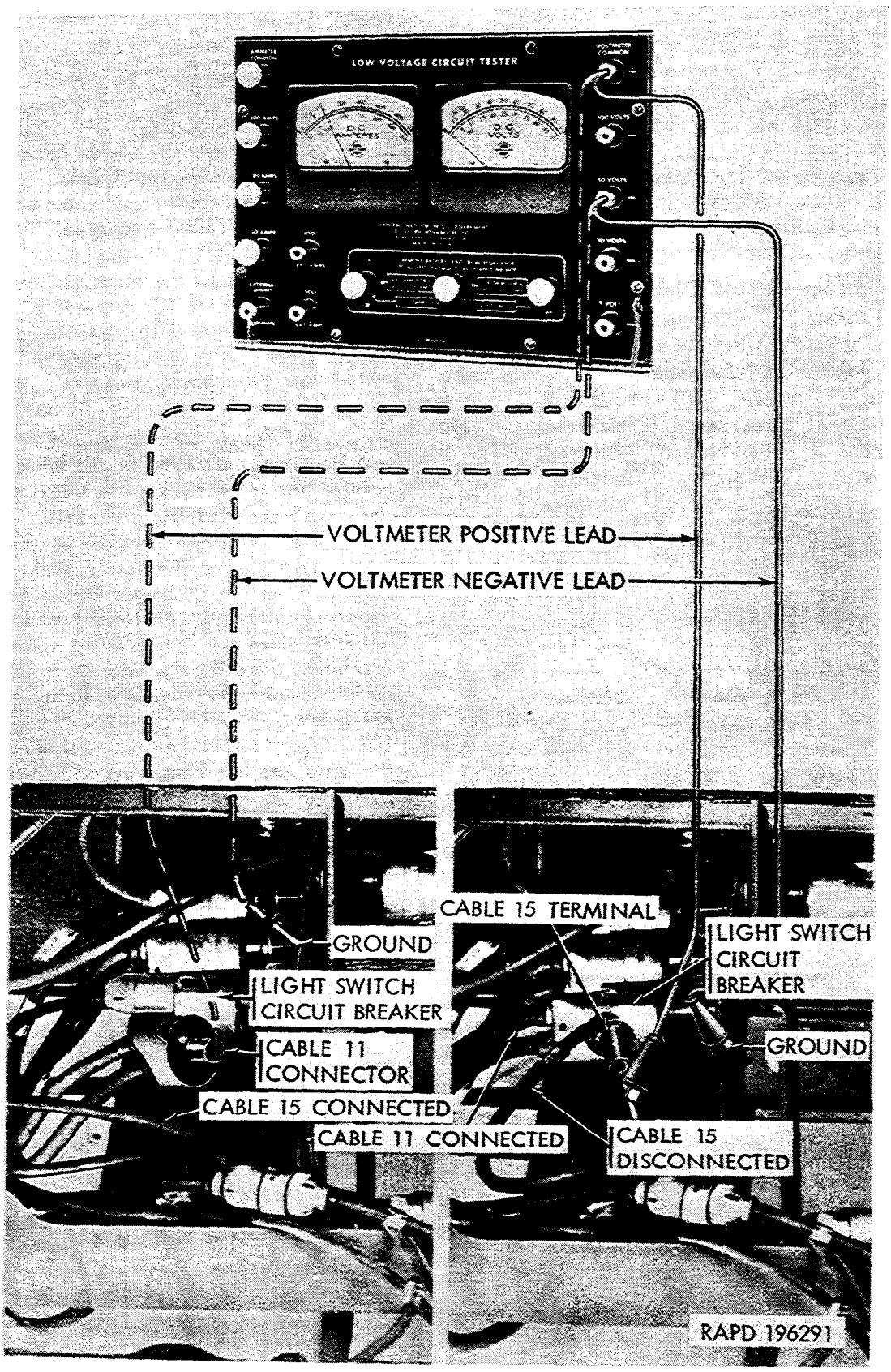


Figure 2-38. Checking for current at circuit breaker.

(a) Disengage the four instrument cluster studs, and lower the instrument cluster to permit access to the circuit breakers.

(b) Disconnect cable (15) from the light switch circuit breaker. Install the connector sleeve to the terminal of the circuit breaker.

(c) With the test leads connected to the low voltage circuit tester ((1) *(b)* and *(c)* above), attach the clip end of the negative (—) test lead to a suitable ground on the instrument panel.

(d) Touch the positive (+) test lead to the connector sleeve in the circuit breaker, making certain that the clip touches the metal in the sleeve. Observe the reading on the lower scale of the voltmeter. The voltmeter should show battery voltage (approximately 24 volts). If voltmeter reading is normal, replace the light switch (para 2-41). Remove testing equipment and connect cable (15) to the circuit breaker. If no voltage reading is indicated, proceed with (3) below.

(3) *Check current to circuit breaker (fig. 2-38).*

(a) Disconnect cable (11) from the light switch circuit breaker.

(b) Connect the voltmeter negative (—) test lead to the low voltage circuit tester and the instrument panel (2) *(c)* above).

(c) Connect the voltmeter positive (+) test lead to the voltmeter positive (+) terminal of the tester and touch the clip end of the lead to the terminal of cable (11).

(d) Observe the voltmeter lower scale reading. The voltmeter should show battery voltage (approximately 24 volts). If voltage reading is normal, the circuit breaker is at fault. Replace the circuit breaker (para 2-42). If no voltage reading is indicated, notify direct support maintenance personnel.

(e) When the checks have been completed and necessary correction accomplished, remove the testing equipment, install the instrument cluster in position, and engage the four instrument cluster studs.

b. Both Headlights Inoperative, or Operate in Only One Beam Position.

(1) *Lamp units faulty.* Check for current to the lamp units, using the low voltage circuit tester (fig. 2-39). Circuits to both headlights are checked in the same manner.

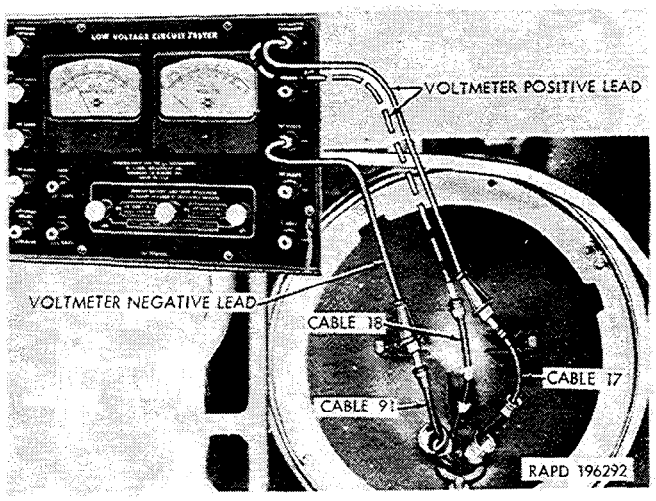


Figure 2-39. Checking for current to headlight.

(a) Remove the lamp unit (para 2-39 *a).*

(b) Connect the voltmeter positive (+) test lead to the positive (+) terminal of the tester and attach the clip end of the lead to the terminal of cable (17) (high beam) in the headlight body.

(c) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the terminal of cable (91) (ground) in the headlight body.

(d) Turn the light switch to SER DRIVE position and observe the reading on the voltmeter lower scale. If no reading is indicated, operate the dimmer switch and again observe the voltmeter. The voltmeter should show battery voltage (approximately 24 volts).

(e) Check the circuit for low beam in the same manner, attaching the voltmeter positive (+) test lead to cable (18).

(f) If the voltmeter reading is normal for both high and low beam circuits, replace the lamp unit. If no voltage reading is indicated in either high or low beam circuit, check for current through the circuit breaker and light switch *(b* (2) above), and the dimmer switch ((2) below).

(g) When the check has been completed, remove the testing equipment, and install the lamp unit and headlight door (para 2-39 *c*).

(2) *Dimmer switch faulty.* Check for current through the dimmer switch, using the low voltage circuit tester (fig. 2-40).

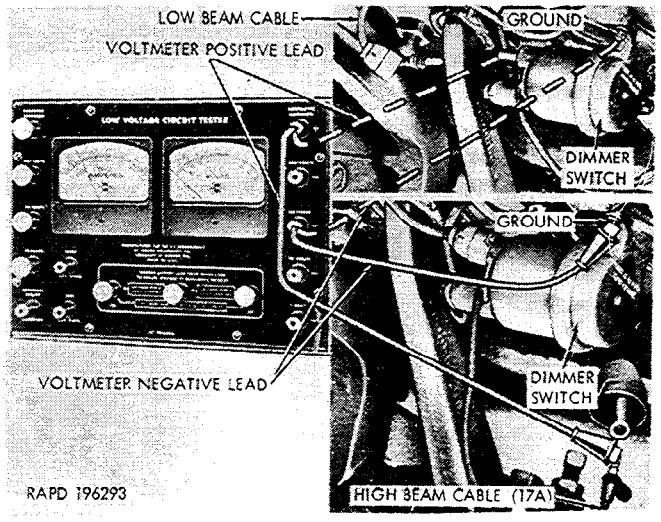


Figure 2-40. Checking for current through dimmer switch.

(a) Disconnect cables (17C and 18A) at the dimmer switch.

(b) Connect the voltmeter test leads to the low voltage circuit tester ((1) *(b)* and *(c)* above).

(c) Attach the clip end of the voltmeter negative (—) test lead to the dimmer switch housing.

(d) Turn the light switch to SER DRIVE position and connect the clip end of the voltmeter positive (+) test lead to the terminal of cable (17) which is attached to the dimmer switch. Operate the dimmer switch and observe the voltmeter lower scale reading. The voltmeter reading should be approximately 24 volts with the dimmer switch in high beam position.

(e) Check the current at the terminal for cable (18A) on the dimmer switch housing (low beam) in the manner described for the high beam circuit (*(d)* above).

(f) If the voltmeter readings indicate that current is flowing through the dimmer switch in one circuit, but not in the other, replace the dimmer switch (para 2-41 *c* and *d*). If both circuits show no voltage readings, determine whether current is reaching the dimmer switch (*(i)* below).

(g) If voltmeter reading is normal for both circuits, the difficulty must be in the wiring harness, cable connections, or headlight cables. Check the cable connectors at the splash shields for loose or corroded terminals. If cable connections are satisfactory, replace headlight (para 2-40) or notify direct support maintenance personnel.

(h) Disconnect cable (16) from the dimmer switch. With the voltmeter negative (—) test lead connected (*(c)* and *(d)* above), attach the clip end of the positive (+) test lead to the terminal cable (16, fig. 2-41). Turn the light switch to SER DRIVE position and observe the voltmeter lower scale reading. If voltmeter shows battery voltage switch (para 2-41 *c and d*). If no voltage reading is indicated, notify direct support maintenance personnel.

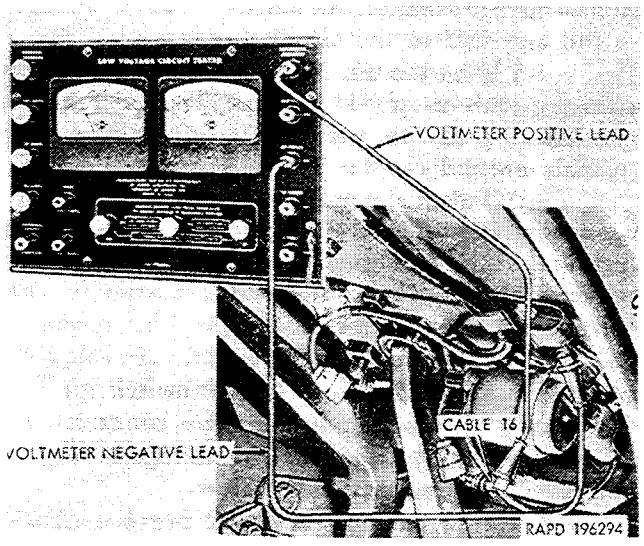


Figure 2-41. Checking for current to dimmer switch.

(i) Remove the testing equipment.

c. Lights Flash On and Off.

(1) *Cable connections faulty.* Check for loose or damaged connections at cable connectors, light switch circuit breaker, and light switch assembly. Service as required.

(2) *Wiring harness faulty.* Notify direct support maintenance personnel.

d. Service Headlights Dim. High resistance in headlight cables or ground circuit. Check cable and ground resistance (1) and (2) below).

(1) *Check headlight cables resistance (fig. 2-42).*

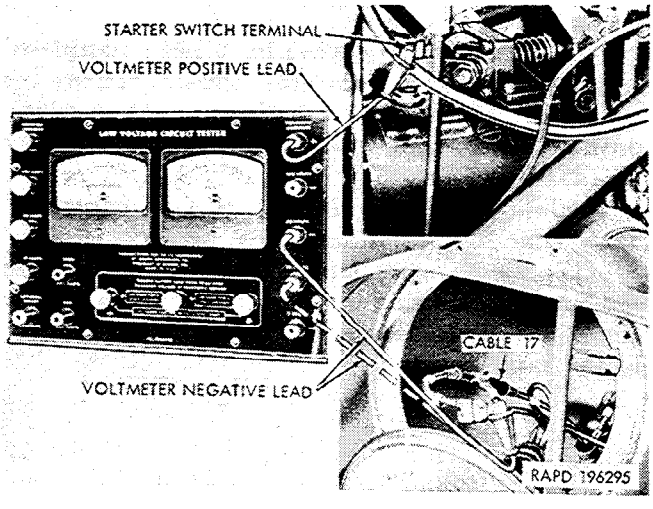


Figure 2-42. Checking headlight circuit resistance.

(a) Remove lamp unit from headlight body (para 2-39 *a*), but do not disconnect lamp-unit cables.

(b) Disengage the cable connector for cable (17) from the connector clip and separate the connector shells. Move one shell, the grommet bushing, and rubber grommet along the lamp unit cable to expose the cable terminal. Do not pull the terminal from the connector sleeve.

(c) Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the battery starter cable at the starter switch.

(d) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal on the tester and attach the clip end of the lead to the exposed lamp unit cable terminal.

(e) Turn on the headlights and observe the voltmeter. If the voltmeter indicates battery voltage (approximately 24 volts on lower scale), operate the dimmer switch to high beam (voltage reading should be practically zero).

(f) Move the voltmeter negative (—) test lead from the 50 VOLTS terminal on the tester to the 10 VOLT terminal and observe the voltmeter upper scale reading. The reading should not exceed 1 volt. Note the reading and turn the headlights off.

CAUTION

Exercise proper precaution, in making voltmeter connections, to prevent battery voltage from being impressed across the voltmeter on the 10-volt scale. With the connections described above, battery voltage passes through the circuit when the headlight is off or on the low beam. Resistance in the circuit registers when the headlight high beam is on.

(g) Remove the voltmeter negative (—) test lead from cable (17) and move the lead from the 1 VOLT terminal to the 50 VOLT terminal of the tester. Attach the negative (—) test lead to cable (18) (*(b)* and *(d)* above).

(h) Turn on the headlights and operate the dimmer switch to low beam. Check cable (18) (*(e)* and (f) above).

(i) If voltage reading for either the high or low beam circuit exceeds 1 volt, check for dirty or corroded connections at the lamp unit cables and cable connectors at the fender splash shield, and a loose or corroded connection at the starter switch or at the light switch. Clean and tighten connections. Replace a defective light switch (para 2-41).

(2) *Check headlight ground circuit resistance*

(a) To check resistance in the headlight ground circuit, attach the clip end of the voltmeter positive (+) test lead to the exposed terminal (see (1) *(b)* above) of cable (9) in fig. 2-39). Connect the voltmeter negative (—) test lead to the frame side rail. Scrape paint from the metal to insure a good connection. Connect the negative (—) test lead to the 1 VOLT terminal of the tester, turn the headlights on and observe the voltmeter upper scale. The reading should not exceed 0.1 volt.

(b) If the voltage reading exceeds 0.1 volts, check for faulty ground cable connection at the fender splash shield (fig. 2-55) or loose attaching parts at the splash shield and fender support. Clean and tighten ground cable connection. Tighten splash shield and fender support lockwasher screws.

(c) When the checks have been completed, remove the testing equipment, complete all cable connections and engage the cable connectors in the connector clips.Install lamp unit (para 2-53).

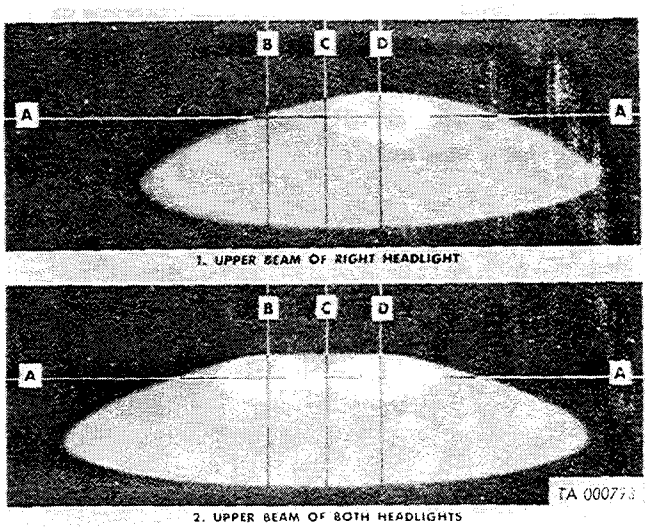
2-38. Service Headlight Aiming

a. General. The service headlights must be properly aimed to provide adequate visibility for night driving and to prevent glare to approaching traffic. Improperly aimed headlights may be caused by unequal inflation of the front tires or by a difference in tread of the tires, bent fenders, or fender supports, or damaged front springs. Check and correct these items before attempting to adjust the headlights.

b. Procedure.

(1) Position the vehicle on a level floor.

(2) Locate the screen at right angles to the vehicle exactly 25 feet ahead of the headlights. Move the screen so that line (C, fig. 2-43) on the screen is directly in line with the center line of the vehicle.



A Horizontal line 3 inches below headlight centers.
B Vertical line, in line with center of left headlight.
C Vertical line, in line with windshield center strip.
D Vertical line, in line with center of right headlight.

Figure 2-43. Headlight aiming screen pattern.

(3) Measure the distance from the center of the headlights to the floor. Compare this measurement with line (A, fig. 2-43) on the screen. Raise or lower the screen until line (A, fig. 2-43) is

3 inches below the measured height of the headlight centers. Lines (B and D, fig. 2-43) must be directly in line with the vertical center lines of the left and right headlights, respectively.

(4) Trun the headlights on and operate the dimmer switch (EE, fig. 2-91) to high beam.

(5) If either headlight pattern differs from view 2, figure 2-43, loosen the adjusting bolt attaching the headlight to the fender mounting bracket (fig. 2-44) and move the headlight as required to produce the correct pattern. Then tighten the bolt. Adjust the other headlight in the same manner.

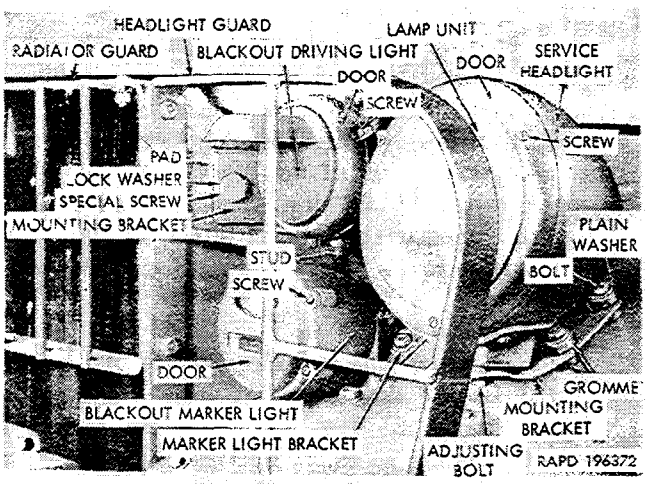


Figure 2-44. Service headlight, blackout driving lights, and blackout marker light.

2-39. Lamps and Lamp Units

a. Replace Service Headlight Lamp Unit (Fig. 2-45). Both service headlight lamp units are serviced in the same manner.

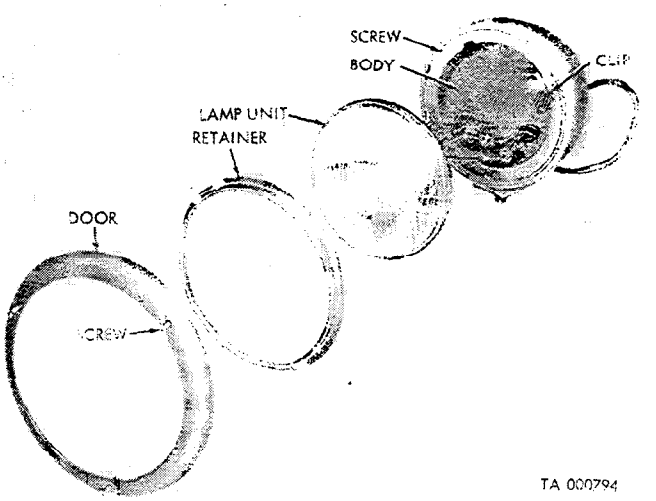


Figure 2-45. Service headlight—partial exploded view.

(1) Unscrew the three screws that secure the headlight door and remove the door, pulling the lower edge of the door away from the headlight body first.

(2) Loosen the four lamp unit retainer screws, turn the retainer clockwise to disengage it from the screws and remove the retainer.

(3) Pull the lamp unit from the headlight body far enough to provide access to the three cable connectors.

(4) Remove the three connectors from the clips inside the headlight body, separate the connector shells, and pull the lamp unit cable terminals from the connector sleeves. Remove the lamp unit with attached cables.

(5) Connect the three lamp unit cables to the three cables in headlight body, matching the cable numbers. Connect the cable shells and engage the connectors in the clips inside the headlight body.

(6) Position the new lamp unit in the headlight body with the three projections alined with the three recesses in the body ring. Install the lamp unit retainer with the enlarged ends of the screw slots over the four retainer screwheads. Turn the retainer counterclockwise to engage the four screws. Tighten screws.

(7) Install the headlight door with the inner recess at the top, opposite the pad at the top of the body. Tighten the three screws to secure the door.

b. Replace Blackout Driving Light Lamp Unit.

(1) Unscrew the three screws that secure the blackout driving light door to the body, and pull the door and lamp unit (fig. 2-46) from the body far enough to expose the lamp unit cable connectors.

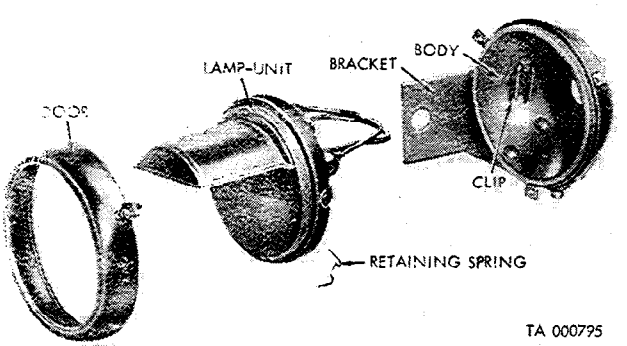


Figure 2-46. Blackout driving light—exploded view.

(2) Remove the two cable connectors from the clips inside the body. Disconnect the cable connectors and cable (*a* (4) above).

(3) Remove the three lamp unit retaining springs and remove the lamp unit from the door.

(4) Install the new lamp unit in the door and install the three lamp unit retaining springs.

(5) Connect the two lamp unit cables to the cables in the headlight body (*a* (5) above). Engage the cable connectors in the clips.

(6) Position the door and lamp unit on the body and tighten the three attaching screws.

c. Replace Lamps in Blackout Marker Lights or Taillights (Fig. 2-47). The same type double tungsten filament lamps are used for the blackout marker lights (fig. 2-44) and the taillights. The stoplight lamps are a single tungsten filament. To replace any of the lamps, unscrew the six screws that secure the door to the body (fig. 2-48). Remove the door and the door gasket. Remove the lamp to be replaced and install a new lamp of the same type. Install the gasket, replacing it with a new one if necessary, and install the door (fig. 2-48).

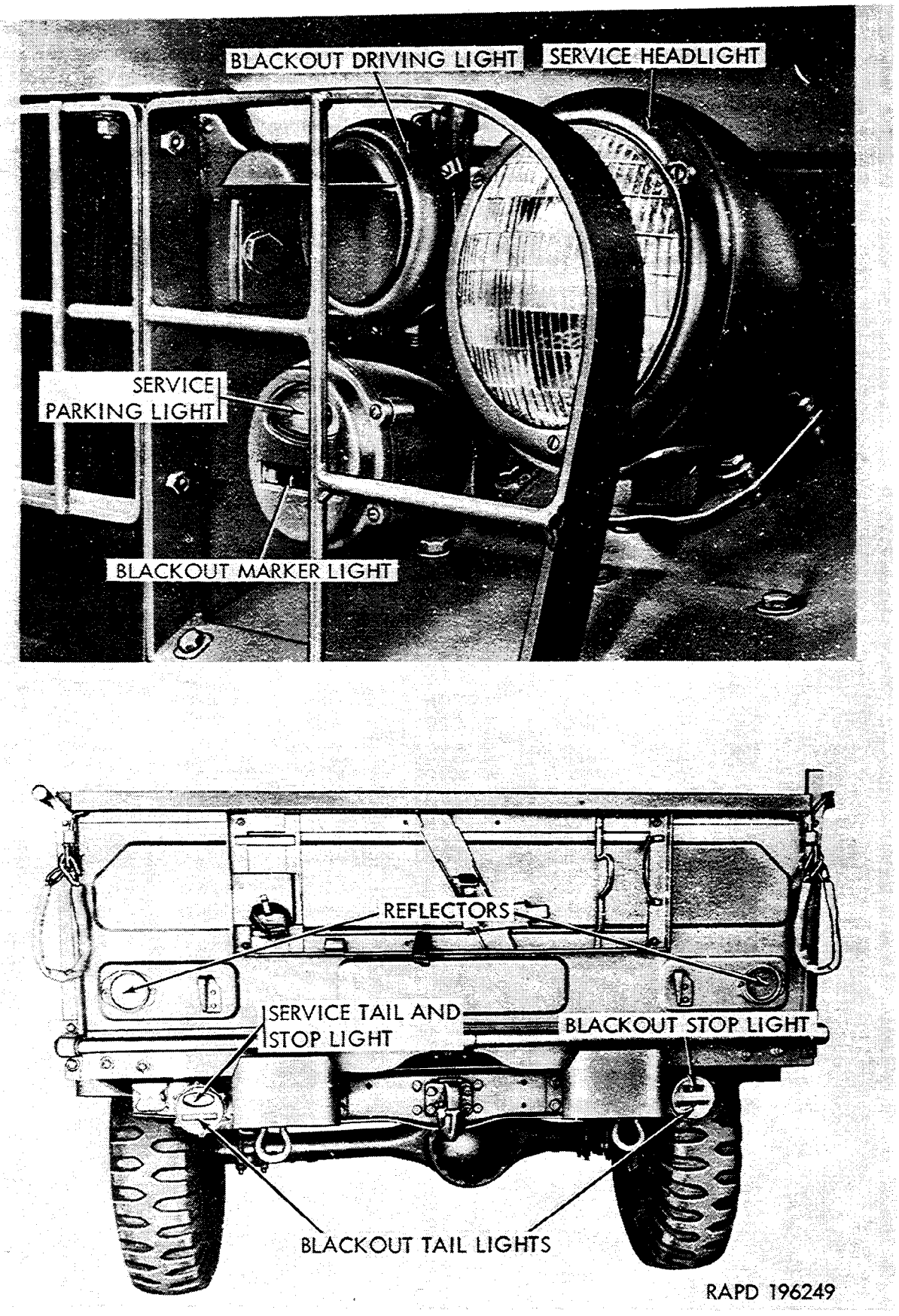


Figure 2-47. Vehicle driving lights.

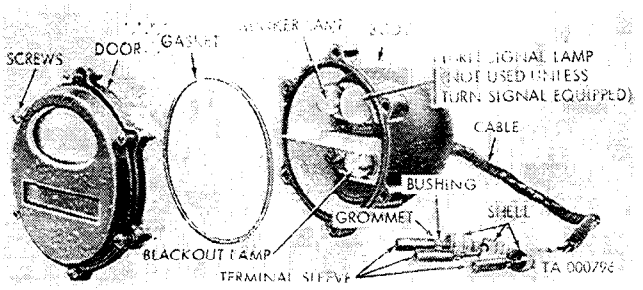


Figure 2-48. Blackout marker light—exploded view.

d. Replace Lamp Unit in Spotlight (Ambulance Truck M43 or Telephone Maintenance Truck M201 (fig. 2-49).

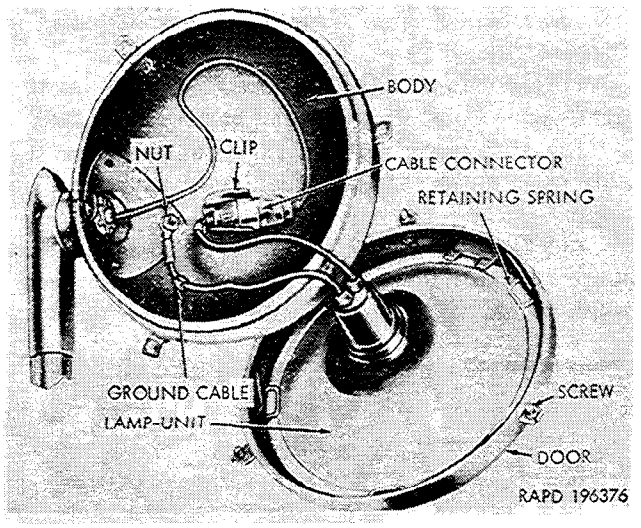


Figure 2-49. Spotlight lamp unit (ambulance truck M43 and telephone maintenance truck M201).

(1) Unscrew the three screws that secure the spotlight door and pull the door and lamp unit away from the body to provide access to the cables.

(2) Remove the nut and lockwasher that secure the ground cable to the screw inside the body.

(3) Remove the cable connector from the clip, separate the cable connector shells, and remove the lamp unit cable from the terminal sleeve.

(4) Remove the three lamp unit retaining springs and remove the lamp unit from the door.

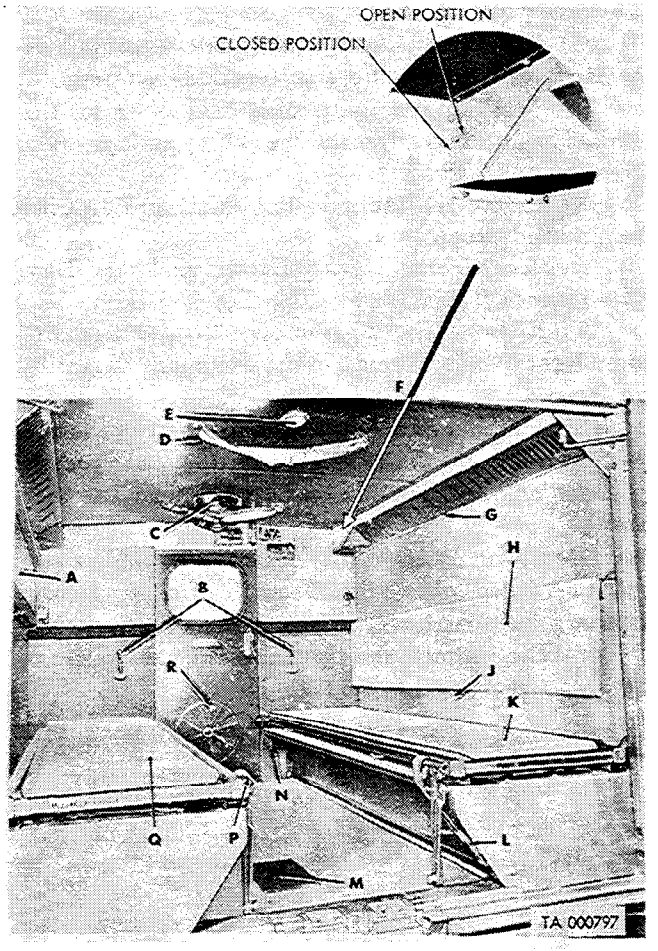
(5) Position the new lamp unit in the door and install the three retaining springs, spacing them evenly.

(6) Connect the cable with the straight terminal to the cable in the spotlight body, engage the connector shells, and install the connector in the clip.

(7) Secure the ground cable to the screw in the lamp body with a lockwasher and nut.

(8) Position the lamp unit and door and tighten the three screws.

e. Replace Surgical Light Lamp Unit (Ambulance Truck M43) (C, Fig. 2-50).



A Seat back (raised position)
B Litter rack catch
C Surgical light
D Safety strap
E Dome light
F Ventilator blower control valve handle.
G Seat back catch hook
H Seat back (lowered position)
J Seat back catch
K Right litter rack
L Litter stowage strap
M Floor panel inspection hole cover
N Heat deflector handle
P Litter hold-down strap
Q Left litter rack
R Partition door ventilator

Figure 2-50. Interior of patient compartment (ambulance truck M43).

(1) Loosen the knurled screw and lower the lamp.

(2) Loosen the two screws which secure the lamp unit door to the retainer ring, and pull the lamp unit and door from the ring.

(3) Remove the screw which secures each lamp unit cable to the lamp unit, and remove the lamp unit and door.

(4) Loosen the two screws that secure the lamp unit to the door, and remove the lamp unit.

(5) Position the new lamp unit in the door and tighten the two screws.

(6) Connect the lamp unit cable terminals to the lamp unit using the two terminal screws.

(7) Position the lamp unit and door in the retainer ring, and tighten the two retainer ring screws.

(8) Install the lamp in the shell, and tighten the knurled screw.

f. Replace Dome Light Lamp and/or Lens (Ambulance Truck M43) (E, Fig. 2-50).

(1) Remove the two screws that secure the dome light door and remove the door lens. Remove the lamp.

(2) Install a new lamp of the same type as the one removed. Install the lens in the door, and install the door and two No. 5x9/16 oval-head tapping screws.

g. Replace Instrument Panel Light Lamps and/or Headlight High Beam Indicator Lamp. All lamps are replaced in the same manner.

(1) Disconnect the speedometer shaft from the speedometer (fig. 2-51).

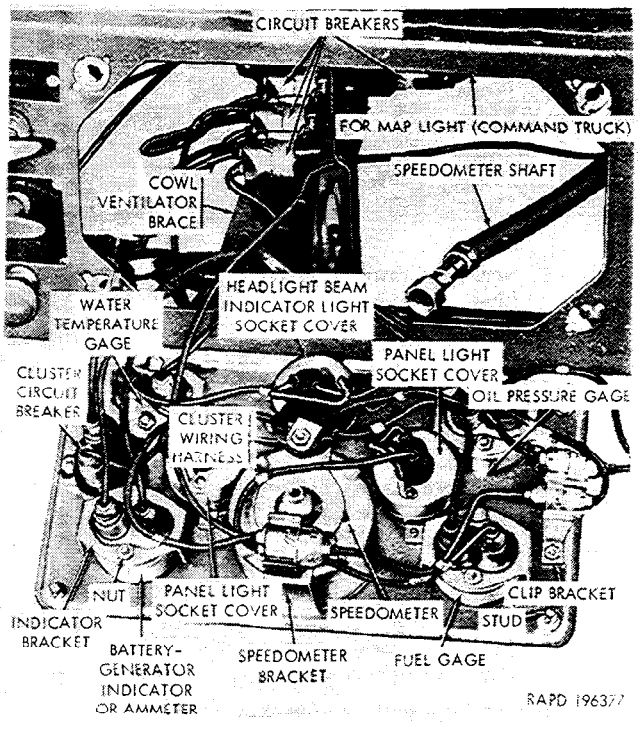


Figure 2-51. Instrument cluster and circuit breaker.

(2) Disengage the four instrument cluster studs and lower the instrument cluster sufficiently to provide access to the headlight beam indicator and panel light socket covers.

(3) Press the socket cover and turn it counterclockwise to disengage from the light body. Remove the lens and the lamp.

(4) Install a new lamp of the same type as the one removed, and install the lens. Insert the socket cover in the body, press and turn clockwise to engage the socket with the body.

(5) Install the instrument cluster in the instrument panel and engage the four studs.

(6) Connect the speedometer shaft to the speedometer.

2-40. Driving Lights and Brackets

a. General. Both service headlights are serviced in the same manner. The left and right headlights and mounting brackets are interchangeable. The two blackout marker lights and mounting brackets are serviced in the same manner and are interchangeable. The two taillights and stoplights are serviced in the same manner, but are not interchangeable.

b. Remove Service Headlight and Mounting Bracket (fig. 2-44).

(1) Disconnect the ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Disengage the headlight cable from the cable clips on the splash shield and radiator side support.

(3) Remove the screw and lockwasher that secure the ground cable (91) to the fender front splash shield (fig. 2-52 and 2-53).

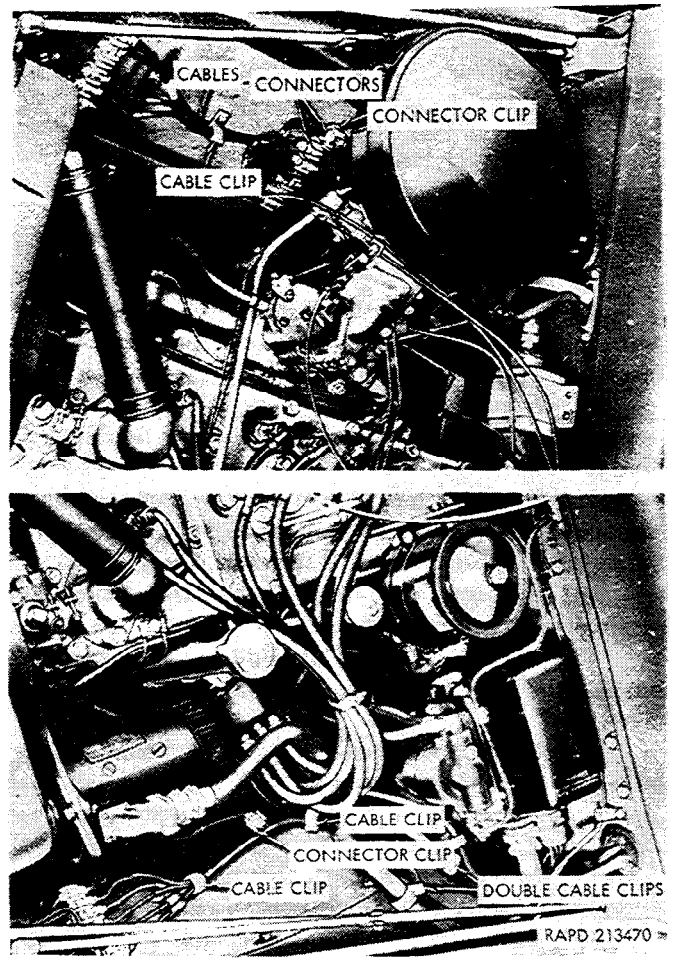


Figure 2-52. Cable connectors and clips.

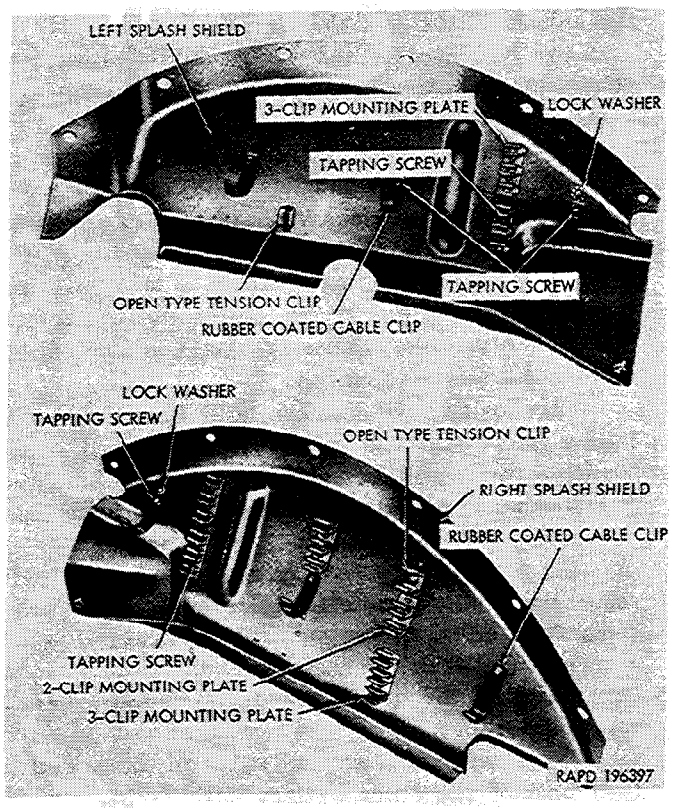


Figure 2-53. Left and right front splash shields.

(4) Remove the connectors for cables (17) and (18) from the clips on the fender front splash shield, separate the connector shells and remove the headlight cables from the connector sleeves.

(5) Remove the three nuts and lockwashers that secure the headlight cable cover to the underside of the fender and remove the cover.

(6) Remove the two remaining nuts and lockwashers from the headlight bracket bolts, and pull the headlight and mounting bracket away from the fender to provide access to the cable grommet. Remove the grommet.

(7) Remove the headlight with attached cables and the mounting bracket, withdrawing one cable at a time through the openings in the splash shield and the fender.

(8) Remove the adjusting bolt, lockwasher, and special washer that secure the headlight to the mounting bracket, and remove the headlight.

(9) Remove the four mounting bracket bolts and flat washers and the four rubber grommets from the mounting bracket.

c. Inspection. Inspect the four bracket mounting bolts and the headlight adjusting bolt for cracks and damaged threads. Inspect the four mounting bracket grommets and the cable grommet for damage or deterioration. Inspect the mounting bracket for damage or distortion. Replace all parts that are unfit for further service.

d. Install Service Headlight and Mounting Bracket (Fig. 2-44).

(1) Install the four rubber grommets in the mounting bracket, engage the groove in each grommet with the bracket. Install a plain washer on each bracket bolt and install the bolts through the grommets.

(2) Install the lockwasher and special washer on the bolt, with the radius side of the special washer up. Position the headlight on the bracket, and install the bolt with washers. Tighten just enough to hold the parts.

(3) Thread the three headlight cables through the openings in the fender and in the splash shield. Install the split rubber grommet on the cables, and engage it in the fender opening.

(4) Position the mounting bracket on the fender with the bracket bolts in the bolt holes, position the cable cover, and install the five lockwashers and nuts to secure the bracket and cable cover.

(5) Connect the headlight cables (17) and (18) to their respective cables. Connect the connector shells and engage the connectors in the clips on the splash shield.

(6) Attach the ground cable (91) to the splash shield with the lockwasher and tapping screw.

NOTE

When installing the left headlight, be sure that the blackout driving light ground cable is secured with the same screw.

(7) Engage the cable in the cable clips on the splash shield and radiator guard support.

(8) Connect the ground to the negative (—) post of the outer battery (fig. 2-23).

(9) Adjust the headlight aiming (para 2-38).

e. Remove Blackout Driving Light and Bracket (Fig. 2-44).

(1) Disconnect the ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Remove the headlight cable cover (*b* (5) above).

(3) Disengage the blackout driving light cables from the cable clips on the left splash shield and radiator guard left side support.

(4) Remove the screw and lockwasher that secure the ground cable terminal to the splash shield. (This screw also secures the headlight ground cable.)

(5) Remove the connector for cable (19) from the clip on the splash shield, separate the connector shells, and pull the cable terminal from the sleeve. Remove the grommet, bushing, and connector shell from the cable.

(6) Remove the split rubber grommet from the opening in the left front fender, and remove the blackout light cables from the openings in the splash shield and fender.

(7) Remove the nut, lockwasher, and bearing washer from the blackout light stud, and remove the light from the bracket.

(8) If the mounting bracket or bracket pad requires replacement, remove the two screws and lockwashers securing the bracket to the radiator guard side support and remove the bracket and pad.

f. Install Blackout Driving Light and Bracket.

(1) Position the bracket pad and bracket (fig. 2-44) on the radiator guard side support, and install the two special screws and lockwashers. Tighten the screws.

(2) Install the blackout light on the bracket and install the bearing washer, lockwasher, and nut on the stud.

(3) Thread the cables through the openings in the fender and in the splash shield. Install the split rubber grommet on the blackout light cables and blackout marker light cables, and engage the grommet in the opening in the fender.

(4) Position the headlight cable cover on the underside of the fender, and install the three lockwashers and nuts. Tighten the nuts.

(5) Install the connector shell, bushing, and grommet on the cable (19). Position the grommet next to the cable terminal and the bushing next to the grommet. Connect the cable terminal to the connector sleeve, connect the two connector shells, and engage the connector in the clip on the splash shield.

(6) Attach the blackout light ground cable and left headlight ground cable to the splash shield with the lockwasher and tapping screw. Engage the cable clips on the splash shield and radiator guard side support.

(7) Connect the ground cable to the negative (—) post of the outer battery (fig. 2-23).

g. Remove Blackout Marker Light and Bracket (fig. 2-44).

(1) Disconnect the ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Remove the headlight cable cover (*b* (5) above).

(3) Disengage the cables from the cable clips on the splash shield and radiator guard side support. Remove the connectors for cables (20, 491, and 480) from the clips on the splash shield, separate the connector shells, and remove the cable terminals from the connector sleeves.

(4) Remove the grommet from the marker light cables and blackout driving light cable (left light only).

(5) Remove the nut, lockwasher, and two bolts that attach the marker light bracket to the fender (one nut and lockwasher were removed when the cover was removed). Remove the three cables, one at a time, through the openings in the splash shield and the fender.

(6) Remove the two screws and lockwashers that secure the marker light to the bracket, and remove the bracket.

h. Install Blackout Marker Light and Bracket.

(1) Position the marker light on the bracket and install the two lockwashers and cap screws. Tighten the screws.

(2) Thread the three cables, one at a time, through the openings in the fender and the splash shield. Fit the split rubber grommet on the cables and in the fender opening.

(3) Position the marker light bracket on the fender and install the two lockwashers and bolts. Position the headlight cable cover, and install the four lockwashers and nuts to secure the bracket and cover. Tighten the nuts.

(4) Connect the three cable terminals to their respective cable connector sleeves, connect the connector shells, and engage the connectors in the clips on the splash shield. Engage the cables in the cable clips on the splash shield and radiator guard side support.

(5) Connect the ground cable to the negative (—) post of the outer battery (fig. 2-23).

i. Remove Left Taillight and Bracket (Fig. 2-54).

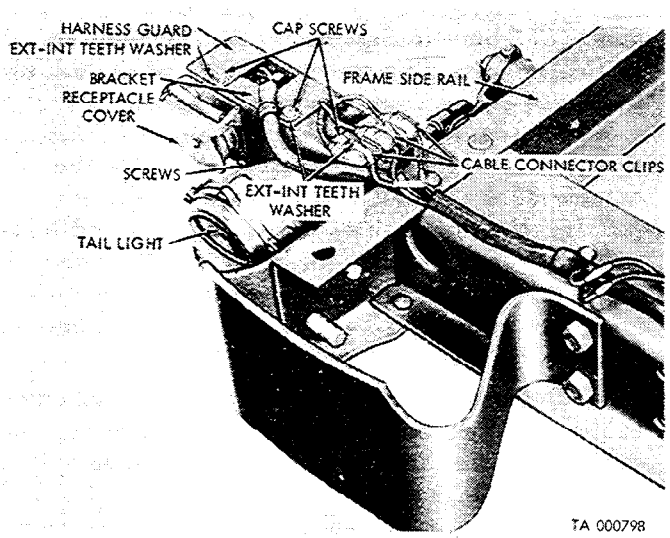


Figure 2-54. Left taillight and trailer coupling receptacle.

(1) Disconnect the ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Remove the screws and lockwashers that secure the harness guard to the taillight bracket and remove the guard.

NOTE

There are two screws for the guard on vehicles without a trailer coupling receptacle, and three screws for vehicles with a receptacle.

(3) Remove the three cable connectors from the cable connector clips, separate the connector shells, and disconnect the cables. The clips may be on the bracket or inside the guard.

(4) Remove the two screws and lockwashers that secure the taillight to the bracket, and remove the taillight with attached cables.

(5) If the vehicle is equipped with a trailer coupling, unscrew the grommet nut from the coupling receptacle, remove the four nuts and lockwasher bolts that secure the receptacle and receptacle cover to the frame, and pull the cover toward the rear to remove the cables from the opening in the bracket.

(6) Remove the two nuts, lockwashers, and bolts that secure the bracket and rear bumper to the frame side rail, and remove the bracket.

j. Install Left Taillight and Bracket (Fig. 2-54).

(1) Position the bracket on the frame side rail and install the two bolts, lockwashers, and nuts. Tighten the nuts.

(2) If the vehicle is equipped with a trailer coupling receptacle, position the receptacle and cover on the bracket and install the four lockwasher bolts and four nuts. Tighten the bolts. Screw the grommet nut to the receptacle.

(3) Thread the taillight cables through the opening in the bracket, position the taillight on the bracket, and install the two lockwashers and cap screws. Tighten the screws.

(4) Connect the three cable terminals to their respective cables, connect the shells, and engage the connectors in the clips.

(5) Position the harness guard on the bracket, alining the screw holes. Place the taillight ground cable terminal over the inner screw hole and the trailer coupling cable clip over the center screw hole (on vehicles so equipped). Install lockwasher and cap screws (three for vehicles equipped with a trailer coupling, two for vehicles not so equipped).

(6) Connect the ground cable to the negative (—) post of the outer battery (fig. 2-23).

k. Replace Right Taillight and Bracket. Procedure for replacement of the right taillight and bracket is essentially the same as that described in *i* and *j* above. The only differences are that there are two cables for the right taillight instead of three, neither of the cables is grounded, and there is no trailer coupling.

2-41. Light Switch and Dimmer Switch

a. Remove Light Switch.

(1) Remove the four screws and lockwashers that attach the steering column access cover to the instrument panel and remove the cover.

(2) Unscrew the nut that retains the waterproof grommet to the light switch receptacle (fig. 2-55) and remove the wiring harness cable plug from the receptacle. If the light switch is provided with the trailer coupling wiring harness in the same manner.

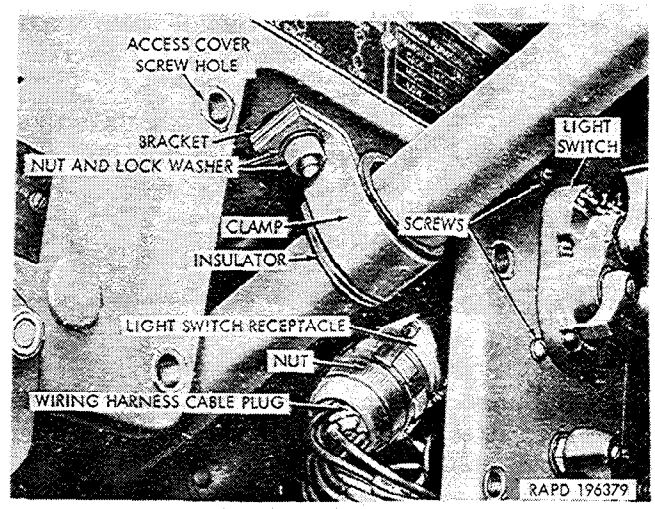


Figure 2-55. Steering column access cover removed.

b. Install Light Switch.

(1) Install the light switch (fig. 2-55) from the underside of the instrument panel. Secure with four lockwashers and screws.

(2) Install the wiring harness cable plug in the light switch receptacle, and screw the grommet retaining nut to the receptacle. If the switch is provided with a trailer coupling receptacle, connect the trailer coupling wiring harness in the same manner.

(3) Install the steering column access cover on the instrument panel with the four lockwashers and screws, being careful to position the cover in such a manner that it does not cause binding at the steering column.

c. Remove Dimmer Switch.

(1) Remove the rear splash shield from the left front fender (para 2-180 *a*).

(2) If the vehicle is equipped with a slave receptacle, disengage the receptacle cable from the cable clip near the dimmer switch.

(3) Remove the large cable connector from the connector clip (fig. 2-56), separate the connector shells on the three cables, and disconnect the cable terminals.

(4) Front inside the driver's compartment, remove the two screws and lockwashers that secure the switch, and remove the switch from the toeboard.

d. Install Dimmer Switch.

(1) Position the dimmer switch (fig. 2-56) on the underside of the toeboard and install the two lockwashers and screws. Tighten the screws.

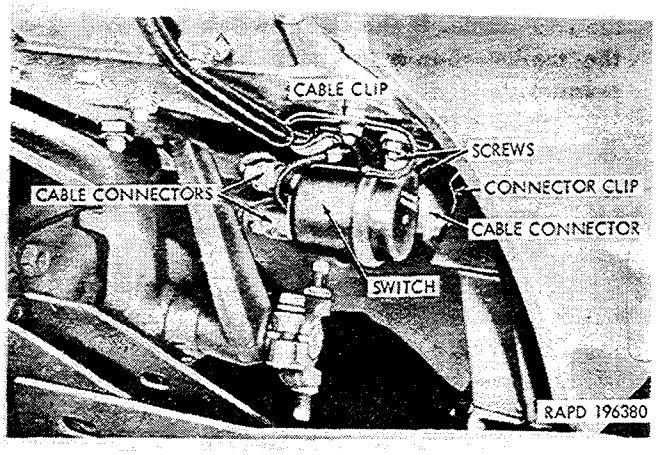


Figure 2-56. Dimmer switch.

(2) Connect the three cable terminals to their respective cables and connect the shells. Engage the large cable connector in the connector clip (fig. 2-56).

(3) Engage the slave receptacle cable in the cable clip(on vehicles so equipped).

(4) Install the left front fender rear splash shield (para 2-180 *b*).

2-42. Circuit Breakers

a. General.

(1) Circuit breakers are of the automatic reset type with a bimetal spring which expands when the circuit is overloaded to cause a break in the circuit. As the spring cools, it contracts and again closes the circuit, causing alternate "off" and "on" conditions, informing the operator that an abnormal circuit condition exists.

(2) With the exception of the instrument cluster circuit breaker on some vehicles, all units are mounted on the cowl ventilator brace (fig. 2-51). All units are accessible with the instrument cluster removed.

b. Removal. Procedure for removal of all circuit breakers is the same.

(1) Turn the four studs that secure the instrument cluster to the instrument panel and carefully pull the cluster out. Disconnect the speedometer flexible shaft from the speedometer (fig. 2-51).

(2) Detach the cables from the circuit breaker to be removed.

(3) Remove the two screws that secure the circuit breaker to the cowl ventilator brace (fig. 2-51) and remove the circuit breaker. For the circuit breaker on the instrument cluster, remove the two nuts, lockwashers, and bolts that secure the circuit breaker to the instrument cluster panel, and remove the circuit breaker.

c. Installation.

(1) Position the circuit breaker on the cowl ventilator brace (fig. 2-51) and install the two screws. For the circuit breaker on the instrument cluster (fig. 2-54), position the circuit breaker on the instrument cluster panel, and install the two bolts, lockwashers, and nuts.

(2) Connect the cables to the circuit breaker, following the wiring diagram (fig. 2-6).

(3) Connect the speedometer flexible shaft to the speedometer, position the instrument cluster in the instrument panel, and engage the four studs by turning them clockwise.

2-43. Auxiliary Outlet Receptacle (on Vehicles so Equipped)

a. Removal.

(1) Disconnect the receptacle cable at the cable connector under the instrument panel, and disengage the cable from the cable clips.

(2) Remove the four screws which attach the auxiliary outlet receptacle to the instrument panel. Remove the receptacle with cable.

b. Installation.

(1) Thread the receptacle cable through the opening in the instrument panel, and position the receptacle on the panel. Install the four screws, attaching the receptacle cover chain with the lower left screw.

(2) Connect the cable terminal at the cable connector and engage the cable in the cable chips.

2-44. Radio Receptacle (on Vehicles so Equipped)

a. Removal.

(1) Disconnect the ground cable from the negative (—) post of the outer battery, and remove the radio receptacle cable from the terminal.

(2) Disconnect the other receptacle cable terminal from the positive (+) terminal of the inner battery.

(3) Disengage the cable from the cable clip in the driver's compartment.

(4) Remove the four small screws that secure the radio receptacle to the wall mounting receptacle (fig. 2-57) and pull the receptacle and cable from the mounting receptacle. Remove the four screws that secure the mounting receptacle to the body front panel, and remove the receptacle.

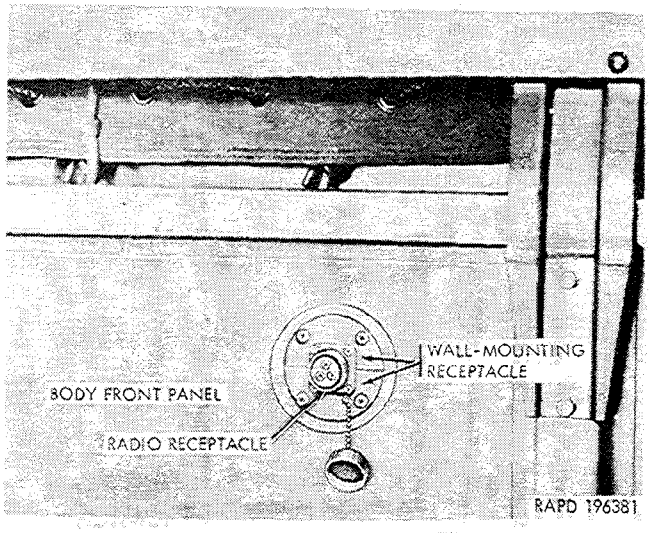


Figure 2-57. Radio receptacle in body front panel.

b. Installation.

(1) Thread the receptacle cables through the receptacle opening in the body panel and through the weatherseal in the cab rear panel.

(2) Fit the two sections of the wall mounting receptacle on the body panel and install the four lockwasher screws. Position the radio receptacle (fig. 2-57) and install the four lockwasher screws, attaching the cover chain with one of the screws.

(3) Connect the radio receptacle positive (+) cable terminal to the positive (+) terminal of the inner battery, and the negative (—) terminal to the negative (—) terminal of the outer battery.

(4) Connect the ground cable to the negative (—) post of the outer battery.

Section XI. TURN SIGNAL SYSTEM

2-45. General

The M37 and M37B1 series vehicles are equipped with turn indicating signal systems. The entire vehicle electrical systems are shown in figures 2-58 and 2-59. Essentially the turn signal system is composed of a lever-operated switch mounted on the steering column, a relay (distribution) box which houses the flasher unit and three relays, and a harness providing connections between the relay box and the steering column switch. The remaining required components are the standard vehicular service taillight, stoplight and parking light assemblies which are provided on all M37 series vehicles, except that an additional light (blackout stoplight) is added on later vehicles. Two of the relays are used to switch between stop light or turn-indicating functions for left- or right-hand turns. The third relay functions to close the circuit to supply a power source to the circuits that are controlled by the other two relays. This third relay is in series with the flasher, and results in an intermittent current being supplied to these circuits, resulting in the desired flashing.

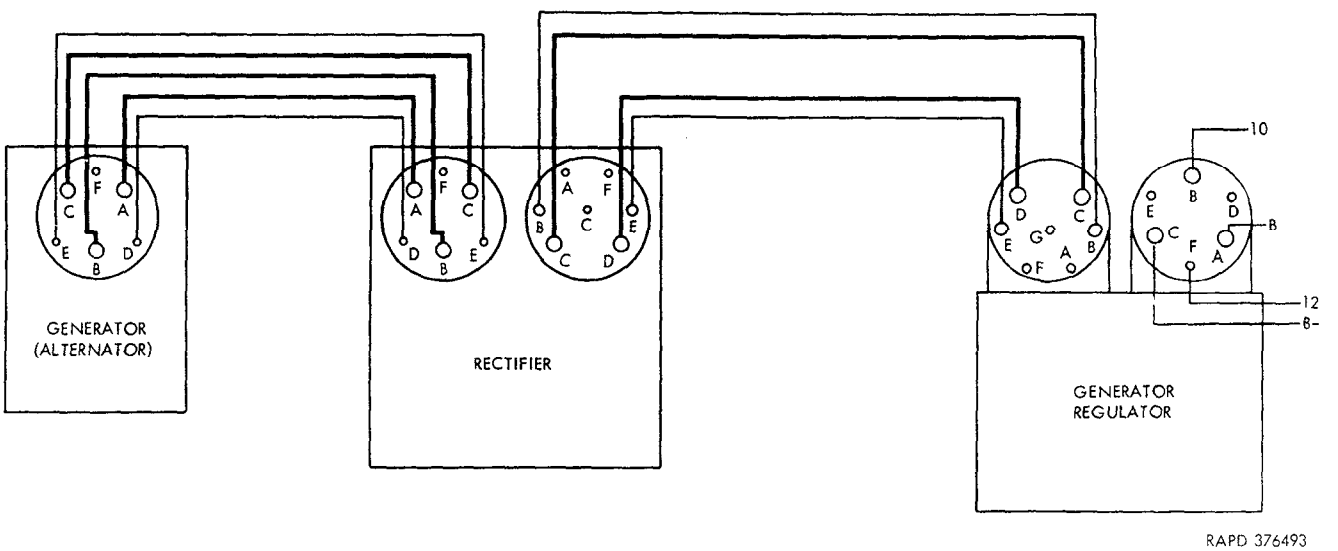


Figure 2-58. External wiring diagram.

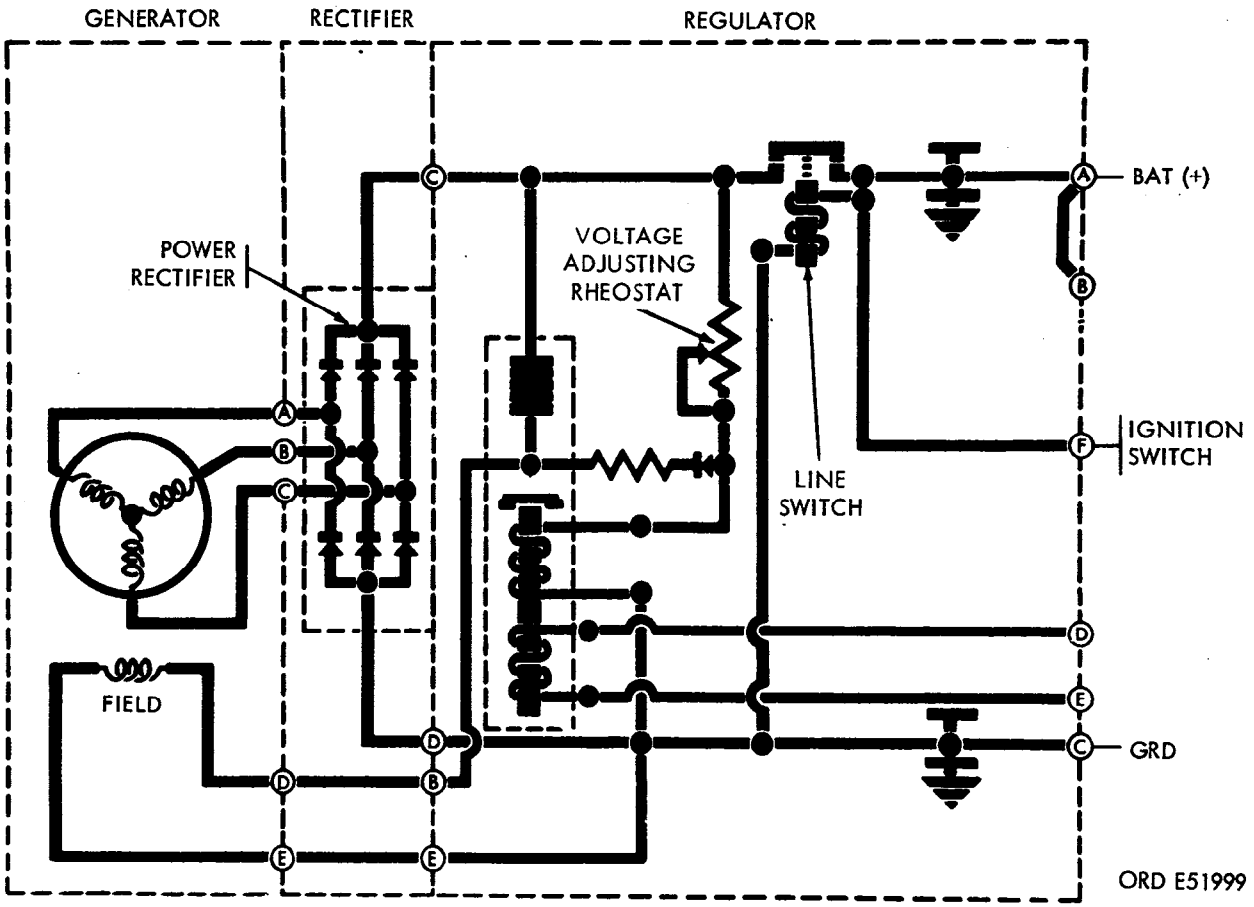
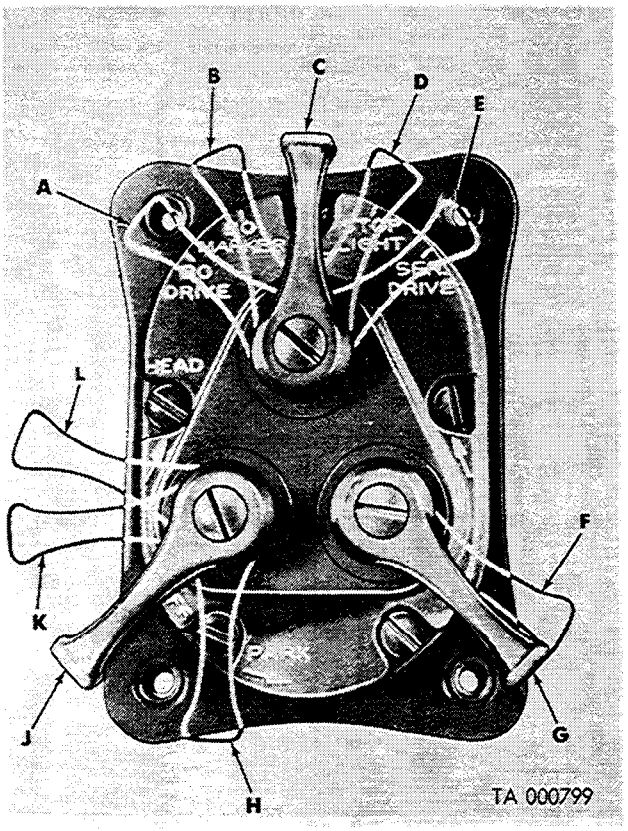


Figure 2-59. Schematic wiring diagram.

2-46. Troubleshooting

a. Troubleshooting the vehicle turn signal system requires a 24-volt test lamp or a voltmeter (0-50 volt range) and two jumper leads. The turn signal system will function only when the vehicle light switch (fig. 2-60) is in STOP LIGHT or SERDRIVE position. Throughout the tests indicated in table 2-4 make sure that the light switch is in one of the two positions that will energize the turn signal system, unless otherwise directed in the instructions.



A Upper lever in blackout drive position.
B Upper lever in blackout marker position.
C Upper lever in off position
D Upper lever in stoplight position.
E Upper lever in service drive position.
F Lower right lever in unlocked position.
G Lower right lever in locked position
H Lower left lever in park position
J Lower left lever in off position
K Lower left lever in dim panel light position.
L Lower left lever in bright panel light position.

Figure 2-60. Light switch.

b. Procedure. Refer to table 2-4 and figures 2-61 and 2-62 for turn signal-equipped vehicle wiring diagrams.

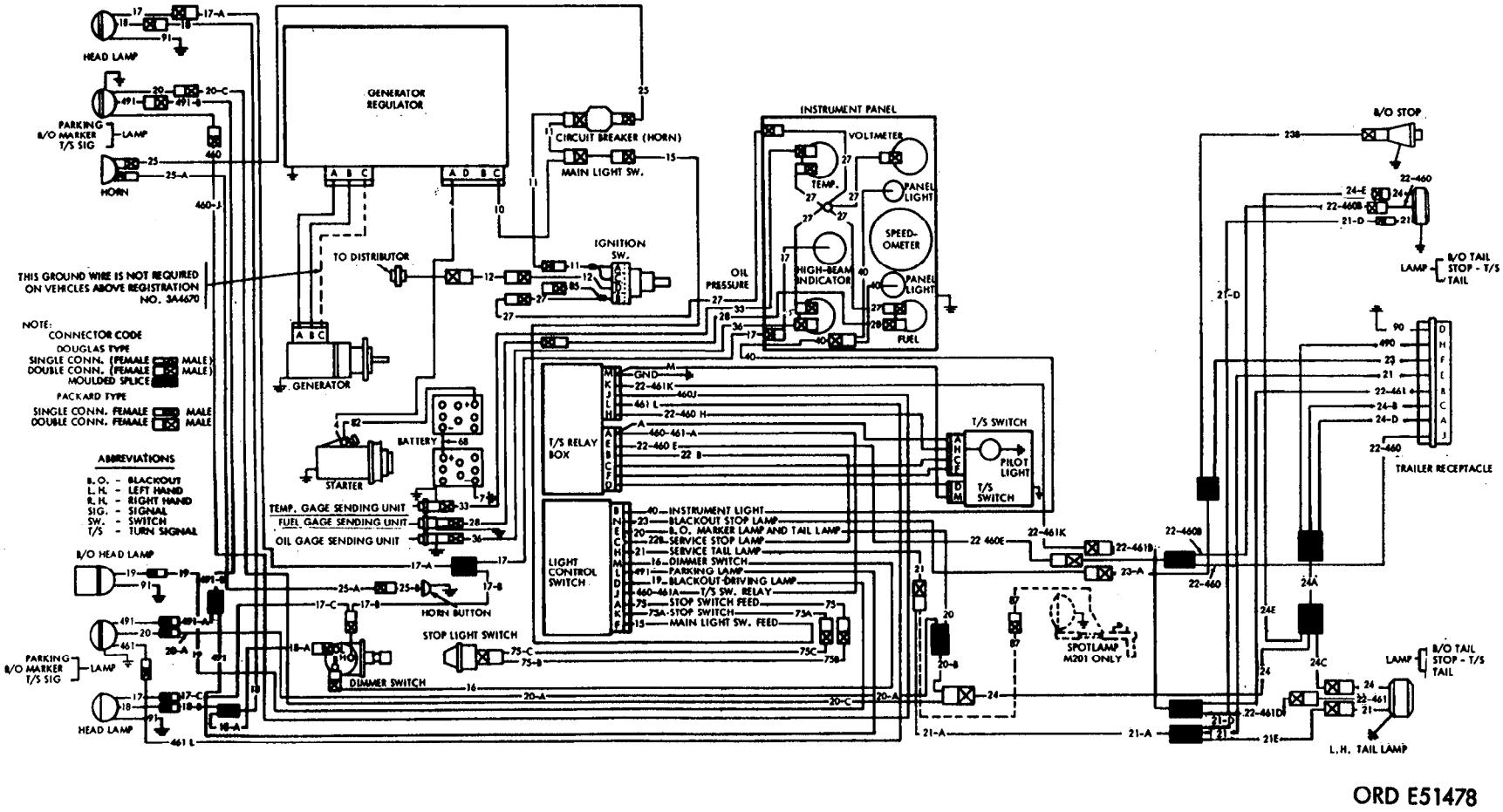


Figure 2-61. Vehicle wiring diagram M37B1, and M201B1 only.

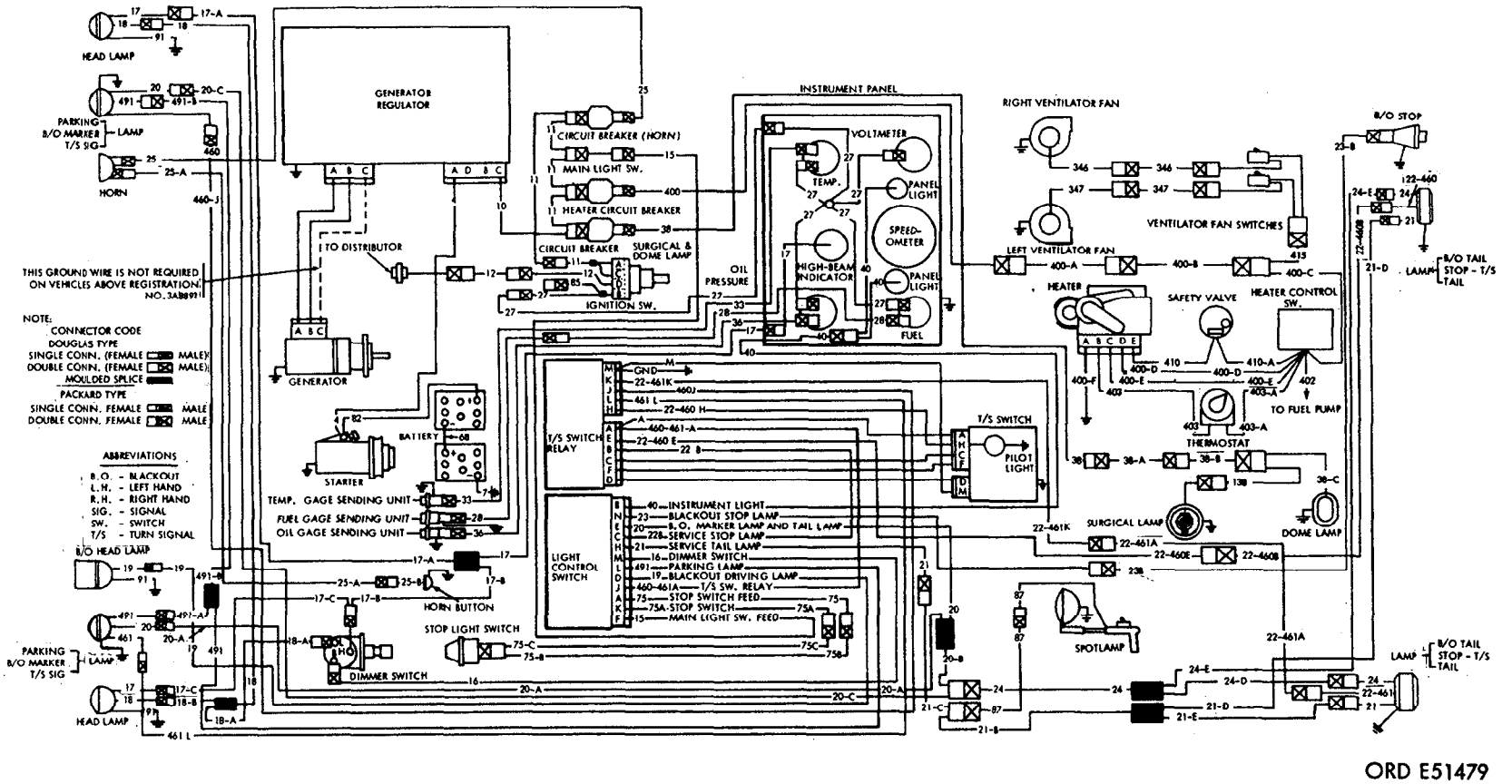


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Figure 2-62. Vehicle wiring diagram—M43B1.

NOTE

On some vehicles the troubleshooting procedures in table 2-4 apply. They do not however, apply to vehicles with commercial type turn signal systems installed under the provisions of SB 9-203.

2-47. Distribution Box Assembly

(Fig. 2-63.)

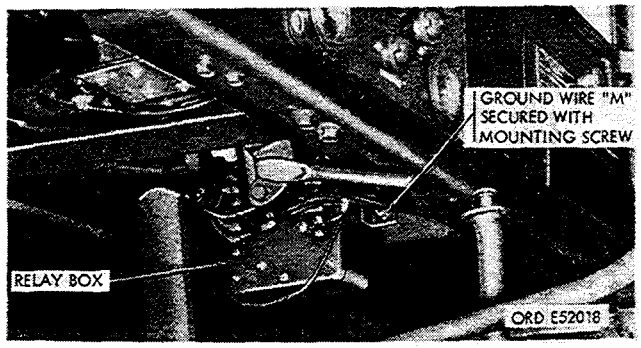


Figure 2-63. Turn signal relay (distribution box).

a. Replacement.

(1) Place vehicle light switch in OFF position.

(2) Open glove compartment and remove the two hex-head screws, washers, and nuts securing box to compartment (left side).

NOTE

Ground wire (M) is secured simultaneously with the front screw.

(3) Remove distribution box from under dash panel and gently pull toward self as far as harness will allow.

(4) Remove one wire at a time and install on replacement box before removing any others. Continue removing and installing wires to the correct terminals of replacement box.

(5) When all wires are installed, position box under dash panel on compartment side wall, and install two hex-head screws, washers, and nuts. Install ground wire M simultaneously with front screw.

NOTE

Make certain box is positioned with terminal A closest to the rear of vehicle.

(6) Tape any wires out of the way that may interfere with operation of parking brake or front axle engagement levers.

(7) Place vehicle light switch in STOP LIGHT position and check operation of turn signal system.

b. Repair.

(1) Repair of the distribution box is limited to replacement of the flasher (para 2-48), soldering loose wires or tightening loose terminals or screws. To perform repair, remove box from under dash panel as described in *a* (1) through (3) above.

(2) Remove six cross-recessed head screws securing cover to box.

CAUTION

Exercise care not to jar or force the cover while removing it, since the relay assemblies are mounted to the cover and one relay can be easily damaged.

Make certain that O-ring gaskets are not lost from the cover retaining screws.

NOTE

Mark cover and box to insure that cover will be in the same position when installed to the box.

(3) Inspect to see if any wires are loose between the relays and terminals. Solder any loose wires as necessary, and tighten any loose nuts or connections. Repair any frayed wiring by taping.

(4) Install gasket to box. Make certain gap in gasket is closed tight by pressing gasket together at the gap. Install cover to box exercising care not to damage relays or cause fraying of wires. Make certain cover is installed in same position as before removal (2) above). Install six cross-recess screws and secure cover to box. making certain an O ring gasket is installed on each cover retaining screw.

(5) Perform operations in *a* (5) through (7) above to complete the installation.

2-48. Turn Signal Flasher Replacement

a. Perform operations in paragraph (2-47 *a* (1) through (3) and 2-47 *b* (2).

b. Pull flasher outward (fig. 2-64) and remove from unit. Check to see that terminals are clean and all wires are secure and connections are tight. Install new flasher unit.

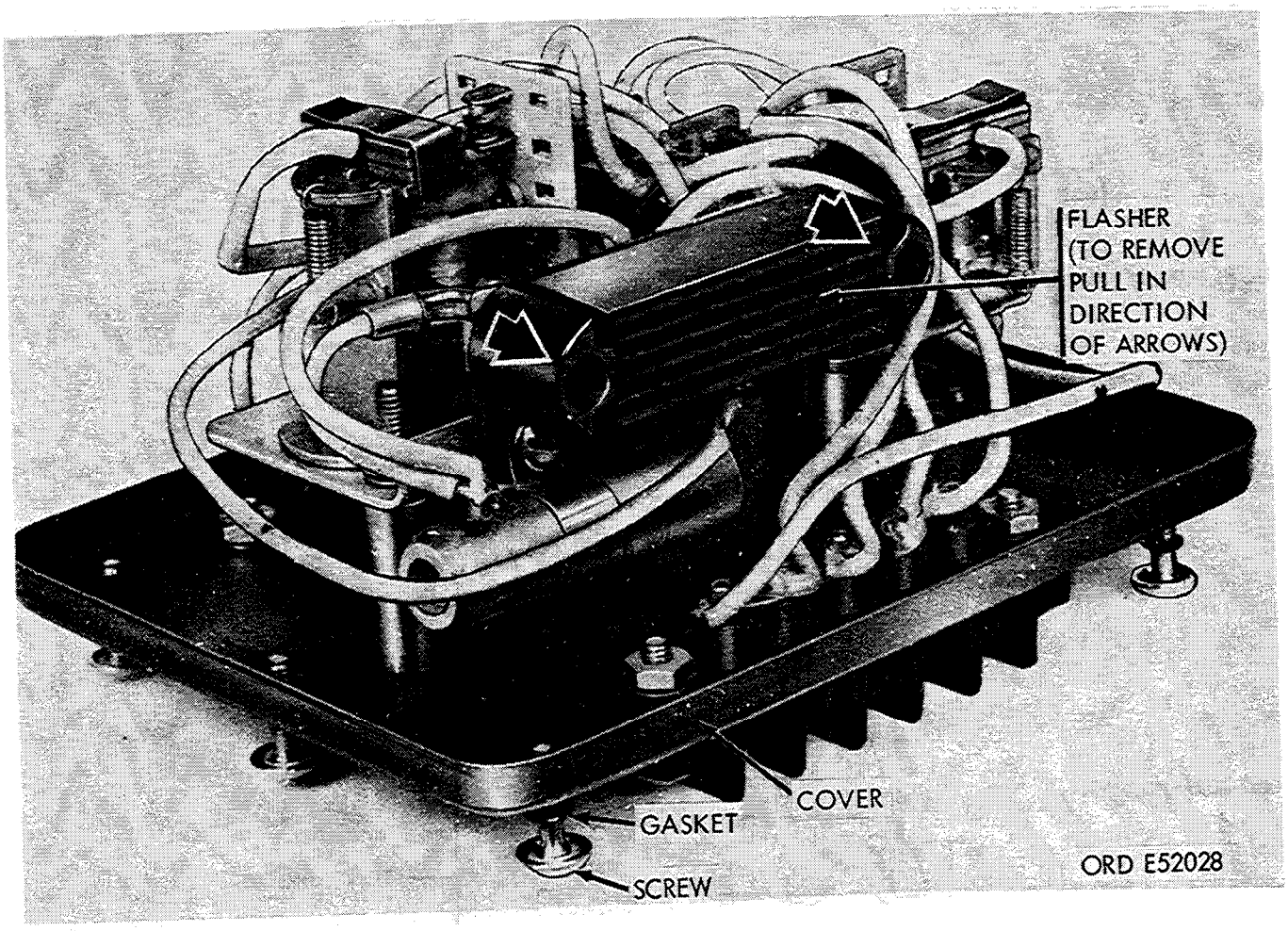


Figure 2-64. Turn signal flasher.

c. Install cover to box as outlined in paragraph 2-47 *b* (4) and perform operations in paragraphs 2-47 *a* (5) through (7) above.

2-49. Turn Signal Control Switch (Alternate Types)

(Fig. 2-65.)

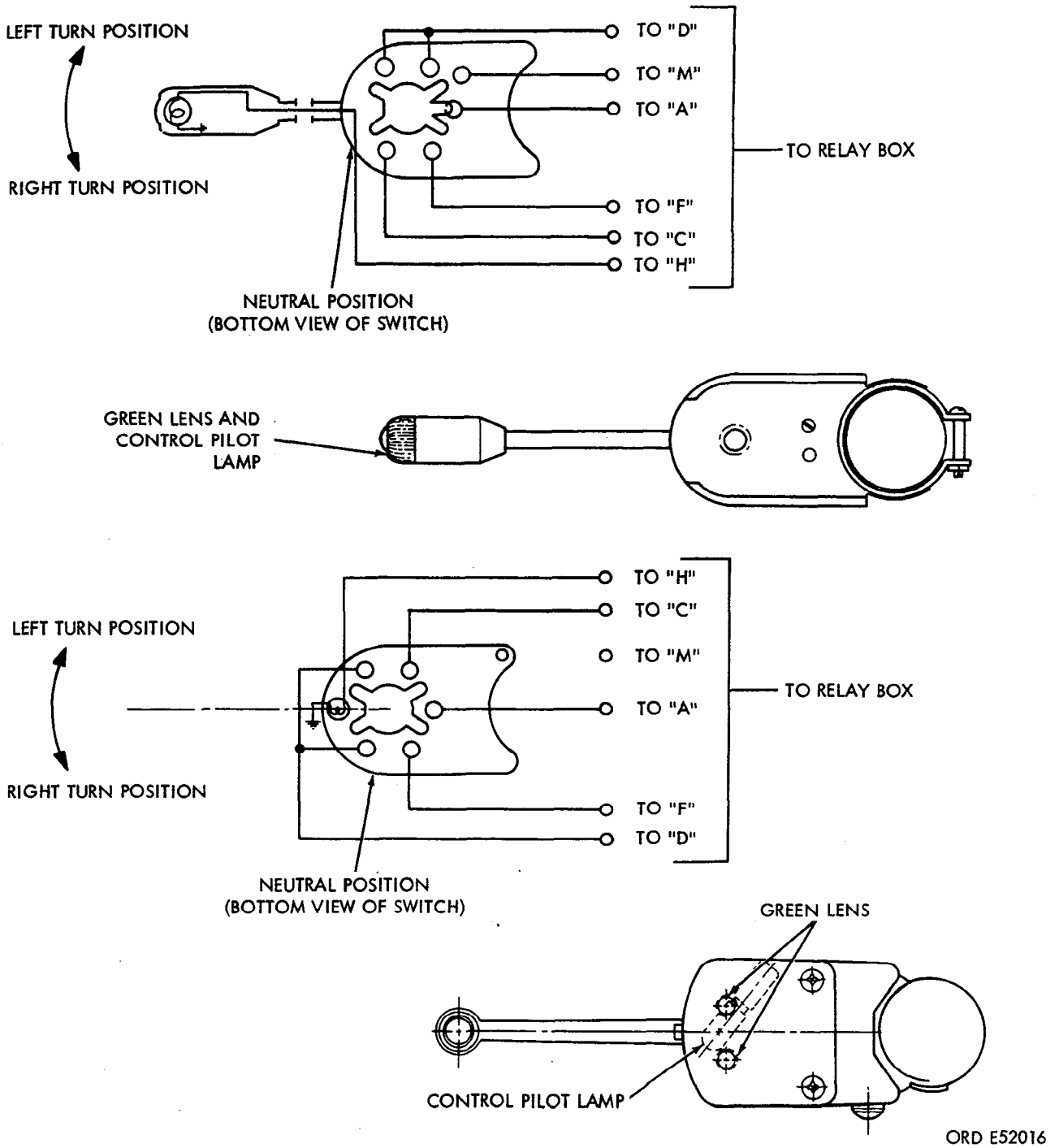


Figure 2-65. Turn signal control switch—alternate types.

a. Removal.

(1) Place vehicle light switch in OFF position.

(2) Remove two clips securing harness to steering column.

(3) Remove clamp securing control switch to column by removing nut and fillister-head screw or by turning clamp screw (alternate type). Before attempting to replace switch, remove bottom cover from switch housing (procedure varies slightly between alternate type switches), and inspect for loose wires. Solder any loose wires or if soldering

does not repair defect, continue to replace switch as outlined in *b* below.

b. Installation.

(1) Before attempting to remove old switch harness terminals from distribution box, route replacement harness through dash panel opening at top side of steering column. Continue to route harness to the right along top of bottom flange of dash panel past cowl ventilator mechanism and to the distribution box. Remove leads at distribution box from old harness and replace with those from new harness as outlined in paragraph 2-47 *a* (2) through (4).

(2) Position new switch on steering column approximately 7/8-inch below edge of steering wheel collar, and tighten switch mounting screw (fig. 2-65) or screw and nut (alternate types) securely. Install harness clamps to steering column (fig. 2-65).

(3) Place vehicle light switch in STOP LIGHT position check operation of switch.

2-50. Turn Signal Lamp Replacement

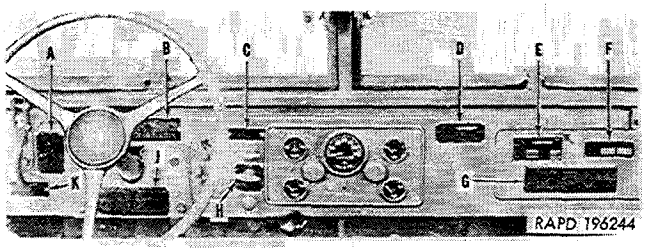
a. Blackout Marker or Taillights. Refer to paragraph 2-39 c.

b. Control Switch Pilot Lamp (Fig. 2-65). Procedure is dependent on type of turn signal control switch installed in vehicle. Remove green lens in end of lever by turning counterclockwise and replace bayonet type lamp in usual manner. Replace lens in end of lever. For alternate type switch, remove switch top cover by removing two cross-recess screws and remove lamp. Replace cover. Correct size lamp is essential to insure the correct flashing rate. Use No. 313 or equal as marked on lamp.

Section XII. INSTRUMENTS, GAGES, AND HORN

2-51. General

The instrument cluster (fig. 2-51 and 2-66) contains the speedometer, battery-generator indicator or ammeter, water temperature gage, fuel gage, and oil pressure gage. These gages are electrically operated by means of sending units. Circuits to the gages are controlled through the ignition switch and are closed only when the ignition switch is in the ON position.



A Winch caution plate
B Transmission and transfer gearshift instruction plate.
C Throttle fording plate
D US property conversion plate
E US property identification plate
F Responsible agency plate
G Weight data plate
H Crankcase plate
J Servicing data plate
K Publications data plate

Figure 2-66. Data, caution, and instruction plates in driver compartment.

Gages supplied on vehicles of early manufacture are 6-volt gages, each one requiring a resistor when used in the 24-volt system. The 6-volt gage may be identified by the resistor case and elbow on the back side of the gage. The 24-volt gages are supplied with vehicles of later manufacture and may be installed to replace the 6-volt gage-with-resistor units. The horn is a vibrator-type, mounted on the under side of the hood.

2-52. Responsibility

Organizational maintenance includes replacement of the gages, speedometer, cluster wiring harness, and the horn and related parts.

2-53. Instrument Cluster

(Fig. 2-51)

a. Remove Battery-Generator Indicator or Ammeter. Procedure is the same for both instruments.

(1) Turn the four studs that secure the instrument cluster to the instrument panel and pull the cluster out carefully. Disconnect the speedometer flexible shaft from the speedometer.

NOTE

Make certain that the ignition switch is in the OFF position before working on the instrument cluster parts.

(2) Disconnect the cable or cables from the battery-generator indicator, or ammeter, respectively.

(3) Remove the two nuts and lockwashers that secure the indicator bracket to the studs in the indicator, and remove the b acket. Remove the indicator from the driver's compartment side.

b. Install Battery-Generator Indicator or Ammeter.

(1) Insert the battery-generator indicator or ammeter from the driver's compartment side of the cluster panel and position it in the panel.

(2) Install the indicator bracket over the

indicator and install the two No. 10-32NF nuts and lockwashers. Tighten the nuts.

(3) Connect cable (27) (fig. 2-6) to the terminal of the battery-generator indicator. For the ammeter, connect cable (9) to the left terminal and cable (8) to the right terminal (fig. 2-3).

(4) Connect the speedometer shaft to the speedometer (fig. 2-51). Position the instrument cluster in the instrument panel, and engage the four studs by turning them clockwise.

c. Replace Fuel Gage, Oil Pressure Gage, and/or Water Temperature Gage. Procedure for replacement of the fuel gage, oil pressure gage, and water temperature gage (fig. 2-51) is the same as that for the ammeter (*a* and *b* above). When a 6-volt gage is installed in the 24-volt system, be sure to install the resistor with the gage (para 2-51 *a*). If a 24-volt water temperature gage is used to replace the 6-volt gage and resistor, replace the gage sending unit also, which is available as part of the kit.

d. Remove Speedometer (fig. 2-51).

(1) Remove the instrument cluster and disconnect the speedometer shaft from the speedometer (*a* (1) above).

(2) Remove the nut, lockwasher, and plain washer that secure the cluster wiring harness to the speedometer bracket stud, and remove the harness from the stud. It is not necessary to disconnect the cables.

(3) Remove the cable connector from the clip on the speedometer bracket, and remove the nut and lockwasher that secure the clip to the stud on the speedometer.

(4) Remove the speedometer from the driver's compartment side of the panel. Remove the bracket. Be careful not to damage the cables as the bracket is removed.

e. Install Speedometer.

(1) Insert the speedometer (fig. 2-51) from the driver's compartment side of the instrument cluster panel, and position it in the panel.

(2) Install the speedometer bracket over the speedometer with the stud holes over the two studs on the speedometer. Hold the parts in position and install the cluster wiring harness on the lower stud. Install the special plain washer, lockwasher, and nut. Tighten the nut.

(3) Position the connector clip on the upper stud and install the lockwasher and nut. Tighten the nut. Engage the cable connector in the clip.

(4) Connect the speedometer flexible shaft to the speedometer, and install the instrument cluster (*b* (4) above).

f. Replace Cluster Wiring Harness.

(1) Remove the instrument cluster (*a* (1) above).

(2) Disconnect the wiring harness cables from the fuel gage, oil pressure gage, and water temperature gage, the instrument cluster circuit breaker or ignition switch, and the battery-generator indicator (on vehicles so equipped).

(3) Remove the nut, lockwasher, and plain washer that secure the wiring harness to the speedometer stud, and remove the wiring harness.

(4) Install a new wiring harness on the speedometer lower stud (fig. 2-51), arranging the cables in proper position. Install the plain washer, lockwasher, and nut. Tighten the nut.

(5) Connect the wiring harness cables to the fuel gage, the oil pressure gage, the water temperature gage, the instrument cluster circuit breaker or ignition switch cable, and the battery-generator indicator (on vehicles so equipped) (fig. 2-3).

(6) Install the instrument cluster (*b* (4) above).

2-54. Horn and Horn Button Cable

a. Replace Horn (fig. 2-67).

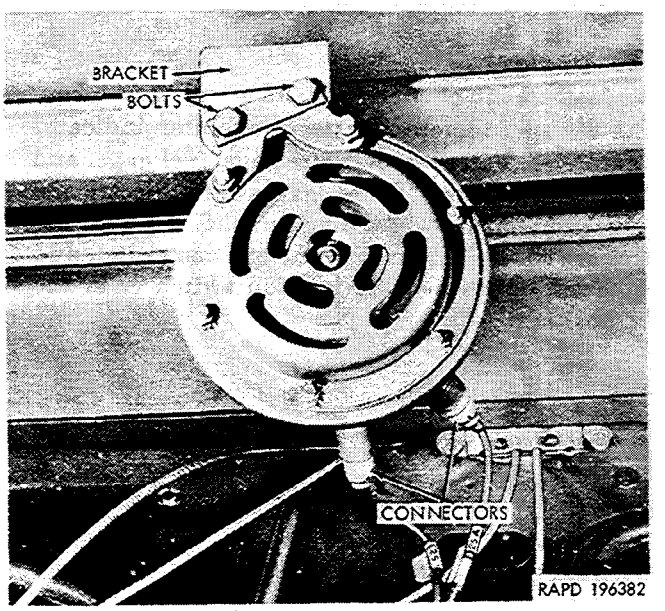


Figure 2-67. Horn and horn cables.

(1) Disconnect the ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Disconnect the two horn cable connectors and pull the cables (No. 25 and 25A) and connectors from the horn.

(3) Remove the two bolts and lockwashers that secure the horn to the bracket on the hood and remove the horn.

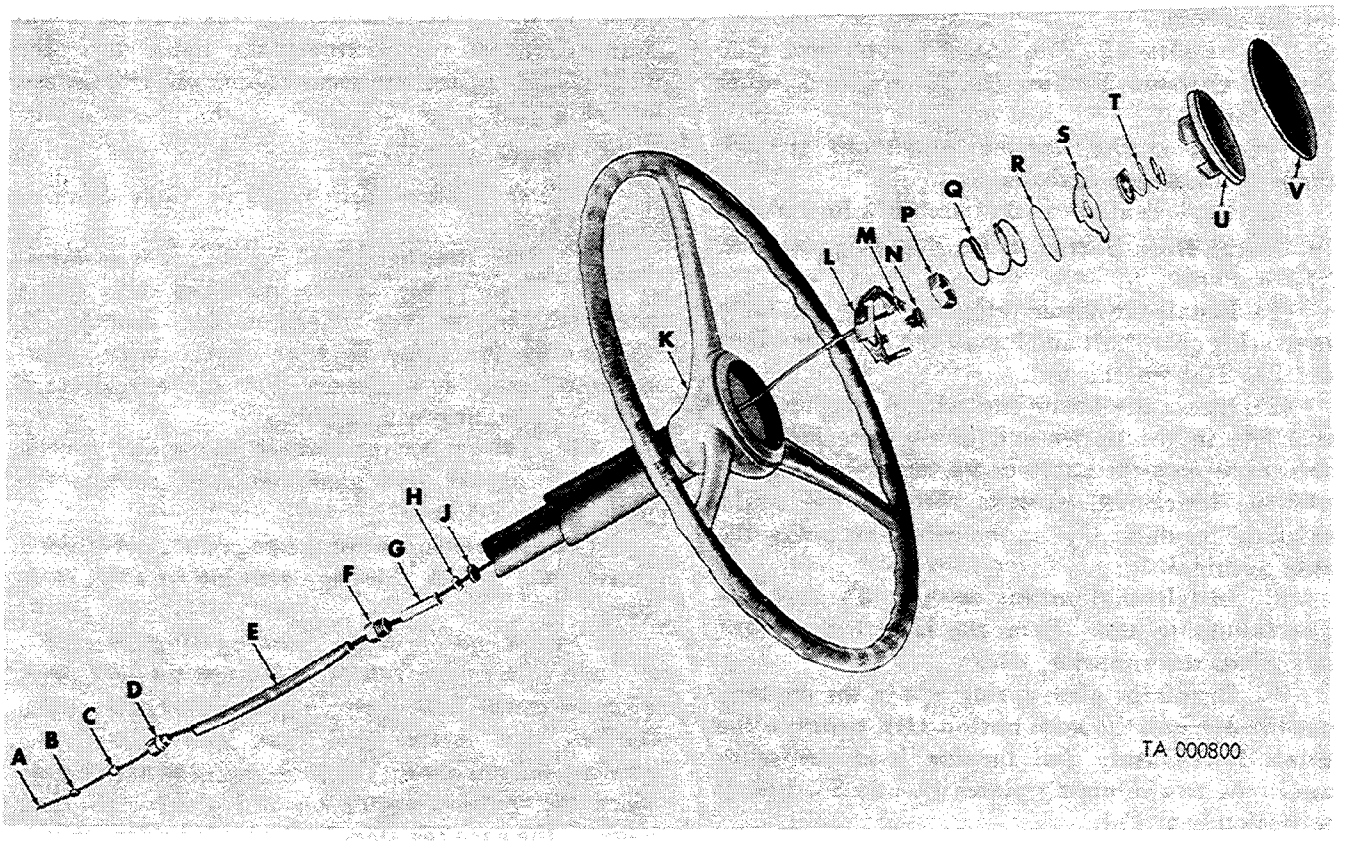
(4) Position a new horn on the bracket, and install the two lockwashers and two bolts. Tighten the bolts.

(5) Attach the horn cable connectors to the horn.

b. Remove Horn Button, Horn Button Cable, and Related Parts.

NOTE

The key letters noted in parentheses are in figure 2-68.



A Cable
B Grommet
C Bushing
D Connector shell
E Hose
F Nut
G Tube
H Washer
J Seal
K Steering wheel
L Lower retaining plate
M Cable terminal
N Insulator
P Steering wheel nut
Q Plate spring
R Snapring
S Upper retaining plate
T Button spring
U Horn button
V Button seal

Figure 2-68. Horn button cable and related parts—exploded view.

(1) Remove the horn button cable connector from the clip on the left front fender splash shield and disconnect the horn button cable 25A. Pull the cable and cable hose through the opening in the frame left side rail.

(2) Remove the grommet, bushing, and cable connector shell from the lower end of the cable (A).

(3) Unscrew the fitting nut from the lower seal plate on the steering gear housing and remove the hose (E), tube (G), and nut (F) from the cable (A). Separate the hose, tube, and nut. Remove the seal washer (H) and seal (J) from the seal plate and from the cable.

(4) Remove the horn button seal (V). Press the horn button U) down firmly and turn it clockwise to disengage the upper retaining plates (S) from the lower retaining plate (L). Remove the button, button spring, upper retaining plate, and snapring as a unit. Remove the plate spring (Q).

(5) Remove the snapring (R) from the horn button (U), and remove the upper retaining plate (S) and the button spring (T).

(6) Remove the insulator (N) from the upper end of the cable and pull the cable with cable terminal from the steering gear shaft.

(7) If the lower retaining plate (L) requires replacement, remove the steering wheel nut (P) and remove the plate.

c. Inspect Horn Button, Horn Button Cable, and Related Parts.

(1) Inspect the button seal (V), seal (J), hose (E), and grommet (B) for damage or deterioration.

(2) Inspect the cable (A) for loose or damaged

terminals, damaged insulation, or broken cable. Inspect the insulator (N) for cracks.

(3) Inspect the horn button (U), retainer plates (L and S), and springs (Q and T) for cracks and distortion.

(4) Inspect tube (G), nut (F), connector shell (D), and grommet bushing (C) for cracks or other visual damage.

(5) Inspect the steering wheel nut (P) for cracks or damaged threads.

(6) Replace all parts that are unfit for service.

d. Install Horn Button, Horn Button Cable, and Related Parts.

(1) Install the lower retaining plate (L) over the steering gear shaft and install the steering wheel nut (P). Tighten the nut.

(2) Insert the lower end of the horn button cable (A) in the upper end of the steering gear shaft, and push the cable down through the shaft until the lower end extends through the shaft. Install the insulator (N) on the cable just below the cable terminal.

(3) Install the button spring (T) and the upper retaining plate (S) in the horn button (U), and install the snapring (R).

(4) Install the plate spring (Q) in the steering wheel and install the horn button (U), pressing the button down firmly and turning it clockwise to engage the two retaining plates (L and S). Install the button seal (V).

(5) Install the cable seal and seal washer over the lower end of the cable and into the lower seal plate (fig. 2-69). Assemble the hose, tube, and 3/8-inch inverted flared tube fitting nut (fig. 2-69), and install the parts on the cable. Screw the nut to the lower seal plate on the steering gear housing.

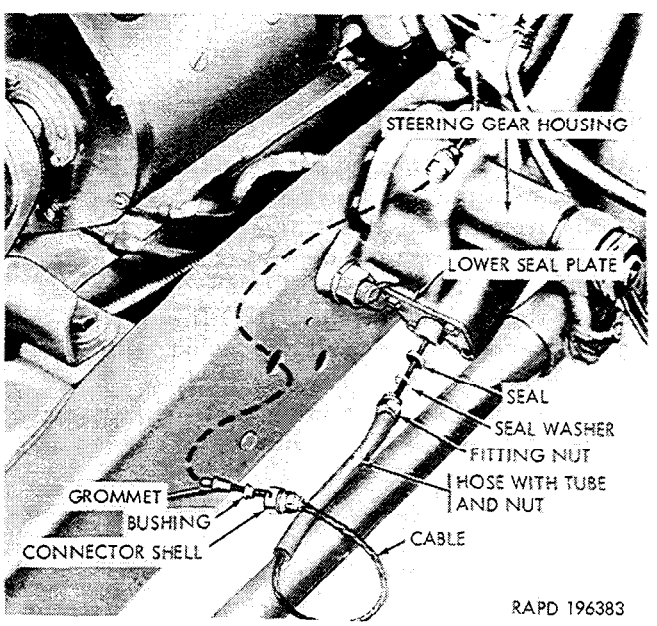


Figure 2-69. Horn button cable disconnect points.

(6) Install the connector shell, bushing, and grommet on the lower end of the cable (fig. 2-69). Position the grommet next to the cable terminal with the bushing holding the grommet in place.

(7) Insert the cable through the opening in the frame left-side rail, connect the cable to cable (25)A, and engage the connector in the clip on the splash shield.

2-55. Gages and Horn

a. Water Temperature Gage or Gage Sending Unit Faulty.

(1) Start the engine and run it until it is warm.

(2) Remove the radiator filler cap and insert a thermometer. If the thermometer reading is reasonably the same as that of the water temperature gage, it indicates that the temperature gage is operating satisfactorily.

(3) If there is considerable variation between the thermometer and gage readings, replace the gage (para 2-53 *c*).

(4) If replacement of the gage does not effect a correction, replace the gage sending unit (para 2-53).

b. Fuel Gage or Gage Sending Unit Faulty.

(1) *Fuel gage defective.* To test the fuel gage, disconnect the fuel gage sending unit cable at the sending unit in the fuel tank and ground the sending unit cable on the bare metal of the frame. Turn the ignition switch on and observe the fuel gage. If the gage registers FULL, it is evident that it is satisfactory. Replace the gage if it fails to register (para 2-53 *c*).

(2) *Fuel gage sending unit defective.* If the test described in (1) above indicates that the gage is satisfactory, replace the fuel gage sending unit (para 2-87 *b*).

c. Ammeter of Battery-Generator Indicator Inoperative.

(1) *Batteries sulphated (ammeter only).* Replace batteries (para 2-64).

(2) *Instrument cluster wiring harness connections faulty.* Check connections at instrument cluster wiring harness. Clean and tighten connections or replace instrument cluster wiring harness, as required (para 2-53 *f*).

(3) *Generator or generator regulator faulty.* Refer to paragraph 2-35 *e*).

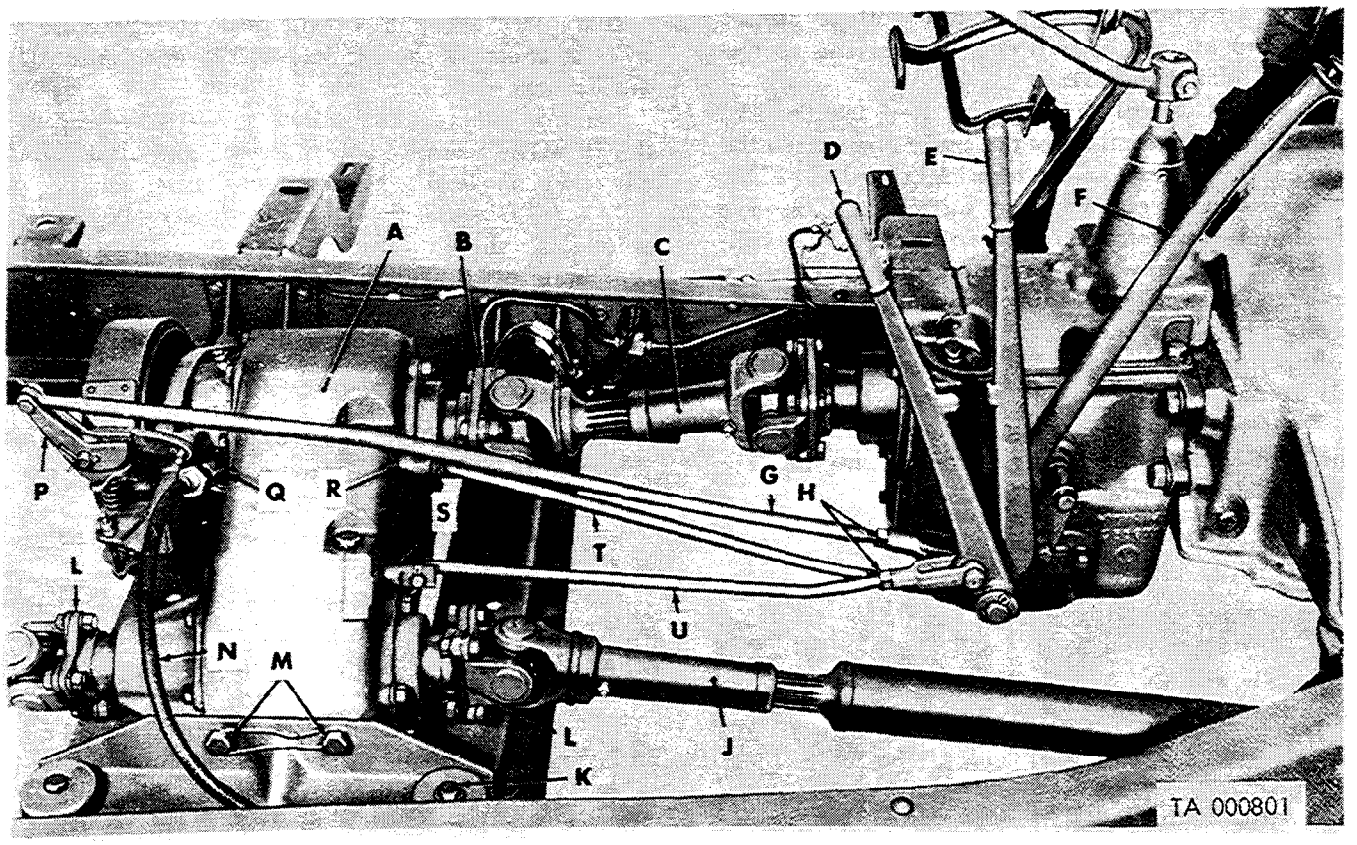
(4) *Instrument faulty.* Replace ammeter or battery-generator indicator (para 2-53 *a* and *b*).

d. Oil Pressure Gage or Gage sending Unit Inoperative. Replace oil pressure gage (para 2-53 *c*) or gage sending unit (para 2-53 *l* and *m*) as required.

e. Speedometer Does not Register.

(1) *Speedometer faulty.* Disconnect speedometer shaft at the speedometer. Drive the vehicle and note if shaft core turns. If the core turns, replace speedometer (para 2-53 *d* and *e*).

(2) *Speedometer shaft broken.* Disconnect speedometer shaft at the drive pinion on the transfer (fig. 2-70). Turn the shaft to determine if it is broken. If broken, replace the shaft or core.



A Transfer
B Input shaft companion flange
C Intermediate propeller shaft
D Declutch lever
E Shift lever
F Brake lever
G Brake control
H Nut
J Front propeller shaft
K Bolt
L Output shaft companion flange
M Mounting bracket bolts
N Speedometer shaft
P Cam lever
Q Pinion retaining nut
R Two-speed clutch gear shifter shaft.
S Front axle output shaft clutch gear shifter shaft.
T Control shifter lever rod
U Declutch shifter lever rod

Figure 2-70. Transfer and controls.

(3) *Drive pinion damaged.* If the speedometer and flexible shaft appear to be satisfactory, replace the speedometer drive pinion (para 2-108).

f. Horn Inoperative.

(1) *Batteries discharged.* Check batteries for specific gravity (para 2-63 *b*). Replace batteries as necessary (para 2-64).

(2) *Horn faulty.* Check to determine whether current reaches the horn cable connectors, using the low voltage circuit tester (fig. 2-71).

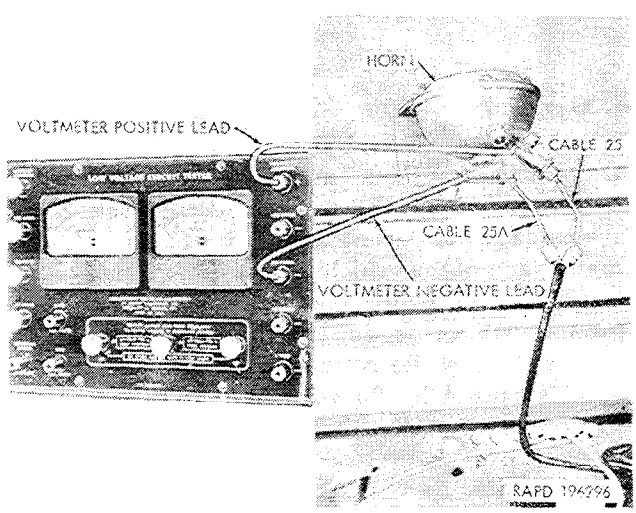


Figure 2-71. Checking for current at horn connections.

(a) Disconnect the two horn cables at the cable connectors.

(b) Connect the positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end of the lead to the terminal of cable (25).

(c) Connect the negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the terminal of cable (25A).

(d) Depress the horn button and observe the lower scale of the tester voltmeter. The voltmeter should show battery voltage (approximately 24 volts). If voltage reading is normal, the horn is faulty. Replace the horn (para 2-54*a*). If no voltage reading is indicated, proceed with (3) and (4) below.

(3) *Horn cable (wiring harness) faulty.* Check the horn cable in the wiring harness, using the low voltage circuit tester (fig. 2-72).

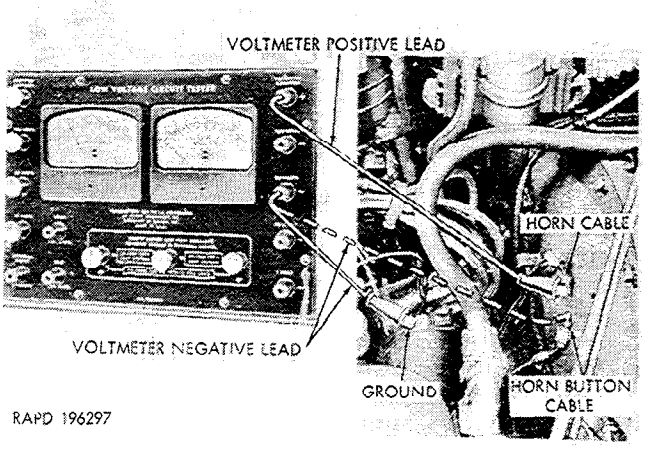


Figure 2-72. Checking for current through horn cables.

(a) Disconnect the horn button cable at the cable connector on left front fender splash shield.

(b) Disconnect the two horn cables at the cable connectors on the horn and connect cable (25) to cable (25A).

(c) Connect the positive (+) test lead to the positive (+) terminal of the low voltage circuit tester and attach the clip end to the horn cable at the harness end.

(d) Connect the negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to a ground on the engine.

(e) Observe the voltmeter lower scale. The voltmeter should show battery voltage (approximately 24 volts). If no voltage reading is indicated, the horn cables in the wiring harness are probably defective. Notify direct support maintenance personnel. If voltage reading is normal, proceed with (4) below.

(4) *Horn button cable or horn button parts faulty.* Check the horn button cable, using the low voltage circuit tester (fig. 2-72).

(a) Connect the voltmeter positive (+) test lead (3) *(c)* above).

(b) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester and attach the clip end of the lead to the horn button cable terminal at the engine end.

(c) Remove the horn button (para 2-54*b*) and ground the upper terminal of the horn button cable to the horn button lower retaining plate. Observe the lower scale of the voltmeter. The voltmeter should show battery voltage (approximately 24 volts). If no voltage is indicated, replace the horn button cable. If voltage reading is normal, replace horn button and / or other parts as required (para 2-54*d*).

g. Horn Operates Continually. Stop horn operation by disconnecting one of the horn cables at the horn. Check the horn cable, horn button cable, and horn button parts (*f.* (2), (3) and (4) above), and correct as necessary.

Section XIII. BATTERIES

2-56. General

WARNING

Certain precautions must be observed before beginning any tests on the 24-volt system. Do not permit a hot wire to touch metal parts of the vehicle at any time. Flash testing by striking a hot wire against a ground will cause an arc that will completely destroy the connector on the lead. This is caused by 24 volts in the system. Personnel who have been accustomed to using this type of test on 6- or 12-volt systems must be very careful not to forget that they are working with higher voltage. When removing the battery cables, disconnect the ground cable first. When installing the battery cables, connect the ground cable last. When two ground cables are used, both cables must be disconnected prior to working on equipment where shorting of cables can occur. Incorrect cable replacement sequence is extremely dangerous. Accidental contact of cable replacing tool with vehicle causes a direct short resulting in arcing and instant heating of tool to red heat. This can cause painful burns on hands and serious damage to tools, vehicle, and battery. Moreover, the shorted battery may explode, spraying hot acid over the surrounding area. Hold in-

sulated portion of cable. Do not touch terminal contact portion of cable while performing test.

Current for the 24-volt lighting system (fig. 2-6) is supplies by two 12-volt batteries. Batteries (fig. 2-23) for all models, except the early production models of the ambulance truck M43, are located in a box under the passenger's seat in the driver's compartment. Batteries (fig. 2-73) for the early production vehicles of the ambulance truck M43 are located in the left front compartment under the patient's seat.

2-57. Responsibility

Organizational maintenance of the batteries includes cleaning, inspection, and replacement of the batteries and battery cables.

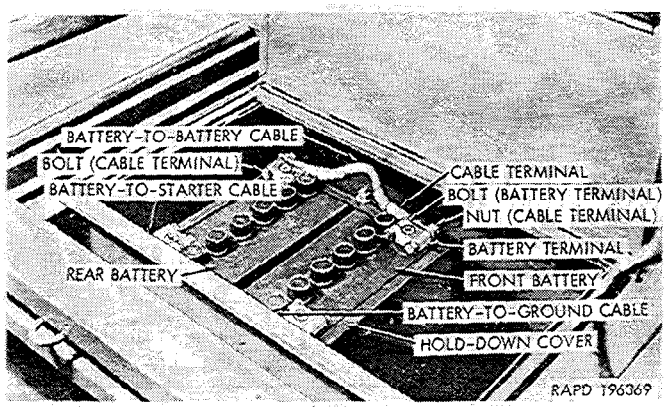


Figure 2-73. Battery box location (early production ambulance truck M43).

On vehicles so equipped, it also includes replacement of the trailer coupling receptacle, radio receptacle, and auxiliary power outlet receptacle.

2-58. Battery Test

a. Use a battery hydrometer and check each battery cell. Water should not be added prior to this test.

b. Battery specific gravity readings should be at least 1.225 in each cell. Variation of more than .025 gravity points per cell (temperature corrected) indicates a battery fault. If this occurs, replace battery. Check batteries for damaged case, terminals, or cell cover plates. If any damage is present, replace batteries (para 2-64).

2-59. Batteries Discharged

a. Excessive Use of Starter. Avoid unnecessary use of starter.

b. Ignition Switch or Vehicle Lights Left on for Long Periods. Turn ignition and light switches off when vehicle is not in operation.

c. Battery to Starter Cable Short Circuiting on Battery Hold Down Cover. Remove, clean, and install insulator and cover (para 2-64).

d. Generator Voltage Regulator Faulty. Check voltage regulator (para 2-35*f* through *i*) and correct.

e. Lack of Periodic Battery Inspection. Check batteries at specified intervals (refer to table 2-2).

2-60. Testing Battery Voltage (fig. 2-74.)

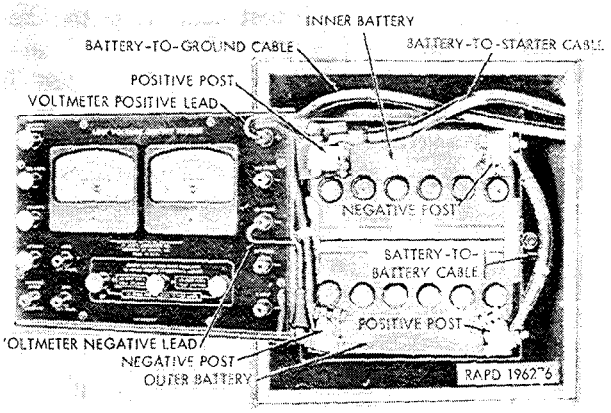


Figure 2-74. Testing battery voltage.

a. Connect Voltmeter Positive (+) Test Lead. Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester, and attach the clip end of the lead to the positive (+) terminal of the inner battery.

b. Connect Voltmeter Negative (—) Test Lead. Connect the voltmeter negative (—) test lead to the 50 volts terminal of the tester, and attach the clip end of the lead to the negative (—) post of the outer battery.

c. Read Voltmeter. Observe the reading on the lower scale of the tester voltmeter. This reading should be at least 23 volts, with the batteries at a temperature of 70° F. Voltage reading will be lower at lower temperatures and higher at higher temperatures. If the combined voltage of the two batteries is less than 23 volts (at 70° F.), check each battery. Replace battery (para 2-64), if voltage reading shows less than 11.5 volts.

d. Remove Testing Equipment. When the check has been completed, remove the testing equipment.

2-61. Battery Voltage Drop (Starter Cranking Engine)

The check of the battery voltage drop with the starter cranking the engine is to determine the condition of the batteries and the starter. The engine must be at normal operating temperature for this check.

a. Connect Voltmeter Test Leads. Connect the voltmeter test leads (*c*(2) and (3) above) and note the combined voltage reading of the batteries.

b. Read Voltmeter. Crank the engine with the

starter (ignition switch off), and observe the voltmeter lower scale reading. The reading should not drop below 22 volts. A reading of less than 22 volts with the starter cranking the engine indicates partially discharged or defective batteries or a faulty starter. Check each battery individually (*c* and *d* below) to determine whether one or both batteries are at fault.

c. Check Voltage of Outer Battery (fig. 2-75). Connect the positive (+) test lead clip to the positive (+) post of the outer battery and the negative (—) test lead clip to the negative (—) post of the outer battery. Crank the engine with the starter (ignition switch off) and note the reading on the voltmeter lower scale.

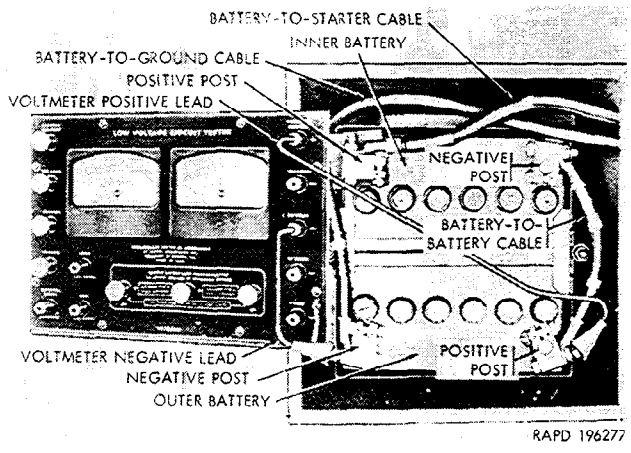


Figure 2-75. Testing voltage of outer battery.

d. Voltage of Inner Battery (Fig. 2-76). Connect the positive (+) test lead clip to the positive (+) post of the inner battery and the negative (—) test lead clip to the negative (—) post of the inner battery. Crank the engine with the starter (ignition switch off) and note the reading on the voltmeter lower scale.

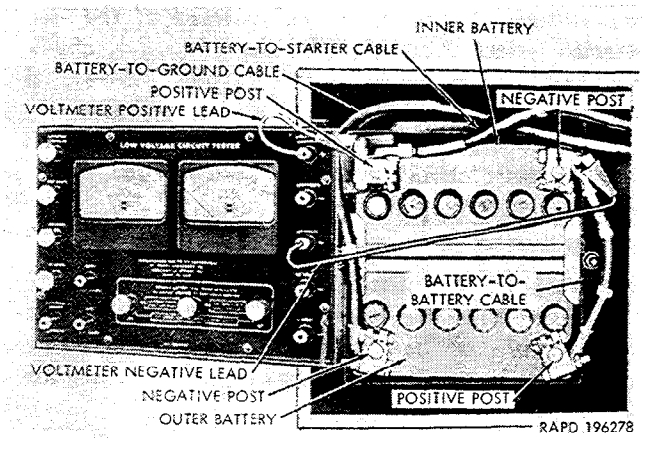


Figure 2-76. Testing voltage of inner battery.

e. Compare Voltage Readings of the Two Batteries. The reading for each battery should be not less than 11 volts and variation between the two batteries should not exceed 1 volt. If voltage reading of one battery is low, replace the low battery (para 2-64) and repeat the check described in *a* and *b* above.

2-62. Battery-to-Battery Cable Resistance (Fig. 2-77.)

Testing the resistance in the battery-to-battery cable is to isolate excessive resistance between the batteries. When making this check, the test leads must be attached to test prods in the battery posts, rather than to the battery cable terminals, to insure accurate readings.

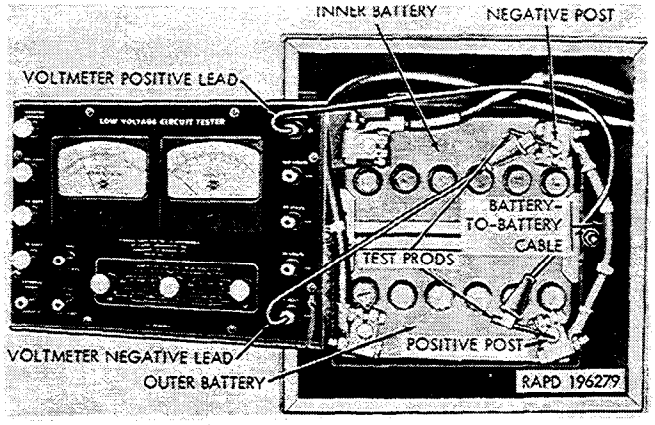


Figure 2-77. Testing battery-to-battery cable resistance.

NOTE

To make a test prod, use a short length of ⅛-inch welding rod and grind one end to a sharp, long point. Two prods will be required. Using a light hammer, drive the prods into the center of the battery posts.

a. Warm Up Engine. Start the engine and run it at idling speed until normal operating temperature is reached. Stop the engine.

b. Install Test Prods in Battery Posts. Drive a test prod into the positive (+) post of the outer battery and the negative (—) post of the inner battery.

c. Connect Voltmeter Positive (+) Test Lead. Connect the positive (+) test lead to the positive (+) terminal of the low voltage circuit tester, and attach the clip end of the lead to the test prod in the positive (+) post of the outer battery.

d. Connect Voltmeter Negative (—) Test Lead. Connect the negative (—) test lead to the 1 volt terminal of the tester and attach the clip end of the lead to the test prod in the negative (—) post of the inner battery.

e. Read Voltmeter. Crank the engine with the

starter (ignition switch) and observe the upper scale of the voltmeter. The voltage reading should not exceed 0.1 volt. If the reading exceeds 0.1 volt, check for corroded battery terminals or a loose cable in the cable terminals. Clean corrosion from terminals. Replace a defective cable (para 2-65).

f. Remove Testing Equipment. When the test has been completed, remove the testing equipment and the test prods.

2-63. Battery Cleaning, Servicing, and Specific Gravity Test

a. Clean and Service.

(1) Clean the batteries and battery cable terminals, removing corrosion and dirt.

(2) Apply a light coating of petroleum jelly to the battery cable terminals to prevent corrosion accumulation. Corrosion around the battery and terminals causes battery drain and must be avoided.

(3) Remove the six fillercaps from each battery and inspect the level of the electrolyte. The correct level should be three-eights of an inch below the top of the cell, or well above the tops of the plates.

(4) Check the specific gravity in each cell of each battery (*b* below). If the electrolyte level is too low to permit filling of the hydrometer, add clean distilled water to the proper level and run the engine for approximately 30 minutes before attempting to check the specific gravity.

NOTE

If distilled water is not available, use clean rain water or drinking water. The use of water with high mineral content must be avoided since it causes rapid deterioration of plates and separators.

b. Check Specific Gravity.

(1) Remove the six filler caps from each battery. Test and note the temperature of the electrolyte and test the specific gravity in each cell, using a hydrometer. Note the readings.

(2) A specific gravity reading of 1.275 to 1.300 at 80° F. in each cell indicates a fully charged battery. A reading of less than 1.220 is unsatisfactory. Replace a battery if the reading is below 1.220 (para 2-64).

(3) If the temperature of the electrolyte is higher or lower than 80° F., compute the corrected specific gravity in accordance with the correction chart (fig. 2-78).

(4) Compare the readings in the cells of the battery. The specific gravity in all cells of either battery should be the same, within 0.025. If variation is greater than this, an abnormal condition within the battery is indicated. Check the battery voltage drop (para 2-61). Replace either or both batteries, as required (para 2-64).

(5) Install the six fillercaps for each battery after completing the check.

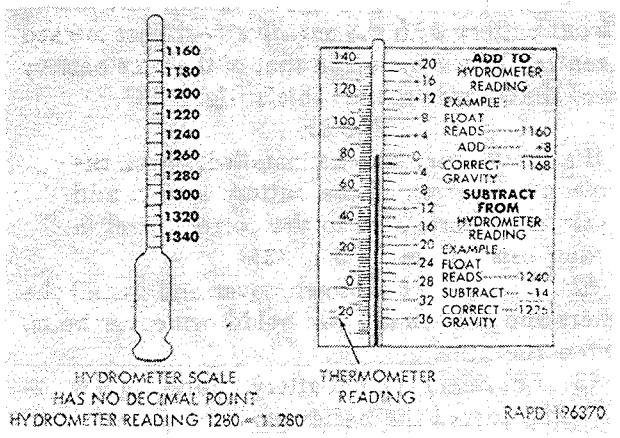


Figure 2-78. Hydrometer scale and temperature correction chart.

2-64. Battery Removal and Installation

a. General. Batteries replaced because of a discharged condition or unsatisfactory voltage tests will be reported to direct support maintenance personnel. Replacement procedure described in *b* and *c* below covers removal and installation of both batteries. If only one battery requires replacement, unnecessary steps may be omitted but, in any case, the battery ground cable must be removed to prevent accidental grounding of the batteries.

b. Removal.

(1) Loosen the nut on the battery terminal bolt at the negative (—) post of the outer battery (fig. 2-23) or front battery (fig. 2-73) and remove the terminal with attached ground cable. Remove the battery-to-battery cable and the battery-to-starter cable in the same manner. Remove the insulator from the positive (+) post of the inner battery (fig. 2-23) or rear battery (fig. 2-73) if so equipped.

NOTE

This insulator is required on vehicles of early manufacture. On later vehicles, the battery holddown cover eliminates the necessity for the insulator.

(2) Remove the two holddown cover bolt nuts and flat washers, and remove the holddown cover. Lift the two batteries from the battery box.

(3) Clean and inspect the inside of the battery box. See that it is dry and free from corrosion. Paint the box if it is rusted or has been damaged by corrosion.

c. Installation.

(1) For vehicles with the batteries under the passenger seat, install the batteries in the battery box with the negative (—) post of the inner battery

toward the front and that of the outer battery (fig. 2-23) toward the rear. For ambulance truck M43 with batteries in the patient compartment, install the front battery with the negative (—) post toward the center of the vehicle and that of the rear battery toward the left side of the vehicle (fig. 2-73).

NOTE

If a new battery is to be installed, check the electrolyte level. If the battery is dry, add diluted sulfuric acid to the correct level in each cell (para 2-63 *a* (3)).

(2) Install the holddown cover and install the washers and nuts on the two holddown cover bolts. Tighten the nuts.

(3) Lubricate the battery posts (para 2-63 *a* (2)). Install the battery-to-battery cable and battery terminals, being sure to install each terminal on the correct battery post (positive on positive and negative on negative (fig. 2-23 and 2-73)).

(4) Install the rubber insulator on the positive post of the inner battery (fig. 2-23), or the rear battery (fig. 2-73) if required. Refer to note in *b* (1) above. Install the battery-to-starter cable and battery terminal on the battery post.

(5) Install battery-to-ground cable and battery terminal on the negative (—) post of the outer battery (fig. 2-23) or front battery (fig. 2-73).

(6) Tighten the nuts on the four battery terminal bolts.

CAUTION

Reversing polarity of battery will burn rectifier.

2-65. Battery Terminals and Cables

a. Remove Battery Terminals (fig. 2-23 and 2-73). All battery terminals are serviced in the same manner. Positive and negative terminals are not interchangeable.

(1) Before removing any of the battery terminals, disconnect the battery-to-ground cable (para 2-64) to prevent accidental short circuits.

(2) Remove the nut from the cable terminal bolt and remove the cable terminal and the bolt.

(3) Loosen the nut on the battery terminal bolt, and remove the terminal.

b. Install Battery Terminals (fig. 2-23 and 2-73).

(1) Clean the battery post, cable terminal, and battery terminal. Lubricate battery posts (para 2-63 *a* (2)).

(2) Install a bolt in the battery terminal and install the nut loosely on the bolt. Install the terminal on the battery post.

(3) Install the bolt through the battery terminal, install the cable terminal on the bolt, and install the nut. Position the battery terminal on the battery post and tighten both nuts.

c. Replace Battery-to-Battery Cable (fig. 2-23 and 2-73).

(1) Remove the nut that secures each battery-to-battery cable terminal and remove the cable from the battery terminals.

(2) Install the terminals of the new cable on the bolts in the battery terminals, and install the nut on each bolt. Tighten the nuts.

d. Remove Battery-to-Ground Cable (fig. 2-23 and 2-73).

(1) Remove the nut that secures the battery-to-ground cable at the battery terminal, and remove the cable terminal from the bolt.

(2) Remove the nut, bolt, and two lockwashers that secure the outer terminal of the cable to the right frame side rail.

(3) Remove the two screws that secure each of the grommet retainers (one at the front side of the battery box and one at the floor panel). Push the grommet retainers along the two cables to provide access to the grommets, and remove the grommets.

(4) Pull the cable from the battery box and grommet retainer up through the opening in the floor panel and the other grommet retainer.

e. Install Battery-to-Ground Cable (fig. 2-23 and 2-73).

(1) Insert the battery terminal end of the new battery-to-ground cable through the grommet retainer at the battery box and into the box. Install the split rubber grommet on the cable at the opening in the box.

(2) Insert the other end of the cable through the grommet retainer at the floor panel and through the opening in the floor panel. Install the other split rubber grommet on the cable at the floor panel.

(3) Position the two grommet retainers and install the two screws for each retainer. Tighten the screws.

(4) Clean the frame side rail at terminal bolt hole and apply a film of lubricant. Attach the terminal of the ground cable to the right frame side rail, with a bolt, two lockwashers (one at each side of the cable terminal), and a nut. Tighten the nut.

(5) Connect the ground cable terminal to the bolt (cable terminal) at the negative (—) post of the outer battery (fig. 2-23) or the front battery (fig. 2-73) and install the nut. Tighten the nut.

f. Remove Battery-to-Starter Cable.

(1) Remove the nut that secures the battery-to-starter cable terminal at the battery terminal, and remove the cable terminal (fig. 2-23) from the bolt.

(2) Disconnect the other end of the cable from the starter switch terminal (fig. 2-24).

(3) Remove the cable grommets at the battery box and floor panel as described in *d* (3) above.

(4) Disengage the cable from the cable clip (fig. 2-79) on the transmission.

(5) Pull the front end of the cable back from the engine compartment. Remove the battery end of the cable from the battery box, two grommet retainers and the floor panel, and remove the cable from the underside of vehicle.

g. Install Battery-to-Starter Cable.

(1) From the underside of the vehicle, place the battery-to-starter cable over the transmission and push the starter terminal end of the cable into the engine compartment below the accelerator shaft.

(2) Insert the other end of the cable through the opening in the floor panel, the two grommet retainers, and the opening in the battery box.

(3) Install the two grommets, and secure the grommet retainers as described in *e* (2) and (3) above.

(4) Connect the cable to the starter terminal (fig. 2-24) and install the special terminal nut. Tighten nut. Install the other end of the cable on the bolt (cable terminal) at the positive (+) post of the inner battery (fig. 2-23) or the rear battery (fig. 2-73). Install a ⅜-16NC nut on the bolt and tighten. Engage the cable in the cable clip (fig. 2-79) on the transmission.

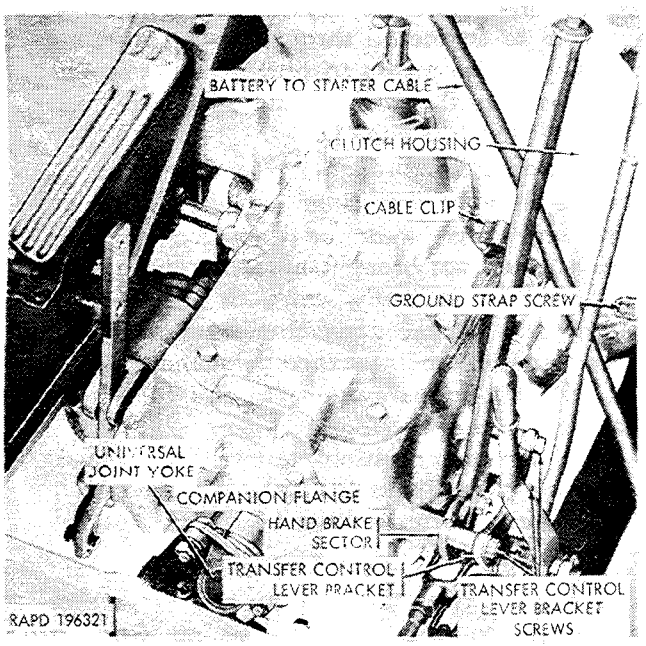


Figure 2-79. Disconnect points in driver's compartment.

Section XIV. ENGINE DESCRIPTION AND MAINTENANCE IN VEHICLE)

2-66. General

a. Description. The gasoline engine is a 4-cycle, in-line, valve-in-cylinder block, liquid-cooled, electrically-ignited Dodge T245 model. Left and right are the left and right sides respectively of the engine as viewed from the operator's seat. Front is the fan and drive belt end of the engine, while rear is the flywheel end.

NOTE

Battery voltage should be normal and engine at normal operating temperature before proceeding with the following steps.

b. Compression Test.

(1) Remove all spark plugs (para 2-17*e*) from left side of engine.

(2) Pull out throttle control knob as far as it will go and leave in locked-out position.

CAUTION

Do not crank engine more than is necessary to obtain a maximum reading.

(3) Insert compression gage in No. 1 spark plug hole (fig. 2-80) depress starter button to crank engine, and note maximum compression indicated by gage.

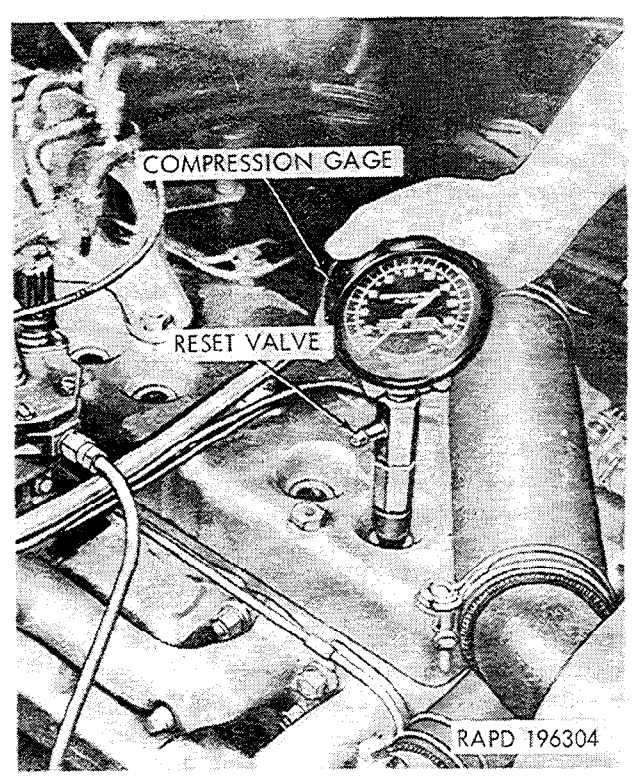


Figure 2-80. Engine compression test.

(4) If pressure in cylinder is appreciably below normal (110 to 130 psi), pour one teaspoonful to engine oil through the spark plug hole on top of the piston to prevent loss of compression temporarily, and repeat (3) above.

NOTE

Low compression brought up to normal by oil sealing indicates piston, piston ring, or cylinder sleeve wear or damage. Low compression not brought up to normal by this method indicates valve or cylinder head gasket leakage. In either case, notify direct support maintenance personnel.

(5) Repeat subparagraph (3) and (4) above for each remaining cylinder.

(6) When compression test is completed, install spark plugs (para 2-17 *g*).

(7) Release throttle control.

2-67. Tuneup

a. General. Engine tuneup is an orderly process of checking the engine to determine whether various units are operating within satisfactory limits, and making necessary adjustments and / or repairs to restore maximum engine performance.

b. Order of Procedure. Perform a complete major tune-up of the engine.

(1) Clean the engine (TM 9-2320-212-10).

(2) Service the carburetor air cleaner (para 2-78).

(3) Test the batteries for specific gravity (para 2-63) and voltage (para 2-60).

(4) Clean and adjust spark plugs (para 2-17 *f*).

(5) Clean and adjust or replace distributor breaker points and capacitor (para 2-22 and 2-23).

(6) Clean and check adjustment of the carburetor (para 2-79).

(7) Check engine timing (para 2-20).

(8) Tighten the cylinder head capscrews, using a torque-indicating wrench (para 2-69 *b*) and the following the sequence shown in figure 2-2.

(9) Tighten manifold stud nuts (para 2-68 *f* (8)) and adjust manifold heat control valve (para 2-68 *g*).

(10) Check oil pan drain plug.

(11) Test manifold vacuum (para 2-68 *a*).

(12) Test engine compression (para 2-66 *b*).

NOTE

The manifold vacuum test and compression test determine whether valve tappet adjustment is necessary. If these tests indicate that valves are operating satisfactorily and quietly, the valve tappet adjustment is not needed. IF valve tappets are operating unsatisfactorily and noisily, notify direct support maintenance personnel for valve tappet adjustment.

(13) Check fuel pump (para 2-83).

2-68. Intake and Exhaust Manifolds

a. Manifold Vacuum Test.

NOTE

The manifold vacuum test is run to determine whether the vacuum is satisfactory for proper engine performance.

(1) *Procedure.*

(a) Remove the primer pump inlet line and elbow type nozzle (on vehicle so equipped) or the pipe plug from the intake manifold and install the vacuum gage hose fitting. Connect the gage hose to the fitting and hang the gage in a convenient spot for reading, as shown in figure 2-81.

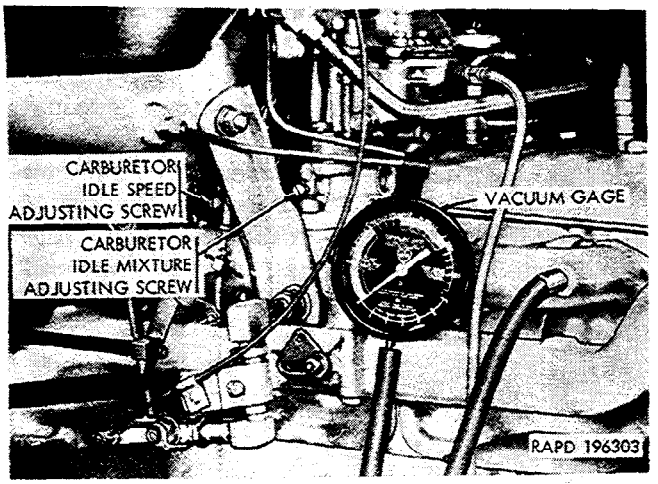


Figure 2-81. Manifold vacuum test.

(b) Start the engine and run at idling speed until normal operating temperature is reached.

(c) Adjust the carburetor idle speed adjusting screw (fig. 2-81) until the desired engine idle speed is obtained. Turn the carburetor idle mixture adjusting screw (fig. 2-81) in either direction slowly until maximum vacuum gage reading is obtained. It may be necessary to reset the carburetor idling speed after adjusting the idle mixture.

(2) *Interpretation of vacuum gage reading.* The pointer of the vacuum gage should be steady and show a reading of 17 to 21 inches at sea level. AT higher altitudes, the reading will be less than than at sea level, decreasing approximately 3½ inches for each 5,000 feet increase in altitude. A fluctuating gage pointed, after (1) through (8) in paragraph 2-67 *b* and (1) *(b)* and *(c)* above have been performed, indicates insufficient valve tappet clearance or a leaky cylinder head gasket. Notify direct support maintenance personnel. An abnormally low reading, with steady pointer, indicates faulty manifold or manifold gaskets. Notify direct support maintenance personnel or replace (para 2-68 *b*, *c*, and *d*).

(3) *Remove gage.* Remove the vacuum gage, hose, and hose fitting from the intake manifold.

Install the elbow-type nozzle and connect the primer inlet line (on vehicles so equipped), or install the ¼ inch pipe plug.

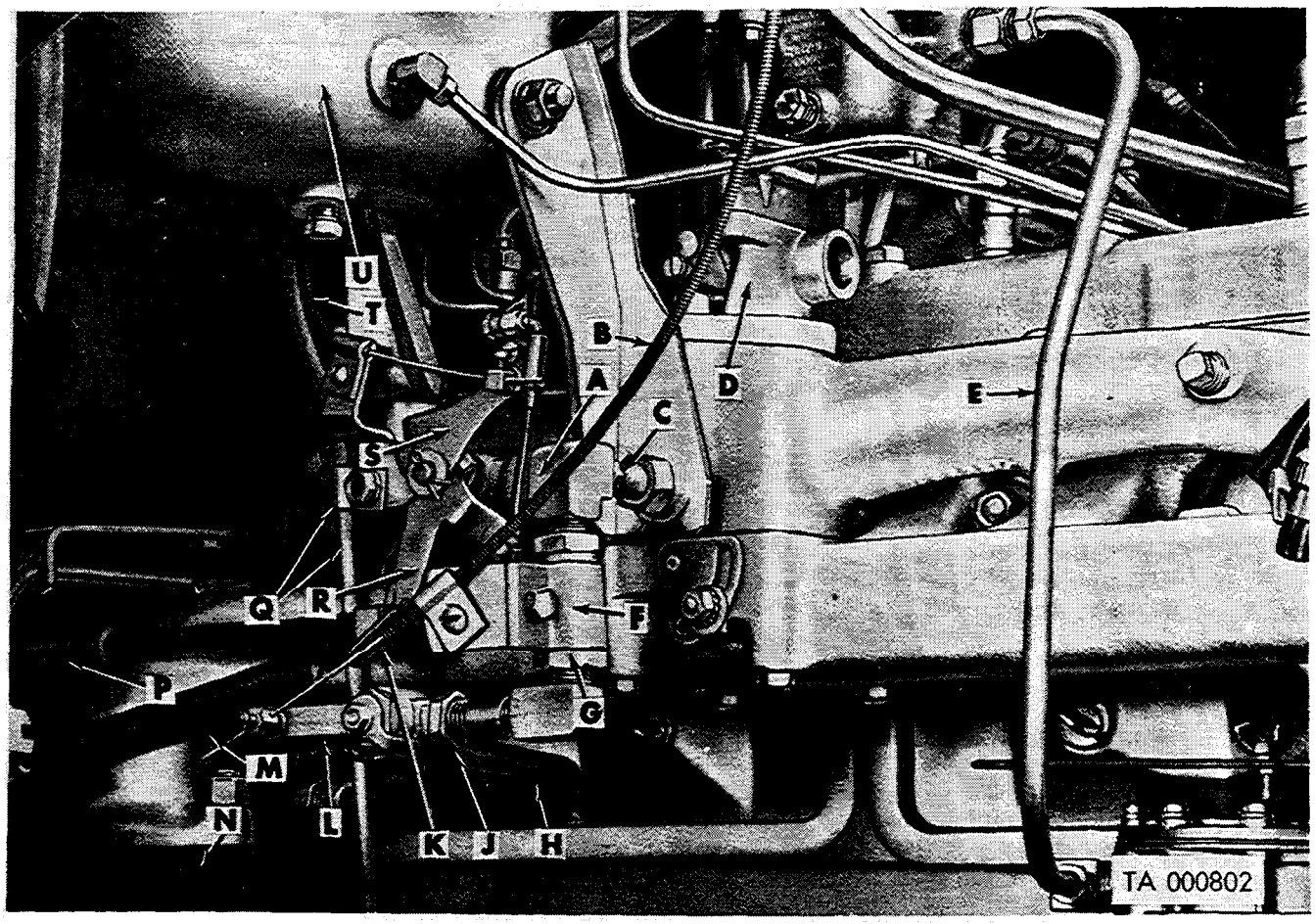
b. Removal.

(1) Remove the four screws that secure the right front fender to hood side panel, and remove the panel.

(2) Loosen the right radiator tie rod at the tie rod bracket on the dash panel, and raise the rod to an upright position.

(3) Remove the carburetor air cleaner (para 2-78).

(4) Remove the air cleaner elbow (U, fig. 2-82) (D, fig. 2-82) as a unit (para 2-81).



A Metering valve upper elbow
B Crankcase ventilation shutoff valve control.
C Metering valve nipple
D Carburetor
E Fuel pump-to-carburetor fuel line.
F Support clamp
G Crankcase metering valve
H Crankcase vent line
J Crankcase ventilation shutoff valve.
K Return spring clip
L Elbow
M Throttle return spring
N Upper exhaust pipe
P Accelerator shaft to throttle control bellcrank rod.
Q Fuel pump to windshield wiper hose line and clip.
R Throttle control bellcrank
S Throttle control lever
T Throttle control
U Air cleaner elbow

Figure 2-82. Right side of engine—partial view.

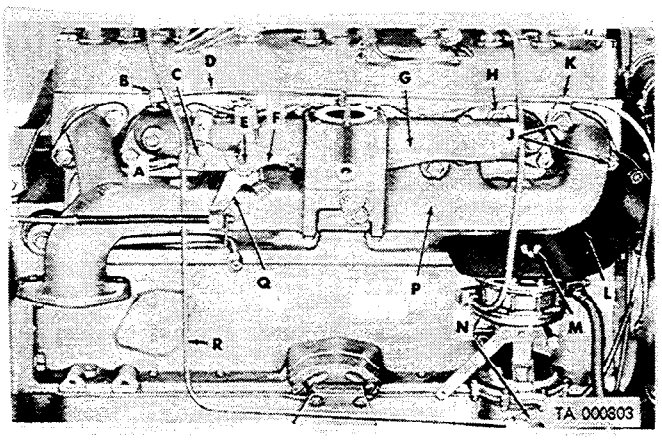
(5) Disconnect the upper exhaust pipe (N, fig. 2-82) from the lower exhaust pipe by loosening the nuts on the two eyebolts and swinging the eyebolts out from the pipe flange.

(6) Disconnect the outer end of the crankcase vent line (H, fig. 2-82) by unscrewing the tube nut from the elbow (L, fig. 2-82).

(7) On engines equipped with crankcase ventilation shutoff valves, detach the valve control (B, fig. 2-82) and remove the shutoff valve (J, fig. 2-82) the crankcase metering valve (G, fig. 2-82), and support clamp (F, fig. 2-82), and fittings as a unit by unscrewing the metering valve upper elbow (A, fig. 2-82) from the metering valve nipple (C, fig. 2-82) or nipple bushing. On engines not so equipped, remove the vent line elbow, union, nipple, the metering valve, and two elbows as a unit the same manner.

(8) On engines equipped with a priming system, disconnect the primer pump to intake manifold line from the tee type nozzle in the rear port of the intake manifold.

(9) Disconnect the fuel pump to intake manifold line (D, fig. 2-83) from the elbow (B, fig. 2-83) in the intake manifold.



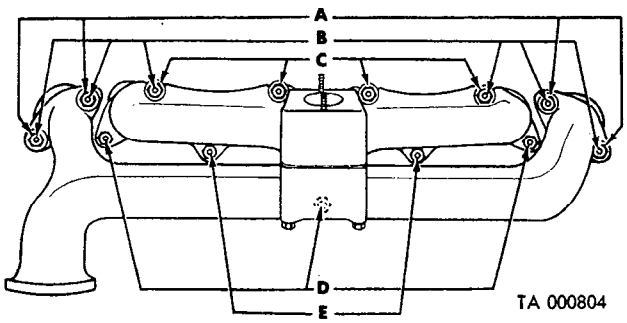
A Wiper hose line cup
B Elbow
C Throttle control cup bracket
D Fuel pump-to-intake manifold line.
E Bellcrank stud
F Throttle control lever
G Intake manifold
H Washer
J Manifold stud nuts
K Vacuum line clip
L Fuel pump heat shield
M Heat shield wing nut
N Fuel pump
P Exhaust manifold
Q Throttle control bellcrank
R Fuel pump to wiper hose line

Figure 2-83. Manifold disconnect points.

(10) Unhook the throttle return spring (M, fig. 2-82) from the return spring clip (K, fig. 2-82) on the bellcrank rod. Remove the cotter pin from the front end of the accelerator shaft to throttle control bellcrank rod (P, fig. 2-82) and remove the return spring clip. Disengage the rod from the throttle control bellcrank (R, fig. 2-82) and temporarily install the cotter pin in the end of the rod to hold the rod spring and washer on the rod. Detach the throttle control (T, fig. 2-82) from the clip and swivel.

(11) Disconnect the fuel pump to wiper hose line (R, fig. 2-82) at the fuel pump (N, fig. 2-83) and remove the wiper hose from the line. Remove the screw and lockwasher from the throttle control clip bracket (C, fig. 2-83) and remove the line and the wiper hose line clip (A, fig. 2-83).

(12) Remove the 13 manifold stud nuts and 8 washers (fig. 2-84). Remove the vacuum line clip (K, fig. 2-83) and move the line out of the way.

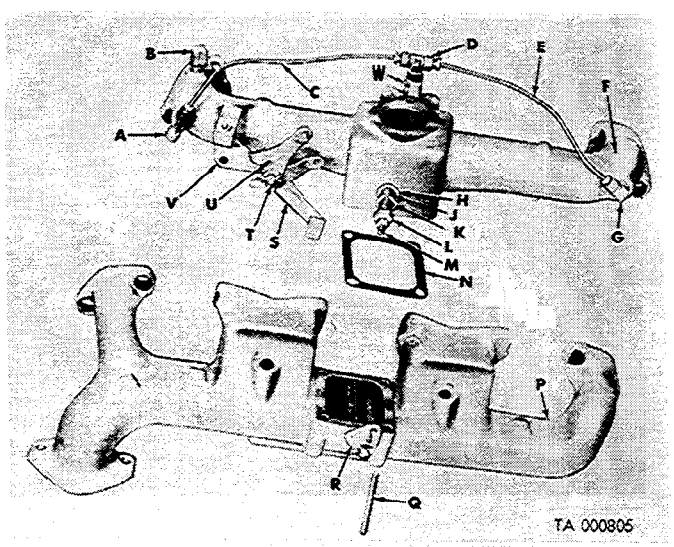


A Nuts and thick washers
B Manifold clamp washers and nuts.
C Studs
D Studs
E Studs

Figure 2-84. Location of manifold studs, nuts, and washers.

(13) Remove the assembled manifolds. Remove and discard the manifold gaskets and the upper to lower exhaust pipe gasket.

c. Disassembly (fig. 2-85).



A Tee type nozzle
B Manifold line elbow
C Priming system line
D Tee type nozzle
E Priming system line
F Intake manifold
G Elbow type nozzle
H Plain washer
J Metering valve nipple
K Lockwasher
L Nut
M Pipe bushing
N Intake to exhaust manifold gasket
P Exhaust manifold
Q Screw
R Heat control valve plate
S Throttle control bellcrank
T Bellcrank stud
U Throttle control lever
V Throttle control clip bracket
W Nozzle extension

Figure 2-85. Intake and exhaust manifolds—exploded view.

(1) Remove the throttle control bellcrank (S), throttle control lever (U), and throttle control clip bracket (V) as a unit by unscrewing the bellcrank stud (T) from the intake manifold.

(2) Remove the two nuts and bolts that secure the upper exhaust pipe to the exhaust manifold, and remove the upper exhaust pipe. Remove and discard the gasket.

(3) Remove the metering valve nipple (J), pipe bushing (M), nut (L), lockwasher (K), plain washer (H), and two capscrews and nuts.

(4) Remove the manifold line elbow (B) from the intake manifold (F).

(5) On engines equipped with a priming system, remove the two priming system lines (C and E) from the two tee type nozzles (A and D) and the elbow type nozzle (G). Remove the three nozzles and the nozzle extension. On engines not so equipped, remove the three pipe plugs from the intake manifold.

(6) Remove the four screws (Q) that secure the exhaust manifold (P) to the intake manifold (F), and separate the manifolds. Remove and discard the intake to exhaust manifold gasket (N).

d. Inspection. Clean the mating surfaces of the manifolds and the engine block. Inspect the manifolds for cracks, damaged flange surfaces, and other visual damage. Inspect the manifold studs for damaged threads and see that all studs are secure. Tighten loose studs; remove damaged studs. Inspect the manifold heat control valve for worn or corroded parts. If the heat control valve is damaged, or inoperative, replace the exhaust manifold. Check all lines and fittings for breaks and damaged threads (fuel, ventilation, vacuum, and priming lines if engine is so equipped). Replace all parts that are unfit for further service.

e. Assembly (Fig. 2-85).

(1) Install new intake to exhaust manifold gasket (N) on the exhaust manifold (P) and install the intake manifold (F) on the exhaust manifold. Install the four 5/16-inch screws (Q) fingertight until the manifolds are installed (*f*(8) below).

(2) On engines equipped with a priming system, install the elbow type nozzle (G) in the front port of the intake manifold, the tee type nozzle (D) with nozzle extension (W) in the center port, and the tee type nozzle (A) in the rear port. On engines not so equipped, install the three ¼-inch pipe plugs in the intake manifold ports.

(3) Install the ¼-inch, 90°, ⅛-inch male pipe end, inverted flared tube elbow for the fuel pump to manifold vacuum line in the intake manifold (F).

(4) Install metering valve nipple (J) in the intake manifold and install the washer (H), lockwasher (K), nut (L), and pipe bushing (M) on the nipple. Tighten the bushing until both the bushing and nipple are tight.

(5) Install a new upper exhaust pipe to manifold gasket and install the upper exhaust pipe on the exhaust manifold with the two capscrews and nuts.

(6) Place a lockwasher, followed by the throttle control clip bracket (V) on the bellcrank stud (T), and screw the stud into the front hole of the boss on the intake manifold. Tighten the stud.

f. Installation.

(1) If any of the manifold studs were removed, install new studs in their respective locations (fig. 2-84) and tighten.

(2) Install a new upper to lower exhaust pipe gasket on the lower exhaust pipe.

(3) Install new intake and exhaust manifold gaskets over the manifold studs.

(4) Position the manifold assembly on the manifold studs. As the manifold is being pushed onto the studs, install a manifold clamp washer and a nut on each of the two upper center studs.

NOTE

Nuts cannot be installed after the manifold is in position against the cylinder block.

(5) Connect the fuel pump-to-intake manifold line (D, fig. 2-83) to the elbow (B, fig. 2-83) in the intake manifold, and install the vacuum line clip (K, fig. 2-83) on the exhaust manifold upper front stud. Position the fuel pump heat shield (L, fig. 2-83) over the exhaust manifold lower front stud.

(6) Install the four thick brass washers (chamfered side out) and four seize-proof nuts (A, fig. 2-84) (tapered side toward washer) on the exhaust manifold studs.

(7) Install the other two manifold clamp washers and two nuts (B, fig. 2-84) on the upper studs. Install the five nuts on the lower studs (D and E, fig. 2-84).

(8) Tighten all manifold stud nuts lightly and evenly until the manifolds are snug against the cylinder block. Tighten the four screws that secure the intake manifold to the exhaust manifold. Tighten the manifold stud nuts.

(9) Connect the wiper-hose line (R, fig. 2-83) at the fuel pump (N, fig. 2-83). Position the wiper hose line clip (A, fig. 2-83) over the throttle control clip bracket hole, and install a lockwasher and capscrew. Connect the windshield wiper hose to the line.

(10) Remove the cotter pin from the front end of the accelerator shaft to throttle control bellcrank rod and insert the rod through the bellcrank swivel. Install the return spring clip (K, fig. 2-82) and a new cotter pin. Attach the throttle return spring (M, fig. 2-82) to the clip.

(11) On engines equipped with a priming system, connect the primer pump-to-intake manifold line to the tee-type nozzle at the rear port of the intake manifold.

(12) Install the crankcase metering valve (G,

fig. 2-82) and assembled fittings by screwing the metering valve upper elbow (A, fig. 2-82) to the bushing on the metering valve nipple (C, fig. 2-82).

(13) Connect the crankcase vent line (H, fig. 2-82) to the elbow (L, fig. 2-82).

(14) Position the two eye bolts that secure the upper exhaust pipe to the lower exhaust pipe, and tighten the eye bolt nuts.

(15) Install the carburetor (D, fig. 2-82) and carburetor air cleaner elbow (U, fig. 2-82) as a unit (para 2-81*d*). Connect and adjust the throttle control (para 2-79).

(16) Install the carburetor air cleaner (para 2-78*d*).

(17) On engines equipped with crankcase ventilation shutoff valves, connect and adjust the shutoff valve control (para 2-72*e*).

(18) Install the radiator right tie rod in the tie rod bracket on the dash panel with the bracket between the two plain washers, and tighten the two tie rod nuts.

(19) Position the right front fender to hood side panel and install the four lockwasher screws.

g. Adjust Manifold Heat Control Valve. Loosen the control valve adjusting plate stud nut and move the heat control valve plate (B, 2-85) to the proper position for prevailing ambient temperature. Set the plate at SUMMER position for ambient temperatures consistently above 60° F. and at WINTER position for ambient temperatures consistently below 30° F. (Fig. 2-86). Be sure to tighten the stud nut after adjusting the plate.

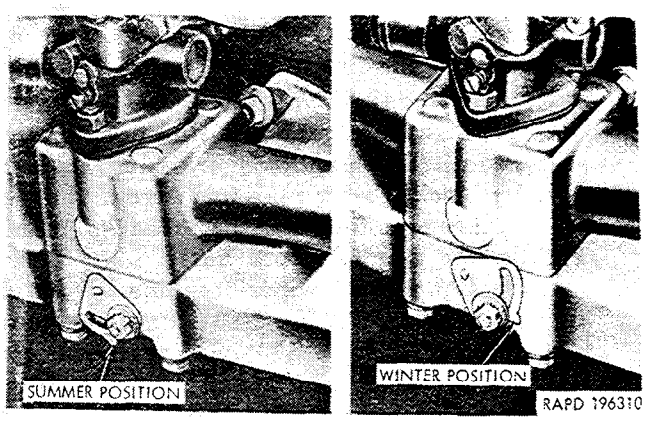


Figure 2-86. Manifold heat control valve.

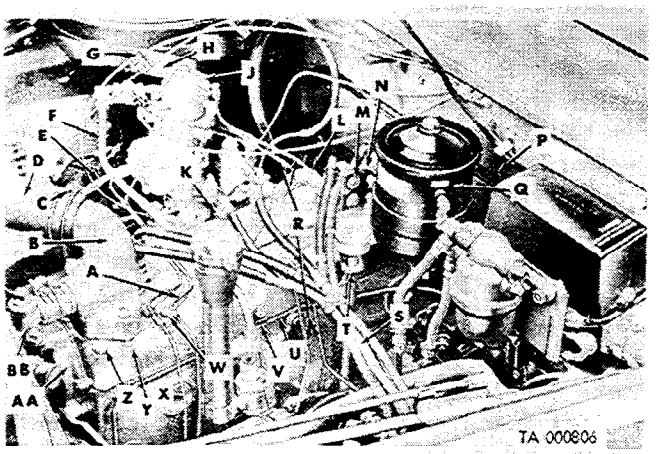
2-69. Cylinder Head and Gaskets

a. General. Organizational maintenance operations include tightening cylinder head capscrews, replacement of the cylinder head gasket, and / or the cylinder head.

b. Tighten Cylinder Head.

(1) Run the engine until normal operating temperature is reached. While Waiting for the engine to warm up, proceed with (2), (3), and (4) below.

(2) Remove the bolts and lockwashers attaching the two vent line clips (W, fig. 2-87) to the cylinder head capscrews. Remove the clips or push them along the lines and out of the way.



A Master cylinder vent line
B Water outlet elbow
C Hose clamp
D Upper hose
E Fuel pump-to-carburetor fuel line.
F Oil filler pipe vent line
G Tension clip
H Control support plate
J Air cleaner elbow
K Spark plug cable elbow nut
L Engine lifting bracket
M Capscrews
N Oil filter bracket
P Temperature gage sending unit cable.
Q Oil filter
R Distributor vent lines
S Spark plug cables
T Oil level gage pipe support
U Oil inlet line
V Oil filter inlet line clip
W Vent line clips
X Fuel tank vent lines
Y Cylinder head
Z Cylinder head capscrew
AA Water pump
BB Bypass elbow

Figure 2-87. Cylinder head disconnect points.

(3) Remove the bolt and lockwasher attaching the oil level gage pipe support (T, fig. 2-87) to the cylinder head capscrew. Move the support out of the way.

(4) Remove the capscrews (M, fig. 2-87) and move the oil filter sufficiently to provide access to the cylinder head capscrew located under the filter.

(5) Stop the engine.

(6) Tighten the cylinder head capscrews, following the sequence shown in figure 2-87. Tighten each screw to 65-70 foot-pounds torque.

(7) Install a washer on each of the four capscrews (M, fig. 2-87). Position the oil filter clamps on the bracket and install the four capscrews and plain washers (from clamp side). Install the four nuts. Tighten the nuts.

(8) Position the oil level gage pipe support (T, fig. 2-87) and install a lockwasher and bolt and tighten.

(9) Position the two vent line clips (W, fig. 2-87) with the two vent lines engaged in each clip, and install a lockwasher and bolt for each clip.

c. Removal.

NOTE

The key letters noted in parentheses are in figure 2-78.

(1) Drain the cooling system (para 2-29 *a*) and disconnect the battery around cable from the outer battery.

(2) Loosen the hose clamp (C) that secures the upper hose (D) to the water outlet elbow (B) and remove the hose from the elbow.

(3) Remove the two bolts and lockwashers that secure the bypass elbow (BB) to the water pump (AA).

(4) Unscrew the spark plug cable elbow nuts (K), and remove the cables (S) from the spark plugs.

(5) Remove the two bolts and lockwashers attaching the two vent line clips (W) to the cylinder head capscrews.

(6) Disconnect the fuel tank vent line (X) and the master cylinder vent line (A). Remove the two distributor vent lines (R) at the elbows in the air cleaner elbow (J) and at distributor.

(7) Disconnect the oil filler pipe vent line (F) and remove the line.

(8) Disconnect the fuel pump to carburetor fuel line (E) at carburetor and move out of way.

(9) Remove the nuts, lockwashers, plain washers, and capscrews (M) attaching the oil filter clamps to the oil filter bracket (N).

(10) Remove the bolt and lockwasher that attach the oil level gage pipe support (T) to the cylinder head capscrew and move the support out of the way.

(11) Disconnect the temperature gage sending unit cable (P) from the sending unit.

(12) Remove the bolt and lockwasher attaching the oil filter inlet line clip (V) to the left side of the cylinder head.

(13) Move fuel tank vent line and master cylinder vent line to the left out of the way. Remove the 21 cylinder head capscrews (Z) and remove the oil filter bracket (N), the engine lifting bracket (L), and the cylinder head (Y). Remove and discard the cylinder head gasket and the bypass elbow gasket.

(14) Remove all carbon from the cylinder block and the cylinder head mating surfaces.

NOTE

If the cylinder head was removed only for replacement of the cylinder head gasket, remove the carbon and install a new gasket and the cylinder head (*f* below).

d. Disassembly.

(1) Remove the heater hole pipe plug (fig. 2-1).

(2) Remove the temperature gage sending unit (para 2-99).

(3) Remove the spark plugs and gaskets (para 2-17).

(4) Remove the two capscrews attaching the outlet elbow to the cylinder head. Remove the outlet elbow, gasket, and thermostat. Discard the outlet elbow gasket.

e. Inspection.

(1) Inspect the capscrews, lockwashers, plain washers, spark plug cable elbow nuts, and pipe plug and vent line connections for damaged threads, corrosion, or other visual damage. Replace parts as necessary.

(2) Inspect the cylinder head for cracks, damaged machined surfaces, damaged threads, or other visual damage. Replace cylinder head (para 2-69).

(3) Inspect the temperature gage sending unit for corrosion, damaged threads, or other visual damage. Replace sending unit (para 2-99).

(4) Inspect the outlet elbow, bypass elbow, and connecting parts for cracks, damaged machined surfaces, deteriorated hose, damaged clamps, or other visual damage. Replace parts as necessary.

(5) Inspect the thermostat for proper closing and for visual damage. Valve will be closed at / or below temperature indicated on thermostat. Replace thermostat (para 2-95).

f. Assembly.

(1) Install the thermostat, gaskets, outlet elbow, and bypass elbow (para 2-95 *c*).

(2) Clean and inspect the spark plugs and adjust spark plug gap (para 2-17 *e*). Install the spark plugs, using new gaskets. Tighten the plug to 30 foot-pounds torque.

(3) Coat the threads of the water temperature gage sending unit with liquid type gasket cement, and install the sending unit. Tighten the unit.

(4) Coat the threads of the pipe plug with liquid type gasket cement and install plug in the heater hole (fig. 2-1).

g. Installation.

NOTE

The key letters noted in parentheses are in figure 2-87, except where otherwise indicated.

(1) Coat both sides of a new cylinder head gasket with a film of liquid-type gasket cement.

Clean the mating surfaces of the cylinder head and block thoroughly. Position the cylinder head gasket on the block with the side marked THIS SIDE DOWN next to the cylinder block. Coat a new bypass elbow with liquid-type gasket cement and install the gasket on the water pump.

(2) Place the cylinder head on the gasket, alining screw holes with those in the gasket and block. Install the cylinder head capscrews with the exception of capscrew No. 1,3,7,9,12, and 15.

NOTE

Temporarily install capscrews fingertight.

Position the engine lifting bracket (L) (flange holes toward spark plugs) over holes 1 and 7 and install the two capscrews. Position the oil filter bracket (N) (flange holes toward left edge of cylinder head) over holes 9 and 15. Install a plain-head capscrew in hole 15 and tapped-head capscrews in holes 3, 9, and 12. Install the two lockwashers and capscrews attaching the bypass elbow (BB) to the water pump (AA). Tighten the screws.

(3) Tighten the cylinder head capscrews *(b* (6) above).

(4) Connect the upper hose (D) to the water outlet elbow (B) and tighten the hose clamp screw.

(5) Connect the fuel tank vent line (X) and the master cylinder vent line (A). Install the two distributor vent lines (R) to air cleaner elbow (J) and distributors (para 2-80 *d* (11) and (12)).

(6) Connect the plug cables to the spark plugs and tighten the cable elbow nuts.

(7) Connect the temperature gage sending unit cable (P) to the sending unit, and connect the fuel pump to carburetor fuel line (E).

(8) Fill the cooling system with proper solution of coolant (para 2-92 *b*). Connect battery ground cable to outer battery.

(9) Start the engine and run it until its normal operating temperature is reached. Stop the engine and again tighten the cylinder head capscrews *(b* (6) above.).

(10) Install a washer on each of the four capscrews (M). Position the oil filter (Q) on the oil filter bracket (N) and install the capscrews with plain washers from the clamp side. Install a lockwasher and nut on each screw. Tighten the nuts.

(11) Position the oil level gage pipe support (T) on the No. 9 tapped-head capscrew and install a lockwasher and bolt. Tighten the bolt.

(12) Install the oil filler pipe vent line (F) and tighten the tube nuts.

(13) Position the fuel tank and master cylinder vent line clip (W) on a capscrew and install a lockwasher and bolt. Tighten the bolt.

(14) Position the clip for the distributor vent lines (R) on No. 3 tapped-head capscrew and install a lockwasher and bolt. Tighten the bolt.

(15) Position the oil filter inlet line clip (V) over the tapped hole at the left side of the cylinder head and install a lockwasher and bolt. Tighten the bolt.

2-70. Engine Oiling System

a. Remove Oil Filter Element (fig. 2-88).

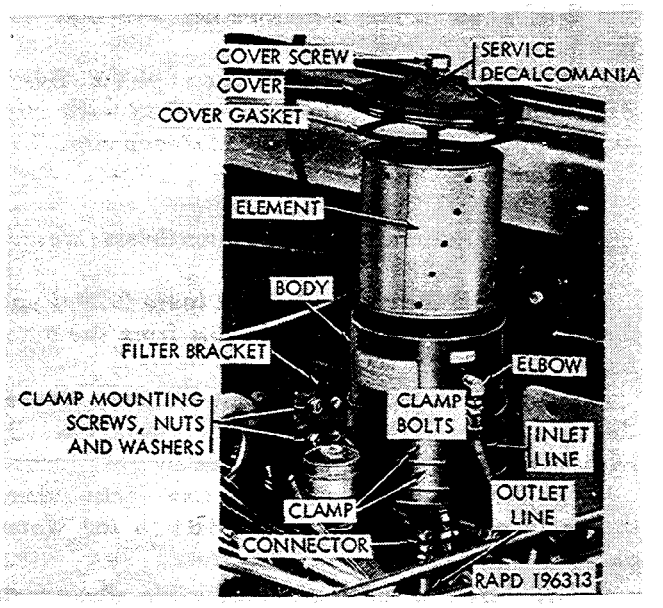


Figure 2-88. Replacing oil filter element.

NOTE

Two makes of filters are supplied and are interchangeable only as an assembly. No attempt should be made to interchange parts.

(1) Remove the drain plug from the bottom of the filter body and drain the oil into a suitable container. Discard the oil.

(2) Unscrew the cover screw and remove the cover and the cover gasket. Remove the filter element from the body.

NOTE

New type filter body does not have a drain plug in the filter body. After filter element has been removed, remove excess oil with suction gun FSN 4930-223-3390.

(3) Clean the inside of the filter body and the cover with drycleaning solvent or volatile mineral spirits and wipe with a clean cloth.

b. Install Oil Filter Element (fig. 2-88).

(1) Install the pipe plug in the drain opening of the filter body.

(2) Install a new filter element in the body.

NOTE

Be sure to install the same type of filter element as the original; refer to note in *a* above.

(3) Install a new cover gasket in the cover.

(4) Make certain the cover screw spring and gasket are in place. Position the cover on the filter body and tighten the cover screw.

CAUTION

Check oil level and replenish as necessary.

c. Remove Oil Filter, Oil Line Fittings, and Filter Clamps (fig. 2-87).

(1) Drain oil filter (*a* (1) above).

(2) Disconnect inlet line from the elbow.

(3) Disconnect outlet line from the connector at the bottom of the filter body.

(4) Remove oil filter clamp mounting nuts, lockwashers, bolts, and plain washers, and remove the oil filter and filter clamp or clamps. (One type of filter is mounted in one clamp, while the other type is mounted in two clamps.)

(5) Remove elbow from the side of the filter body.

(6) Remove connector from the bottom of the filter body.

(7) Remove filter clamp or clamps. Remove nut and bolt from each clamp, and remove the clamp from the filter body.

(8) If the inlet oil lines and the outlet oil line are to be replaced, remove them at this time (*f* below).

d. Inspect Oil Filter and Fittings.

(1) Inspect oil filter body for leaks and damaged threaded surfaces. Replace a damaged oil filter.

(2) Inspect the elbow (inlet line) and the connector (outlet line) for damaged threads or cracks. Replace damaged fittings.

e. Install Oil Filter, Oil Line Fittings and Filter Clamps (fig. 2-88).

(1) If the filter inlet and outlet lines were removed, install lines (*h* below).

(2) Install filter clamp (or clamps) on the oil filter body. For the Fram filter, install a clamp bolt through each clamp and install a nut on each bolt. For the Purolator filter, install a clamp bolt and nut in the manner described above.

(3) Install the inverted flared tube connector in the filter body outlet opening.

(4) Install the inverted flared tube elbow in the inlet opening of the filter body.

(5) Install the pipe plug in the filter body drain opening.

(6) Install a washer on each of the four clamp mounting bolts. Position the oil filter and clamp (or clamps) on the filter bracket and install the four clamp mounting screws, lockwashers, and nuts. Do not tighten the nuts.

(7) Position the filter so that clearance exists between the bottom of the filter and the filter bracket. Tighten each clamp bolt. Tighten the nuts on the four clamp mounting screws.

(8) Connect the outlet line to the connector in the bottom of the filter body.

(9) Connect the inlet line to the elbow.

(10) Replenish the engine oil. Refer to lubrication order (LO 9-2320-212-12).

f. Remove Oil Filter Lines.

(1) Drain oil filter (*a* (1) above).

(2) Disconnect two upper (flexible) lines from the oil filter inlet elbow and oil filter outlet connector, and from the lower inlet line and lower outlet line; remove the upper (flexible) lines.

(3) Disconnect the lower inlet line from the elbow at the cylinder block, back of the generator mounting bracket. Disengage the line from the oil filter inlet line clip (V, fig. 2-87) on the cylinder head and remove the line. Remove the elbow from the crankcase.

(4) Disconnect the lower outlet line from the elbow in the crankcase near the oil level gage pipe, and remove the line. Remove the elbow from the crankcase.

g. Inspect Oil Filter Lines.

(1) Inspect the upper (flexible) lines for damaged fittings and damaged or deteriorated hose. Replace lines as required.

(2) Inspect the inlet and outlet lower lines for cracks, kinks, or other visual damage. Replace lines as required.

(3) Inspect the two oil line elbows for cracks and damaged threads. Replace elbows as required.

h. Install Oil Filter Lines.

(1) Install an inverted flared tube elbow in each oil line opening in the crankcase.

(2) Install the outlet lower line, and connect the line to the outlet line elbow in the cylinder block.

(3) Install the inlet lower line in position, and connect the front end of the line to the inlet line elbow in the cylinder block. Engage the line in the clip on the side of the cylinder head.

(4) Install the inlet and outlet upper (flexible) lines, connecting the inlet line to the inlet lower line and the elbow in the filter body. Connect the outlet lower line and the connector in the outlet opening of the filter body.

(5) Install the filter drain plug and replenish the engine oil.

i. Remove Oil Filler Pipe.

(1) Loosen the generator adjusting arm bolt, remove the fan belt from the pulley on the generator, and move the generator away from the engine as far as possible.

(2) Disconnect the filler pipe vent line from the elbow in the oil filler pipe (fig. 2-89).

(3) Remove the nut, lockwasher, and bolt that secure the two oil pressure gage sending unit clamps, and remove the clamps from the filler pipe.

(4) Remove the nuts and lockwashers from the filler pipe studs in the cylinder block and

remove the filler pipe and filler pipe gasket. Discard the gasket.

(5) Remove the filler cap and cap gasket.

(6) Remove the vent line elbow from the filler pipe.

j. Inspect Oil Filler Pipe.

(1) Inspect the filler pipe for cracks, damaged flange surface, and damaged threads in the vent line elbow opening. Replace a damaged filler pipe.

(2) Inspect the filler pipe cap and cap gasket for damage. Replace the cap and/or gasket as required.

(3) Inspect the studs in the cylinder block for looseness or damaged threads. Tighten loose studs; replace damaged studs.

(4) Inspect the elbow (vent line) for cracks or damaged threads.

k. Install Oil Filler Pipe (Fig. 2-89).

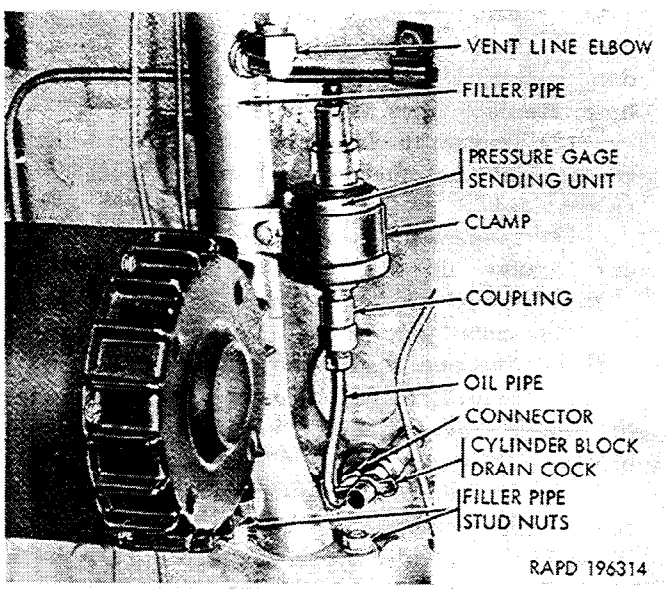


Figure 2-89. Oil filler pipe and oil pressure gage sending unit.

(1) If the studs for the filler pipe were removed, install the two studs in the cylinder block and tighten.

(2) Install the male pipe end, inverted flared tube (vent line) elbow in the vent line opening in the filler pipe.

(3) Install the filler cap and cap gasket.

(4) Install the filler pipe gasket over the studs and install the filler pipe on the cylinder block. Install the lockwashers and nuts on the two studs and tighten the nuts.

(5) Position the clamp (two-halves) on the filler pipe and pressure gage sending unit and install the bolt, lockwasher, and nut. Tighten the nut.

(6) Connect the filler pipe vent line to the vent line elbow on the filler pipe.

(7) Move the generator back into position, install the fan belt on the generator pulley, and adjust the fan belt (para 2-96).

l. Remove Oil Pressure Gage Sending Unit and Oil Line (Fig. 2-89).

(1) Disconnect the sending unit cable from the oil pressure gage sending unit.

(2) Move the generator (*i* (1) above) to provide access to the parts.

(3) Disconnect the sending unit oil line from the coupling on the oil pressure gage sending unit.

(4) Remove the sending unit clamp nut, lockwasher, and bolt, and remove the clamp. Remove the sending unit.

(5) Disconnect the sending unit oil line from the connector in the cylinder block and remove the oil line. Remove the connector from the cylinder block.

(6) Remove the coupling from the sending unit.

m. Inspect Oil Pressure Gage Sending Unit and Oil Line.

(1) Inspect the coupling, the connector, the sending unit oil line, and nuts for cracks, damaged threads or restrictions. Replace parts as required.

(2) Inspect the oil pressure gage sending unit for damage, worn threads, and corrosion at the cable connector. Replace the sending unit if necessary.

n. Install Oil Pressure Gage Sending Unit and Oil Line (fig. 2-89).

(1) Install a tube connector in the cylinder block opening.

(2) Install the pipe coupling on the oil pressure gage sending unit.

(3) Connect the sending unit oil line to the connector in the cylinder block.

(4) Install the sending unit on the oil line and tighten the nuts.

(5) Position the clamp (two-halves) on the filler pipe and the sending unit, and install the bolt, lockwasher, and nut. Tighten the nut.

(6) Install the fan belt on the generator pulley and adjust the fan belt (para 2-96*a*).

(7) Connect the sending unit cable to the sending unit.

o. Remove Oil Level Gage Pipe.

(1) Remove the oil level gage.

(2) Unscrew the oil level gage pipe from the cylinder block with pliers. Remove the pipe by pulling it up through the pipe support.

(3) Remove the pipe support bolt and lockwasher, and remove the support.

p. Install Oil Level Gage Pipe.

(1) Install the oil level gage pipe support in position on the cylinder head and install lockwasher and bolt. Do not tighten the screw until the pipe has been installed.

(2) Install the oil level gage pipe through the

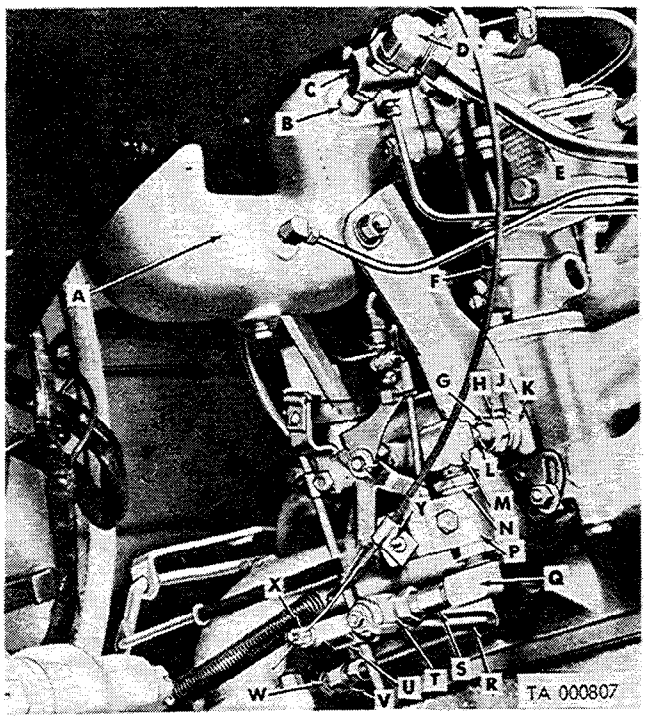
support and screw it into the cylinder block. Tighten the pipe support bolt.

(3) Install the oil level gage in the pipe. Be sure that the gage cap gasket is in place and in good condition.

2-71. Crankcase Ventilating System

NOTE

The key letters noted in parentheses are in figure 2-90, except where otherwise indicated.



A Air cleaner elbow
B Pipe nipple
C Shutoff valve (upper)
D Elbow
E Oil filler pipe vent line
F Shutoff valve control
G Metering valve nipple
H Nut
J Lockwasher
K Plain washer
L Pipe bushing
M Elbow
N Metering valve
P Control support clamp
Q Street elbow
R Crankcase vent line
S Pipe nipple
T Shutoff valve (lower)
U Elbow (vent line)
V Crankcase fitting
W Connector
X Lever swivel
Y Clip

Figure 2-90. Crankcase ventilating system.

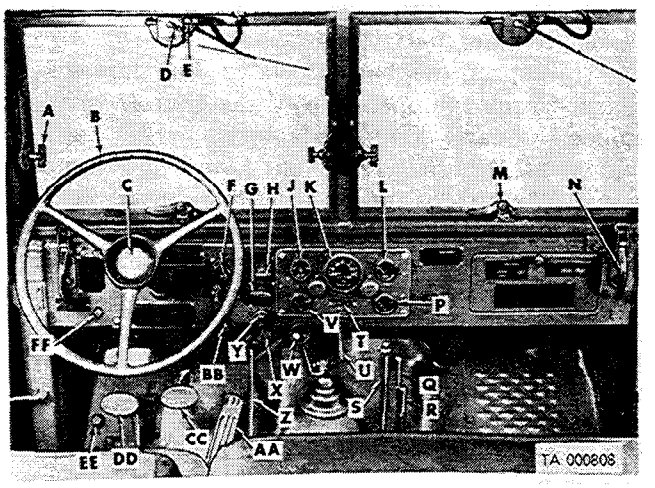
a. General.

(1) Crankcase ventilation is provided by the crankcase vent line and metering valve and the vent line from the carburetor air cleaner elbow to the oil filler pipe. On some vehicles, shutoff valves are provided in each vent line to close the lines during fording operation. Organizational maintenance of the system includes replacement of the vent lines and fittings, the metering valve, and replacement and adjustment of the shutoff valve controls on vehicles so equipped.

(2) Servicing of the metering valve is required every 6,000 miles to remove carbon formation that may impair its operation. Servicing of the metering valve is described in *f* through *l* below.

b. Remove Oil Filler Pipe Vent Line and Fittings.

(1) On vehicles equipped with ventilation shutoff valves, loosen the filler pipe shutoff valve lever swivel screw at the upper shutoff valve (C) and pull out the crankcase ventilation valve dual control (G, fig. 2-91) to disengage the control from the swivel.



A Windshield adjusting arm
B Steering wheel
C Horn button
D Windshield wiper handle.
E Windshield wiper control knob.
F Light switch
G Crankcase ventilation valve dual control.
H Throttle control
J Ammeter or battery-generator indicator.
K Speedometer
L Fuel gage
M Windshield locking handle.
N Windshield support frame clamp handle.
P Oil pressure gage
Q Transfer shift control lever (front).
R Transfer declutch control lever (rear)
S Handbrake lever
T Service headlight high beam indicator.
U Cowl ventilator handle
V Water temperature gage
W Transmission gear shift lever
X Starter pedal
Y Choke control
Z Power-takeoff shift lever
AA Accelerator pedal
BB Ignition switch
CC Brake pedal
DD Clutch pedal
EE Dimmer switch
FF Engine primer knob

Figure 2-91. Controls and instruments in driver's compartment.

(2) Remove the oil filler pipe vent line (E).

(3) Remove the elbow (D), from the upper shutoff valve (C) or from the union.

(4) Remove the upper shutoff valve (C) or union and remove the pipe nipple (B).

(5) Remove the vent line elbow from the oil filler pipe.

c. Inspect Oil Filler Pipe Vent Line and Fittings.

(1) Inspect the oil filler pipe vent line for cracks and kinks; inspect the nuts for cracks or damaged threads. Replace line.

(2) Inspect the elbows, nipple, and union (on vehicles so equipped) for cracks or damaged threads. Replace parts as necessary.

(3) Inspect the shutoff valve for damaged threads. Check the operation of the shutoff valve. Replace the valve if unsatisfactory.

d. Install Oil Filler Pipe Vent Line and Fittings.

(1) If vehicle is equipped with a shutoff valve install a nipple (B) in the air cleaner elbow. If the vehicle is not equipped with a shutoff valve, install a nipple and union in the air cleaner elbow.

(2) Install the upper shutoff valve (C) on the nipple (valve lever opposite air cleaner elbow). When the shutoff valve is tightened, the lever must be toward the engine.

(3) Install tube elbow (D) in the upper shutoff valve or union.

(4) Install a tube elbow in the oil filler pipe (fig. 2-89).

(5) Position the oil filler pipe vent line (E) and tighten both flared-tube elbows to the proper angle to permit connection of the vent line. Install the vent line and tighten the nuts.

(6) Adjust shutoff valve control (para 2-72 *e*).

e. Remove Crankcase Vent Line and Related Parts.

(1) Disconnect the crankcase vent line (R) from the vent line elbow (U).

(2) Remove the bolt, gasket, flat washer, and lockwasher that secure the crankcase fitting (V) to the cylinder block, and remove the vent line fitting and fitting gasket. Discard the gaskets.

f. Remove Metering Valve and Related Parts.

(1) Loosen the vent line shutoff valve lever swivel screw at the lower shutoff valve (T). Loosen the screw in the clip (Y) and move the control out of the way.

(2) Unscrew the elbow (M) with metering valve and related parts from the pipe bushing (L).

g. Disassemble Crankcase Vent Line and Related Parts. Remove the crankcase vent line (R) from the connector (W) and remove the connector from the fitting.

h. Disassemble Metering Valve and Related Parts.

(1) Remove the elbow from the shutoff valve (fig. 2-92) or union. Remove the shutoff valve or union, and remove the pipe nipple from the street elbow. Remove the street elbow from the metering valve lower housing. Remove the elbow from the metering valve upper housing.

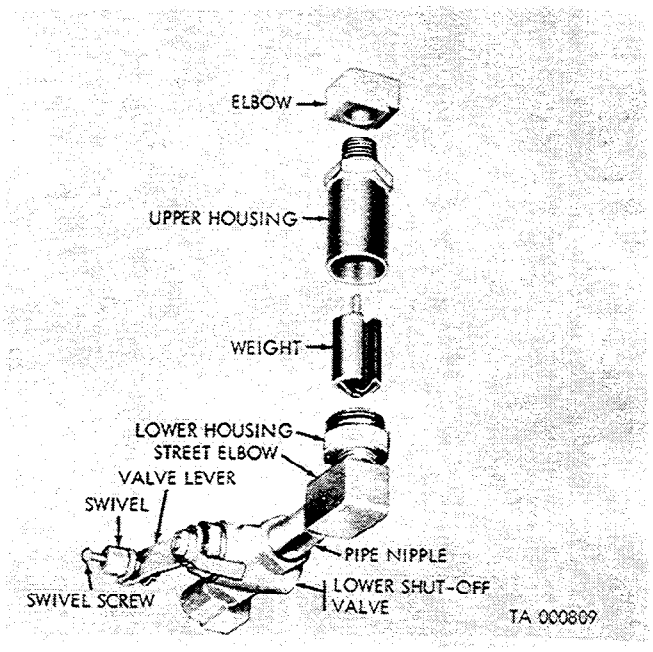


Figure 2-92. Metering valve and related parts.

(2) Unscrew the metering valve upper housing from the lower housing and remove the weight. Loosen the control support clamp nut, and slide the support clamp off the metering valve upper housing.

i. Inspect Crankcase Vent Line and Related Parts, and Metering Valve and Related Parts.

(1) Inspect the crankcase fitting, connector, elbows, and pipe nipple for damaged threads, cracks, or other visual damage. Replace parts as necessary.

(2) Inspect the shutoff valve for damaged threads. Check operation of the shutoff valve. Replace valve if unsatisfactory.

(3) Clean the metering valve parts in drycleaning solvent or volatile mineral spirits and dry with compressed air. Inspect the metering valve weight and metering valve lower housing seating surfaces for pitting or corrsion. Replace metering valve if either condition exists.

(4) Inspect the control support clamp for distortion or other visual damage. Straighten or replace as necessary.

(5) Inspect the pipe bushing (L) and metering valve nipple (G) for damaged threads or other visual damage. Replace the bushing or nipple (para 2-68*f*).

j. Assemble Crankcase Vent Line and Related Parts.

(1) Install a tube connector (W) in the crankcase fitting (V).

(2) Install the crankcase vent line in the connector.

k. Assemble Metering Valve and Related Parts (fig. 2-92).

(1) With the metering valve upper housing in an upright position, install the control support clamp (on vehicles so equipped) with the offset toward the left. Install the weight (shaft end first) in the upper housing. Install the lower housing and tighten.

(2) Install metering valve (upper housing) in the elbow and tighten.

(3) Install a street elbow in the metering valve (lower housing). When the street elbow is tightened, it must be at a right angle to the elbow on the metering valve upper housing (fig. 2-90).

(4) If vehicle is equipped with a shutoff valve, install a pipe nipple in the street elbow. Tighten the nipple. If vehicle is not equipped with a shutoff valve, install a ¼x2⅜ pipe nipple and a ¼-inch union.

(5) Install the lower shutoff valve ((4) above) on the nipple (valve lever opposite the pipe nipple). When the shutoff valve is tightened, the lever must be at a right angle to the metering valve (N).

(6) Install a tube vent line elbow (U) in the shutoff valve or union. When the elbow is tightened, it must be parallel with the elbow on the metering valve upper housing.

l. Install Metering Valve and Related Parts.

(1) Install the elbow at the metering valve upper housing on the pipe bushing (L). When tightened, the metering valve must be in the vertical position.

(2) Position the control support clamp (P) on the metering valve so that the clip (Y) is parallel with the vent line shutoff valve lever. Install the shutoff valve control (F) in the clip (Y) and tighten the clip screw lightly. Insert the control wire in the lever swivel (X). Adjust the lower shutoff valve control (para 2-72*e*).

m. Install Crankcase Vent Line and Related Parts.

(1) Install a lockwasher and washer on a bolt.

(2) Postion the crankcase fitting gasket on the crankcase fitting, and insert the bolt through the hole provided in the fitting. Position the fitting with related parts to the cylinder block, and tighten the bolt lightly. Aline the crankcase vent line with the elbow attached to the lower shutoff valve or union, and tighten both vent line nuts. Tighten the crankcase fitting bolt.

2-72. Crankcase Ventilation Valve Dual Control

a. General. The crankcase ventilation shutoff valves must operate properly to protect the engine during deep water fording and insure maximum engine performance. The shutoff valve dual control, operated from the instrument panel, controls both shutoff valves. Both valves must be fully closed when the control (G, fig. 2-91) is pulled all the way out, and must be fully opened when the control is pushed in.

b. Removal (on Vehicles so Equipped).

(1) Disconnect the crankcase ventilation valve dual control at the shutoff valve control lever swivels. Remove the control from each control clip by loosening the clip screws.

(2) Disconnect the instrument cluster from the instrument panel by turning the four studs counterclockwise, and lower the cluster to provide access to the dual control retaining nut in back of the instrument panel.

(3) Unscrew the nut that secures the control at the back of the instrument panel. Withdraw the control from the instrument panel while holding the nut and lockwasher.

c. Inspection.

(1) Inspect the control for binding, broken control handle, kinked conduits, broken control wires, damaged threads, or corrosion. Replace the dual control if any of the above conditions exist.

(2) Inspect the control grommets in the cowl front panel for deterioration. Replace grommets if necessary.

d. Installation.

(1) Insert both controls through the hole provided in the instrument panel and thread both controls through a lockwasher and nut. Thread the long control through the right grommet in the cowl front panel and the short control through the left grommet. Insert the control in the instrument panel, and tighten the nut on the control.

(2) Position the instrument cluster in the instrument panel opening, and turn the four studs clockwise to secure the cluster to the instrument panel.

(3) Engage the long control in the upper

portion of the tension clip (G, fig. 2-87) located on the control support plate (H, fig. 2-87). Engage the short control in the lower portion of the clip. Engage the long control in the clip (Y, fig. 2-90).

(4) Insert the control wires, in the shutoff valve lever swivels. Adjust the controls (*e* below).

e. Adjustment.

(1) Push the dual control (G, fig. 2-91) all the way in, and position each shutoff valve lever in the fully open position (against the lever stop and parallel with the valve). Tighten both swivel screws.

(2) Pull the dual control all the way out to make certain the valves close completely (levers at 90° from the open position and against the stop). Operate the control to make certain both valve levers work freely, and that sufficient clearance exists between the control conduits and the valve levers. Tighten the clip screws.

2-73. Maintenance Operations

Organizational maintenance operations that may be preformed with the engine in the vehicle include the services listed below, in addition to those described in this section.

a. Air Cleaner. Service or replace (para 2-78).

b. Air Cleaner Elbow. Replace (para 2-80).

c. Carburetor. Adjust or replace (para 2-79 and 2-82).

d. Carburetor Controls and Linkage. Adjust or replace (para 2-88).

e. Cooling System. Clean and service (para 2-92 and 2-93).

f. Distributor Breaker Points. Adjust or replace (para 2-22 and 2-23).

g. Distributor Timing. (Para 2-20.)

h. Distributor Capacitor. Replace (para 2-22).

i. Distributor. Replace (para 2-19).

j. Exhaust Pipe, Muffler, and Tailpipe. Replace (para 2-90).

k. Fan and Fan Belt. Adjust or replace (para 2-96).

l. Fuel Filters. Service or replace (para 2-84).

m. Fuel Pump. Test or replace (para 2-83).

n. Fuel Lines and Fittings. Replace (para 2-85).

o. Generator. Replace (para 2-33).

p. Generator Regulator. Replace (para 2-34).

q. Ignition Coil. Replace (para 2-24).

r. Ignition Wiring. Replace (para 2-18).

s. Radiator and Hoses. Replace (para 2-94, 2-97).

t. Spark Plugs. Clean, adjust, or replace (para 2-17).

u. Starter. Replace (para 2-27).

v. Thermostat. Replace (para 2-95).

w. Water Pump. Replace (para 2-98).

Section XV. ENGINE REMOVAL AND INSTALLATION

2-74. Coordination With Direct Support Maintenance Unit

Replacement of the engine is normally a direct support maintenance operation, but may be performed in an emergency by the using organization, providing authority for performing this replacement is obtained from the responsible commander. A replacement engine and tools needed for the operation, which are not carried by the using organization, may be obtained from the supporting maintenance unit.

2-75. Engine Removal

a. General. Items removed with the engine are the radiator, clutch, transmission with or without power-takeoff, and accessories such as the generator, distributor, starter, and carburetor. It is not necessary to drain the engine oil, cooling system, or transmission.

b. Preliminary Operation.

(1) Place the vehicle under suitable engine-lifting equipment. Arrange to have tools, wood blocking, and supports available for use when needed. Block the wheels to prevent the vehicle from moving.

(2) Disconnect the battery ground cable from the outer battery.

(3) Open the hood to the wide-open position and secure the windshield support frame hood holder in the hood holder socket (fig. 2-93).

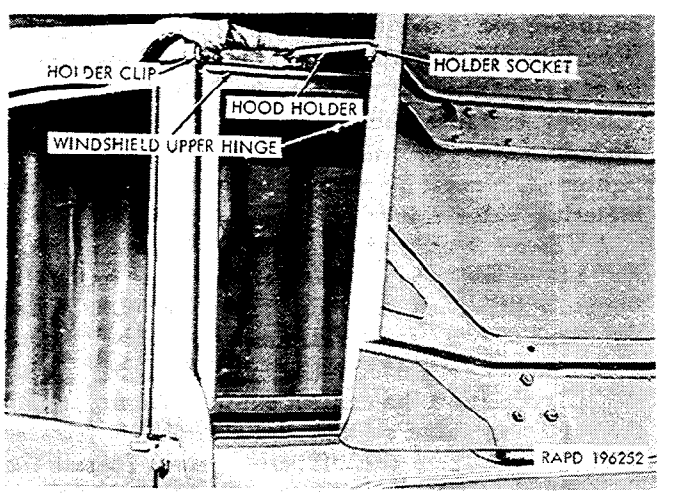


Figure 2-93. Hood in open position.

c. Remove Front Fenders, Radiator Guard, and Headlight Guards as a Unit. Refer to paragraph 2-179 a.

d. Disconnect Radiator Support. Remove the locking wire (fig. 2-94), from the two radiator support bolts. Remove the two bolts, lockwashers, and plain washers.

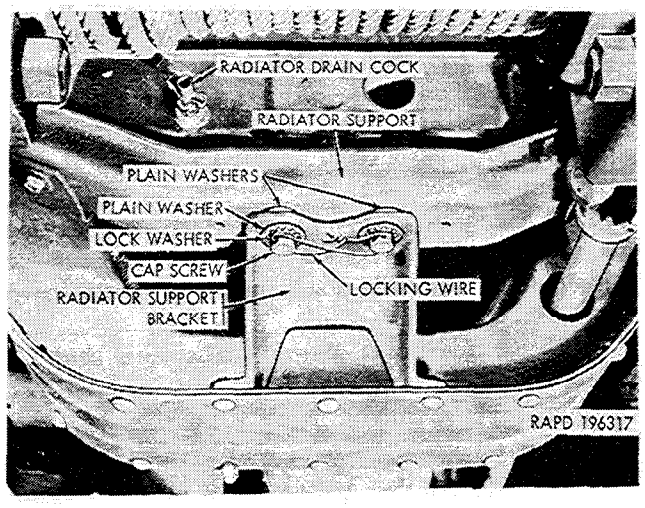


Figure 2-94. Disconnect points at radiator support.

e. Disconnect Points at Left Side of Engine.

NOTE

The key letters noted in parentheses are in figure 2-11.

(1) Disconnect the generator-to-regulator cable (A) at the generator, using a suitable spanner wrench. Loosen the generator adjusting cap screw and move the generator toward the engine.

(2) Disconnect the oil pressure gage sending unit cable (B) and the water temperature gage sending unit cable (D) at the cable connectors.

(3) Disconnect the brake master cylinder vent line (N) and the fuel tank vent line (P) at the flexible lines.

(4) Disconnect the distributor primary cable (M) at the distributor.

(5) Disconnect the cables (E, F, and G) from the starter switch terminal.

NOTE

On vehicles not equipped with a slave receptacle, only two cables are attached to the starter switch.

(6) Remove the cotter pin and clevis pin that secure the clutch operating rod to the clutch release fork lever (K).

(7) Disconnect the accelerator pedal rod at the accelerator bellcrank lever (H) by removing the cotter pin and clevis pin (J).

(8) Remove the nut, lockwasher, engine front mounting screw (Q), and plain washer that secure the engine front support plate (R) to the support plate bracket (S).

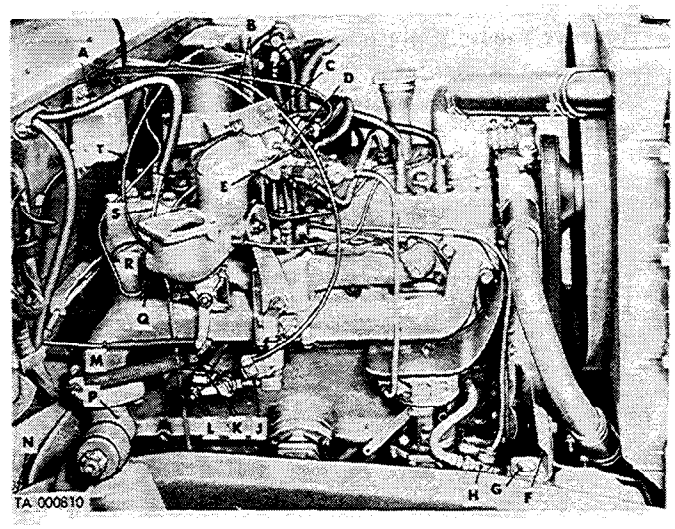
(9) On engines equipped with a priming system, disconnect the priming system inlet line (C) at the fuel filter (if connected).

(10) Remove the cotter pin, sloted nut (L), and plain washer from the engine rear support mounting bolt. Remove the bolt, plain washer, and lower insulator. Discard the Insulator.

f. Disconnect Points at Right Side of Engine.

NOTE

The key letters noted in parentheses are in figure 2-95.



A Windshield wiper hose
B Crankcase ventilation shutoff valve controls.
C Tension clip
D Choke control
E Shutoff valve lever swivel
F Engine front support plate
G Engine front mounting screw
H Fuel line shutoff cock
J Tension clip
K Throttle return spring
L Shutoff valve lever swivel
M Throttle return spring extension
N Slotted nut
P Upper exhaust pipe
Q Tee type nozzle
R Priming system line
S Fuel pump vacuum line
T Throttle control

Figure 2-95. Disconnect points at right side of engine.

(1) Disconnect the choke control (D) and throttle control (T) at the lever swivels and clips.

(2) Disconnect the crankcase ventilation shutoff valve controls (B) at the tension clips (C and J) and shutoff valve lever swivels (E and L) (on engines so equipped).

(3) Remove the windshield wiper hose (A) from the fuel pump vacuum line (S).

(4) Disengage the throttle return spring extension (M) from the cowl.

(5) Close the fuel line shutoff cock (H) and disconnect the flexible line from the shutoff cock.

(6) On engines equipped with a priming

system, disconnect the priming system line (R) from the tee type nozzle (Q) at the intake manifold rear port.

(7) Disconnect the upper exhaust pipe (P) from the lower exhaust pipe by loosening the eyebolt nuts and disengaging the two eyebolts.

(8) Remove the nut, lockwasher, screw, and plain washer that secure the engine front support plate (F) to the support plate bracket.

(9) Remove the cotter pin, slotted nut (N), and plain washer from the engine rear support bolt. Remove the bolt, plain washer, and lower insulator. Discard the insulator.

g. Remove Transmission Access Covers (Fig. 2-96).

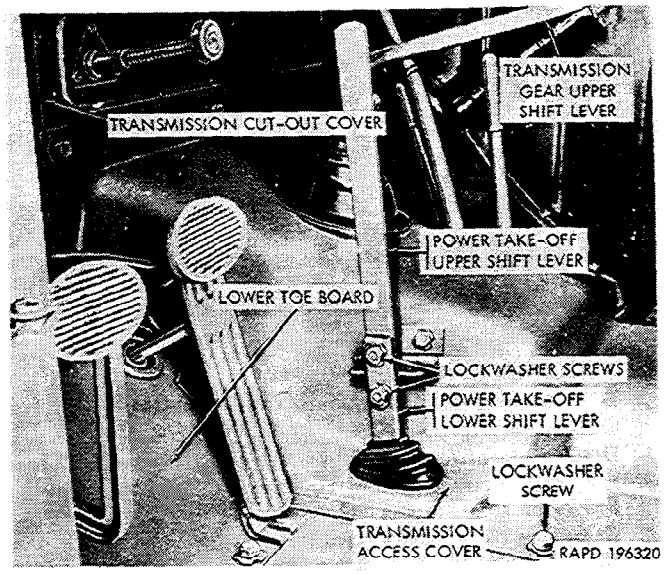


Figure 2-96. Items removed in driver's compartment.

(1) Remove the two lockwasher screws that secure the power-takeoff upper shift lever to the lower shift lever, and remove the upper lever (on vehicles so equipped).

(2) Remove the transmission gearshift upper lever from the lower lever by removing the nut, lockwasher, and bolt.

(3) Remove the 18 lockwasher screws that secure the transmission access cover and the transmission cutout cover, and remove both covers.

h. Disconnect Points in Driver's Compartment (Fig. 2-79).

(1) Disengage the battery-to-starter cable from the cable clip on the transmission case cover and pull the cable back from the engine compartment.

(2) Remove the three screws and lockwashers that secure the transfer control lever bracket to the transmission.

(3) Remove the four nuts, lockwashers, and bolts that secure the universal joint yoke at the companion flange. Slide the yoke back on the shaft. Secure the propeller shaft to keep it off the floor.

(4) Remove the screw and lockwasher that secure the ground strap to the clutch housing.

i. Disconnect Winch Drive Shaft (on Vehicles so Equipped). Working underneath the vehicle, remove the locking wire from the setscrew in the drive shaft rear universal joint and from the drive shaft collar setscrew, if a collar is used. Loosen both setscrews and push the universal joint and collar forward to disengage the universal joint from the power-takeoff drive shaft.

j. Remove Engine.

(1) Each engine is supplied with an engine eyebolt. Place hook of chain in eyebolt and raise the engine enough to place a small amount of strain on the chain.

(2) At this point, check to be sure that all disconnect operations have been completed. Raise the power plant slowly, using a number of short lifts, until radiator, oil pan, and transmission are clear of crossmember. Check again to see that all lines and accessories are clear as power plant is being removed upward and forward.

(3) Remove the upper insulator and spacer from each of the engine rear support brackets (fig. 2-97). Discard the insulator.

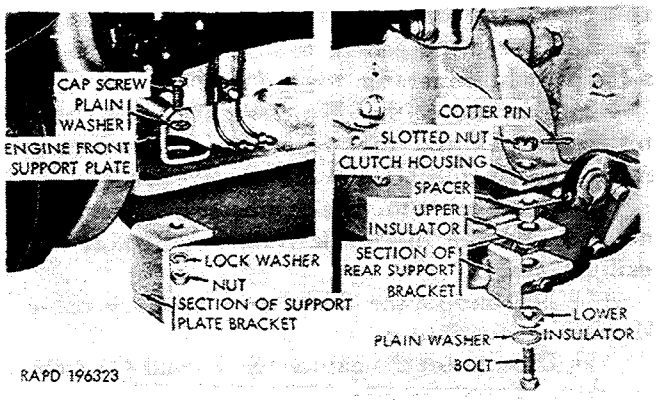


Figure 2-97. Engine mounting parts—exploded view.

(4) Remove and discard the upper exhaust pipe to lower exhaust pipe gasket.

k. Remove Radiator and Related Parts.

(1) Drain cooling system (para 2-92 *a*).

(2) Detach the radiator inlet and outlet hoses from the radiator and the engine (para 2-94 *a*).

(3) Remove the screws, lockwashers, and plain washers that secure the radiator left and right support brackets to the engine and remove the radiator, radiator support, support brackets, and fan shroud.

(4) Cover the hose openings in the water outlet elbow and the water pump to exclude dirt from the engine.

l. Remove Transmission.

(1) Remove the four bolts and lockwashers that secure the transmission to the clutch housing and remove the transmission.

(2) Cover the transmission shaft opening in the clutch housing to exclude dirt from the housing.

2-76. Engine Installation

a. Install Transmission.

(1) Clean the machined surfaces of the clutch housing and the transmission case thoroughly and clean the pilot bearing in the end of the crankshaft.

(2) Aline the clutch parts (para 2-139*g* (2)).

(3) Position the transmission on the clutch housing, engaging the transmission shaft in the clutch. Install the four lockwashers and bolts. Tighten the bolts evenly.

b. Install Radiator and Related Parts.

(1) Position the assembled radiator, radiator support, support brackets, and fan shroud, alining the screw holes in the support brackets with their respective holes in the engine front support plate. Install the washer, lockwasher, and capscrew for each bracket. Tighten the screws.

(2) Install the radiator inlet and outlet hoses (para 2-94*c*).

c. Install Engine.

(1) Install a new upper-exhaust-pipe-to-lower-exhaust-pipe gasket on the lower exhaust pipe flange.

(2) Assemble a new upper insulator on each spacer (fig. 2-97). Install the assembled parts on each engine rear support bracket.

(3) Position the correct number of plain washers on the radiator support bracket. Refer to paragraph 2-75*j* (2) above.

(4) Make certain the generator-to-regulator cable and the carburetor and shutoff valve controls are properly located to prevent interference with engine installation.

(5) Install the engine (fig. 2-98) making certain that the spacers, insulators, and plain washers remain in correct alinement with their respective holes.

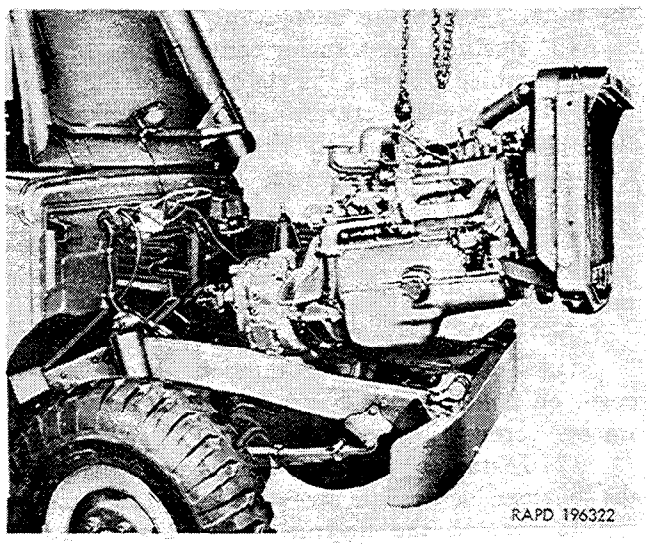


Figure 2-98. Removing or installing engine.

(6) Temporarily install a suitable drift in each of the engine front and rear mounting screw holes. Remove the hoist hook from the engine lifting bracket.

d. Connect Winch Drive Shaft (Vehicles so Equipped).

(1) Install the winch drive shaft rear universal joint on the power-take-off drive shaft, alining the keyway in the universal joint yoke with the key in the shaft. Tighten the universal joint setscrew, and secure the screw with locking wire.

(2) If the drive shaft is equipped with a collar, position the collar to provide a clearance of five-eighths of an inch between the rear of the collar and the front of the universal joint. Tighten the collar setscrew, and secure the screw with locking wire.

e. Connect Points in Driver's Compartment (fig. 2-79).

(1) Position the ground strap on the clutch housing and install the screw and lockwasher. Tighten the screw.

(2) Aline the intermediate propeller shaft universal joint yoke flange holes with the holes in

the companion flange at the rear of the transmission. Install the four lockwashers followed by the nuts. Tighten the nuts evenly.

(3) Position the transfer control lever bracket and assembled parts at the right side of the transmission, alining the screw holes in the bracket with those in the transmission case. Install the three lockwashers and cap screws. Tighten the screws evenly.

(4) Install the battery-to-starter cable through to the engine compartment, and engage the cable in the cable clip on the transmission.

f. Install Transmission Access Covers (fig. 2-96).

(1) Position the transmission cutout access cover on the dash panel and install the three lockwasher screws, in the three upper holes.

(2) Install the transmission access cover and the fourteen lockwasher screws. Tighten the screws.

(3) Install the transmission gearshift upper lever on the lower lever and install the bolt, lockwasher, and nut. Tighten the nut.

(4) Position the power-takeoff upper shift lever on the lower shift lever with the screw holes alined. Install the two lockwasher screws. Tighten the screws.

g. Connect Points at Right Side of Engine.

NOTE

The key letters noted in parenthesis are in figure 2-95 except where otherwise indicated.

(1) Remove the drifts from the engine and support brackets. Install a washer on the engine rear support bolt, followed by a new lower insulator (fig. 2-97). Install the engine rear support bolt from the underside of the rear support bracket and install the washer and slotted nut (fig. 2-97). Tighten the nut enough to hold the parts.

(2) Install a plain washer on the capscrew. Install the capscrew through the front support plate and front support plate bracket. Install the lockwasher and nut (fig. 2-97). Tighten the nut enough to hold the parts.

(3) Connect the upper exhaust pipe (P) to the lower exhaust pipe by engaging the two eyebolts. Do not tighten the eyebolt nuts at this time.

(4) On engines equipped with a priming system, connect the priming system line (R) to the tee type nozzle (Q) in the intake manifold rear port.

(5) Connect the flexible line from the fuel pump to the fuel line shut off cock (H) and open the shutoff cock.

(6) Attach the throttle return spring extension (M) to the cowl.

(7) Install the windshield wiper hose (A) on the fuel pump vacuum line (S).

(8) Connect the crankcase ventilation shutoff valve controls (B). Adjust the controls (para 2-72 *e*).

(9) Connect the choke control (D) and throttle control (T). Adjust the controls (para 2-79).

h. Connect points at left side of engine.

NOTE

The key letters noted in parentheses are in figure 2-11.

(1) Remove the drifts from the engine and support brackets, and install the engine mounting parts (*g* (1) and (2) above).

(2) Connect the engine priming system inlet line (C) at the fuel filter (on engines so equipped and if previously connected).

(3) Aline the accelerator pedal rod with the accelerator bellcrank lever (H) and install a clevis pin (J) and cotter pin.

(4) Aline the clutch operating rod with the clutch release fork lever (K) and install the clevis pin and cotter pin.

(5) Connect the battery-to-starter cable (E), the starter-to-regulator cable (F), and the starter-to-slave receptacle cable (G) (on vehicles so equipped) at the starter switch front terminal. Tighten the terminal nut.

(6) Connect the distributor primary cable (M) at the distributor.

CAUTION

Use extreme care when tightening the connector nut to prevent breakage.

(7) Connect the brake master cylinder vent line (N) and the fuel tank vent line (P) at the flexible lines.

(8) Connect the oil pressure gage sending unit cable (36) (B) to the oil pressure gage sending unit, and the water temperature gage sending unit cable (33D) to the water temperature gage sending unit.

(9) Connect the generator-to-regulator cable (A) at the generator and tighten the connector nut with a suitable spanner wrench.

i. Tighten Engine Mounting Parts and Exhaust Pipe. Tighten the nuts on the engine mounting screws and bolts evenly. Install a cotter pin in each rear bolt. Tighten the nuts on the exhaust pipe eyebolts.

j. Connect Radiator Support. Install a lockwasher and a plain washer on each radiator support bolt. Aline the plain washers between the radiator support bracket and the radiator support with a drift, and install the two radiator support bolts. Tighten the bolts and secure them with locking wire (fig. 2-94).

k. Install Front Fenders, Headlight Guards, and Radiator Guard. Refer to paragraph 2-179 *b*.

l. Connect Battery Ground Cable. Refer to figure 2-73.

m. Fill the Cooling System. Refer to paragraph 2-92 *b*.

n. Record of Replacement. Record the engine replacement on the appropriate forms in accordance with TM 38-750.

2-77. General

The fuel and air intake system includes the fuel tank, carburetor, carburetor air cleaner, air cleaner elbow, fuel filter, fuel pump, connecting fuel and vent lines, and carburetor controls and linkage. Vent lines from the air cleaner elbow to the oil filler pipe, distributor, fuel tank, and brake master cylinder provide filtered air and protection from water for these units. The exhaust system includes the upper and lower exhaust pipes, the muffler, and tailpipe, and supports and attaching parts. Organizational maintenance includes adjustment of the carburetor, carburetor controls and linkage, servicing of the air cleaner, and replacement of unsatisfactory parts or assemblies in the system.

WARNING

Any vehicle that does not have a flame and spark arrestor muffler should be tagged DO NOT USE FOR TRANSPORTING OF FLAMMABLE OR EXPLOSIVE CARGO.

WARNING

Do not permit smoking, sparks, or open flame within 60 ft of vehicle during any operation involving removal or draining of fuel-carrying components.

WARNING

Exhaust gases are dangerous. Troubleshoot exhaust systems in well ventilated area to preclude injury to personnel.

WARNING

Explosive fumes. When draining tanks attach a ground wire from vehicle fuel tank to fuel receptacle to carry off static electricity.

2-78. Carburetor Air Cleaner

a. Description. The carburetor air cleaner is an oil bath type with a replaceable element (fig. 2-99). Its purpose is to remove dirt and other foreign matter from the air before it enters the carburetor. The air cleaner shroud provided on vehicles of early manufacturers was discontinued on later vehicles. Maintenance of both types of air cleaner is described in this section.

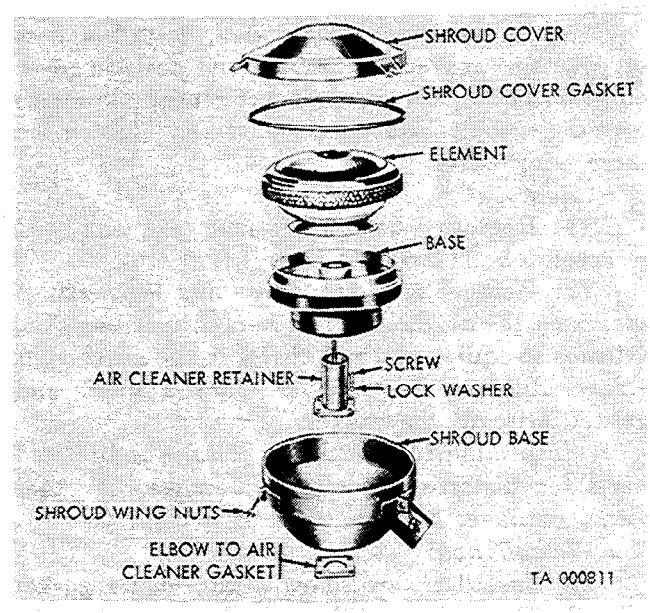


Figure 2-99. Carburetor air cleaner with shroud —exploded view.

b. Servicing. Servicing of the carburetor air cleaner is part of the lubrication service. It should be performed as frequently as operating conditions require.

(1) On air cleaners equipped with a shroud, loosen the three shroud wing nuts attaching the shroud cover to the shroud base. Disengage the eyebolts from the retainer brackets and remove the shroud cover with gasket.

(2) Loosen the wing nut on top of the air cleaner element and remove the reservoir and element as a unit.

(3) Lift the element from the reservoir.

(4) Remove the oil from the reservoir and clean both the element and the reservoir with volatile mineral spirits or drycleaning solvent, and dry with compressed air.

(5) Install the reservoir on the air cleaner retainer.

(6) Fill the reservoir to the oil level mark with specified lubricant. Refer to lubrication order LO 9-2320-212-12.

(7) Install the element in the reservoir and tighten the wing nut on top of the element.

(8) On vehicles so equipped, install a new shroud cover gasket if necessary, and position cover on shroud base, alining the cover retainer brackets with the eyebolts attached to the base. Tighten the three wing nuts.

c. Removal.

(1) Remove the air cleaner element and reservoir (*b* (1) and (2) above).

(2) Remove the four screws and lockwashers attaching the air cleaner retainer, shroud base (on vehicles so equipped), and gasket to the air cleaner elbow. Remove the retainer, shroud base, and gasket. Discard the gasket.

d. Inspection. Inspect the air cleaner and related parts for distortion, corrosion damage, or other visual damage. Replace parts as necessary.

e. Installation.

(1) Install a new elbow-to-air cleaner gasket (fig. 2-99) on the air cleaner elbow, alining the screw holes.

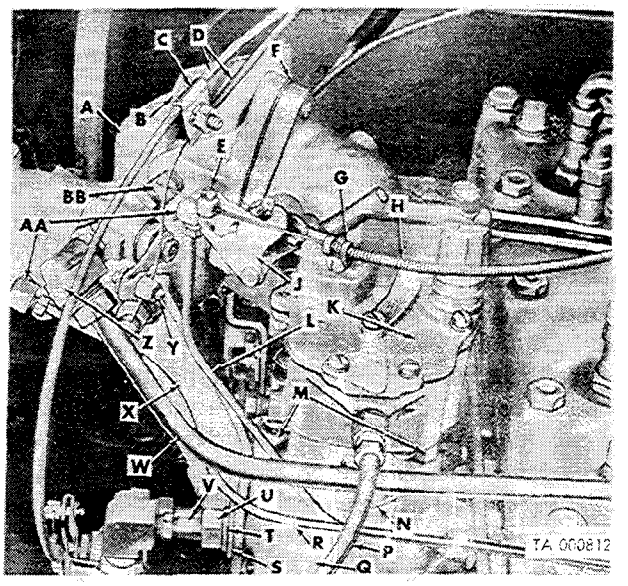
(2) On vehicles so equipped, position the shroud base on the gasket with the snorkel extension toward the right fender.

(3) Position the air cleaner retainer in the shroud base or on the elbow-to-air cleaner gasket, alining screw holes. Install four lockwashers and screws. Tighten screws.

(4) Install the air cleaner reservoir, element, and shroud cover (*b* (7) and (8) above).

2-79. Carburetor Adjustments

a. Adjust Choke Control. Loosen the choke control swivel screw (E, fig. 2-100). Push the choke control bracket to the fully closed position and if sufficient clearance does not exist between bracket and control conduit, loosen the screw at the choke control clip (G, fig. 2-100), and push the conduit back. Tighten screw. Push the choke control (Y, fig. 2-91) all the way in. Hold the choke control bracket (J, fig. 2-91) to the fully open position (toward air cleaner) and tighten the choke control swivel screw (E, fig. 2-100).



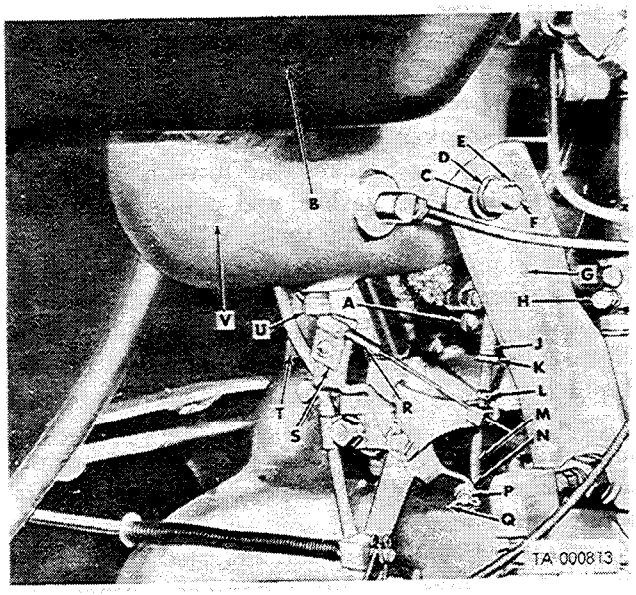
A Air cleaner elbow
B Control support plate
C Tension clip
D Crankcase ventilation shutoff valve controls.
E Choke control swivel screw
F Gasket
G Choke control clip
H Choke control
J Choke control bracket
K Carburetor
L Cylinder vent line
M Nuts
N Carburetor mounting gasket
P Fuel pump-to-carburetor fuel line
Q Intake manifold
R Fuel tank vent line
S Plain washer
T Lockwasher
U Nut
V Metering valve nipple
W Oil filler pipe vent line
X Elbow front support bracket
Y Shutoff valve lever swivel screw
Z Inverted flared tube elbow
AA Inverted flared tube elbow
BB Pipe nipple

Figure 2-100. Carburetor and air cleaner elbow (late type).

b. Adjust Throttle Control.

NOTE

The key letters noted in parentheses are in figure 2-101.



A Idle speed adjusting screw
B Air cleaner
C Plain washer
D Lockwasher
E Nut
F Stud
G Elbow front support bracket
H Idle mixture screw
J Ball joint
K Nut
L Lever swivel screw
M Bellcrank to carburetor rod
N Bellcrank
P Plain washer
Q Cotter pin
R Throttle control
S Throttle control clip
T Elbow support bracket
U Pipe plug
V Air cleaner elbow

Figure 2-101. Throttle controls.

(1) Loosen the nut (K) on the throttle control bellcrank to carburetor rod (M). Disengage the bellcrank rod by removing the cotter pin (Q) and plain washer (P).

(2) Push the throttle control (H, fig. 2-91) all the way in, and loosen the lever swivel screw (L).

(3) Unscrew idle speed adjusting screw until throttle is fully closed.

(4) Hold throttle lever at carburetor in closed position and turn the carburetor rod (M) either in or out of the ball joint (J) until the offset of the rod is one-sixteenth of an inch above the hole in the bellcrank (N).

NOTE

The carburetor rod must be adjusted one-sixteenth of an inch above the hole in the bellcrank to insure spring tension on the throttle controls in the closed position.

(5) Attach the rod to the bellcrank and secure with a washer (P) and cotter pin (Q). Tighten the nut (K) on the throttle control bellcrank to carburetor rod (M). Start the engine and adjust the idle speed (para 2-68 *a* (1) (c)).

(6) Hold the throttle hand control lever toward the front of the engine until it contacts the stop; tighten the lever swivel screw (L). Pull the throttle control (H, fig. 2-91) out to make certain there is sufficient clearance between the control conduit and the lever swivel. Adjust the conduit in the throttle control clip (S), as necessary.

c. Adjust Carburetor. Adjustment of the carburetor idle mixture and idle speed must be accomplished with the use of a vacuum gage (para 2-68).

2-80. Air Cleaner Elbow

NOTE

The key letters noted in parentheses are in figure 2-100 except where otherwise indicated.

a. General. The air cleaner elbow connects the air cleaner to the carburetor. Two types of elbows have been used. The design of the air cleaner elbow was changed to relocate vent line connections. Figure 2-102 shows the early type elbow, with the various fittings and their locations. When servicing the vent lines or connecting fittings, make certain that correct fittings are used and that the lines are connected to their respective fittings.

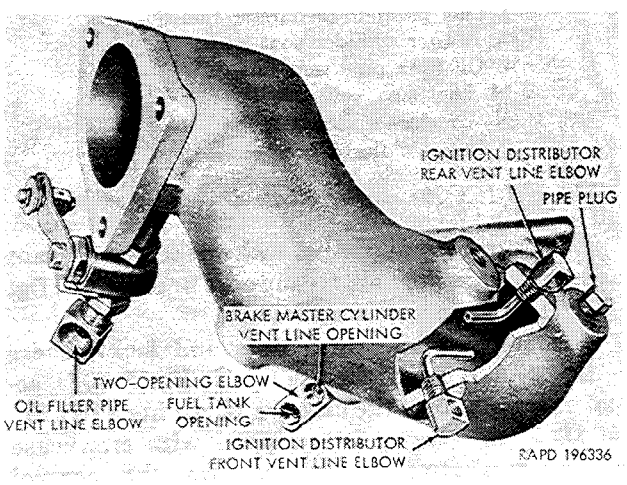


Figure 2-102. Early type air cleaner elbow with fittings.

b. Removal.

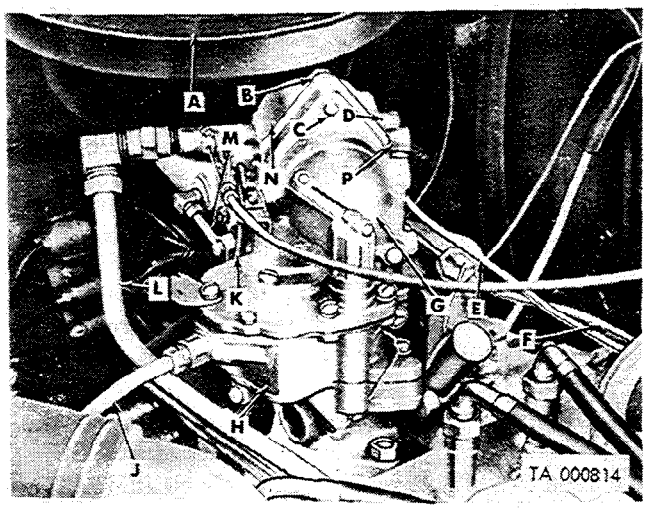
(1) Remove air cleaner (para 2-78 *c*).

(2) Disconnect the oil filler pipe vent line (W) at the inverted flared tube elbow (Z).

(3) On engines equipped with crankcase ventilation shutoff valves, loosen the shutoff valve lever swivel screw (Y) and the screw that secures the tension clip (C), and disengage the control from the oil filler pipe vent line shutoff valve lever swivel.

(4) Disconnect the brake master cylinder vent line (L) and the fuel tank vent line (R) from the inverted flared-tube elbows (AA) or from the special two-opening elbow (fig. 2-102).

(5) Disconnect the distributor front and rear vent lines (E and F, fig. 2-103) at the inverted flared tube elbows (D, fig. 2-103 and P, fig. 2-103).



A Air cleaner
B Nut and lockwasher
C Stud
D Inverted flared tube elbow
E Distributor front vent line
F Distributor rear vent line
G Carburetor air horn
H Carburetor
J Fuel pump-to-carburetor fuel line
K Master cylinder vent line
L Oil filler pipe vent line
M Fuel tank vent line
N Air cleaner elbow
P Inverted flared tube elbow

Figure 2-103. Air cleaner elbow disconnect points.

(6) Remove the screw, lockwasher, and plain washer attaching the elbow support bracket (T, fig. 2-101) to the intake manifold.

(7) Remove the three nuts and lockwashers (B, fig. 2-103) from the studs (C, fig. 2-103) attaching the elbow to the carburetor air horn (G, fig. 2-103). If the engine is equipped with crankcase ventilation shutoff valves, remove the control support plate (B), with attached controls.

(8) Loosen the nut (U) on the metering valve nipple (V) sufficiently to free the elbow front support bracket (X). Remove the air cleaner elbow and support brackets. Remove and discard the carburetor air horn to air cleaner elbow gasket (f).

c. Inspection.

(1) Clean the machined surfaces of the air cleaner elbow and the carburetor air horn, and inspect for scratches and other visual damage. Inspect the three studs in the air horn for damaged threads or looseness. Tighten loose studs; remove damaged studs. If the carburetor air horn machined support surface is damaged, replace the carburetor (para 2-82).

(2) Inspect the two air cleaner support brackets for broken welds and distortion. If either support bracket or bracket stud must be replaced, remove the nut, lockwasher, and plain washer that attach each bracket and remove the elbow front support bracket (G, fig. 2-101).

(3) Inspect the air cleaner elbow for cracks and loose or damaged support bracket studs. Tighten loose studs; remove damaged studs. Replace a damaged air cleaner elbow.

(4) Inspect the pipe nipple (BB) and other parts that connect the oil filler pipe vent line to the air cleaner elbow. These items are described in paragraph 2-71.

(5) Inspect the vent line inverted flared tube elbows for cracks and other damage. Inspect the offset tubes in the air cleaner elbow which are part of the distributor vent line inverted flared tube special elbows for restriction, damage, cracks, and unsatisfactory welds. Remove any elbows that are unfit for further service.

(6) If the pipe plug (U, fig. 2-101 or fig. 2-102) is damaged, remove the plug.

d. Installation.

(1) If the pipe plug (U, fig. 2-101 or fig. 2-102) was removed (*c* (6) above), install a pipe plug.

(2) Install the two inverted flared tube special elbows for the distributor front and rear vent lines (D and P, fig. 2-103). The elbows for the late type air cleaner elbow are not interchangeable. When the elbows are installed, the tubes extending inside the air cleaner elbow must face in opposite direction.

(3) For the late type air cleaner elbow, install the two tube elbows (AA) for the brake master cylinder and fuel tank vent lines. For the early type air cleaner elbow, install the special two-opening elbow (fig. 2-102) for these vent lines.

(4) If the pipe nipple (BB, fig. 2-100) and other fittings were removed (*c* (6) above), install the parts. Refer to paragraph 2-71.

(5) If the support bracket studs were removed (*c* (2) above), install the two studs, and tighten. Install the elbow support bracket (T, fig. 2-101) on the rear stud, and install the washer and nut. Install the front support bracket in the same manner.

(6) If the three studs were removed from the carburetor air horn (*c* (1) above), install the three studs, and tighten.

(7) Install a new air horn to air cleaner elbow gasket over the three studs on the air horn. Install the air cleaner elbow in position on the air horn, with the slotted end of the front support bracket

(X) over the metering valve nipple (B) between the plain washer (S) and the intake manifold (Q).

(8) If the engine is equipped with crankcase ventilation shutoff valves, install the control support plate (B) on the upper air horn stud, and install the three 5/16-inch lockwashers and nuts (B, fig. 2-103).

(9) Position the elbow support bracket (T, fig. 2-101) on the intake manifold and install a capscrew, lockwasher, and washer.

(10) Tighten the capscrew that secures the elbow support bracket, the nut (U) that secures the front support bracket, and the three nuts that secure the elbow to the carburetor air horn.

(11) Connect the distributor front vent line (E, fig. 2-103) to the inverted flared tube elbow (P, fig. 2-103 or 2-102). Connect the distributor rear vent line (F, fig. 2-103) to the inverted flared tube elbow (D, fig. 2-103 or fig. 2-102). Tighten the vent line nuts.

(12) Connect the master cylinder vent line (L) to the inverted flared tube elbow (AA) or to the inner opening of the special two-opening elbow (fig. 2-102). Connect the fuel tank vent line (R) to the other inverted flared tube elbow (AA) or to the outer opening of the special two-opening elbow (fig. 2-102). Tighten the vent line nuts.

(13) On engines equipped with crankcase ventilation shutoff valves, insert the control wire for the oil filler pipe vent line shutoff valve in the swivel on the valve lever. Engage the two shutoff valve controls in the tension clip (C) on the control support plate (B). Adjust the shutoff valve controls (para 2-72 *e*) before tightening the swivel screw or the tension clip screw.

(14) Connect the oil filler pipe vent line (W) to the inverted flared tube elbow (Z). Tighten the vent line nut.

(15) Install the air cleaner (para 2-78).

2-81. Carburetor and Air Cleaner Elbow

NOTE

The key letters noted in parentheses are in figure 2-100 except where otherwise indicated.

a. General. If replacement of the manifolds or manifold gaskets is necessary, remove the carburetor, air cleaner elbow, and related parts, as a unit.

b. Removal.

(1) Remove the air cleaner (para 2-78).

(2) Remove heat shield (para 2-83 *b* (2)).

(3) Remove the fuel pump to carburetor fuel line (J, fig. 2-103).

(4) On engines equipped with crankcase ventilation shutoff valves, loosen the swivel screw (Y) and the screw securing the tension clip (C) to the control support plate (B). Disengage the two shutoff valve controls (D) from the tension clip and remove the control wire from the swivel on the oil filler pipe vent line shutoff valve lever.

(5) Loosen the choke control swivel screw (E) and the screw in the choke control clip (G). Move the choke control out of the way.

(6) Remove the oil filler pipe vent line (W).

(7) Disconnect the fuel tank vent line (R), master cylinder vent line (L), and the distributor front and rear vent lines (E and F, fig. 2-103) at the air cleaner elbow.

(8) Disengage the throttle control bellcrank to carburetor rod (M, fig. 2-101) by removing the cotter pin (Q, fig. 2-101) and plain washer (P, fig. 2-101) at the bellcrank.

(9) Remove the capscrew, lockwasher, and plain washer that attach the elbow support bracket (T, fig. 2-101) to the intake manifold. Loosen the nut (U, fig. 2-100) on the metering valve nipple.

(10) Remove the two nuts (M) that secure the carburetor on the studs in the intake manifold. Raise the carburetor slightly as the outer nut is removed, to provide clearance for the nut. Lift the carburetor and attached parts from the engine. Remove and discard the carburetor mounting gasket (N).

(11) Inspect the two carburetor studs in the intake manifold for looseness and damaged threads. Tighten loose studs; replace damaged studs.

c. Installation.

(1) Clean the mating surfaces of the carburetor and the intake manifold thoroughly.

(2) If the studs in the intake manifold were removed (*b* (10) above), install the two studs.

(3) Install a new carburetor mounting gasket (N) on the intake manifold studs.

(4) Place the carburetor and assembled parts in position, with the slotted end of the elbow front support bracket (X) over the metering valve to metering valve nipple (V, fig. 2-100) between the plain washer (S) and the intake manifold (Q). Start the two nuts (M) on the carburetor studs before lowering the carburetor all the way, since there is insufficient clearance for the outer nut. Do not tighten the nuts until the elbow support brackets have been secured.

(5) Aline the elbow support bracket (X, fig. 2-100) over the screw hole in the intake manifold, and install capscrew, lockwasher, and washer.

(6) Tighten the nut (U) on the metering valve-to-intake manifold nipple (V) to secure the elbow front support bracket (X, fig. 2-100).

(7) Tighten the capscrew that secures the elbow support bracket to the intake manifold and the two carburetor stud nuts (M).

(8) Connect the throttle control bellcrank-to-

carburetor rod (M, fig. 2-101) to the bellcrank para 2-79 *b* (5)).

(9) Connect the two distributor vent lines, the master cylinder vent line, and the fuel tank vent line (para 2-80 *d* (5) and (12).

(10) Install the oil filler pipe vent line (W). Tighten vent line nuts.

(11) Install the choke control (H) through the control clip (G) and the control wire in the swivel on the choke control bracket (J). Adjust the choke control (para 2-79 *a*) before tightening the choke control swivel screw (E).

(12) On vehicles so equipped, engage the crankcase ventilation shutoff valve controls (D) in the tension clip (C), and insert the control wire in the swivel on the oil filler pipe shutoff valve lever. Adjust the shutoff valve dual control (para 2-72 *e*) before tightening the shutoff valve lever swivel screw (Y) and the tension clip screw.

(13) Install the fuel pump-to-carburetor fuel line (J, fig. 2-103).

(14) Install the heat shield (para 2-84 *d* (11). Tighten fuel line nuts.

(15) Install the air cleaner (para 2-78 *e*).

2-82. Carburetor

a. Removal.

(1) Remove the carburetor, air cleaner elbow, and related parts (para 2-81 *b*).

(2) Remove the three carburetor air horn-to-air cleaner elbow stud nuts and lockwashers (B, fig. 2-103). On vehicles equipped with crankcase ventilation shutoff valves, remove the control support plate (B, fig. 2-100). Remove the air cleaner elbow and gasket. Discard the gasket.

b. Installtion.

(1) Postition a new gasket on the carburetor air horn-to-air cleaner elbow studs.

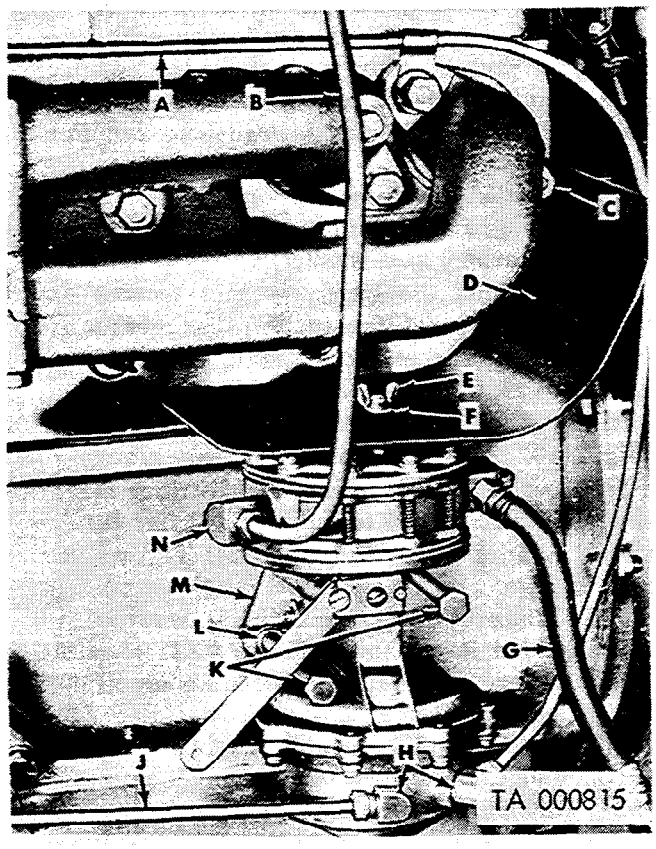
(2) Install the air cleaner elbow on the carburetor air horn studs. On vehicles equipped with crankcase ventilation shutoff valves, install the control support plate (B, fig. 2-100) on the upper stud. Install the three lockwashers and nuts. Tighten nuts.

(3) Install the carburetor, air cleaner elbow, and related parts (para 2-81 *c*).

2-83. Fuel Pump

NOTE

The key letters noted in parentheses are in figure 2-104.



A Pump-to-manifold line
B Pump-to-carburetor fuel line
C Manifold stud nut
D Heat shield
E Wingnut
F Lockwasher
G Flexible line
H Inverted flared tube elbows
J Pump-to-windshield wiper hose line
K Screws
L Lockwasher
M Flange gasket
N Outlet elbow

Figure 2-104. Fuel pump and lines.

a. Test. The fuel pump should deliver a pressure of 4 to 5¼ psi. To measure the pressure, proceed as outlined below.

NOTE

On vehicles equipped with crankcase ventilation shutoff valve, dual control is pushed all the way in before making the test.

(1) Disconnect the fuel pump to carburetor

line at the carburetor, and install a tee fitting between the fuel line and the carburetor.

(2) Attach a pressure gage to the tee.

(3) Start the engine and run at idle speed. Observe the pressure registered by the gage. Pressure should be not less than 4 psi and should not exceed 5¼ psi.

(4) If fuel pump pressure is not within the specified limits, replace the fuel pump (*b*, *c*, and *d* below).

(5) After performing the test, remove the gage and tee fitting and connect the fuel pump to carburetor fuel line.

b. Removal.

(1) Close the fuel line shutoff cock, and remove the fuel pump to carburetor fuel line (B).

(2) Remove the wingnut (E) and lockwasher (F) from the fuel pump heat shield stud. Loosen the manifold stud nut (C) that secures the heat shield (D), and remove the heat shield.

(3) Disconnect the fuel pump-to-windshield wiper hose line (J) at the elbow in the fuel pump.

(4) Disconnect the fuel pump-to-manifold line at the elbow in the fuel pump.

(5) Disconnect and remove the fuel flexible line (G) or lines at the fuel pump inlet elbow.

(6) Remove the two screws (K) and lockwashers (L) that secure the fuel pump to the cylinder block. Remove the fuel pump and the pump mounting gasket. Discard the gasket.

(7) Remove the four fuel line and vacuum line fittings from the fuel pump if the fuel pump requires replacement.

c. Inspection.

(1) Inspect the four fuel line and vacuum line fittings for damaged threads, cracks, distortion, and other visual damage. Replace fittings as necessary.

(2) Inspect the fuel lines, vacuum lines, and nuts for cracks and damaged threads. Replace lines as necessary.

(3) Inspect the flexible line or lines for damaged and deteriorated hose and damaged fittings. Replace flexible line as warranted.

(4) Clean and inspect the machine surfaces of the engine block and fuel pump. Replace fuel pump if mounting flange is damaged.

d. Installation.

(1) Install the two tube elbows in the fuel pump. Tighten the elbows.

(2) Install the outlet elbow (N).

(3) Install the inlet elbow (or elbows). When tightened, the elbow opening (or openings) must be opposite the flange.

(4) Install the fuel flexible line (G) and fuel pump to heater flexible line (ambulance truck M43). Tighten flexible line nuts.

(5) Apply a thin coating of liquid type gasket cement to both sides of the pump mounting gasket, and position the gasket on the cylinder block, alining the holes.

(6) Install a lockwasher on each of the two special fuel pump screws. Position the fuel pump on the cylinder block with the pump rocker arm through the opening in the cylinder block. Insert the screws through the fuel pump flange and gasket. Tighten screws.

(7) Connect the fuel pump-to-windshield wiper hose line (J) and the fuel pump to manifold line (A). Tighten nuts.

(8) Install the fuel pump-to-carburetor fuel line (B), and tighten nuts.

(9) Connect the fuel flexible line to the shut off cock. Tighten nut.

(10) Connect the fuel pump-to-heater flexible line to the heater fuel line (ambulance truck M43). Tighten the flexible line nut (or nuts). Open the shutoff cock.

(11) Install the heat shield (D) on the stud in the fuel pump and over the manifold stud between the manifold and the stud washer. Install the No. 10 lockwasher and No. 10-32NF wingnut (E) on the heat shield stud. Tighten the manifold stud nut (C).

(12) Operate the fuel pump primer handle to fill the pump and lines with fuel (TM 9-2320-212-10).

2-84. Fuel filters

a. General. There are two types of fuel filters. One is located in the fuel tank (fig. 2-105A), and the other is located on the generator-regulator mounting bracket in the engine compartment (fig. 2-105B). Servicing of both types of filters is included in this section.

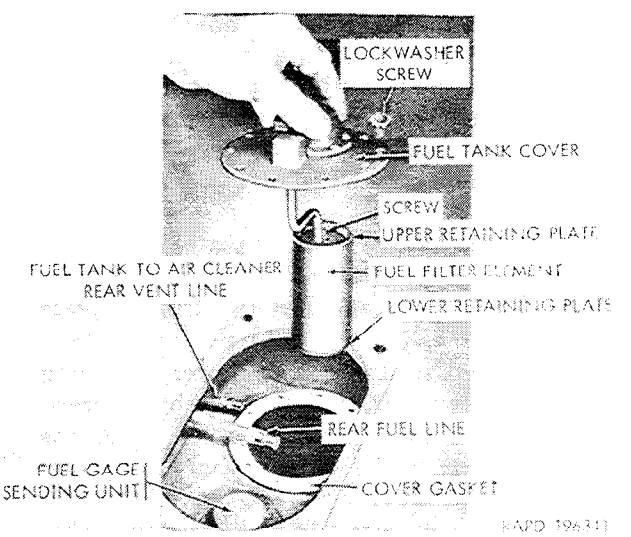


Figure 2-105A. Fuel filter (fuel tank).

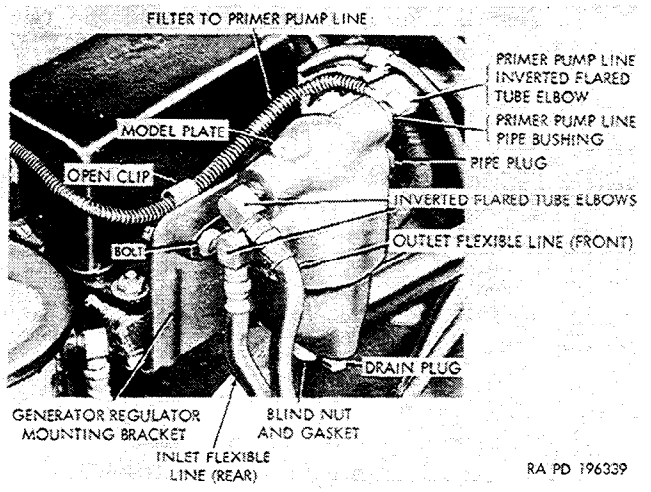


Figure 2-105B. Fuel filter (engine compartment).

NOTE

Replace filter element every 6,000 miles or semiannually, whichever comes first.

b. Service Fuel Filter (Fuel Tank).

(1) Remove the four floor-panel-fuel-gage-inspection-hole cover screws and remove the cover (fig. 2-105A).

(2) Clean area around the fuel tank cover and disconnect the fuel tank-to-air cleaner rear vent line at the fuel tank cover.

(3) Disconnect the rear fuel line at the fuel tank cover.

(4) Remove the 10 lockwasher screws that secure the fuel tank cover to the tank, and lift the fuel tank cover with attached filter from the tank.

(5) Remove and discard the cover gasket. Cover the fuel tank opening to prevent dirt from entering the fuel tank.

(6) Remove the screw which holds the upper and lower retaining plates to the fuel filter element.

(7) Remove the retaining plates and element.

(8) Wash all parts in drycleaning solvent or volatile mineral spirits and let dry. If foreign particles are evident on the fuel filter element, drain and let dry.

(9) Slide the upper retaining plate on the fuel tank cover pipe (cupped side up), followed by the fuel filter element and the lower retaining plate (cupped side down).

(10) Install the upper and lower retaining plate screw, lockwasher, and nut. Tighten screw.

(11) Remove the temporary cover from the fuel tank opening. Make certain that the gasket surfaces are clean. Coat cover gasket lightly with liquid type gasket cement and position the gasket on the fuel tank, alining the screw holes.

CAUTION

Check fuel filter line at the respective fitting in the cover for looseness, and tighten fuel line nut securely.

(12) Insert the filter element into the tank, alining the screw holes, the vent line, and fuel line with their respective fittings on the cover. Install the ten lockwasher screws. Tighten screws evenly.

(13) Connect the fuel tank-to-air cleaner rear vent line and rear fuel line to the fuel-tank-cover fittings. Tighten nuts.

(14) Apply a coating of sealing compound around the floor panel fuel gage inspection hole cover opening. Position the inspection hole cover over the opening and install the four lockwasher screws. Tighten screws.

c. Service Fuel Filter (Engine Compartment).

(1) Remove the sediment bowl blind nut and gasket, and remove the sediment bowl and bowl gasket. Discard the gaskets.

(2) Unscrew the cup and nut from the stud and remove the element.

(3) Clean all parts in drycleaning solvent or volatile mineral spirits and allow to dry.

CAUTION

Do not use compressed air on the element, since it will damage the element.

(4) Install the element on the stud, followed by the cup and nut. Tighten the nut.

(5) Install a new bowl gasket on the sediment bowl.

(6) Install the sediment bowl, sediment bowl nut gasket, and the blind nut. Tighten nut.

(7) *Removal.*

(a) Disconnect the outlet flexible line, the inlet flexible line, and the priming system line (if connected) at the fuel filter (fig. 2-105B).

(b) Remove the two nuts, lockwashers, and bolts attaching the fuel filter to the generator regulator mounting bracket and remove the fuel filter.

(c) If the filter requires replacement, remove the inlet and outlet elbows and the drain plug. On engines equipped with a priming system, remove the primer pump line elbow and the pipe bushing from the upper opening at the fender side. If the priming system has been disconnected from the filter, remove the pipe plug and pipe bushing. On engines not equipped with a priming system, remove the pipe plugs from the two openings at the feeder side.

(8) *Inspection.* Inspect the elbows, bushing, drain and pipe plugs, and the priming system line for cracks and damaged threads. Inspect the elbows for distortion and other visual damage. Inspect the flexible line hoses for damage and deterioration. Replace parts as necessary.

(9) *Installation.*

(a) Install the two tube elbows in the inlet and outlet openings in the fuel filter (model plate

side). Tighten elbows. Refer to figure 2-105 for correct positioning of elbows.

(b) If the engine is equipped with a priming system, install a bushing in the opposite upper opening of the fuel filter. If the engine is not equipped with a priming system, install a pipe plug in the opening.

(c) Install a pipe plug in the lower opening of the fuel filter. Tighten plug or plugs.

(d) Position the filter on the generator regulator mounting bracket. Install two bolts through the filter and bracket. Install a lockwasher and nut on each bolt. Tighten nut.

(e) Connect the inlet (rear) flexible line to the lower elbow.

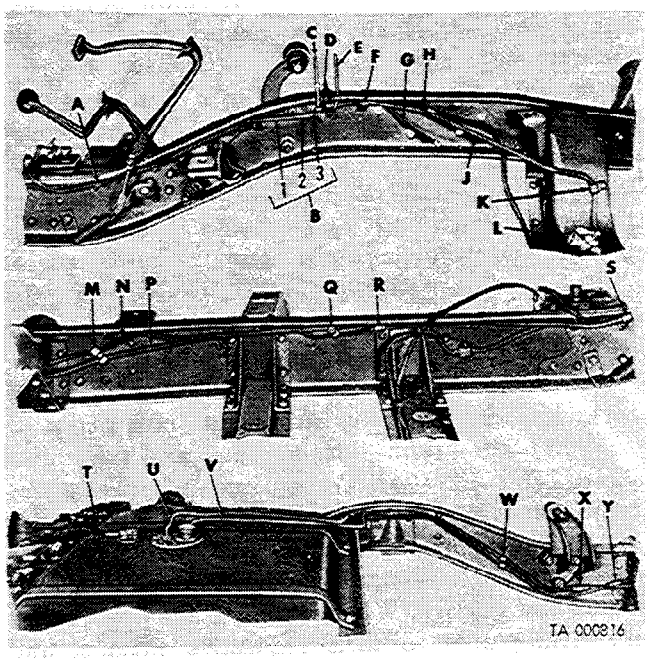
(f) Tighten nut.

(g) Connect the outlet (front) flexible line to the upper elbow.

(i) If the priming system line is to be connected to the filter, install tube elbow in the pipe bushing ((9) *(b)* above) and connect the priming system line to the elbow. If the line is not to be connected, install a pipe plug in the bushing.

2-85. Fuel Lines and Fuel Tank Vent Lines

a. General. Replacement of the fuel lines or the fuel tank vent lines (fig. 2-106) is seldom necessary. If a fuel line is restricted as a result of dirt or other foreign matter in the fuel system, disconnect each line in turn at both ends and blow the line out with compressed air. Start with the fuel pump-to-carburetor line and work toward the fuel pump. If obstructions cannot be removed with compressed air or if a line is cracked or damaged, replace the affected lines as instructed below. If replacement fuel lines are not available as assemblies, use seamless tubing, flexible conduit, and fitting nuts. Double flare the tube at each end, using a flaring tool.



A Clip
B Intermediate fuel line
  1 Flexible conduit
  2 Tubing
  3 Fitting nut
C Tank-to-filter line
D Inverted flared tube elbows
E Filter-to-pump line
F Clip
G Master cylinder rear vent line
H Tank front vent line
J Front fuel line
K Clip
L Shutoff cock
M Double clip
N Tank intermediate vent line
P Intermediate fuel line
Q Double clip
R Union (vent line)
S Clip
T Fuel tank
U Rear fuel line
V Tank rear vent line
W Double clip
X Union (fuel line)
Y Union (vent line)

Figure 2-106. Fuel lines, fuel tank vent lines, and related parts.

b. Replace Fuel Pump to Carburetor Line. Unscrew the fitting nuts from the elbow in the fuel pump (fig. 2-104) and the carburetor (fig. 2-100 and remove the line. Install a new line, screwing the fitting nuts firmly into place.

c. Replace Flexible Fuel Lines. A flexible fuel line (G, fig. 2-104) is used to connect the shutoff cock (L, fig. 2-106) to the fuel pump. Disconnect the line at both ends and remove. Install a new flexible line, screwing both fitting nuts into place.

d. Replace Shut-off Cock. Disconnect the flexible line and the front fuel line at the shutoff cock (L, fig. 2-106) by unscrewing the fitting nuts. Remove the shutoff cock. Install a new shutoff cock, screwing the two fitting nuts into place.

e. Replace Front, Intermediate, and Rear Fuel Lines (Fig. 2-106). To replace the front, intermediate, or rear fuel line, disconnect both ends of the line to be replaced by unscrewing the two fitting nuts. Disengage the line from clips on the frame and remove. When installing the lines, screw the fitting nuts to their respective fittings, and engage the line in the clips on the frame. On vehicles equipped with a fuel filter in the fuel tank, a union connects the intermediate and front lines. Figure 2-106 shows the fuel lines, connections, and clips.

f. Replace Fuel Tank Vent Lines. Replacement of the fuel tank vent lines (fig. 2-106) may be accomplished in the same manner as described in *e* above for the fuel lines. If replacement vent lines are not available as assemblies, use suitable lengths of seamless tubing, flexible conduit, and fitting nuts. Double flare the tube at each end, using a suitable flaring tool.

2-86. Fuel Tank, Filler Pipes, and Hoses

a. Remove fuel Tank.

(1) Drain the fuel tank.

(2) Remove the inspection hole cover from the floor panel and disconnect the fuel tank rear vent line (fig. 2-107) the rear fuel line, and the fuel gage sending unit cable.

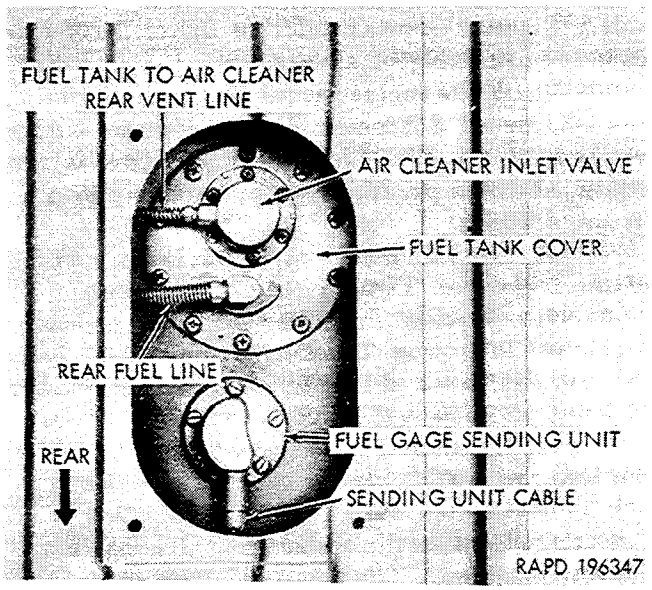


Figure 2-107. Fuel tank cover, air cleaner inlet valve, and fuel gage sending unit.

(3) Loosen the clamps on the filler pipe hose and the filler pipe vent hose (fig. 2-108) and separate both hoses from the tank.

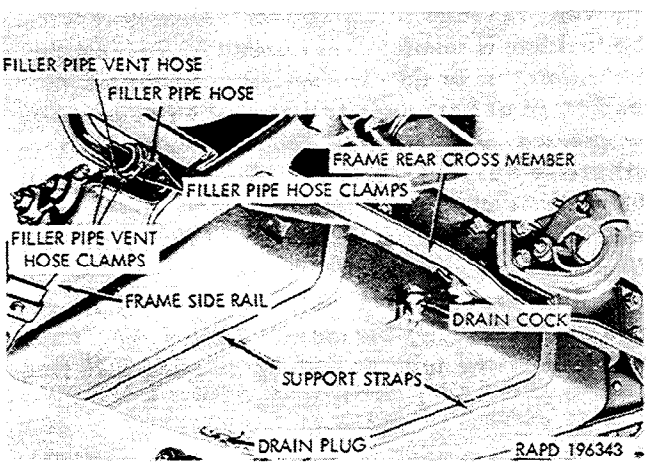


Figure 2-108. Fuel tank—bottom view.

(4) Support the fuel tank, and remove the nuts and lockwashers that secure the two tank support straps (fig. 2-108) and holddown straps to the fuel tank support frame crossmember. Swing the two support straps down and toward the rear, out of the way.

(5) Remove the tank by lowering the right end first and working the left side from between the frame side rail and the vehicle body, being careful to avoid damage to the lower filler pipe and filler pipe vent line.

(6) Remove and discard the filler pipe hose and the filler pipe vent hose.

(7) If the fuel tank is to be replaced, remove the fuel tank cover complete with all related parts, the cover gasket, and fuel gage sending unit. Unscrew lower filler pipe and discard gasket. Unscrew nut and vent lower line, the drain cock, and drain plug (if so equipped).

b. Install Fuel Tank.

(1) Install the parts that were removed from the tank (*a* (7) above), using new gaskets for the lower filler pipe, the fuel gage sending unit (fig. 2-109), and the fuel tank cover; and replacing any parts that are unfit for further service.

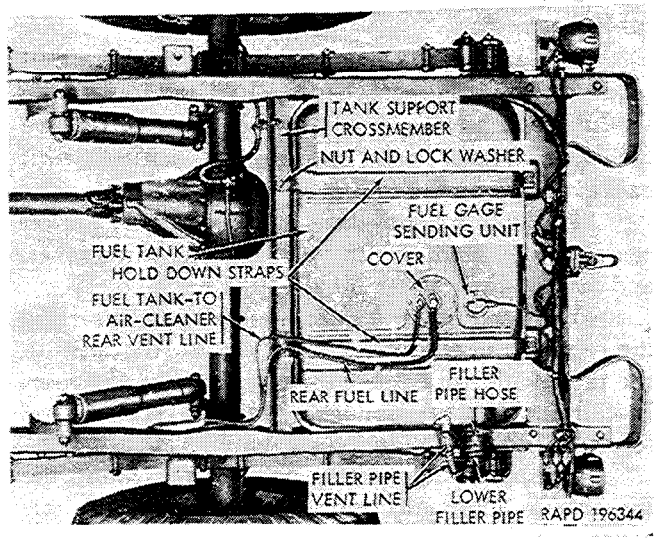


Figure 2-109. Fuel tank—top view (vehicle body removed).

(2) Apply a coating of liquid type gasket cement to the upper and lower filler pipes and the upper and lower filler pipe vent lines, and install new hoses on the upper filler pipe and upper vent line. Use a 3-inch length of 2¼ inch (ID) hose for the filler pipe and a 2-7/8-inch length of ½-inch (ID) hose for the vent line. Install the two hose clamps on each hose, and push hoses on lower fillter pipe and lower vent line as far as they will go.

(3) Install the tank in position under the two holddown straps, raising the left end first to position it between the frame left side rail and the vehicle body. Raise the right end of the tank into place and support it from the bottom between the support straps. Position the two support straps with the strap ends inserted through the openings, in the tank support cross member and the holddown straps. Install a lockwasher and nut on each support strap end. Tighten the nuts.

(4) Position the two hoses on the upper and lower filler pipes and upper and lower vent lines. Position the hose clamps and tighten the hose clamp screws.

(5) Working through the inspection hole in the floor, connect the fuel tank rear vent line, the rear fuel line, and the fuel gage sending unit cable (fig. 2-109).

(6) Install the inspection hole cover (para 2-84 *b* (4)).

(7) Close the drain cock and fill the fuel tank.

CAUTION

When filling the tank, always hold the pump hose nozzle firmly against the strainer tube to prevent static sparks. Do not fill the upper filler pipe, since room must be provided for expansion of fuel.

c. Replace Filler Pipe Strainer and/or Cap. Remove the filler cap, unhook the safety chain, and remove the strainer from the filler pipe (fig. 2-110). Install a new strainer in the filler pipe, attach the safety chain to the cap, and install the cap.

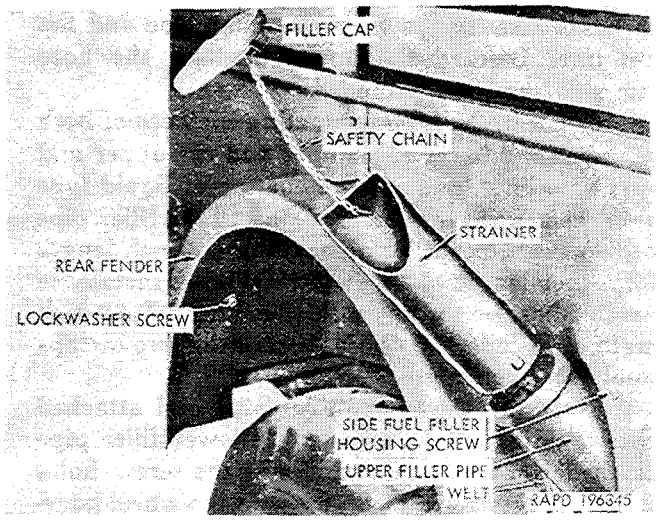


Figure 2-110. Fuel filler cap, strainer, and upper filler pipe.

d. Replace Upper Filler Pipe.

(1) Loosen the lower hose clamps on the filler pipe hose (fig. 2-108) and the filler pipe vent hose, and free the two hoses from the lower filler pipe and the lower vent line.

(2) On cargo truck M37 remove the eight nuts, lockwashers, and screws that secure the side filler fuel housing, and remove the housing. Remove the two nuts, lockwashers, and screws that attach the upper filler pipe support bracket to the left rear wheel housing (fig. 2-111).

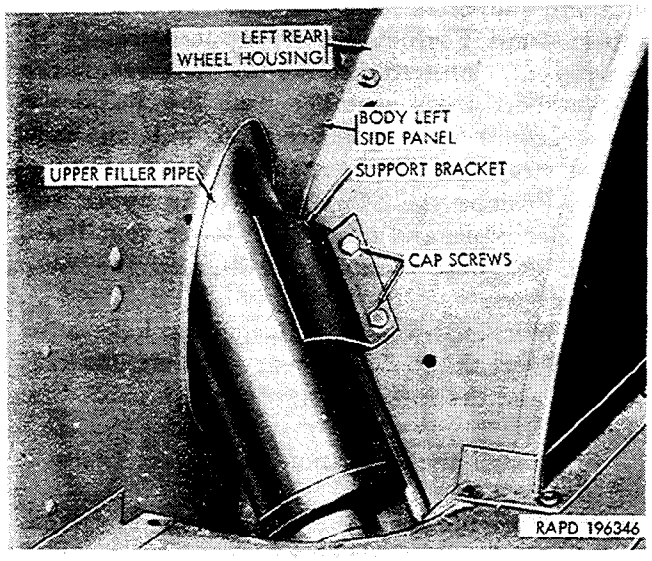


Figure 2-111. Upper fuel filler pipe (cargo truck M37).

(3) On the ambulance truck M43 or telephone maintenance truck M201 remove the two lockwasher screws that secure the upper filler pipe support bracket, working from the underside of the left rear fender.

(4) Remove the filler pipe and attached hoses by pulling them from the opening in the side of the vehicle.

(5) Loosen the two hose clamps, and remove the hoses and clamps from the filler pipe and the vent line. Discard the hoses. Replace the hose clamps if they are damaged.

(6) Clean the hose contacting surfaces of both the upper and lower filler pipes and the upper and lower vent lines, and apply a coating of liquid type gasket cement to the surfaces. Install the filler pipe hose on the upper filler pipe, using a 3-inch length of 2¼-inch length of 2¼-inch (ID) hose. Install the vent line hose on the upper line, using a 2-7 / 8-inch length of ½-inch (ID) hose. Install the two clamps loosely on each hose.

(7) Install the upper filler pipe and attached hoses, guiding the hoses over the lower filler pipe and the lower vent line, and alining the screw holes in the support bracket with those in the wheel housing or left rear fender.

(8) Install the filler pipe support bracket retaining screws. For the cargo truck M37, install the two capscrews, lockwashers, and nuts (fig. 2-111). For the ambulance truck M43 or telephone maintenance truck M201, install the two special lockwasher screws from the underside of the fender into the weld nuts on the bracket. Tighten the parts.

(9) Position the filler pipe hose so it extends an equal distance over the upper and lower filler pipes, position the two clamps, and tighten the clamp screws. Position the vent line hose and hose clamps in the same manner, and tighten the clamp screws.

(10) For the cargo truck M37, install the side fuel filler housing. Apply body sealing compound to the flanged edges of the housing, and install it in position. Install the five special screws that secure the housing to the rear wheel housing and the floor from the housing side, and install the three special screws that secure the housing to the body panel from outside the body (fig. 2-110). Install a lockwasher and nut on each screw and tighten all nuts.

2-87. Fuel Gage Sending Unit and Air Cleaner Inlet Valve

a. General. The fuel gage sending unit and the air cleaner inlet valve are located at the top of the fuel tank. Both are accessible when the inspection hole cover is removed from the floor panel. The air inlet valve, on vehicles of early production, is a part of the fuel tank cover. On later vehicles the air cleaner inlet valve (fig. 2-10) is a separate unit mounted on the fuel tank cover.

b. Replace Fuel Gage Sending Unit (fig. 2-107).

(1) Remove the four lockwasher screws that secure the inspection hole cover to the floor panel and remove the cover.

(2) Disconnect the sending unit cable at the cable connector.

(3) Remove the five screws and washers that secure the sending unit to the fuel tank. Lift the sending unit and tilt it toward the rear to remove the float. Remove and discard the sending unit gasket and clean the gasket surface of the tank.

(4) Apply a light coating of liquid type gasket cement to both sides of a new sending unit gasket, and install the gasket on the fuel tank.

(5) Install the fuel gage sending unit, inserting the rear end of the float first. Position the unit on the tank with the cable connector toward the rear. Install the five special lead washers and special screws. Tighten the screws evenly.

(6) Apply body sealing compound around the inspection hole, and install the inspection hole cover and four lockwasher screws.

c. Replace Air Cleaner Inlet Valve.

(1) Remove the floor panel inspection hole cover (*b* (1) above).

(2) Disconnect the fuel tank-to-air cleaner rear vent line at the air cleaner inlet valve fitting.

(3) On vehicles with the inlet valve in the fuel tank cover, disconnect the rear fuel line at the elbow in the cover (fig. 2-109).

(4) If the inlet valve is a separate unit, remove the six screws and lockwashers that secure the inlet valve to the fuel tank cover (fig. 2-107). If the inlet valve is a part of the cover, remove the 10 lockwasher screws that secure the cover. Remove the air cleaner inlet valve or the cover. Remove and

discard the inlet valve gasket or the cover gasket.

(5) Clean the gasket surface of the cover on the fuel tank, being careful to prevent dirt from dropping into the fuel tank.

(6) If the vent line fitting in the air inlet valve (or cover) is not damaged, remove the fitting. If the fuel line was disconnected for removal of the cover, also remove the fuel line elbow.

(7) Apply a light coating of liquid type gasket cement to both sides of a new gasket (air inlet valve or fuel tank cover, as required) and install the gasket.

(8) If the inlet valve is a separate unit, install the valve on the cover, and install the six lockwashers and screws.

(9) If the inlet valve is a part of the fuel tank cover, install the cover on the tank with the fuel and vent line openings in proper position for connecting the lines (fig. 2-109). Install the 10 special lockwasher screws.

(10) Install a tube elbow in the cover or a tube connector in the air cleaner inlet valve. Tighten fittings. If the fuel line elbow was removed, install a tube elbow in the cover.

(11) Connect the rear vent line to the elbow in the fitting in the inlet valve or cover. If the fuel line was disconnected ((3) above) connect the rear fuel line to the fuel line elbow. Tighten the line nuts.

(12) Install the floor panel inspection hole cover (*b* (6) above).

2-88. Carburetor Controls and Linkage

a. Description.

(1) Carburetor controls include the hand-operated choke and throttle controls and the foot-operated accelerator. Linkage from the accelerator pedal rod connects the rod to the throttle control bellcrank which is connected to the carburetor throttle by means of an adjustable rod. The throttle control operates the throttle control lever which engages the throttle control bellcrank.

(2) Organizational maintenance of the controls and linkage includes adjustment of the choke control (para 2-79 *a*) and the throttle control (para 2-79 *b*) and replacement of the two controls and linkage.

b. Replace Choke Control (fig. 2-12).

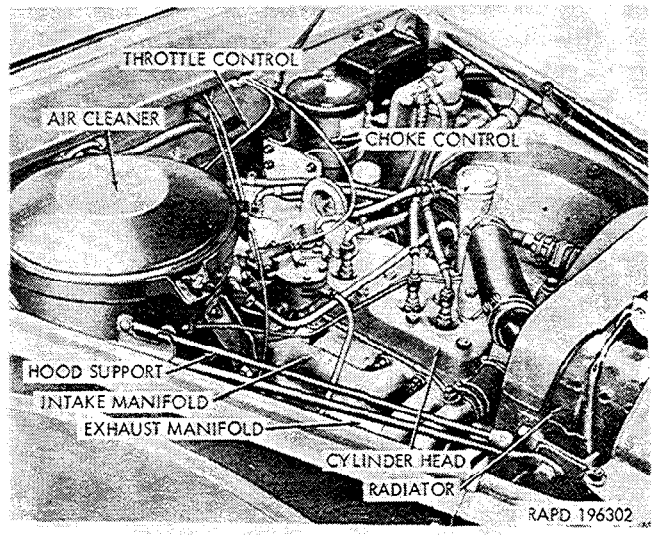


Figure 2-112. Engine—right side.

(1) Loosen the choke control swivel screw (E, fig. 2-100) and the screw in the choke control clip (G, fig. 2-100) and withdraw the control from the clip and swivel.

(2) Loosen the two screws that secure the control clamp to the bracket on the dash.

(3) Unscrew the nut that secures the choke control to the instrument panel. Hold the nut and lockwasher and pull the control from the opening.

(4) Thread the new choke control through the opening in the instrument panel and slip a lockwasher and nut over the control. Continue to push the control through the dash between the dash bracket and the clamp.

(5) Position the control in the instrument panel and screw the retaining nut into place.

(6) Insert the choke control through the choke control clip (G, fig. 2-100) and the control wire in the swivel on the choke lever (E, fig. 2-100). Adjust the choke control (para 2-79 *a*) before tightening the swivel screw and choke control clip screw.

(7) Tighten the two dash bracket clamp screws.

c. Replace Throttle Control. Procedure for replacement of the throttle control (H, fig. 2-91) is the same as that for the choke control (*b* above).

Figure 2-101 shows the throttle control connections in the engine compartment. Adjust the throttle control (para 2-79 *b*).

d. Remove Accelerator Linkage. Removal of various components of the accelerator linkage (fig. 2-113 may be accomplished without removing all of the linkage from the vehicle. However, if the accelerator shaft and connecting linkage requires replacement, remove the assembled parts as a unit.

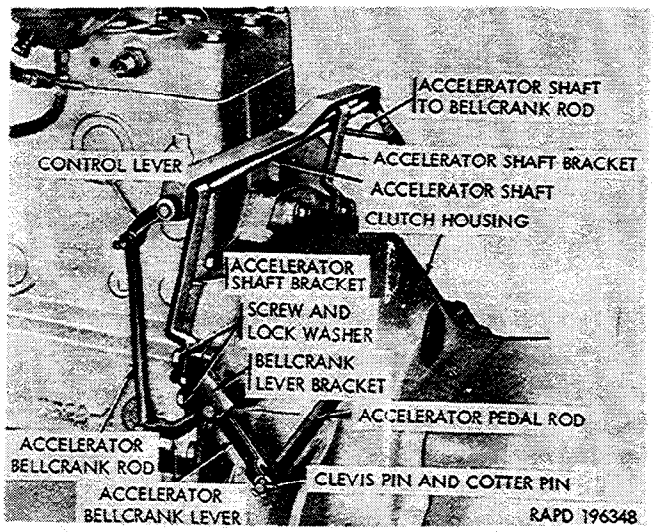


Figure 2-113. Accelerator shaft and linkage.

(1) Detach the accelerator pedal rod from the accelerator bellcrank lever (fig. 2-113) by removing the cotter pin and clevis pin.

(2) Disconnect the throttle return spring from the return spring clip (fig. 2-101).

(3) Disconnect the right end of the accelerator shaft from the throttle control bellcrank rod by removing the cotter pin and flat washer, and pulling the rod from the end of the shaft.

(4) Remove the two screws and lockwashers that secure the accelerator shaft bracket and the accelerator bellcrank lever bracket to the left side of the clutch housing (fig. 2-113).

(5) Remove transmission access covers (para 2-75 *g*).

(6) Remove the capscrew and lockwasher that secure the accelerator shaft bracket to the right side of the clutch housing (fig. 2-113).

(7) Remove the accelerator shaft with assembled parts from the opening in the driver's compartment.

(8) Remove the two screws that secure the accelerator hinge to the left floor panel in the driver's compartment, and remove the accelerator pedal and pedal rod.

e. Inspect Accelerator Linkage.

(1) Inspect the accelerator pedal, pedal hinge, and pedal rod for binding, distortion, or worn or damaged parts. Replace parts as necessary. Inspect the pedal rod weatherseal for deterioration and damage. Replace the weatherseal if necessary.

(2) Inspect the accelerator shaft and shaft bracket for broken welds, distortion, and worn parts. Replace the shaft and bracket if necessary.

(3) Inspect the bellcrank lever, lever bracket, bellcrank rod, and the throttle control bellcrank rod and rod spring for wear, distortion, or other damage. Replace parts as necessary.

f. Install Accelerator Linkage.

(1) If the weatherseal for the accelerator rod was removed (*e* (1) above, install a new weatherseal in the floor panel.

(2) Insert the accelerator pedal rod through the weatherseal and position the pedal in the floor panel. Install the two self-locking washers and screws.

(3) Insert the accelerator shaft and assembled parts through the opening in the driver's compartment, and position the shaft bracket on the clutch housing (fig. 2-113) with the screw holes in the bracket alined with those in the clutch housing. Secure the shaft bracket to the right side of the clutch housing with a capscrew and lockwasher. Do not tighten the screw at this time.

(4) Position the accelerator bellcrank lever bracket between the accelerator shaft bracket and the left side of the clutch housing (fig. 2-113), aline the screw holes, and install the two capscrews and lockwashers. Tighten the screws.

(5) Tighten the capscrew that secures the shaft bracket to the right side of the clutch housing.

(6) Install the transmission access covers (para 2-76 *f*).

(7) Attach the throttle control bellcrank rod to the right end of the accelerator shaft, and install the flat washer and cotter pin.

(8) Attach the throttle return spring to the return spring clip (fig. 2-101).

(9) Aline the accelerator pedal rod with the bellcrank lever and install the clevis pin and cotter pin.

2-89. Engine Priming System and Primer Pump (Vehicles So Equipped)

a. General.

(1) The engine priming system and primer pump were provided on early type vehicles to facilitate starting the engine during extreme cold weather operation. On some vehicles equipped with the system, the line from the fuel filter to the primer pump has been disconnected, rendering the system inoperative.

(2) Organizational maintenance of the components of the priming system includes replacement of the lines from the fuel filter to the primer pump, and from the primer pump to the intake manifold; replacement of the three priming

nozzles, the primer pump, and the primer pump inlet and outlet check valve balls.

(3) The most common cause for failure of the priming system is gum or varnish formation in the lines, nozzles, or fittings. When servicing the system, clean all parts in drycleaning solvent or volatile mineral spirits and blow out with compressed air.

b. Replace Line from Fuel Filter to Primer Pump.

(1) Disconnect the line from the fuel filter by unscrewing the primer line nut from the elbow in the fuel filter (fig. 2-105B). Disconnect the opposite end of the line from the primer pump body by unscrewing the inlet nut and sleeve.

(2) Loosen the two dash bracket clamp screws. Cut the inlet line at the front side of the dash bracket and remove the two sections of the line. Remove the cover from the front section of the line, and discard the two sections of line and the nuts.

(3) Cut a 25-inch length of 3/16-inch seamless tubing. Insert one end of the tubing through the extreme left opening in the dash, between the dash bracket and the bracket clamp. Install the cover over the front portion of the tubing and install a fitting nut. Double flare the end of the tubing with a flaring tool.

(4) Form the line as required to aline the fitting nut with the elbow in the fuel filter, and screw the nut to the elbow.

(5) Install the inlet line nut and sleeve on the inner end of the tubing, flare the tubing ((3) above), and screw the inlet line nut to the inlet valve connector in the primer pump body.

(6) Tighten the two dash bracket clamp screws.

c. Replace Line from Primer Pump to Intake Manifold.

(1) Disconnect the priming system line (R, fig. 2-95) from the tee type nozzle in the rear port of the intake manifold by unscrewing the line nut from the nozzle. Disconnect the opposite end of the line from the connector in the primer pump body by unscrewing the line nut.

(2) Loosen the two dash bracket clamp screws. Cut the line at the front side of the dash bracket, and remove the two sections of the line.

(3) Cut a 48-inch length seamless tubing and insert one end of the tubing through the extreme right opening in the dash, between the dash bracket and the clamp.

(4) Install a tube nut with sleeve on each end of the tubing, flare the tubing ends, and screw the tube nuts to the tee type nozzle in the intake manifold rear port and the connector in the primer pump body, forming the line as necessary to aline the parts.

(5) Tighten the two dash bracket clamp screws.

d. Replace Manifold Inlet Lines and Nozzles.

(1) Disconnect the manifold inlet lines from the three nozzles in the intake manifold by unscrewing the tube nuts. Remove the lines.

(2) Remove the elbow type nozzle from the front port, the tee type nozzle and extension from the middle port, and the tee type nozzle from the rear port of the intake manifold.

(3) Clean the parts as described in *a*(3) above. Replace parts as necessary.

(4) Install the tee type nozzle in the intake manifold rear port, the tee type nozzle and extension in the center port, and the elbow type nozzle in the front port.

(5) For replacing manifold lines, cut two suitable lengths of seamless tubing, install two tube nuts on each section of tubing, and double flare both ends of each section with a flaring tool.

(6) Install the two manifold inlet lines, screwing the nuts to the nozzles in the intake manifold. Connect the line from the primer pump to the tee type nozzle in the manifold rear port.

e. Remove Primer Pump.

(1) Disconnect the two fuel lines from the pump by unscrewing the fuel line nuts from the connectors.

(2) Pull the primer knob out enough to provide access to the two flat spots on the pump plunger stem. Hold the stem with a small wrench at the flat spots, and unscrew the primer knob from the stem. Remove the lockwasher.

(3) Remove the packing nut from the pump.

(4) Loosen the inner locknut securing the pump body at the front (engine) side of the instrument panel and remove the mounting nut from the rear (driver's compartment) side of the instrument panel. Push the pump forward until the stem clears the instrument panel, and remove the pump.

(5) Remove the fuel inlet check valve connector, the fuel outlet connector, and the outlet check plug, spring, and ball. Remove the inner locknut from the pump body if the nut is damaged.

f. Inspect Primer Pump.

(1) Clean the fuel inlet and outlet connectors, the outlet check plug, ball, and spring in drycleaning solvent or volatile mineral spirits. Inspect the parts for damaged threads, cracks, and abrasions. Replace parts as necessary.

(2) Inspect the pump body for damaged threads, cracks, and distortion. Operate the plunger stem and check for distortion and damaged or worn packings. Replace the pump, if necessary.

g. Install Primer Pump.

(1) Install the fuel inlet check valve connector, the fuel outlet connector, and the ball,

spring, and outlet check plug in the pump body. Install the inner locknut on the pump body if the nut was removed.

(2) Insert the stem end of the pump in the opening in the instrument panel from the cowl side. Position the pump so that the fuel inlet connector is down. Install the pump mounting nut on the rear of the pump body at the driver's compartment side of the instrument panel. Tighten the nut until it bottoms on the pump body. Tighten the inner locknut at the front side of the panel against the panel.

(3) Install the packing nut over the plunger stem and tighten the nut fingertight. Install a lockwasher in the opening in the knob, and install the knob on the plunger stem. Hold the stem with a small wrench at the flat spots and tighten the knob.

(4) Connect the fuel inlet and outlet lines to the inlet connectors, respectively, tightening the line nuts.

2-90. Exhaust Pipes, Muffler, and Tailpipe

a. Replace Muffler.

(1) Remove the two nuts, lockwashers, and bolt which attach the lower exhaust pipe to the muffler (fig. 2-114).

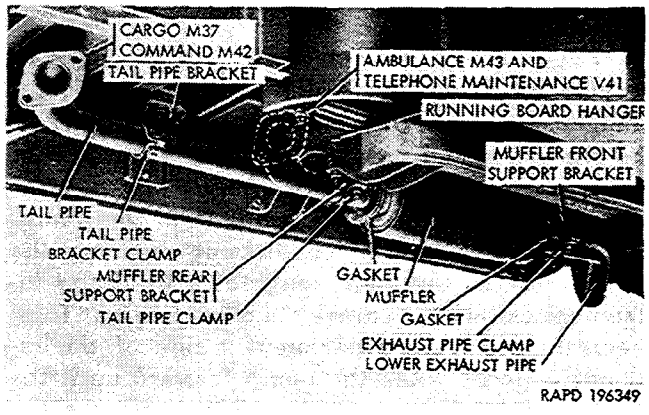


Figure 2-114. Muffler, tailpipe, and exhaust pipes.

(2) Support the muffler and remove the two nuts, lockwashers, and bolts which attach the tailpipe to the muffler. Remove and discard the muffler and two gaskets.

(3) Position new gaskets on the front and rear flanges of the muffler and position the muffler between the lower exhaust pipe and tailpipe with the large opening of the muffler forward. Aline the screw holes in the gaskets and flanges, and install the two bolts and nuts for each flange. Tighten nuts.

b. Remove Upper and Lower Exhaust Pipes and Related Parts.

(1) Remove the two nuts and bolts that attach the upper exhaust pipe to the exhaust manifold.

(2) Remove the two nuts and bolts that attach the lower exhaust pipe to the muffler.

(3) Remove the two nuts, lockwashers, bolts, and plain washers that secure the exhaust pipe clamp to the muffler front support bracket, and remove the clamp. Remove the assembled upper and lower exhaust pipes from the under side of the vehicle. Remove and discard the upper exhaust pipe-to-manifold gasket and the lower exhaust pipe-to-muffler gasket.

(4) Loosen the nuts on the two eye bolts that attach the upper exhaust pipe to the lower exhaust pipe, disengage the eyebolts, and separate the pipes. Discard the upper-to-lower exhaust pipe gasket.

(5) Remove the cotter pin and clevis pin that secure each eyebolt to the upper exhaust pipe and remove the eyebolts, nuts, and flat washers.

(6) If the muffler front support bracket (fig. 2-114) requires replacement, remove the two nuts, lockwashers, and bolts that secure the support bracket to the running board front hanger, and remove the bracket.

c. Install Upper and Lower Exhaust Pipes and Related Parts.

(1) If the muffler front support bracket was removed (*b* (6) above), position a new bracket on the running board front hanger and install two bolts, lockwashers, and nuts.

(2) Install the flat washer and nut on each exhaust pipe eyebolt, and attach the two eyebolts to the upper exhaust pipe with the clevis pins and cotter pins.

(3) Install a new upper-to-lower exhaust pipe gasket on the lower exhaust pipe, install the upper exhaust pipe, and engage the two eyebolts. Tighten the eyebolt nuts lightly.

(4) Install new gaskets on the flange of the upper exhaust pipe, and on the front flange of the muffler. Install the assembled exhaust pipes, alining them with the exhaust manifold and the muffler.

(5) Install the two bolts and nuts to secure the upper exhaust pipe to the exhaust manifold.

(6) Install bolts and nuts to secure the lower exhaust pipe to the muffler.

(7) Tighten the four nuts and the two eyebolts nuts evenly.

(8) Install a flat washer on each of the bolts for the exhaust pipe clamp. Install the clamp, alining the bolt holes in the clamp with those in the muffler front support bracket. Install the two bolts from the bracket side and install lockwashers and nuts. Tighten the nuts.

d. Remove Tailpipe and Related Parts.

(1) Remove the two nuts, lockwashers, bolts, and plain washers that secure the tailpipe clamp to the muffler rear support bracket, and remove the clamp (fig. 2-114).

(2) For the cargo truck M37 remove the two

nuts, lockwashers, and bolts that secure the tailpipe bracket clamp to the tailpipe bracket, and remove the clamp.

(3) Remove the two nuts and bolts that secure the tailpipe to the rear flange of the muffler, and remove the tailpipe. Remove and discard the muffler-to-tailpipe gasket.

(4) If the muffler rear support bracket requires replacement, remove the two nuts, lockwashers, and bolts that secure the bracket to the running board rear hanger, and remove the bracket.

(5) If the tailpipe bracket (cargo truck M37) requires replacement, remove the nut, lockwasher, and bolt that secure the bracket to the frame side rail, and remove the bracket.

e. Install Tailpipe and Related Parts.

(1) Position the tailpipe bracket (fig. 2-114) cargo truck M37 on the frame side rail, and install the bolt, lockwasher, and nut. Tighten the nut.

(2) Position the muffler rear support bracket on the running board rear hanger and install the two bolts, lockwashers, and nuts. Tighten the nuts.

(3) Install a new muffler-to-tailpipe gasket on the rear flange of the muffler. Install the tailpipe on the muffler and install the two bolts and nuts. Tighten the nuts.

(4) Install a flat washer on each of the two bolts, position the clamp, and install the two bolts with washers from the bracket side. Install the two lockwashers and two nuts. Tighten the nuts.

(5) For the cargo truck M37, install the tailpipe bracket clamp and install the two bolts, lockwashers, and nuts. Tighten the nuts.

Section XVII. COOLING SYSTEM

2-91. General

The sealed type cooling system includes the radiator, fan, water pump, thermostat, water passages in the engine, and connecting hoses. Liquid is drawn from the bottom of the radiator by the belt-driven centrifugal type water pump, circulated through passages in the engine, and returned through the upper hose to the radiator. The fan, also belt-driven, draws air through the radiator to cool the liquid in the radiator. The thermostat located in the outlet elbow on the cylinder head, restricts flow of coolant to the radiator during the warmup period. When the coolant reaches the activating temperature for the thermostat, the thermostat opens, permitting full circulation. Organizational maintenance of the cooling system includes draining, filling, and preventive cleaning of the system, and replacement of parts such as hoses, fan, fan belt, water pump, thermostat, and radiator.

2-92. General Service

WARNING

Before checking or draining radiator, turn filler cap to the left until its stop is reached. Cap is then in vented position to allow pressure to escape. Noncompliance could result in serious burns.

a. Drain Cooling System.

(1) If radiator is hot, remove the filler neck cap (fig. 2-115) slowly to permit pressure to escape through the vent in the cap. Open the radiator drain cock (fig. 2-169) at front lower right corner of the radiator core. If cooling system contains antifreeze, drain it into a suitable container and save it for use again.

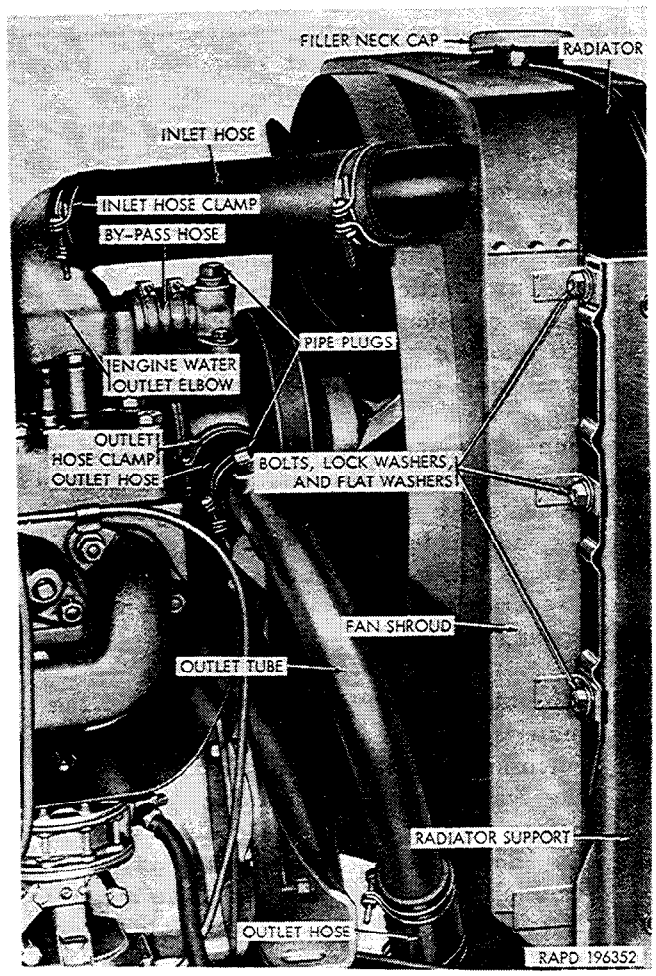


Figure 2-115. Radiator and hoses.

(2) Open the drain cock at the left side of the engine block.

NOTE

Draining the radiator alone will not completely drain the cooling system.

b. Fill Cooling System. Close the radiator drain cock and the drain cock at the left side of the engine block. Fill the system with coolant to a level 2¼ inches below the top of the filler neck. Refer to para 2-93 for application of corrosion inhibitor or antifreeze compound. Turn the filler neck cap clockwise as far as possible to seal the system.

2-93. Preventive Cleaning

a. General.

(1) The cooling system must be cleaned at least twice a year, before antifreeze is added and again after it is removed. Rusty or otherwise contaminated coolant or rust and grease deposits inside the radiator indicate that cleaning of the cooling system is necessary. Cleaning at the prescribed intervals will reduce clogging and overheating to a minimum and will largely eliminate the necessity for corrective cleaning by a higher echelon. If the cooling system is very dirty or clogged so that overheating occurs, the conditions must be reported to direct support maintenance personnel.

(2) The entire cooling system must be examined for leaks, both before and after cleaning and flushing.

(3) The cooling system should never be allowed to stay for an extended time without protection, particularly after cleaning. Considerable corrosion may take place in a few hours.

b. Cleaning Compound. The prescribed cleaning compound is one with inhibitor (for engine cooling system). It consists of two separated components (aluminum chloride and oxalic acid); these are intermixed immediately prior to use. The components are packaged in a single container having independent compartments. An inhibitor (borax), is furnished in the same container in a third separate compartment. Use one container for the cooling system.

CAUTION

Do not under any circumstances mix the materials with antifreeze compound or corrosion inhibitor compound. Never mix the water and the cleaning compound before putting it into the cooling system. Do not spill the compound on skin, clothing, or painted portions of the vehicle. If spilled, flush affected area with clean water immediately.

c. Engine Temperature. During engine idling periods, required in cooling system cleaning processes, it is important to cover the radiator and keep the cover adjusted so that a temperature of 180° to 200° F. is maintained. The engine develops so little heat while running without load that the thermostat valve remains partially or fully closed. Covering the radiator opens the valve quickly; but if the cover is removed, the valve will close again, even though the temperature gage shows little change.

NOTE

With the flow to the radiator restricted by the thermostat valve, cleaning, inhibiting, and flushing are not effected.

(1) Drain system by opening drain cocks (para 2-92*a*). Make certain temperature of coolant has dropped considerably below 200° F. before draining and refilling with cold water to avoid cracking the block and head. If necessary, use a wire to keep open any drain hole which tends to become clogged.

(2) Close the drain cocks (para 2-92*b*), pour water slowly into the radiator until the level is within 2 inches of overflow pipe.

(3) Replace the filler neck cap, cover radiator if necessary, start the engine, and run it at idling speed until temperature reaches above 180° F., but not above 200°F. Then pour cleaning components together into the hot radiator as specified in *b* above. Allow engine to continue running for 30 to 60 minutes.

(4) Stop the engine and turn the filler neck cap to release pressure. Since temperature rise can be expected at shutdown, coolant temperature should be allowed to drop considerably below 200°F. before draining and refilling with cold water to avoid cracking the block and head. Then remove the cap and drain the system competely.

e. Normal Flushing.

(1) With the engine stopped and the temperature of the coolant considerably below 200° F., open both drain cocks.

(2) Add clean water and, while so doing, run the engine at fast idle (drains open). Flush, continually flooding cooling system with clean water, running the engine for 25 minutes.

(3) Stop the engine, close both drain cocks, refill with clean water, leaving sufficient space for the addition of inhibitor or antifreeze compound.

f. Inhibition. Add inhibitor, in amounts specified in *b* above, to the radiator, fill to the correct level with clean water, start and run the engine at idle until the temperature reaches over 180° F., but does not rise above 200° F. Cover the radiator, if necessary.

NOTE

If antifreeze compound is to be added after flushing the radiator, do not add inhibitor; discard it.

g. Pressure Flushing.

(1) To flush the radiator (fig. 2-116) proceed as in *(a)* through *(g)* below.

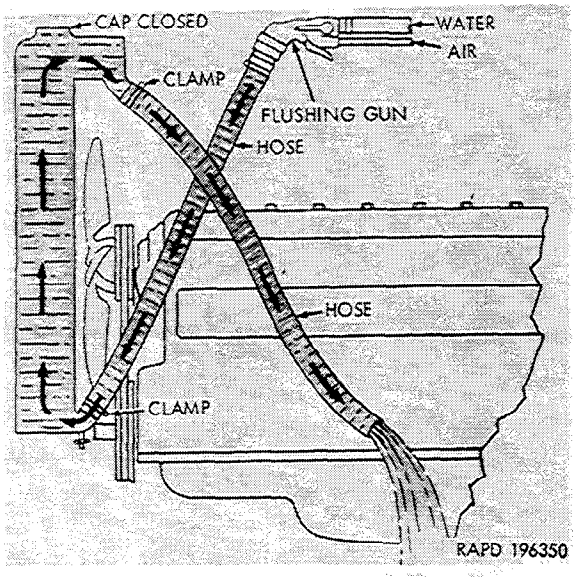


Figure 2-116. Pressure flushing radiator.

(a) Drain the cooling system (para 2-92 *a*).

(b) Loosen the hose clamps on the radiator inlet hose and outlet hoses and remove the inlet hose and the outlet hoses and outlet tube (fig. 2-115).

(c) Clamp a convenient length of new hose to the radiator core outlet opening, and attach another suitable length of hose to the radiator inlet opening to carry away flushing stream (fig. 2-115).

(d) Connect the flushing gun to compressed air and to a waterline, and clamp the nozzle of the gun in the hose attached to the radiator outlet opening.

(e) With the filler neck cap on tight, fill the core with water and apply compressed air.

CAUTION

Turn on compressed air in short blasts to prevent core damage.

(f) Allow radiator to fill with water and again apply air pressure as before. Repeat this process until the water comes out clear. Connect the hoses, and proceed as in *f* above.

(g) Blow insects and dirt from radiator core air passages, using water to soften obstructions.

(2) To flush the engine block (fig. 2-117), proceed as in *(a)* through *(e)* below.

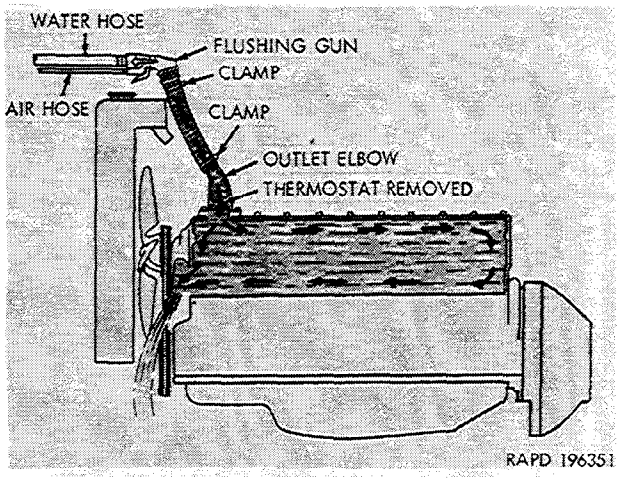


Figure 2-117. Pressure flushing engine block.

(a) Drain cooling system (para 2-92 *a*).

(b) Remove the radiator inlet hose (fig. 2-115), the water outlet elbow, and thermostat (fig. 2-118). Install the outlet elbow and gasket.

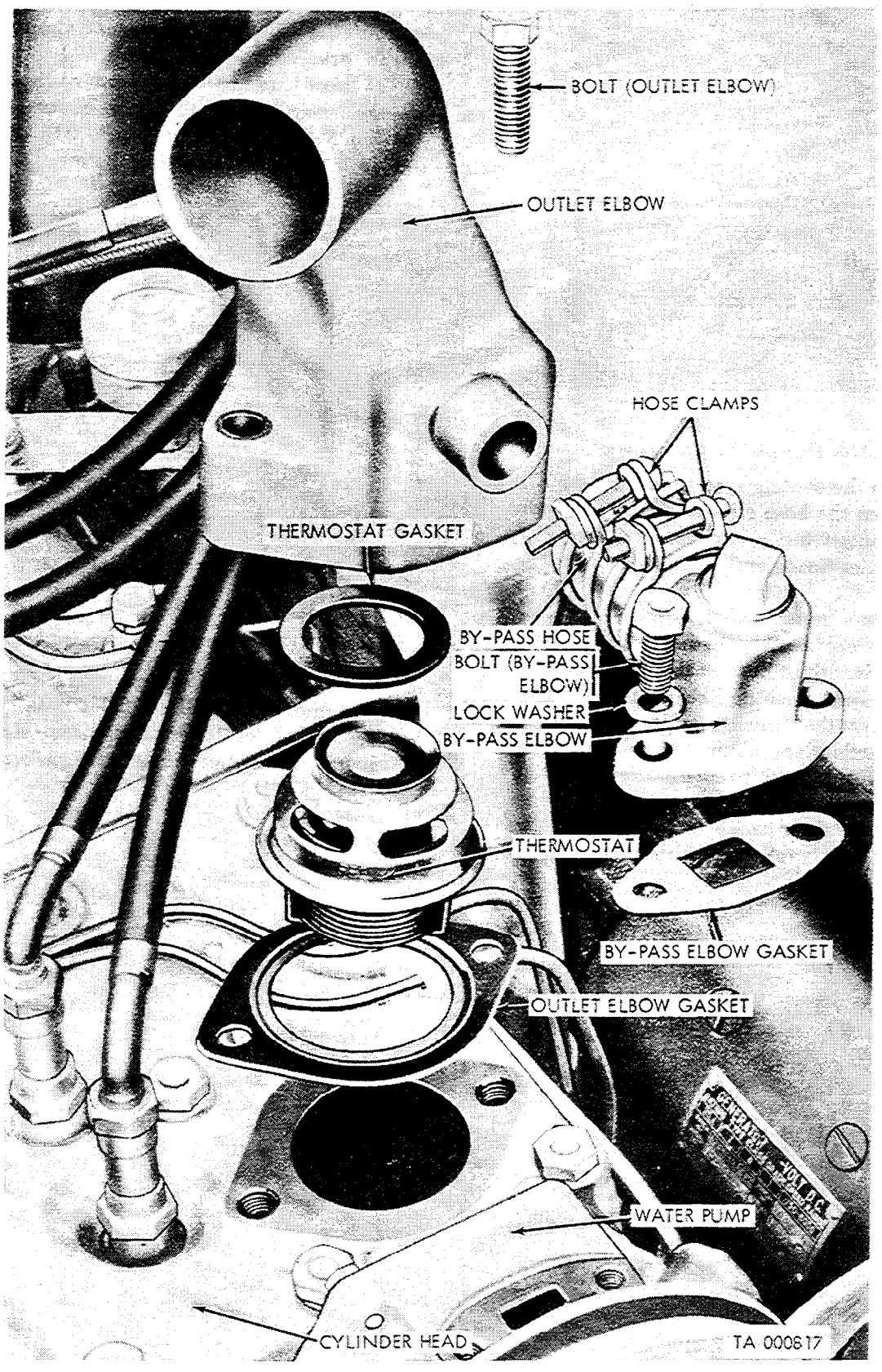


Figure 2-118. Water outlet elbow, thermostat and related parts.

(c) Loosen the hose clamp on the radiator outlet hose (fig. 2-115), and disconnect the hose from the water pump.

(d) Clamp the flushing gun nozzle firmly to a length of hose attached securely to the outlet elbow (fig. 2-117), and fill the engine with water, partially covering the opening in the water pump to insure complete filling.

(e) Turn on compressed air to blow out water and loosen sediment. Repeat the process of filling with water and blowing out with compressed air, until flushing stream comes out clean.

(3) For complete removal of sediment, repeat flushing process of the radiator core and engine block in opposite directions.

(4) If the engine water jackets are badly clogged so that they do not respond to regular pressure flushing, engine should be replaced (para 2-75 and 2-76), and direct support notified for corrective cleaning.

(5) Remove flushing equipment and the water outlet elbow. Clean all hose connections of both radiator and engine block. Clean out the radiator overflow pipe. Inspect and lubricate the water pump. Inspect the thermostat; clean it and check it for proper operation.

(6) Install the thermostat (para 2-95 *c*). Connect the hoses (para 2-94 *c*). Close both drain cocks, test for leaks (*h* below), and proceed as in *f* above.

h. Leaks. Pour water slowly into the radiator until the system is approximately half full. Start engine, run at idling speed, and fill the system completely. Stop the engine and examine the entire cooling system for leaks. Carefully check the radiator hose connections, water pump mounting bolts, gasket, water outlet elbow mounting bolts and gasket, bypass elbow mounting bolts and gasket, and the cylinder head bolts and gasket.

NOTE

Inspect the radiator core for leakage. This is important because the cleaning solution may uncover leaks which existed before cleaning but were plugged with rust or corrosion.

Leaks that cannot be corrected by organizational maintenance must be reported immediately to direct support maintenance personnel.

i. Coolant Service.

(1) When servicing the engine for operation at anticipated temperatures above 32° F., fill the system nearly full with clean water. Add corrosion inhibitor compound in the proportion of one container of inhibitor to each 4 gallons of cooling system capacity. Then complete filling the system with water.

(2) When servicing the engine for operation at anticipated temperatures below 32° F., use the procedure prescribed for reclaimed or new antifreeze compound, whichever is to be used. Inspect entire cooling system for leaks, and replace any hoses not suited for extended use.

2-94. Hoses

a. Remove Radiator Inlet and Outlet Hoses and Radiator Outlet Tube (fig. 2-115).

(1) Drain cooling system (para 2-92 *a*).

(2) Loosen the radiator inlet hose clamps by loosening the clamp screws. Remove the hose with clamps. Remove the clamps from the hose if hose is to be discarded or clamps must be replaced.

(3) Loosen the radiator outlet hose upper and lower hose clamps. Remove the outlet hoses and the outlet tube. Remove the clamps from the hoses if the hoses are to be discarded or other clamps must be replaced.

b. Inspection.

(1) Clean rust and scale from the outlet tube. Clean all hose connections.

(2) Inspect the inlet and outlet hose clamps for distortion, cracks, corrosion damage, or stripped threads. Replace clamps as necessary.

(3) Inspect the outlet tube for corrosion damage, cracked weld around pipe plug boss (on vehicles so equipped), and other visual damage. Replace tube as necessary.

c. Install Radiator Inlet and Outlet Hoses and Radiator Outlet Tube (fig. 2-115).

NOTE

Apply a coating of liquid type gasket cement around all hose connections and gaskets.

(1) Install a 4-inch length hose on each end of the outlet tube. Install a hose clamp on each end of each outlet hose.

(2) Install the outlet tube with hoses attached to the radiator outlet opening and to the water pump. Position the clamps on the two hoses and tighten the clamp screws.

(3) Install a hose clamp on each end of the inlet hose. Position the hose on the engine water outlet elbow and on the radiator inlet opening. Position the clamps on the hose and tighten the clamp screws securely.

d. Replace Water Pump Bypass Hose.

(1) Remove the two bolts and lockwashers attaching the water pump bypass elbow to the water pump (fig. 2-118).

(2) Loosen the two hose clamps and remove the bypass elbow and hose. Remove the clamps and discard the bypass hose and bypass elbow gasket.

(3) Install a hose on the water pump bypass elbow. Install a hose clamp on each end of the hose.

(4) Clean both gasket contacting surfaces, and install a new water pump bypass elbow gasket on the water pump. Install the bypass elbow hose

on the engine outlet elbow, and aline the bolt holes in the elbow flange with those in the gasket and water pump. Install the two bolts with lockwashers through the bypass elbow and gasket. Tighten bolts evenly.

(5) Position both clamps and tighten screws.

(6) Fill the cooling system (para 2-92 *b*).

2-95. Thermostat

a. General. Replacement of the thermostat may be necessary if the unit is inoperative, or if it is desired to change the type of thermostat.

b. Removal.

(1) Drain sufficient coolant from the cooling system (para 2-92 *a*) to lower the level to below the cylinder head.

(2) Loosen the hose clamp that secures the radiator inlet hose to the engine water outlet elbow (fig. 2-115), and remove the hose from the elbow.

(3) Remove the two bolts and lockwashers that attach the water pump bypass elbow to the water pump (fig. 2-118).

(4) Remove the two bolts that secure the engine water outlet elbow to the cylinder head, and remove the outlet elbow and bypass elbow as a unit. Remove and discard the bypass elbow gasket.

(5) Remove the thermostat, the thermostat gasket, and the outlet elbow gasket. Discard gaskets.

c. Installation.

(1) Clean the gasket contacting surfaces and hose contacting surfaces thoroughly. Apply a coating of liquid type gasket cement to both sides of a new outlet elbow gasket and a new bypass elbow gasket (fig. 2-118).

(2) Install the outlet elbow gasket on the cylinder head and the bypass elbow gasket on the water pump.

(3) Install a new thermostat gasket on the top of the thermostat, and install the thermostat in the cylinder head with the word FRONT toward the radiator and coils of thermostat down into block.

(4) Mount the assembled elbows in position and install the two bolts in the outlet elbow, and the two lockwashers and bolts in the bypass elbow. Tighten all bolts evenly.

(5) Apply liquid type gasket cement to the outlet elbow at the hose connection. Install the radiator inlet hose on the elbow, and tighten the hose clamp.

(6) Fill the cooling system (para 2-92 *b*).

2-96. Fan and Generator Drive Belt

a. Adjustment. Loosen the generator adjusting arm bolt, and move the generator toward or away from the engine to provide ½-inch deflection of the belt (fig. 2-119). Tighten the adjusting arm bolt.

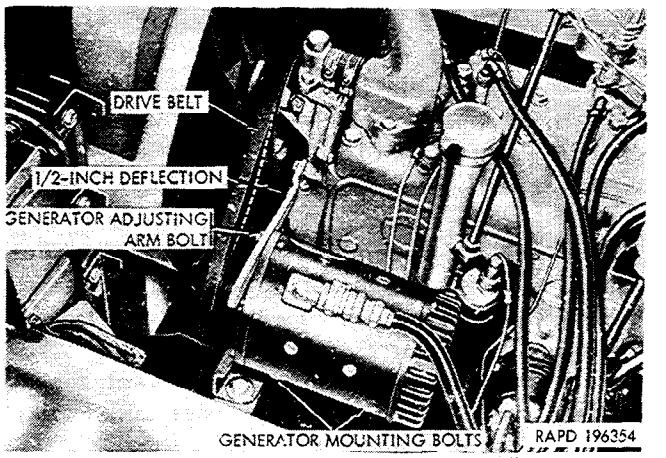


Figure 2-119. Adjusting fan and generator drive belt.

b. Replacement.

(1) Loosen the generator adjusting arm bolt (fig. 2-119) and push the generator toward the engine as far as possible. Disengage the belt from the generator drive pulley, the crankshaft pulley, and the fan drive pulley and remove the belt over the fan blades.

(2) Place a new belt over the fan blades, install it in position on the crankshaft pulley, the fan drive pulley, and the generator drive pulley. Adjust the belt (*a* above).

2-97. Radiator

a. Removal.

(1) Drain cooling system (para 2-92 *a*).

(2) Remove the radiator inlet and outlet hoses (para 2-94 *a*).

(3) Remove fan and fan drive pulley.

(4) Remove the three bolts, lockwashers, and flat washer which secure each side of the fan shroud and radiator to the radiator support (fig. 2-115).

(5) Move the fan shroud back out of the way over the water pump, move the radiator back far enough to clear the upper baffle, and lift out the radiator.

CAUTION

Exercise care to avoid damaging the radiator core against the fan blades.

b. Installation.

(1) Position the radiator in the radiator support.

(2) Position the fan shroud, alining the bolt holes in the shroud and radiator with those in the radiator support.

(3) Install a lockwasher and a flat washer on each of the six bolts (fig. 2-115). Insert bolts through the holes in the fan shroud and radiator. Tighten the bolts evenly.

(4) Install the radiator inlet and outlet hose (para 2-94 *b*).

(5) Fill cooling system (para 2-92 *b*).

2-98. Fan, Fan Drive Pulley, and Water Pump

a. Remove Fan and Related Parts.

(1) Loosen the fan belt (para 2-96 *b*) and disengage it from the fan pulley (fig. 2-120).

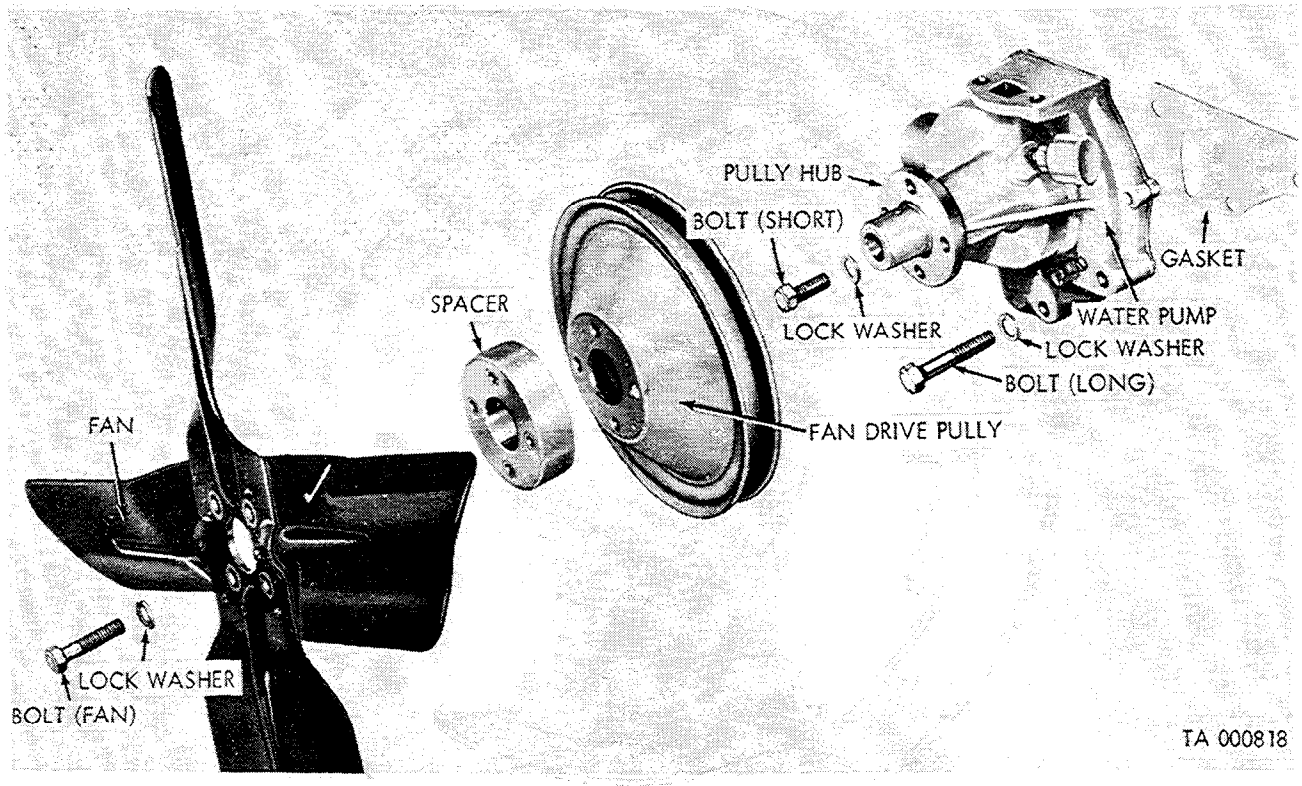


Figure 2-120. Fan, water pump, and related parts—exploded view.

(2) Remove the four bolts and lockwashers that secure the fan, spacer, and fan drive pulley to the pulley hub and remove the fan, spacer, and fan drive pulley.

b. Inspection. Inspect the fan for loose blade rivets, distortion, worn bolt holes, or other damage. Inspect the pulley and spacer for cracks and distortion. Replace worn or damaged parts as necessary. If fan drive pulley does not have ignition timing marks, proceed to mark the pulley using one of the following procedures:

(1) When available, use the discarded or replaced pulley as a template to locate the timing marks.

(2) If discarded pulley is not available, the timing marks can be located as follows:

(a) Using a protractor, locate a point that is 60° right from the center of hole No. 2, and 5° left from the center of hole No. 3 (fig. 2-121).

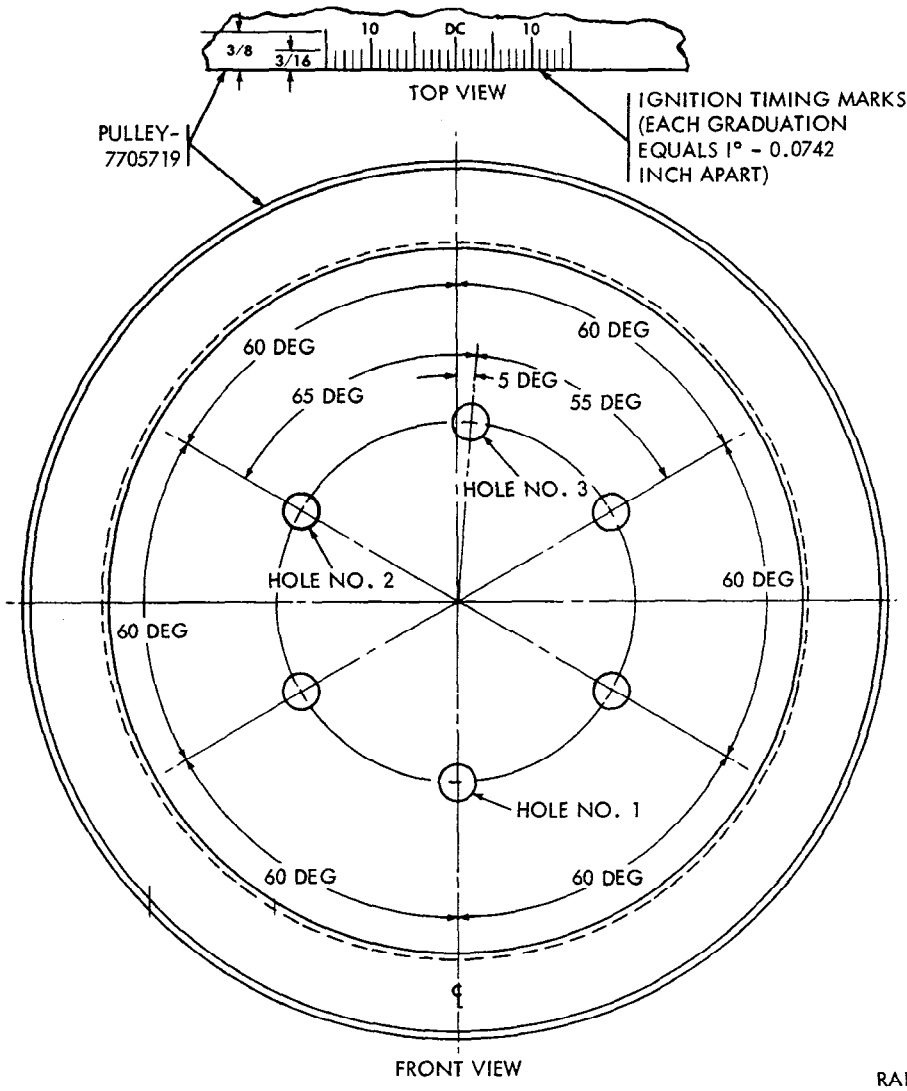


Figure 2-121. Location of ignition marks on fan drive pulley.

(b) Lay a straight edge through this point and the center of hole No. 1 and scribe the top dead center (TDC) mark on the pulley.

(c) Locate and scribe additional marks.

c. Install Fan and Related Parts.

(1) Install the fan drive pulley on the pulley hub with the dished side toward the water pump. Position the fan belt over the pulley and install the spacer and fan. Aline the four bolt holes in the fan, spacer, and pulley with those in the pulley hub and install the four lockwashers and four bolts. Tighten bolts evenly.

(2) Adjust the fan belt (para 2-96 *a*).

d. Remove Water Pump.

(1) Drain the cooling system (para 2-92 *a*).

(2) Remove the fan and related parts (*a* above).

(3) Remove the two bolts and lockwashers that secure the bypass elbow to the water pump (fig. 2-118).

(4) Remove the three bolts and lockwashers that secure the water pump to the cylinder block, move the generator adjusting arm out of the way, and remove the water pump.

(5) Remove and discard the water pump gasket and the bypass elbow gasket.

(6) If the generator adjusting arm is to be replaced, remove the bolt and plain washer that secures the arm to the generator, and remove the arm.

e. Inspection. Clean the mating surfaces on the water pump, cylinder block, and bypass elbow. Inspect the water pump for cracks, loose body parts, and other damage. Replace the pump, if necessary.

f. Install Water Pump.

(1) If the generator adjusting arm was removed (*d* (6) above), position the arm on the generator and install the plain washer and bolt, tightening the bolt only fingertight.

(2) Apply a coating of liquid type gasket cement to both sides of the water pump gasket and the bypass elbow gasket, and install the gaskets in position.

(3) Position the pump on the cylinder block, alining the bolt holes in the pump, gaskets, cylinder block, and bypass elbow. Install a lockwasher and a bolt at the right side of the pump. Install a lockwasher and a bolt in the lower bolt hole. Aline the hole in the generator adjusting arm with the bolt hole at the left side of the water pump, and install a lockwasher and bolt. Tighten the three bolts evenly.

(4) Install the two lockwashers and bolts to secure the bypass elbow to the water pump. Tighten the bolts.

(5) Install the fan and related parts (*c* above).

(6) Fill the cooling system (para 2-92 *b*).

2-99. Temperature Gage Sending Unit

a. General. When replacing the water temperature gage sending unit, be sure to install the correct type unit for the gage. The temperature gage kit includes a replacement gage and sending unit. If the gage is replaced (para 2-53 *c*), replace the sending unit also.

b. Removal (fig. 2-122).

(1) Drain sufficient coolant from the cooling system to lower the level to below the cylinder head.

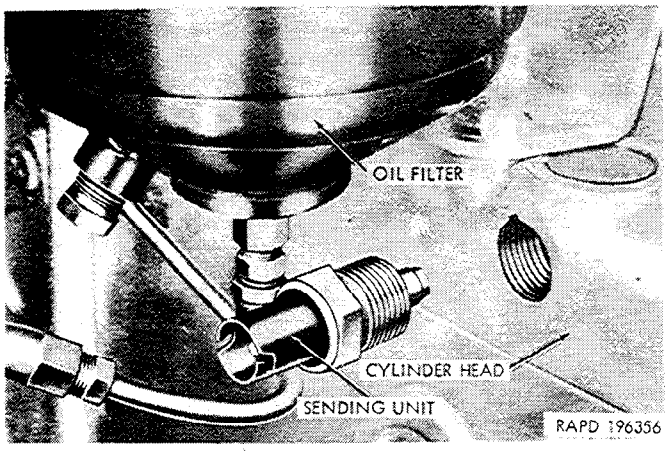


Figure 2-122. Water temperature gage sending unit removed.

(2) Disconnect the sending unit cable at the cable connector on the sending unit.

(3) Unscrew the sending unit and remove it from the cylinder head.

c. Installation.

(1) Coat the threads of the sending unit (fig. 2-122) with liquid type gasket cement, install the unit in the cylinder head, and tighten.

(2) Connect the sending unit cable at the cable connector.

2-100. Drain Cocks

a. Removal.

(1) Drain the cooling system (para 2-92 *a*).

(2) Unscrew the drain cock (fig. 2-169) from the front of the radiator.

(3) Unscrew the cylinder block drain cock (fig. 2-89) from the cylinder block or pipe coupling (on vehicles so equipped) at the left side of the cylinder block. If the coupling or pipe nipple is damaged, unscrew the nipple and coupling from the cylinder block, and discard, since these parts are not required.

b. Installation.

(1) Install the drain cock in the pipe coupling or cylinder block (fig. 2-89), and tighten.

(2) Install the drain cock in the radiator.

(3) Close both drain cocks and fill the cooling system (para 2-92 *b*).

2-101. General

a. The transmission is a helical gear, synchroshift unit, with four forward speeds and one reverse. On vehicle equipped with a winch, the power-takeoff is mounted at the left side of the transmission.

b. Transmission assembly (model 420) complete with cover assembly is installed in current production M37B1, M43B1, and M201B1 vehicles. This transmission assembly is interchangeable with transmission assembly (model 88950) which was used in the M37, M43, and M201 vehicles.

c. Component parts of these transmissions are not interchangeable. Both transmissions are helical gear synchroshift type. Power-takeoff assemblies on winch equipped vehicles must be matched or modified.

d. Organizational maintenance operations include replacement of the transmission and gear shift lever, the power-takeoff cover gasket or gaskets, and the filler and drain plugs; and emergency replacement of the transmission top cover and / or gasket, and the transmission with or without the power-takeoff.

2-102. Gear Shift Hand Lever

a. Removal. Remove the nut, lockwasher, and bolt that clamps the gear shift hand lever to the gear shift lower lever and remove the hand lever.

b. Installation. Position the hand lever on the lower lever and install the bolt, lockwasher, and nut. Tighten the nuts.

2-103. Power-Takeoff Cover Gasket

a. General. The transmission is provided with one or two power-takeoff covers, the number depending on whether a power-takeoff is used. On transmissions with power-takeoff, one cover is attached to the right side of the transmission and on a transmission without power-takeoff, a second cover is used at the left side. If either cover gasket is damaged or deteriorated, causing leakage of transmission lubricant, replace the gasket (*b* below).

b. Replacement. Both cover gaskets are removed and installed in the same manner.

(1) Remove the drain plug (S, fig. 2-123) from the bottom of the transmission case and drain the lubricant into a clean container. Install the drain plug and tighten.

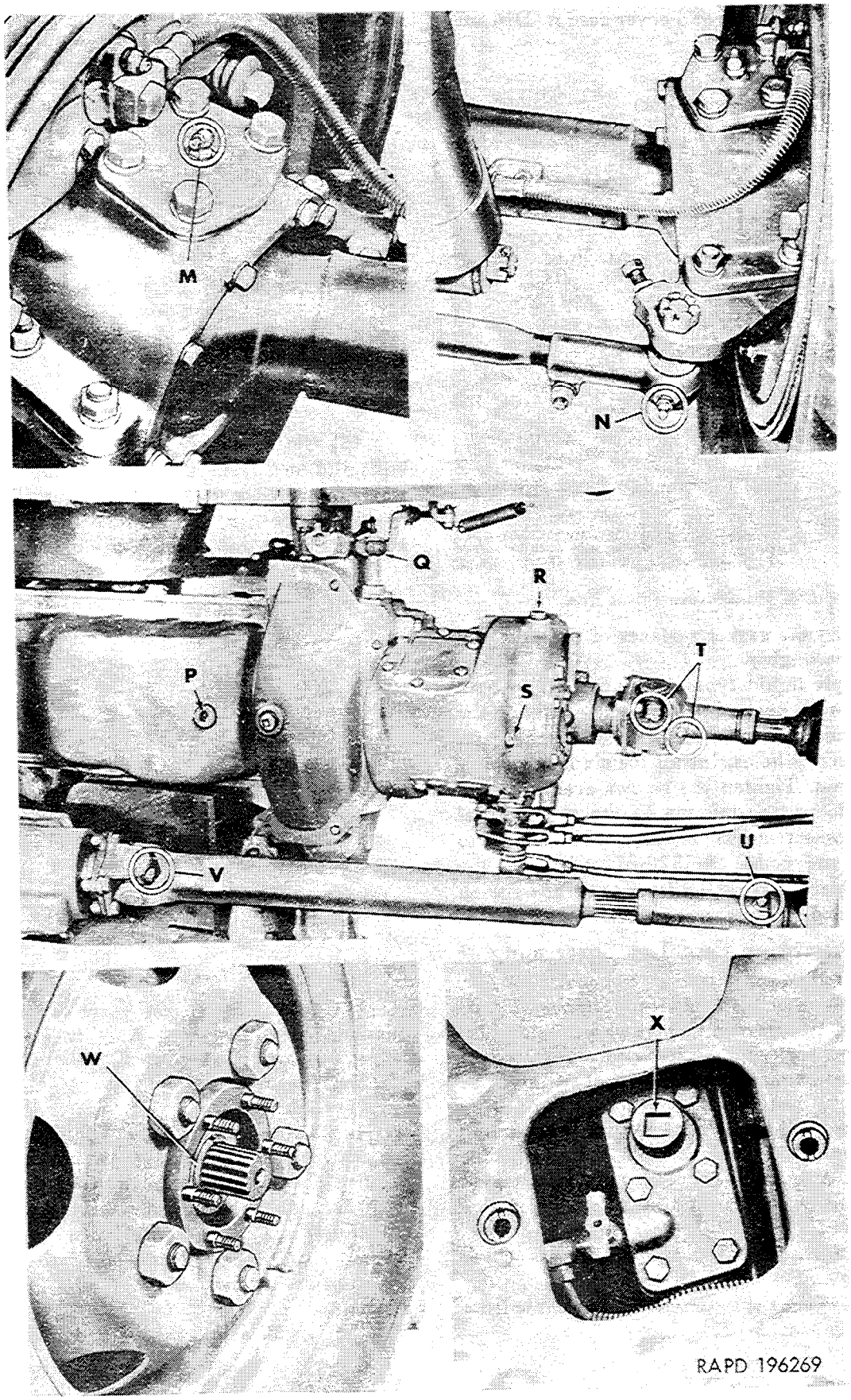


Figure 2-123. Localized lubrication points (M through X).

(2) Remove the six capscrews and lockwashers that secure the cover to the transmission case (fig. 2-124) remove the cover and cover gasket. Discard the gasket.

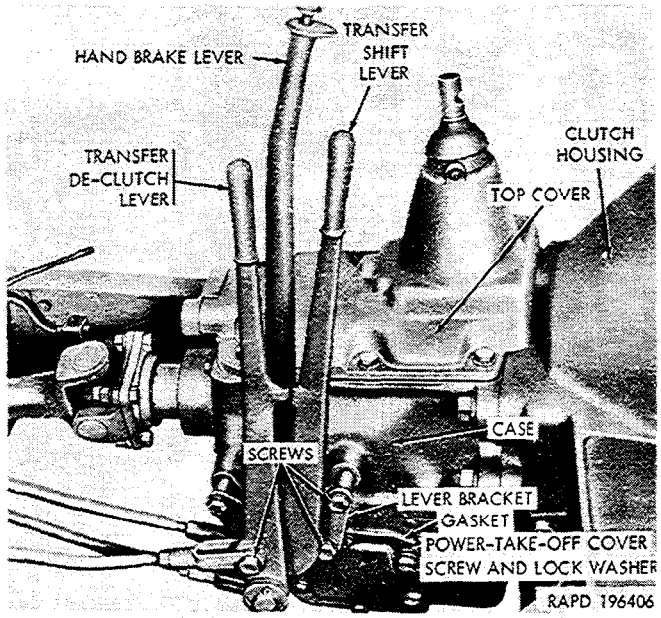


Figure 2-124. Transmission—right side.

(3) Clean the gasket surfaces of the case and the cover thoroughly.

(4) Apply liquid type gasket cement to both sides of a new gasket and position the gasket on the cover. Position the cover and gasket on the case, alining the screw holes. Install the six lockwashers and capscrews. Tighten the screws evenly.

(5) Fill the transmission to the proper level with the correct grade of lubricant. Refer to lubrication order LO 9-2320-212-12. Use the lubricant which was drained from the transmission if it is clean and of the correct grade.

2-104. Transmission Case Top Cover and / or Gasket

a. Coordination with Direct Support Maintenance Unit. Replacement of the transmission case top cover and / or cover gasket is normally a direct support maintenance operation, but it may be preformed in an emergency by the using organization, provided authority for performing such replacement is obtained from the responsible commander. A replacement cover may be obtained from the direct support unit.

b. Removal.

(1) Remove the transmission access cover (para 2-75 *g*).

(2) Disengage the battery-to-starter cable from the cable clip (fig. 2-125).

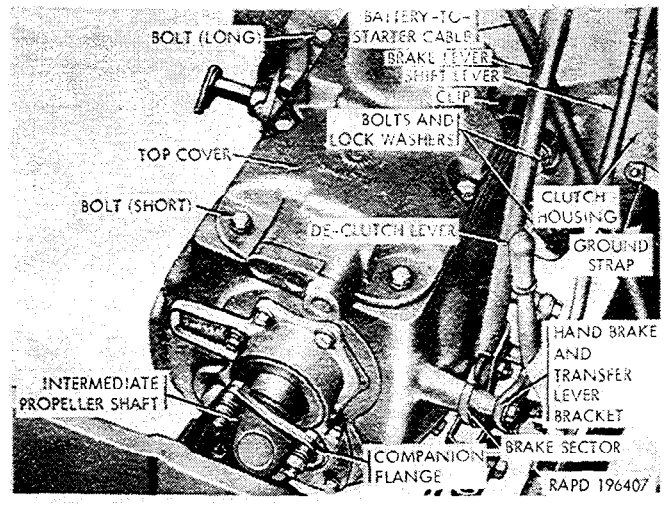


Figure 2-125. Transmission—installed.

(3) Clean the top cover and remove the six bolts and lockwashers that secure the cover to the transmission case. Remove the cable clip from the right front corner, and remove the cover (fig. 2-126). Remove and discard the cover gasket.

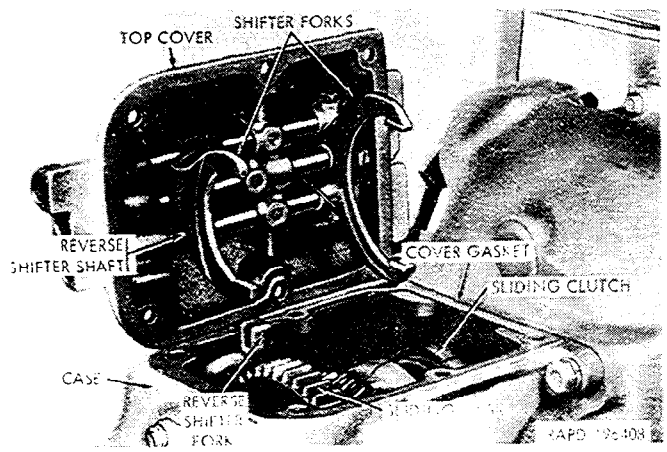


Figure 2-126. Transmission top cover removed.

(4) Clean the gasket surfaces of the transmission case and cover thoroughly, exercising care to prevent any dirt or other foreign matter from entering the case.

c. Installation.

(1) Apply a coating of liquid type gasket cement to both sides of a new cover gasket and position the gasket on the transmission case.

(2) Install the cover carefully, engaging the rear shifter fork in the transmission sliding gear, the reverse shifter fork with reverse shifter shaft, and the front shifter fork in the sliding clutch (fig. 2-126).

(3) Install a lockwasher and bolt for the left

front bolt opening (fig. 2-125) and a ⅜-inch lockwasher and bolt for each of the other five openings, attaching the cable clip at the right front corner. Tighten the bolts evenly.

(4) Engage the battery-to-starter cable in the cable clip.

(5) Install the transmission access cover (para 2-76 *f*).

d. Record Replacement. Record the replacement on the appropriate forms in accordance with TM 38-750.

2-105. Transmission
(Fig. 2-124)

a. Coordination with Direct Support Maintenance Unit. Replacement of the transmission is normally a direct support maintenance operation, but may be performed by the using organization, provided authority for performing such replacement is obtained from the responsible commander, A replacement transmission may be obtained from the direct support maintenance unit.

b. Removal. Removal operation described below are for a transmission with power-take-off. When replacing a transmission without power-take-off, disregard steps pertaining to the power-takeoff and winch drive shaft.

(1) Remove the transmission access cover (para 2-75 *g*).

(2) Remove the three screws and lockwashers that secure the handbrake and transfer lever bracket to the right side of the transmission case.

(3) Disengage the battery-to-starter cable from the clip on the transmission top cover (fig. 2-125).

(4) Remove the four nuts, lockwashers, and bolts that secure the intermediate propeller shaft to the companion flange on the transmission (fig. 2-125). Secure the shaft to keep it off the floor.

(5) Remove the four bolts and lockwashers that secure the transmission to the clutch housing. Using jacks or a dolly, move the transmission straight back to disengage the main shaft from the clutch housing and the splined yoke of the winch drive shaft from the drive shaft. Lower the transmission and remove it.

(6) If the transmission is to be replaced, remove the winch drive shaft rear universal joint from the power-takeoff drive shaft (para 2-155 *a* (4)).

c. Installation.

(1) Clean the machined surfaces of the transmission and the clutch housing thoroughly.

(2) Install the winch drive shaft rear universal joint on the power-takeoff drive shaft (para 2-155 *c* (1) and (2)).

(3) Using jacks or a dolly, position the transmission and move it forward to engage the transmission shaft in the clutch; at the same time, guide the winch drive shaft into the front yoke of the rear universal joint on the power-takeoff drive shaft, alining the universal joint journals. Do not attempt to force the transmission into the clutch by hammering or other extreme methods.

(4) Install four lockwashers and bolts. Tighten the bolts evenly. Remove the jacks or dolly.

(5) Connect the intermediate propeller shaft to the transmission companion flange and install four bolts, washers, and nuts. Tighten the nuts evenly.

(6) Engage the battery-to-starter cable in the clip on the transmission cover (fig. 2-125).

(7) Place the assembled handbrake lever and transfer shift levers and bracket in position at the side of the transmission and install the three lockwashers and screws (fig. 2-124). Tighten the screws evenly.

(8) Install the transmission access cover (para 2-76 *f*).

d. Record Replacement. Record the transmission replacement on appropriate forms in accordance with TM 38-750.

Section XIX. TRANSFER

2-106. General

a. The transfer (fig. 2-70) is of the two-range type and provides a means of transferring engine power to the front and rear axles. The handbrake band and drum are mounted at the rear of the transfer. The speedometer drive pinion is actuated by the transfer driven shaft.

b. Organizational maintenance operations include adjustment of the transfer control linkage, replacement of the speedometer drive pinion, air vent, and emergency replacement of the transfer. The vent is serviced in the same manner as the vent for the front axle (para 2-118 *a*).

2-107. Transfer Control Linkage Adjustment

NOTE

The key letters noted in parentheses are in figure 2-70 except where otherwise indicated.

a. General. The transfer control shifter lever rod and declutch shifter lever rod must be properly adjusted to prevent disengagement of the clutch gears.

b. Check Operation of Shifter Shafts.

(1) Remove the two cotter pins that secure the declutch shifter lever rod (U) and control shifter

lever rod (T) to the shifter shafts (R) and (S), and disengage the rods from the shafts.

(2) Jack up one rear wheel from the floor far enough to permit the wheel to be rotated. Block the other wheels and release the handbrake.

(3) While an assistant rotates the rear wheel, move the shifter shafts in and out by hand. Make certain that the poppet ball for each shaft engages in the detent slots as the shifts are accomplished.

c. Adjust Control Shifter Lever Rod.

(1) Push the shifter shaft (R) in until the poppet ball engages in the slot, indicating that the transfer is in high range.

(2) Move the transfer shift control lever (Q, fig. 2-91) forward until approximately one-half inch exists between the lever and the front end of the lever slot in the transmission access cover. While an assistant holds the lever in this position check the alinement of the control shifter lever rod (T) with the hole in the shifter shaft (R). If adjustment of the rod is necessary, loosen the nut (H) on the front end of the rod and turn the rod in turns of 360-degrees in or out until proper alinement is obtained. Insert end of rod through shifter shaft (offset of rod down) and install a cotter pin. Tighten nut (H) at the front end of rod.

(3) Move the shifter lever to the rear until the poppet ball engages in the slot, indicating that the transfer is in low range.

d. Adjust Declutch Lever Rod (fig. 2-91).

(1) Push the shifter shaft (S) in until the poppet ball engages in the slot, indicating that the front axle is engaged.

(2) With the transfer shift control lever (Q, fig. 2-91) in the low range position as described in *c* (3) above, move the transfer declutch control lever (R, fig. 2-91) forward until approximately ½ inch clearance exists between the bosses of both levers. While an assistant holds the lever in this position, check the alinement of the declutch shifter lever rod (U) with the hole in the shifter shaft (S). If adjustment of the rod is necessary, loosen the nut on the front end of the rod and turn the rod in turns of 360° in or out until proper alinement is obtained. Insert the end of the rod through the shifter shaft (offset of rod down) and install a cotter pin. Tighten the nut (H) at the front end of the rod.

NOTE

Do not change the position of the declutch shifter lever rod to establish the correct clearance, since this lever has been positioned properly if instructions in *c* above were followed.

(3) Remove the jack and blocking.

2-108. Speedometer Drive Pinion and Oil Seal

a. Removal (Fig. 2-70).

(1) Disconnect the speedometer shaft (N) from the pinion retaining nut (Q).

(2) Unscrew the pinion retaining nut from the bearing retainer. Remove the nut and drive pinion.

(3) Remove the pinion and the pinion oil seal from the retaining nut. Discard the oil seal.

b. Installation (Fig. 2-70).

(1) Position speedometer drive pinion in the bearing retainer, making certain that the pilot at the lower end of the pinion engages in the hole of the retainer boss.

(2) Place speedometer drive pinion oil seal in the drive pinion retaining nut (Q), and install the nut in the bearing retainer. Tighten the nut.

(3) Connect the speedometer shaft (N) engaging the shaft core with the drive pinion, and screw the shaft nut to the pinion retaining nut.

2-109. Transfer

NOTE

The key letters noted in parentheses are in figure 2-70 except where otherwise indicated.

a. Coordination with Direct Support Maintenance Unit. Replacement of the transfer is normally a direct support maintenance operation, but may be performed in an emergency by the using organization, provided authority for such replacement is obtained from the responsbile commander. A replacement transfer may be obtained from the direct support maintenance unit.

b. Remove Transfer.

(1) Working from the underside of the vehicle, disconnect the propeller shaft from the two output shaft companion flange (L) and the input shaft companion flange (B) by removing the four nuts, lockwashers, and bolts that secure each propeller shaft yoke. Secure the propeller shafts to the frame to keep them off the floor.

(2) Disconnect the transfer control shifter lever rod (T) and the declutch shifter lever rod (U) at the transfer by removing the cotter pin that secures each rod to the shifter shafts (R and S), and disengage the rods.

(3) Disconnect the speedometer shaft (N) from the pinion retaining nut (Q).

(4) Remove the cotter pin and clevis pin that secures the handbrake control rod to the cam levers (fig. 2-127).

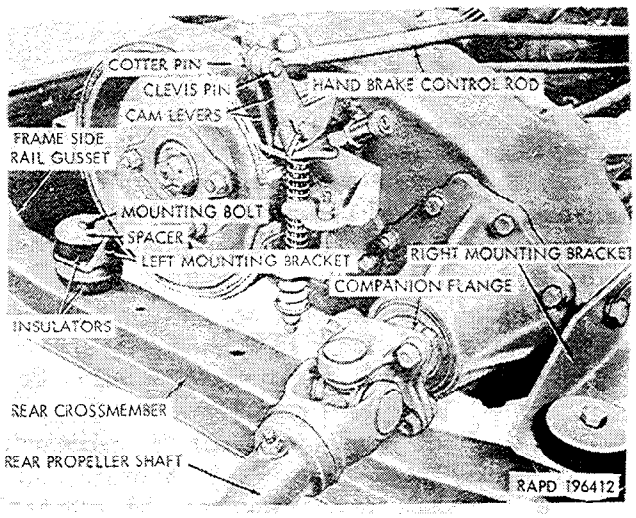


Figure 2-127. Transfer—rear view.

(5) Remove the nuts, lockwashers, and plain washers from the four transfer mounting bolts (fig. 2-128).

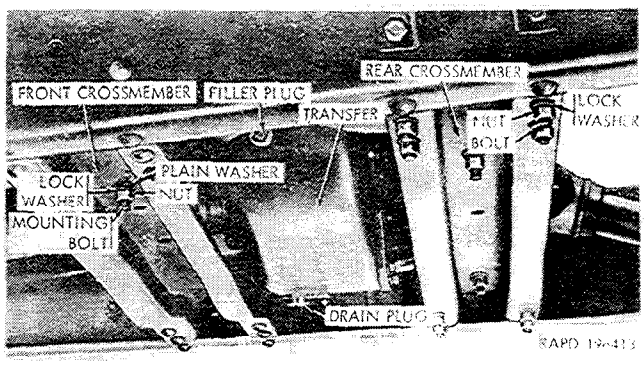


Figure 2-128. Transfer—bottom view.

(6) Support the transfer with jacks or a dolly and remove the eight nuts, lockwashers, and bolts that secure the rear cross member (fig. 2-128) to the gusssets on the frame side rails. Remove the rear cross member.

WARNING

Exercise extreme care when removing the transfer. Support it adequately and prevent it from dropping and causing damage to the transfer or serious injury to personnel.

(7) Remove the four transfer mounting bolts (fig. 2-127). Move the transfer to the rear to clear the front cross member, lower the transfer, and remove it from underneath the vehicle. Remove the four spacers and eight insulators from the left and right mounting brackets (fig. 2-127).

c. Remove Mounting Brackets and Speedometer Drive Pinion.

(1) Remove the locking wire from the two mounting bracket bolts (M, fig. 2-71) for each mounting bracket.

(2) Remove the two bolts and lockwashers from each bracket and remove the two brackets.

(3) Remove the speedometer drive pinion (para 2-108 *a*).

d. Inspection. Inspect the mounting brackets and mounting parts for cracks and distortion. Inspect the mounting bolts for damaged threads. Check the insulator spacers for damage or distortion, and the insulators for damage or deterioration. Replace parts that are unfit for further service.

e. Install Mounting Brackets and Speedometer Drive Pinion.

(1) Install the speedometer drive pinion (para 2-108 *b*).

(2) Position the mounting brackets on the transfer.

NOTE

The left (large) bracket and right (small) bracket are installed in the same manner, but are not interchangeable.

(3) Install a lockwasher on each mounting bracket bolt (M, fig. 2-70) and install the two bolts for each bracket. Tighten the bolts and secure with locking wires.

f. Install Transfer.

(1) Install the eight insulators in the mounting brackets with the larger diameters of the insulator toward the brackets, and install an insulator spacer from the upper side through each pair of insulators (fig. 2-127).

(2) Position the transfer on the front cross member. Support the transfer in this position with jacks or blocking.

(3) Position the rear cross member under the frame side rail gussets, alining the bolt holes in the crossmember with those in the gussets and mounting bolt spacers. Install the eight bolts from the upper side, and lockwashers and nuts to secure the crossmember (fig. 2-127 and 2-128). Tighten the nuts.

(4) Install a transfer mounting bolt through each of the four spacers (fig. 2-70). Install a plain washer, lockwasher, and nut on each bolt. Tighten the nuts evenly.

(5) Remove the jacks or blocking that were used to support the transfer.

(6) Attach the handbrake control rod to the two cam levers with the clevis pin and cotter pin.

(7) Connect the speedometer shaft (N) to the pinion retaining nut (Q).

(8) Aline each propeller shaft with its respective companion flange and install the four bolts, lockwashers, and nuts for each shaft. Tighten the nuts to 40-50 foot-pounds torque.

(9) Adjust the transfer control linkage (para 2-107).

(10) Adjust handbrake (para 2-130).

g. Record Replacement. Record the transfer replacement on appropriate forms in accordance with TM 38-750.

Section XX. PROPELLER SHAFTS

2-110. General

The intermediate propeller shaft (C, fig. 2-70) transmits power from the transmission to the transfer. The front propeller shaft (J, fig. 2-70) and rear propeller shaft (fig. 2-127) divert power from the transfer to the front and rear axles respectively. Complete interchangeability is provided on the roller bearings, bearing oil seals, bearing oil seal retainers, and snaprings for all universal joints; however, the journals and yokes of the intermediate propeller shaft are of greater width than those provided for the other two propeller shafts. Organizational maintenance operations include replacement of the propeller shafts and the universal joints or related parts. When replacing the rear propeller shaft, be sure to install the correct shaft for the vehicle involved, refer to paragraph 1-8 *k* for the correct length.

2-111. Propeller Shaft Removal and Installation

a. Removal. Procedure is the same for all propeller shafts. Remove the four nuts, lockwashers, and bolts that secure each universal joint flange yoke to the companion flanges on the transfer, transmission, or differential and remove the shaft.

b. Installation.

NOTE

When installing the propeller shafts, be sure to install the front and rear shafts with the splined yoke toward the transmission (fig. 2-70).

Place the shaft in position at the companion flanges, alining the bolt holes. Install the four bolts, lockwashers, and nuts for each flange yoke. Tighten the nuts to 40-50 foot-pounds torque.

2-112. Propeller Shaft Disassembly and Reassembly

(Fig. 2-129.)

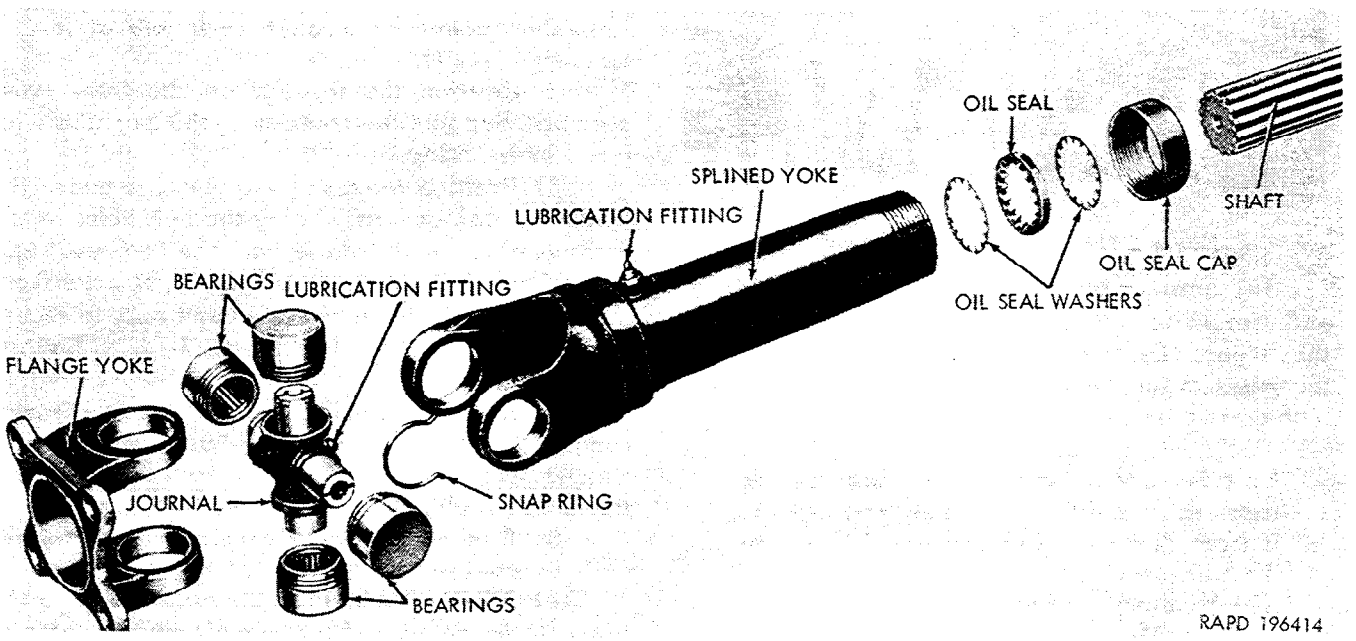


Figure 2-129. Propeller shaft—exploded view.

a. Disassemble Propeller Shafts. Disassembly procedure is the same for all propeller shafts.

(1) Remove the propeller shaft (para 2-111 *a*).

(2) Unscrew the oil seal cap from the splined yoke and remove the oil seal and two oil seal washers from the cap.

(3) Remove the splined yoke from the shaft.

(4) Remove the lubrication fitting from the splined yoke.

b. Disassemble Universal Joints. All universal joints are disassembled in the same manner, with the exception of the lubrication fittings for the intermediate propeller shaft journals.

(1) Place the universal joint in a vise and compress the two bearings sufficiently to remove the two snaprings (fig. 2-130). Change the position of the joint in the vise and remove the other two snaprings.

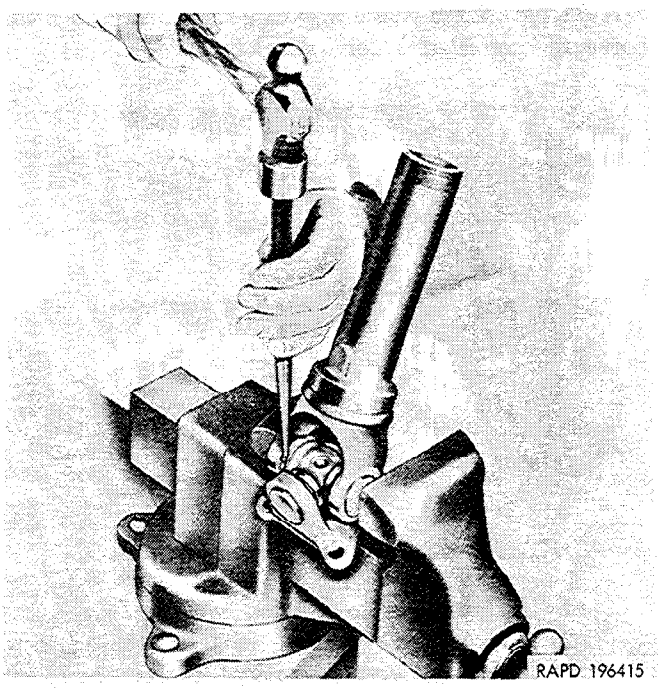


Figure 2-130. Removing bearing snaprings.

(2) Press the four bearings from the universal joint in an arbor press, or remove them in the manner shown in figure 2-131. For this method, place the universal joint in a vise with a 1¼-inch heavy-duty socket over one bearing and a ½-inch socket against the opposite bearing. Tighten the vise to force the bearing from the yoke, being careful not to damage either oil seal retainer as the bearing is removed. Remove the other three bearings in the same manner. Separate the two yokes and remove the journal.

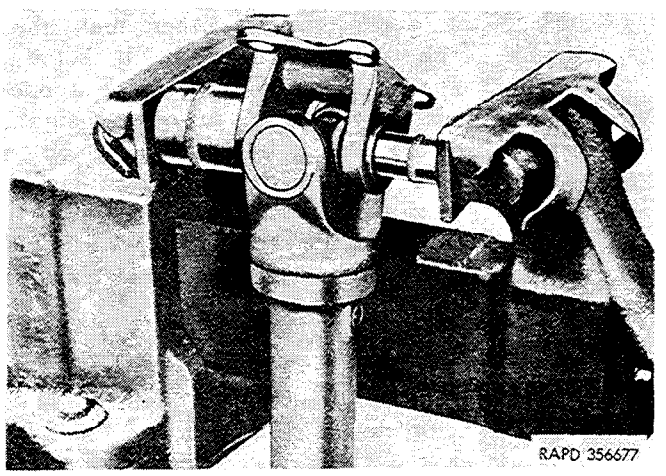


Figure 2-131. Removing bearings.

(3) Remove the four bearing oil seals from each journal.

NOTE

Do not remove the oil seal retainers unless they are to be replaced, since the retainers must fit snugly on the journal.

(4) Remove the lubrication fitting from each journal.

c. Inspection.

(1) Clean the parts in drycleaning solvent or volatile mineral spirits and dry with compressed air.

(2) Inspect the splined yoke and tube for distortion, cracks, and worn or damaged splines or bearing surfaces.

(3) Inspect the flange yokes for distortion, cracks, and worn or damaged bearing surfaces.

(4) Inspect the journals for damaged or worn bearing surfaces, damaged oil seal retainers, and distortion.

(5) Replace parts that are unfit for further service. The universal joint repair kits provide journals with oil seals and retainers installed, journal bearings, and bearing snaprings.

d. Assemble Universal Joints.

(1) For the front or rear propeller shaft, install a lubrication fitting in each journal, and tighten the fittings so they are properly positioned for grease gun connections. For the intermediate propeller shaft journals, install a lubrication fitting.

(2) Prepare new bearing oil seals by soaking them in light engine oil for 10 minutes. If the four oil seal retainers were removed from the journal (*b* (3) above), install new retainers. Install a new oil seal in each retainer.

NOTE

Replace the oil seals whenever the universal joint is disassembled.

(3) Position the journal in the splined yoke or tube, so the lubrication fitting is toward the splined yoke or tube (front or rear propeller shaft). Install a bearing at each side of the yoke, over the journal, pressing the bearings into position with an arbor press or between the jaws of a vise. Force the bearings in until the bearing oil seals are compressed, and install a new snapring for each bearing, making certain that the rings are fully seated.

e. Assemble Propeller Shaft.

(1) Install a lubrication fitting in the splined yoke.

(2) Place an oil seal washer on each side of the oil seal and install the parts in the cap. Position the cap on the shaft.

(3) Install the shaft in the yoke, matching the blind splines. Screw the cap to the splined yoke.

(4) Lubricate all fittings with automotive and

artillery lubricating grease. Make certain that grease reaches all the journal bearings and splines.

(5) Install the propeller shaft (para 2-111 *b*).

Section XXI. FRONT AXLE

2-113. General

a. The front axle is of the full-floating hypoid type. The complete unit includes the housing, differential with carrier, steering knuckles, universal drives, tie rod, hubs, and service brakes.

b. Organizational maintenance operations include front wheel alinement toe-in, and replacement of filler and drain plugs, air vent, steering knuckles, universal drives and tie rod; and emergency replacement of the front axle.

2-114. Front Wheel Alinement

a. General. Front wheel alinement affects steering of the vehicle from a standpoint of control, ease of steering, and safety, and is an important factor in the life of tires. The items affecting front wheel alinement are caster, camber, pivot angle, and toe-in. Caster, camber, and pivot angle are built into the front axle housing and cannot be adjusted. The toe-in adjustment is described in *d* below. Caster may be affected by shifting of the front springs on the axle, damaged springs, or distortion of the frame. Camber may be affected by loose hub bearings or steering knuckle flange bearings, bent steering knuckles, or a damaged axle housing.

b. Check Camber, Caster, and Pivot Angle.

(1) Check both front springs for sagged or broken leaves and loose spring clip U bolts. Make certain that the springs are positioned properly on the axle. Tighten spring clip U bolt nuts or replace springs, as required.

(2) Check hub bearings for looseness. If looseness is evident, notify direct support maintenance personnel.

(3) Check the flange bearings for looseness. If looseness is evident, notify direct support maintenance personnel.

(4) Check wheel and tire runout. If runout exceeds three-eighths of an inch replace the wheel (para 2-142).

(5) Inflate all tires to 40 psi. Tread on both front tires should be approximately the same. Replace badly worn tires (para 2-144).

(6) If correction of camber, caster, and pivot angle, requires alining equipment, notify ordnance maintenance personnel.

c. Check Toe-In (Fig. 2-132). Since incorrect toe-in may be caused by worn, damaged, or incorrectly adjusted wheel bearings, damaged or loose steering knuckle parts, or a bent tie rod, make certain that these items are in good condition and correctly installed before checking toe-in.

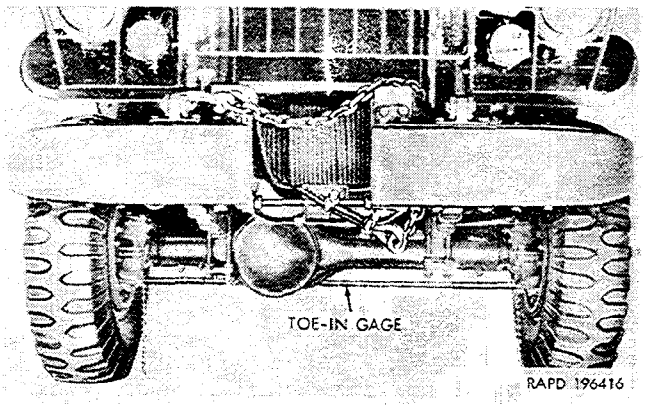


Figure 2-132. Measuring front wheel toe-in.

(1) Inflate tires to 40 psi.

(2) Check for correct wheel bearing adjustment. If incorrect, notify direct support maintenance personnel.

(3) Position the vehicle on a smooth level floor with the wheels in a straight-ahead position.

(4) Place the toe-in wheel alinement gage between the wheel at the rear of the axle and as near hub height as possible, with the ends of the gage bearing against the tire side walls and at equal distances from the floor.

(5) Set the gage at zero.

(6) Roll the vehicle straight back far enough to bring the gage toward the front the same distance from the floor as it was at the rear.

(7) Observe the gage pointer. The reading should be 0 to ⅛ inch.

(8) If the gage indicates other than that specified in (7) above, adjust the toe-in (*d* below).

d. Adjust Toe-In. If toe-in is more than one-eighth of an inch or if the wheels toe-out one-eighth of an inch or more, adjust both tie rod ends an equal amount. Otherwise, the adjustment may be made at the left tie rod end.

(1) Detach the left tie rod end or both tie rod ends, if necessary, from the steering knuckle flange or flanges (para 2-115 *a*).

(2) Loosen the nut on the clamp bolt in the left tie rod end (fig. 2-134) or both ends, as required. Turn the end or ends counterclockwise to increase toe-in, or clockwise to decrease toe-in.

(3) Attach the tie rod end or ends to the

steering knuckle flange and again measure the toe-in (*c* (4) through (7) above).

(4) Adjust the ends ((1) and (2) above) until toe-in is from 0-⅛ inch.

(5) When the adjustment has been completed, tighten the nuts on the tie rod end clamp bolts, install the slotted stud nuts on the ball studs, tighten to 130 to 150 foot-pounds torque, and install cotter pins.

2-115. Tie Rod and Tie Rod Ends
(Fig. 2-133, and 2-134.)

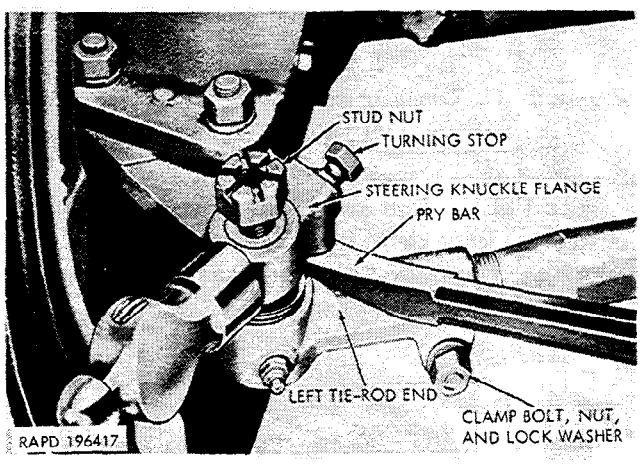


Figure 2-133. Removing tie rod.

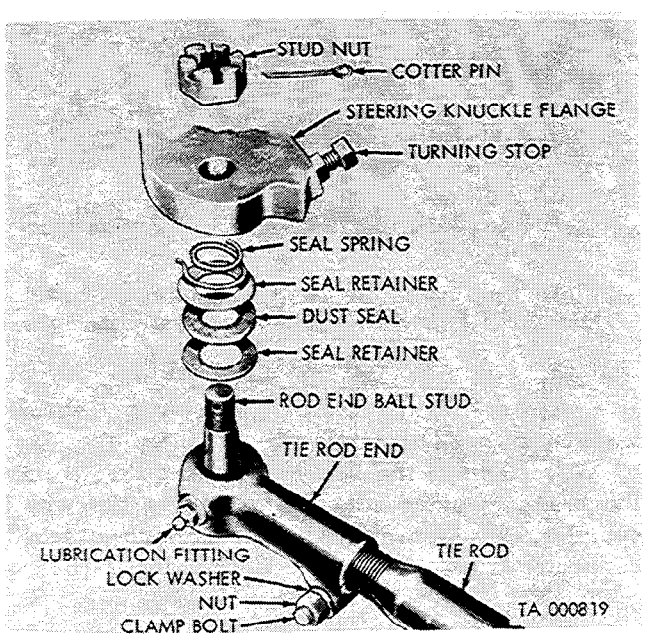


Figure 2-134. Tie rod—exploded view.

a. Removal.

(1) Remove the cotter pin from each tie rod end ball stud. Loosen but do not remove the stud nuts.

(2) Insert a pry bar between the left tie rod end and the steering knuckle flange. Apply pressure on the pry bar and strike the flange with a medium hammer to free the ball stud from the flange. Loosen the righ tie rod end in the same manner.

(3) Remove the two stud nuts and remove the tie rod.

b. Disassembly.

(1) Remove the dust seal spring, the dust seal, and two seal retainers from each rod end ball stud (fig. 2-134). Discard seals.

(2) Remove the nut, lockwasher, and clamp bolt from each tie rod end and unscrew the ends from the tie rod.

(3) Remove the lubrication fitting from each tie rod end.

(4) Turning radius is governed by stop screws which are adjusted, then tack-welded to the steering knuckle arms. If inspection reveals the screws to be loose or missing, notify direct support maintenance personnel.

c. Inspection.

(1) Clean the tie rod and two tie rod ends in drycleaning solvent or volatile mineral spirits and dry with compressed air.

(2) Inspect the tie rod for distortion or damaged threads.

(3) Inspect both tie rod ends for cracks, damaged threads, distortion, or restricted lubricant opening. Rotate the end on the ball stud and check for freedom of operation or excessive looseness. Inspect the stud nuts for cracked and damaged threads.

(4) Replace all parts that are unfit for further service. Dust seal parts and left and right tie rod ends are provided in kits.

d. Assembly.

(1) Install a lubrication fitting in each tie rod end (fig. 2-134).

(2) Screw the tie rod ends on the tie rod, installing the right end at the offset end of the rod. Turn the two ends an equal amount on the rod until the distance from center to center of the ball studs is 48 1 / 16 inches and the lubrication fittings in both ends are toward the rear.

(3) Install the clamp bolt in each tie rod end from the front and install a lockwasher and nut on each bolt. Do not tighten the nuts at this time.

(4) Install the dust seal and related parts on each ball stud. Place a seal retainer on each side of the dust seal, install the parts on the ball stud, and install the dust seal spring with the larger diameter down.

(5) Insert the ball studs up through the openings in the flanges. Install the two stud nuts but do not tighten.

(6) Lubricate both tie rod ends with automotive and artillery lubricating grease.

(7) Measure the toe-in (para 2-114*c*) and adjust (para 2-114*d*). Tighten the nuts on both tie rod end clamp bolts securely, and tighten the two

stud nuts to 130-150 foot-pounds torque. Install a cotter pin in each stud.

2-116. Steering Knuckle and Universal Drive Removal

a. General. Both steering knuckles and universal drives are removed in the same manner.

b. Remove Wheel and Tire (para 2-142). Jack up the wheel and remove the five wheel stud nuts (the nuts for the left wheel have left-hand threads). Remove the wheel and tire.

c. Remove Drive Flange.

(1) Mark adjacent points of the drive flange and hub with a center punch.

NOTE

This is important, since the flange must be reinstalled in the same position on the hub to prevent peeling of the studs.

(2) Remove the six nuts and lockwashers from the flange studs. Remove the two puller screws from the flange.

(3) Remove the nuts from the two puller screws. Install the screws and tighten evenly to force the flange from the hub. Remove the flange and the flange gasket. Discard the gasket. Remove the two puller screws from the flange.

d. Remove Hub and Drum.

(1) Remove the hub bearing outer adjusting nut, using the wrench (fig. 2-135).

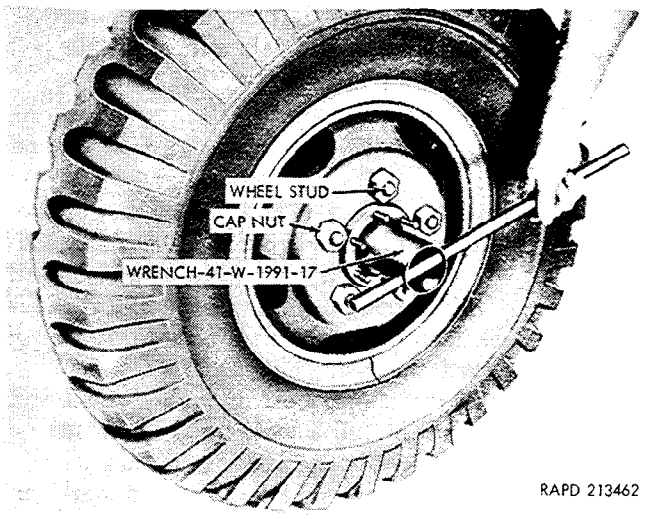


Figure 2-135. Adjusting wheel bearings.

(2) Remove the adjusting nut lock, using diagonal-cutting pliers (fig. 2-136).

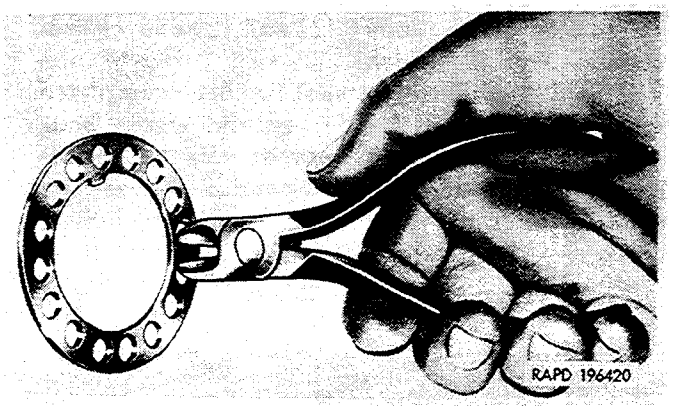


Figure 2-136. Removing or installing adjusting nut lock.

(3) Remove the hub bearing inner adjusting nut, using the wrench (fig. 2-135).

(4) Pull the hub and brake drum part way off the steering knuckle to free the outer bearing cone, remove the cone, the hub, and brake drum (fig. 2-137).

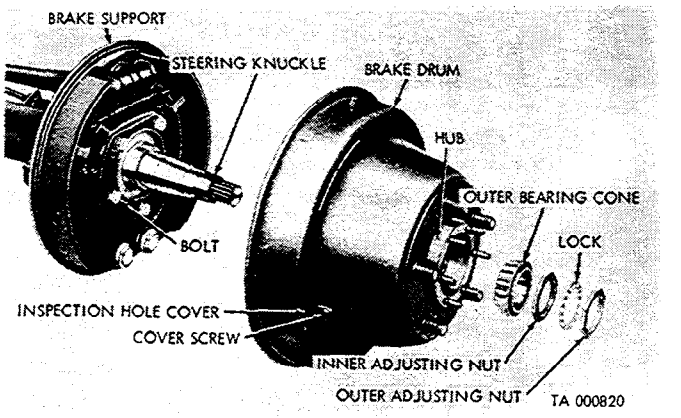


Figure 2-137. Front wheel hub and drum and related parts —exploded view.

c. Remove Brake Support, Steering Knuckle, and Universal Drive.

(1) Remove the bolt and gasket that secure the brake cylinder inlet connection to the wheel cylinder, and remove the flexible line and attached connector from the wheel cylinder (fig. 2-138).

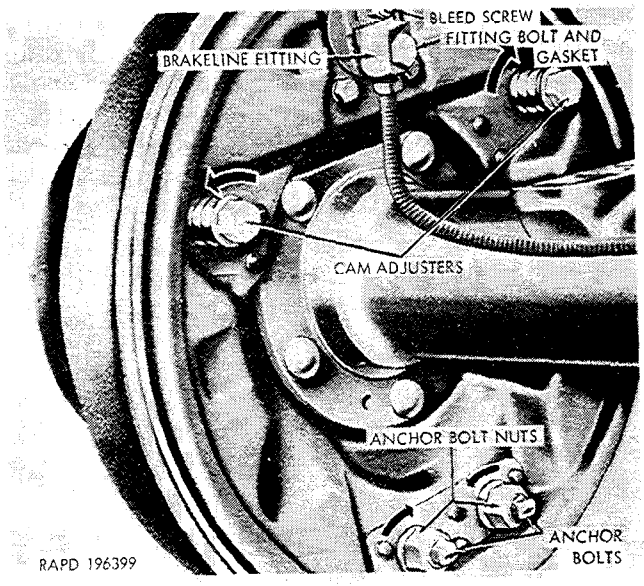


Figure 2-138. Brakeshoe cam adjusters and anchor bolts.

(2) Remove the five bolts and lockwashers that secure the brake support and steering knuckle to the steering knuckle flange. Remove the brake support (fig. 2-137).

(3) If the steering knuckle cannot be removed by pulling it from the flange, temporarily install the wheel bearing adjusting nuts on the knuckle and strike the nuts with a plastic hammer to free the steering knuckle (fig. 2-139). Remove the knuckle, outer shaft, and female portion of the universal joint. Separate the parts.

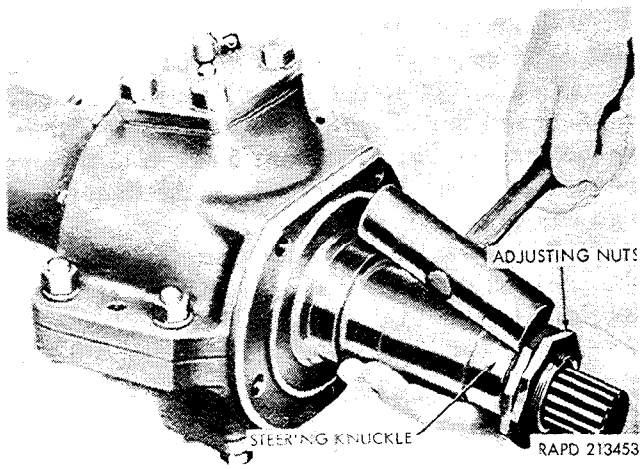


Figure 2-139. Removing steering knuckle.

(4) Remove the male portion of the universal joint and the inner shaft (fig. 2-140). Separate the parts.

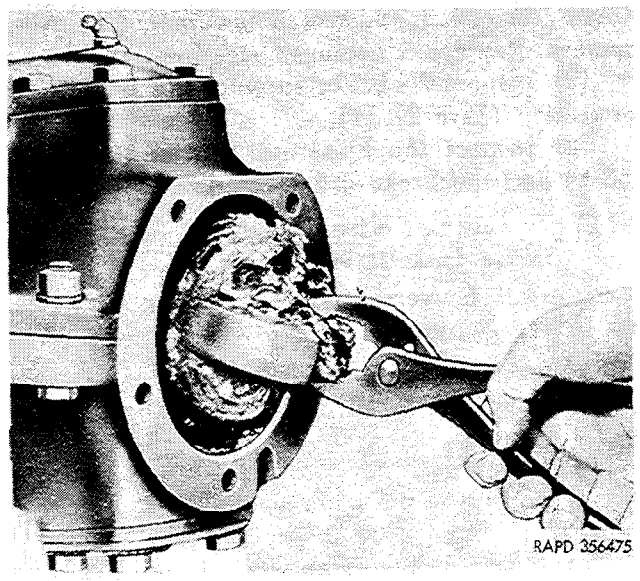


Figure 2-140. Removing inner shaft.

f. Cleaning and Inspection.

(1) Inspect the lubricant in the steering knuckle flange for evidence of differential lubricant. Differential lubricant in the flange indicates leakage past the drive shaft oil seal. Notify direct support maintenance personnel.

(2) Clean the parts in drycleaning solvent or volatile mineral spirits and clean the inside of the bearing flange.

(3) Inspect the splined surfaces of the inner and outer shafts for cracks, abrasions, or chipping. Check the shafts for distortion or damaged bearing surfaces.

(4) Inspect the universal joint parts for cracks, chipping, or scoring.

(5) Assemble the shafts and universal joint, and check for clearance between parts as shown in figure 2-141. If clearance at any of the checking points exceeds 0.015 inch, replace the shaft assembly.

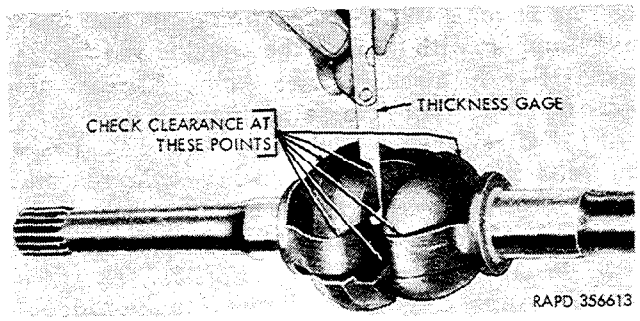


Figure 2-141. Checking universal drive parts for wear.

(6) Inspect the steering knuckle for damaged threads, distortion, and scored or damaged bearing surfaces. Replace a damaged steering knuckle.

(7) Inspect the brake support and brake line connection (para 2-131).

(8) Inspect the hub and bearing (para 2-143 *d*) and the brake drum (para 2-131 *e*).

2-117. Steering Knuckle and Universal Drive Installation

a. Install Universal Drive, Steering Knuckle, and Brake Support (Fig. 2-142).

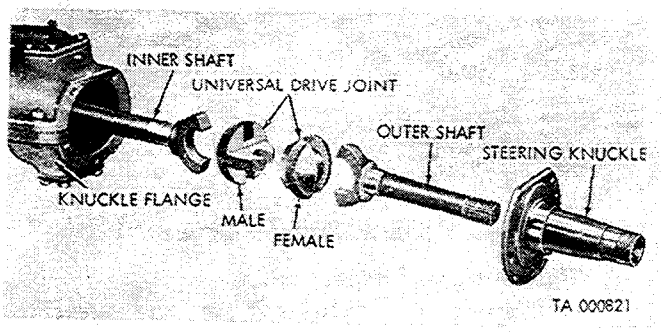


Figure 2-142. Steering knuckle and universal drive —exploded view.

(1) Apply a coating of automotive and artillery lubricating grease to the parts and inside the bearing flange.

(2) Fit the male half of the universal drive joint on the inner shaft and insert the shaft into the axle housing, engaging the splined end of the shaft in the differential gear.

(3) Fit the female half of the universal drive joint on the outer shaft and insert the shaft through the steering knuckle. Engage the female half of the universal drive joint with the male half, and position the steering knuckle on the knuckle flange (flat side up), alining the bolt holes. Tap the steering knuckle into place with a plastic hammer.

(4) Position the brake support over the steering knuckle (fig. 2-137), alining the bolt holes in the support with those in the knuckle and flange. Install five lockwashers and bolts. Tighten the bolts to 80-85 foot-pounds torque.

(5) Clean the contacting surfaces of the brake line inlet connection and the wheel cylinder, and position the connection on the cylinder. Install the bolt gasket and the bolt. Tighten the bolt.

b. Install Hub and Drum (Fig. 2-137).

(1) Apply a light film of grease to the inside of the hub and the steering knuckle to prevent rust.

(2) Install the assembled hub and brake drum on the steering knuckle.

(3) Lubricate the outer bearing cone with automotive and artillery grease, using a roller bearing lubricator or kneading the grease into the bearing with the fingers. Do not over-lubricate. Install the cone on the steering knuckle, and install the inner bearing adjusting nut with the lock pin toward the outside. Screw the nut on the steering knuckle, using the wrench (fig. 2-135), but do not tighten.

(4) Install the wheel and tire (para 2-142b).

(5) Adjust the hub bearings (para 2-141).

c. Install Drive Flange (Fig. 4-143).

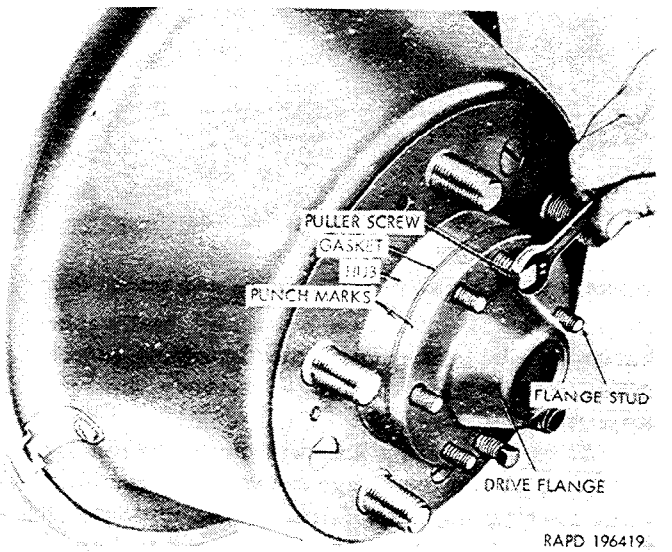


Figure 2-143. Removing drive flange.

(1) Coat both sides of a new drive flange gasket with liquid type gasket cement, and install the gasket over the drive flange studs.

(2) Position the drive flange on the hub, matching the punch marks on the flange and hub (para 2-116 *c* (1)). Install six foot-pounds lockwashers and nuts. Tighten the nuts to 30-35 foot-pounds torque. Install the nut on each of the two puller screws, install the screws in the flange, and tighten the nuts.

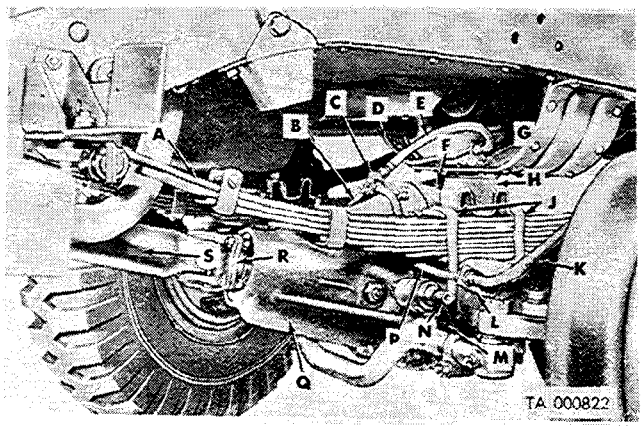
d. Lubricate. Lubricate the universal drive and the steering knuckle flange bearings. Refer to lubrication order LO 9-2320-212-12.

e. Bleed the Brakes. Refer to paragraph 2-127.

2-118. Air Vent, Filler and Drain Plugs

a. Air Vent.

(1) The air vent (F, fig. 2-144) protects the axle against excessive pressure build-up and prevents water or dirt from entering the axle housing. The vent must operate properly to prevent failure of oil seals and contamination of the lubricant.



A Front spring
B Left brake line
C Brake line tee
D Brake line (frame tee-to-front flexible line).
E Brake flexible line (front)
F Air vent
G Brake line bracket (frame)
H Axle bumper
J Spring clips
K Brake flexible line (to wheel)
L Brake line bracket (axle)
M Spring clip plate
N Shock absorber stud
P Right brake line
Q Differential carrier
R Companion flange
S Front propeller shaft

Figure 2-144. Removal or installation of front axle.

(2) At each inspection, or as often as necessary, remove the vent from the housing and clean in drycleaning solvent or volatile mineral spirits. Dry with compressed air and inspect for restriction of the air passage and faulty operation.

(3) Install the air vent, replacing it with a new one, if warranted. Screw the vent into the housing.

b. Filler Plug. The filler plug (EE, fig. 2-145) is a ¾-inch pipe plug. Check the filler plug each time the axle is serviced, and replace if necessary. No gasket is required.

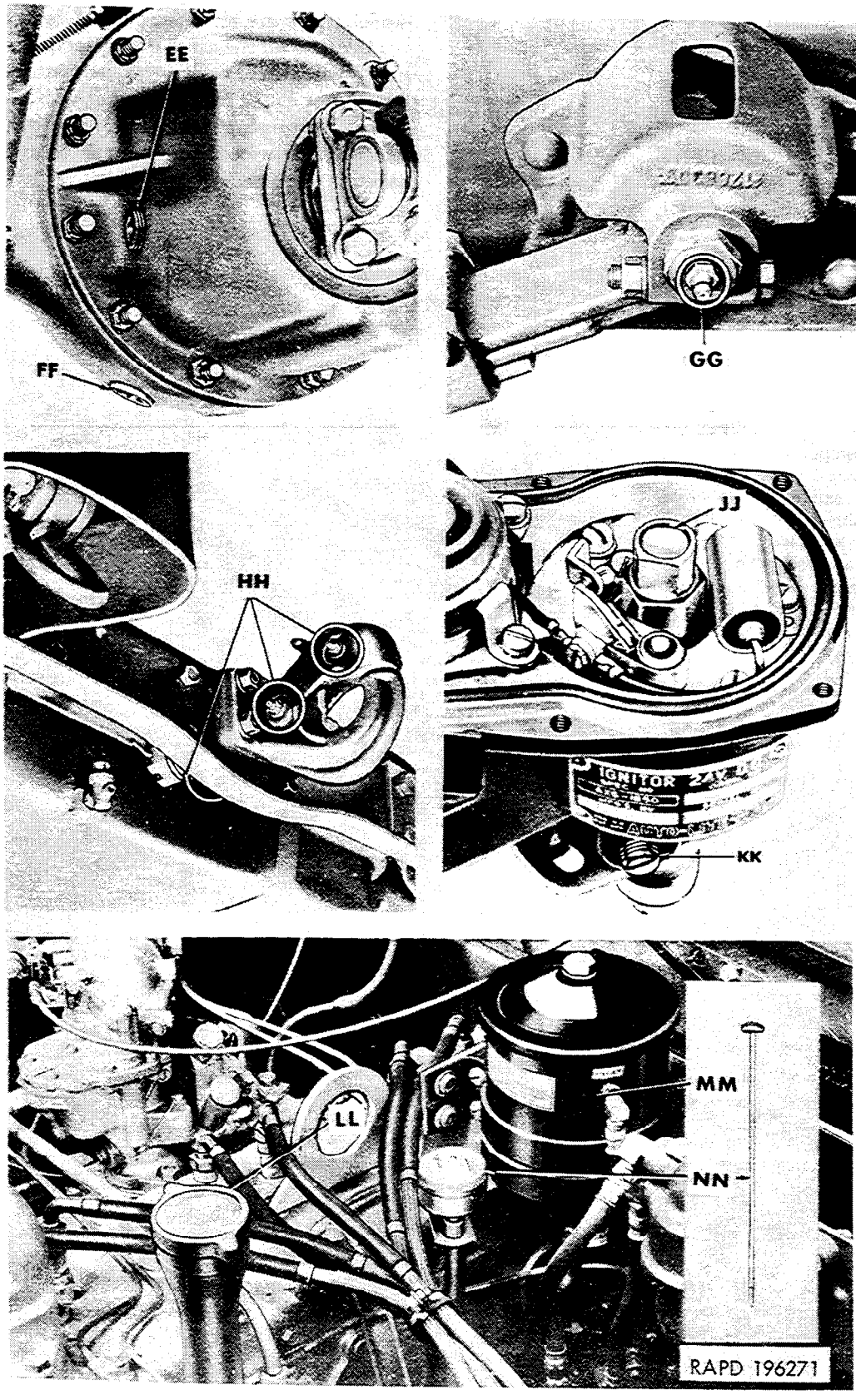


Figure 2-145. Localized lubrication points (EE through NN).

c. *Drain Plug.* The drain plug (E, fig. 2-146) is a special plug. A 7 / 8-inch annular gasket is used with the drain plug. Check the plug and gasket each time the axle is serviced, and replace when warranted.

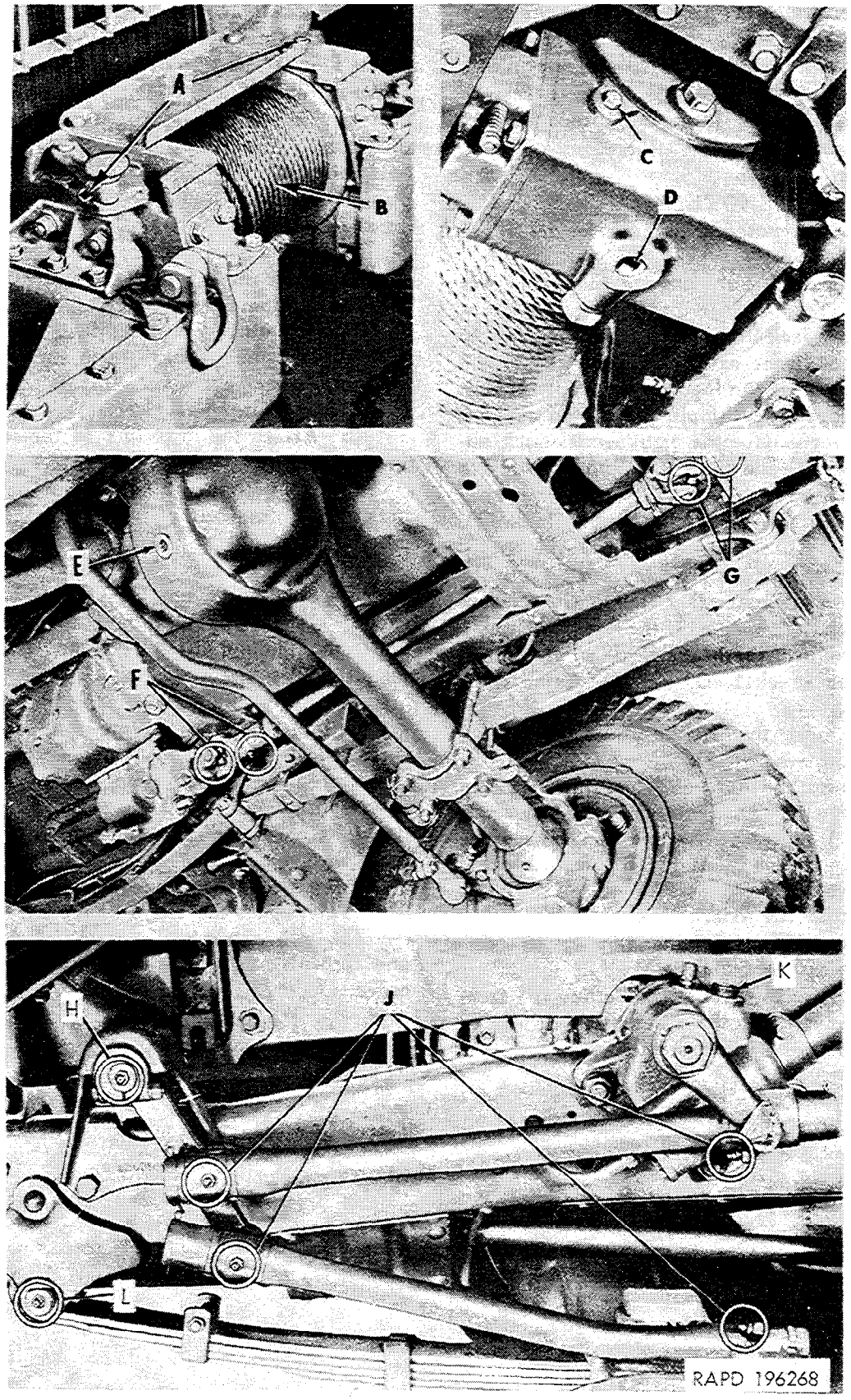


Figure 2-146. Localized lubrication points (A through L).

2-119. Front Axle

a. Coordination with Direct Support Maintenance Unit. Replacement of the front axle is normally a direct support maintenance operation, but may be performed in an emergency by the using organization, provided authority for performing such replacement is obtained from the responsible commander. A replacement axle and necessary tools may be obtained from the direct support maintenance unit.

b. Removal.

NOTE

The key letters noted in parentheses are in figure 2-144.

(1) Apply the handbrake and block the rear wheels.

(2) Place a jack under each frame side rail to the rear of the front axle, and raise the frame sufficiently to relieve the load on the front springs.

(3) Remove the cotter pin and slotted nut that secure the lower end of the right front shock absorber, and remove the bearing retainer and shock absorber with bearings from the shock absorber stud (N) in the right spring clip U bolt plate (M).

(4) Remove the four nuts, lockwashers, and bolts that secure the front propeller shaft (S) to the differential carrier companion flange (R). Secure the propeller shaft to keep it off the floor.

(5) Disconnect the brake flexible line (E) at the brake line bracket (G) on the frame front crossmember.

(6) Disconnect the drag link from the steering knuckle arm, (para 2-149).

(7) Remove the nuts and lockwashers from the four spring clips (J). Remove the clips and axle bumpers (H) from above the axle, and swing the left spring clip plate with attached shock absorber toward the rear.

(8) Remove the axle.

(9) Support the axle and remove the two wheels and tires (para 2-142 *a*).

(10) Remove the brake flexible line (F) from the brake line tee (C) on the differential carrier and discard if unfit for further service.

c. Installation.

(1) Install the brake flexible line (E) in the brake line tee (C) on the differential carrier (Q tighten.

(2) Install wheels (para 2-142 *b*).

(3) Position a front axle bumper (H) over the center bolt of each front spring (A) (offset toward center of vehicle), and install the two spring clips U bolts (J) for the right spring on the bumper, over the spring and axle and through the spring clip U bolt plate (M). Position the left spring clip U bolt plate under the axle and install the clips U bolts.

NOTE

The spring clips U bolts for the right front spring are longer than those for the left front spring. Be sure to install the correct clips U bolts for each spring.

(4) Install two lockwashers and spring clip U bolt nuts on each clip U bolt. Tighten the eight nuts to 130-140 foot-pounds torque.

(5) Attach the drag link to the steering arm (para 2-149).

(6) Connect the brake flexible line (E) at the brake line bracket (G) on the frame front crossmember.

(7) Aline the front propeller shaft flange yoke with the companion flange (R) on the differential carrier (Q) and install the four bolts, lockwashers, and nuts. Tighten the nuts to 40-50 foot-pounds torque.

(8) Attach the right shock absorber with bearings to the shock absorber stud (N) in the spring clip U bolt plate. Install the bearing retainer and triple-slotted nut. Tighten the nut and install a cotter pin.

(9) Lower the frame and remove the jacks and rear wheel blocking.

(10) Bleed the brake system (para 2-127).

(11) Adjust the toe-in (Para 2-114).

(12) Check the lubricant level of the front axle and replenish as warranted. Refer to lubrication order, LO 9-2320-212-12.

d. Record Replacement. Record the replacement of the front axle on appropriate forms in accordance with TM 38-750.

2-120. General

The single-speed rear axle is of the full floating hypoid type. The complete axle consists of the axle housing, differential with carrier, axle drive shaft, hubs, and service brakes. Organizational maintenance operations include replacement of the air vent, filler and drain plugs, and the axle shafts, and emergency replacement of the axle.

2-121. Drive Shaft

a. Removal (Fig. 2-147). Both drive shafts are removed in the same manner. It is not necessary to raise the rear axle.

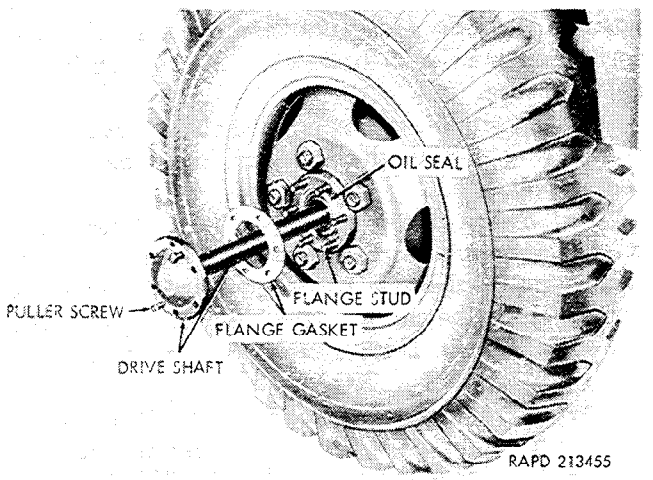


Figure 2-147. Rear axle drive shaft removal.

(1) Mark adjacent spots on the shaft flange and the hub with a center punch.

NOTE

This is important, since the shaft flange must be reinstalled in the same position on the hub to prevent peeling of the studs.

(2) Remove the nuts and lockwashers from the six drive shaft flange studs. Remove the two puller screws from the flange and remove the nuts. Install the screws in the flange and tighten evenly to force the flange from the hub. Pull the drive shaft from the axle housing. Remove and discard the flange gasket and remove the two puller screws from the flange.

(3) If the drive shaft is broken and a piece of the shaft remains in the axle housing, it may be removed by snaring it with a length of wire. If the broken portion cannot be removed, replace the axle (para 2-123).

b. Installation (Fig. 2-147).

(1) If the original shaft is to be installed, clean and inspect it for damaged splines, distortion, and damaged flange surfaces. Clean the gasket surfaces of the flange and the hub.

(2) Apply a coating of liquid type gasket cement to both sides of a new flange gasket, and position the gasket over the flange studs.

(3) Install the drive shaft in the axle housing, engaging the splines in the differential gear and alining the punch marks on the flange and hub (*a* (1) above). (Disregard the punch mark on the hub when installing a new shaft.)

(4) Install lockwashers and nuts on the flange studs. Tighten the nuts to 30-35 foot-pounds torque. Install the nuts on the two puller screws, install the screws in the flange, and tighten the nuts.

2-122. Air Vent, Filler, and Drain Plugs

a. Replace Air Vent. The air vent (fig. 2-148) for the rear axle serves the same purpose as the vent in the front axle (para 2-119). The rear axle vent secures the brake line tee on the axle housing and is removed by unscrewing the vent nut. At each inspection, service the vent as described in paragraph 2-118 *a* (2). When installing the vent, position the tee on the axle housing and screw the vent through the tee into the housing. Tighten the vent nut.

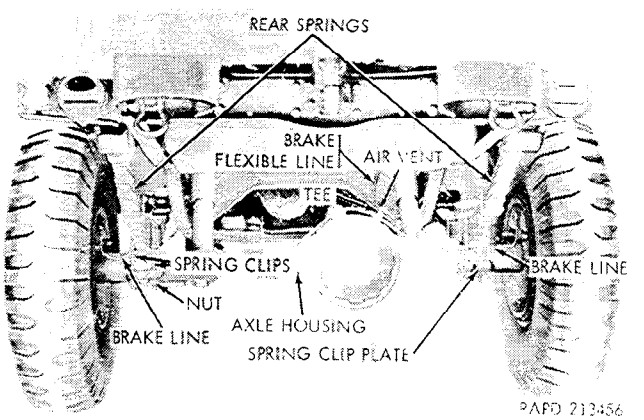


Figure 2-148. Removal or installation of rear axle.

b. Filler and Drain Plugs. The filler plug, drain plug and gasket for the rear axle are the same as corresponding plugs for the front axle, and are serviced in the same manner (para 2-118 *b* and *c*.).

2-123. Rear Axle

a. Coordination with Direct Support Maintenance Unit. Replacement of the rear axle is normally a direct support maintenance operation, but may be performed in an emergency by the using organization, provided authority for performing such replacement is obtained from the responsible commander. A replacement axle may be obtained from the direct support maintenance unit.

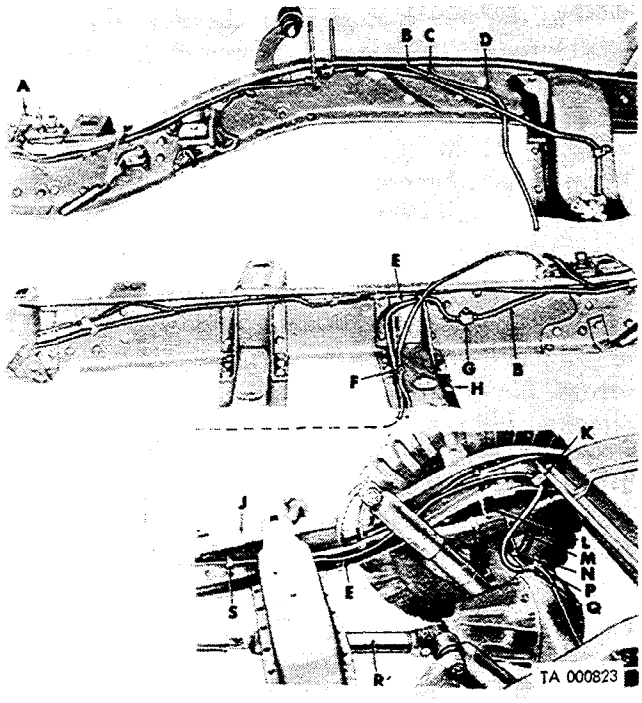
b. Removal.

(1) Apply the handbrake and block the front wheels of the vehicle.

(2) Place a jack under each frame side rail

ahead of the rear axle. Raise the frame sufficiently to relieve the load on the rear springs (fig. 2-148).

(3) Disconnect the rear propeller shaft (R, fig. 2-149) at the differential carrier companion flange by removing the four nuts, lockwashers, and bolts.



A Master cylinder rear vent line
B Line (frame tee-to-union)
C Union
D Line (union-to-frame bracket)
E Line (frame tee-to-frame bracket).
F Clip
G Frame tee
H Frame crossmember
J Right frame side rail
K Frame bracket
L Line (axle tee-to-right rear wheel cylinder).
M Flexible line
N Clip
P Line (axle tee-to-left rear wheel cylinder).
Q Axle tee
R Rear propeller shaft
S Clip

Figure 2-149. Brake lines and fittings.

(4) Disconnect the brake flexible line at the bracket attached to the fuel tank support frame crossmember (H, fig. 2-149).

(5) Remove the nuts and lockwashers from the four spring clips. Remove the clips, U bolts, and the two clip U bolt seats. Swing the two spring clip U bolt plates, with attached shock absorbers, forward.

(6) Remove the axle.

(7) Support the axle on jacks or blocking.

(8) Remove both wheels and tires (para 2-142 *a*).

(9) Remove the brake flexible line (M, fig. 2-149) from the tee on the differential carrier and discard, if unfit for further service.

c. Installation.

(1) Install the brake flexible line (fig. 2-148) in the tee on the differential carrier and tighten.

(2) Install the two wheels and tires (para 2-142 *b*).

(3) With the frame raised ((2) above), position the axle under the rear springs, with the spring center bolts in the recesses of the seats in the axle housing.

(4) Position a spring clip U bolt seat over each rear spring, fitting the opening over the spring center bolt.

(5) Swing the spring clip U bolt plates, with attached shock absorbers, toward the rear and fit each plate on the axle housing directly below the spring. Hold the parts in position and install the two spring clips U bolt for each rear spring.

NOTE

Be careful not to damage the brake lines when installing the clips. Make certain that the lines are to the rear of the clips U bolt.

(6) Install lockwashers and nuts for each spring clip U bolt. Tighten all spring clip U bolt nuts to 130-140 foot-pounds torque.

(7) Connect the brake flexible line at the bracket attached to the fuel tank support crossmember.

(8) Aline the rear propeller shaft (R, fig. 2-149) flange yoke with the companion flange on the differential carrier and install four bolts, lockwashers, and nuts. Tighten the nuts to 40-50 foot-pounds torque.

(9) Lower the frame, and remove the jacks and front wheel blocking.

(10) Bleed the brake system (para 2-142).

(11) Check lubricant level of rear axle and replenish if necessary. Refer to lubrication order LO 9-2320-212-12.

d. Record Replacement. Record the replacement of the rear axle on appropriate forms in accordance with TM 38-750.

2-124. General

Hydraulic service brakes with expanding brakeshoes are used at all four wheels. The brake pedal in the driver's compartment actuates the master cylinder, which operates the four wheel cylinders to apply the brakes. Brake linings, when new, are tapered so they are thicker at the center than at the ends. This necessitates different major adjustment procedures for new and worn linings (para 2-129). Organizational maintenance operations for service brakes include replenishing brake fluid, adjustment of the brake pedal, bleeding brake systems, minor brake adjustment, major brake adjustment, replacement of the master cylinder, wheel cylinders, brakeshoes, lines, and fittings. The handbrake lever (S, fig. 2-91) is connected to a control rod which operates a contracting brake band on the rear of the transfer. Organizational maintenance operations for the handbrake include adjustment of the brake hand and control rod and replacement of the brake lever, control rod, and brake band.

2-125. Service Brake Minor Adjustment

a. General. Minor adjustment of service brakes may be necessary to compensate for normal wear of brake linings. This adjustment is made by turning the two cam adjusters on each wheel (*b* below). Before adjusting the brakes, be sure that the pedal free-travel is correct (para 2-128) and that the wheel bearings are in good condition and properly adjusted (para 2-141). Brake drums must be cool for proper adjustment.

b. Procedure.

(1) Place the vehicle on a level floor and release the handbrake lever (S, fig. 2-91). Place transmission gearshift lever (W, fig. 2-91) in the neutral position. Disengage the front axle (fig. 2-150).

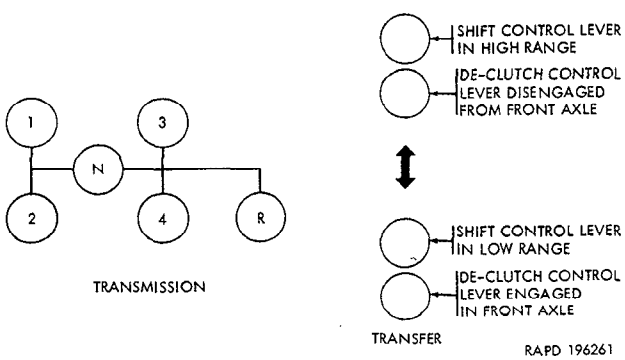


Figure 2-150. Transmission and transfer shift diagram.

(2) Jack up the wheel of the brake to be adjusted until the tire is off the floor, and block the other wheels.

(3) Turn one brakeshoe cam adjuster, in the direction shown in fig. 2-138, to decrease the clearance between the lining and the drum. Rotate the wheel and turn the cam adjuster until a noticeable drag is felt. Repeat this operation on the other cam adjuster.

(4) Repeat the operation (3) above on both brakeshoe cam adjusters of the other three wheels.

2-126. Replenishing Brake Fluid

a. General. If the brake fluid is low in the master cylinder, it may be an indication of an external leak in the brake system. Inspect the master cylinder, brake lines, fittings, and brake support plates (brakeshoe cam adjuster side) for evidence of brake fluid leakage. Replace parts, as required, to correct leakage.

b. Procedure.

(1) Turn the master cylinder access cover studs 90 degrees counterclockwise and remove the cover from the floor panel in the driver's compartment (fig. 2-151).

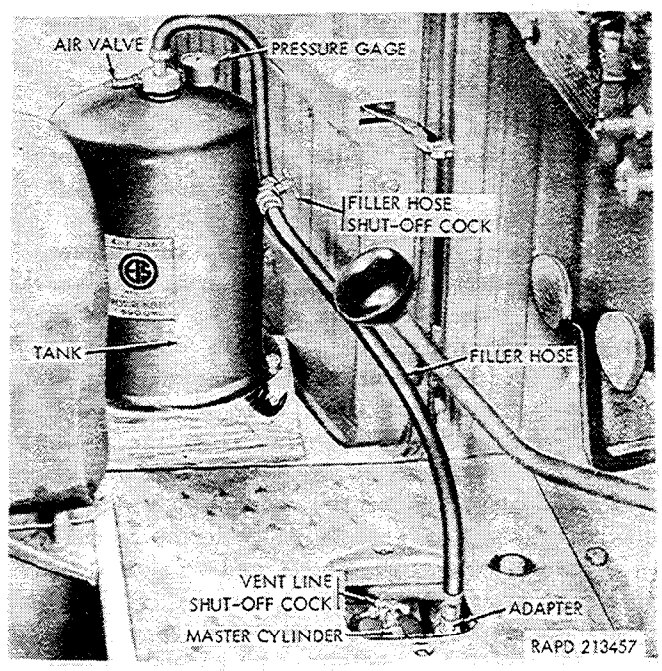


Figure 2-151. Pressure filler connected to master cylinder.

(2) Clean the top of the master cylinder and remove the master cylinder filler plug.

(3) Fill the master cylinder with brake fluid until the fluid level is three-fourths of an inch below the top of the filler plug opening.

(4) Install the filler plug.

(5) Install the master cylinder access cover and turn the cover studs 90° clockwise.

NOTE

Use hydraulic non petroleum base brake fluid (HB) only.

2-127. Bleeding Brake System

a. General. Bleeding of the hydraulic brake system is necessary when wheel cylinders or brake lines have been replaced or whenever any part of the system has been disconnected. A hydraulic brake pressure filler is available for this operation (*b* below). However, the system may be bled in an emergency without use of the pressure filler (*c* below).

b. Bleed Brake System, Using Pressure Filler (Fig. 2-151).

(1) Remove the master cylinder access cover (para 2-126*b* (1)). Close the master cylinder vent line shutoff cock. Clean top of master cylinder and remove the filler plug.

NOTE

Make certain the pressure filler contains an adequate amount of brake fluid.

(2) Connect the filler hose to the top of the tank. Close the filler hose shutoff cock.

(3) Connect a compressed air hose to the air valve in the top of the tank, and charge the tank to a minimum of 25 psi as indicated on the pressure gage.

(4) Insert the end of the filler hose in the master cylinder filler opening, and open the filler hose shutoff cock just enough to fill the master cylinder to the top. Close the filler hose shutoff cock.

(5) Remove the filler hose from the master cylinder, and install the proper adapter in the filler opening. Connect the filler hose to the adapter in the master cylinder.

(6) Before tightening the hose connection in the adapter, open the filler hose shutoff cock slightly. When the fluid flowing from the loose connection is free from air bubbles close the filler hose shutoff cock. Tighten the connection and open the filler hose shutoff cock fully. Note the reading on the pressure gage. The gage reading should be maintained at approximately 25 psi.

(7) Attach bleeder hose to the bleeder screw (fig. 2-138) rear wheel cylinder. Submerge the free end of the bleeder hose in a glass receptacle containing a small amount of brake fluid. Open the bleeder screw and allow fluid to flow into the receptacle until the fluid is entirely free from air bubbles. Close the bleeder screw and remove the bleeder hose.

(8) Bleed the left rear, right front, and left front wheel cylinders in that order, following the procedure in (7) above. When the left front wheel cylinder has been bled and while the bleeder hose is still attached to the bleeder screw (screw open), close the filler hose shutoff cock and remove the hose from the adapter in the master cylinder. Depress the brake pedal and hold it down while closing the bleeder screw at the left front wheel cylinder. Release the brake pedal and remove the bleeder hose.

(9) Remove the adapter from the master cylinder and install the filler plug. Open the vent line shutoff cock.

(10) Install the master cylinder access cover and turn the two studs clockwise 90°

c. Bleed Brake System, Without Pressure Filler.

(1) Fill the master cylinder as in paragraph 2-126*b* (1), (2), and (3).

(2) Connect the bleeder hose to the bleeder screw (fig. 2-138) on the right rear wheel cylinder. Submerge the free end of the bleeder hose in a glass receptacle containing a small amount of brake fluid. Open the bleeder screw.

(3) Depress the brake pedal slowly about halfway and allow the pedal to return to the released position. Refill the master cylinder, as necessary, to maintain the fluid level. Repeat this procedure until the fluid flowing from the bleeder hose is clear and free from bubbles.

(4) Close the bleeder screw and remove the bleeder hose.

(5) Bleed the left rear, right front, and left front wheel cylinders in that order, following the precedure in (3) and (4) above for each wheel.

(6) Fill the master cylinder, if necessary, to bring the fluid level to three-fourths of an inch below the top of the filler plug opening.

(7) Install the filler plug.

(8) Install the master cylinder access cover and turn the two studs 90° clockwise.

2-128. Brake Pedal Adjustment

a. Measure Free Travel of Pedal. Depress the brake pedal by hand until resistance is felt, release the pedal, and note the distance the pedal travels. Correct free travel is ¼ to ⅜-inch. If the free travel is not within these limits, adjust the pedal rod (*b* below).

b. Adjust Pedal Rod (Fig. 2-152). Loosen the locknut on the pedal rod, detach the pedal rod from the brake pedal by removing the cotter pin and clevis pin. Turn the pedal rod in or out of the push rod as required to establish correct pedal travel (*a* above). Turning the pedal rod in increases pedal travel, and turning it out decreases the pedal travel. Turn the locknut up tight against the push rod after completing the adjustment. Aline the pedal rod with the brake pedal and install the clevis pin and cotter pin.

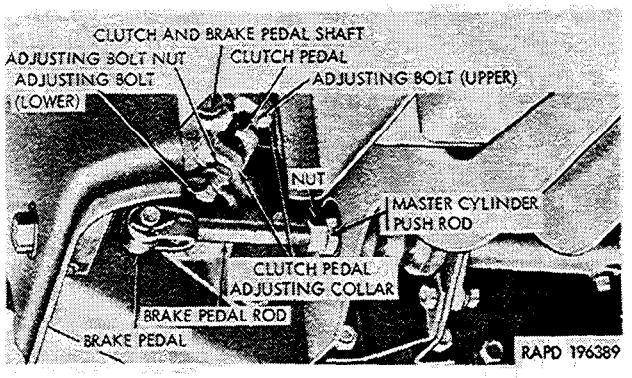


Figure 2-152. Clutch and brake pedals installed.

2-129. Service Brake Major Adjustment

a. General.

(1) A major brake adjustment is necessary when new brakeshoes are installed or when the linings have worn to the degree that they are no longer tapered.

(2) For new shoes or linings, perform the major brake adjustment as in *b* below. For linings that are slightly worn, perform the major brake adjustment as in *c* below.

b. Adjust Brake With New Linings.

NOTE

Check the wheel bearing adjustment for all wheels before adjusting the brakes (para 2-141).

(1) Place the vehicle on a level floor, release the handbrake, place the transmission gearshift lever in neutral, and disengage the front axle.

(2) Jack up one of the wheels and block the other wheels to prevent the vehicle from rolling off the jack. Remove the wheel and tire.

(3) Remove the screw that secures the drum inspection hole cover and remove the cover.

(4) Loosen the anchor bolt nuts (fig. 2-138) and turn both anchor bolts to the fully released position (flats on the same horizontal plane and the arrows or punch marks toward each other).

(5) Rotate the drum until the inspection hole is opposite the top (toe) of the front shoe and note the clearance between the lining and the drum.

(6) Rotate the drum until the inspection hole is opposite the bottom (heel) of the front shoe and note the clearance at this point.

(7) Adjust the cam adjuster and the anchor bolt alternately in the directions indicated in fig. 2-138, until clearance is equalized at the toe and heel and the center of the lining is in contact with the drum, resulting in a decided drag at this point.

(8) Hold the anchor bolt and tighten the anchor bolt nuts to 90-110 foot-pounds torque after completing the adjustment.

(9) Adjust the rear shoe in the same manner ((5) through (8) above). Position the inspection hole cover and install the tapping screw. Install the wheel and tire (para 2-142 *b*), and remove the jack and blocking.

(10) Adjust the other three brakes in the same manner.

c. Adjust Brakes with Worn Linings (No Taper).

(1) Perform the preliminary operations as in *b*, (1) through (4) above.

(2) Turn the cam adjusters so that a 0.006-inch feeler gage is a snug fit between the upper end (toe) of each brakeshoe lining and drum.

(3) Turn the anchor bolts in the direction indicated in figure 2-138 to decrease the clearance between the lower and (heel) of the brakeshoe lining and the drum to 0.006 inch. This will cause the brakeshoe to move down and out, increasing the clearance at the toe of the lining to approximately 0.012 inch, resulting in proper centralization of the brakeshoe.

(4) Hold the anchor bolts and tighten both anchor bolt nuts, to 90-110 foot-pounds torque after completing the adjustment.

(5) If pedal travel is too great after the adjustments have been completed, decrease the clearance between the toe of the lining and the drum (para 2-125 *b*(3)).

(6) Position the inspection hole hole cover and install the tapping screw.

(7) Install the wheel and tire (para. 2-142 *b*) and remove the jack and blocking.

(8) Adjust the other three brakes in the same manner.

2-130. Handbrake Adjustments

a. Adjust Handbrake Band (Fig. 2-153).

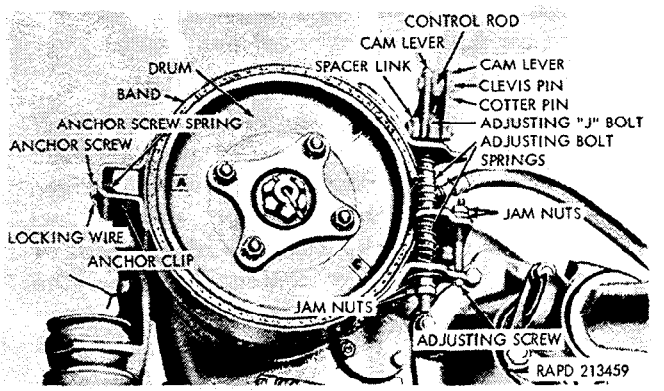


Figure 2-153. Handbrake band adjustment.

(1) Place the vehicle on a level floor and place the handbrake in the fully released position.

(2) Remove the cotter pin and clevis pin that attach the control rod to the cam levers.

(3) Remove the locking wire from the anchor screw.

(4) Loosen the two jamnuts on the adjusting J bolt and the two jamnuts on the adjusting screw.

(5) Insert a 0.015-inch thickness gage between the brake lining and the drum at the anchor clip (point A). Turn the anchor screw as required until slight friction is felt as the gage is withdrawn.

(6) Insert the thickness gage at point B and turn the upper nut on the adjusting J bolt as required to establish the same clearance as at point A.

(7) Insert the thickness gage at point C, hold the adjusting screw, and turn the lower nut on the adjusting screw as required to establish the same clearance as at points A and B.

(8) Check the clearance between the lining and the drum at several points. Clearance should be approximately 0.015 inch at all points.

(9) When the adjustment has been completed, tighten the jamnuts on the adjusting J bolt and the adjusting screw. Secure the anchor screw with locking wire, attaching the wire to the bracket in such a manner that it will not interfere with the anchor screw spring.

(10) Adjust the handbrake control rod (*b* below) before connecting it to the cam levers.

b. Adjust Handbrake Control Rod.

(1) With the brake control rod detached from the cam levers (*a* (2) above), loosen the nut at the yoke end of the brake control rod (G, fig. 2-70) and turn the rod in the yoke until the eye of the rod is in alinement with the clevis pin holes in the two cam levers (fig. 2-153).

(2) Attach the control rod to the cam levers with the clevis pin and cotter pin.

(3) Tighten the nut against the yoke.

NOTE

With the brake band and control rod properly adjusted, the pawl should be engaged in the third to fifth notch of the sector for full application of the brake.

2-131. Brakeshoe and Wheel Cylinder

a. General. Front and rear brakeshoes for all wheels are identical and hence interchangeable. Wheel cylinders are marked L or R for left or right wheels, respectively, and must be installed accordingly. When brakeshoes for one of the front or rear wheels require replacement, replace the brakeshoes for the other front or rear wheel at the same time to insure proper equalization of the brakes. Procedure is the same for all wheels.

b. Remove Brakedrum.

(1) Remove the wheel and tire (para 2-142 *a*).

(2) Remove the three bolts that secure the brakedrum to the hub (fig. 2-154) using a broad-bladed screwdriver. If the bolts are corroded, strike the screwdriver with a hammer to shock each bolt, being careful not to damage the bolt slots.

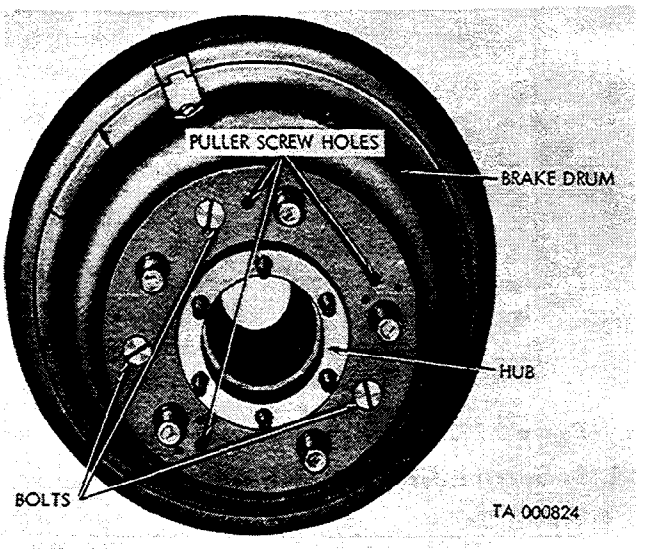


Figure 2-154. Brakedrum and hub.

(3) Install a bolt in each of the three puller screw holes in the drum and turn the three bolts in evenly to force the drum from the hub. If the drum is corroded, strike the puller bolts with a hammer as they are tightened to free the drum from the hub. Remove the drum and remove the three puller bolts.

c. Remove Brakeshoes.

(1) Remove the brakeshoe return spring, using brake spring pliers (fig. 2-155).

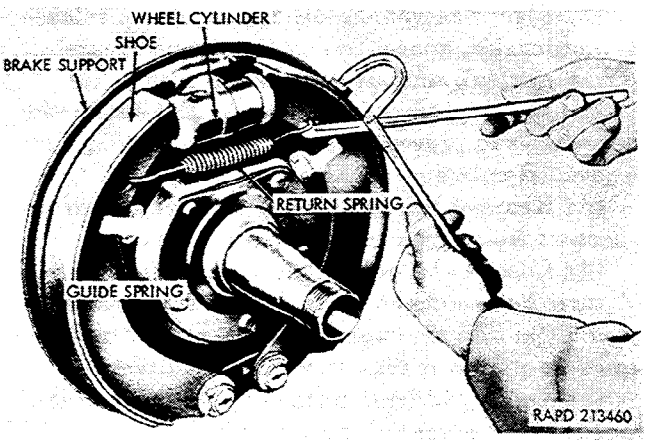


Figure 2-155. Removing brakeshoe return spring.

NOTE

Insert a tough rubber pad between the pliers and the brake lining to prevent damaging the lining.

(2) Place a wheel cylinder clamp over the ends of the wheel cylinder to hold the parts in place when the shoe is removed.

(3) Remove the nut and lockwasher that

secures each anchor bolt (fig. 2-138) and remove the two anchor bolts, with assembled C washers, oil washers, and oil washer retainers.

NOTE

While the brakeshoes can be removed from the anchor bolts by removing the C washers, it is advisable to remove the anchor bolts as described above, since they must be cleaned and lubricated each time the brakeshoes are replaced.

Release the shoes from the guide springs and wheel cylinder (fig. 2-155), and remove the shoes.

d. Remove Wheel Cylinder (Fig. 2-155).

(1) Remove the wheel cylinder inlet fitting bolt and gasket (fig. 2-138).

(2) Remove the two wheel cylinder bolts and lockwashers (fig. 2-138) and remove the wheel cylinder.

e. Inspection.

(1) Inspect the brakedrum for cracks, distortion, wear, scoring. Replace the drum, if necessary.

(2) Inspect the brakeshoe return spring for cracks, distortion, or weakness. Replace the spring, if necessary.

(3) Inspect the anchor bolts for wear, corrosion, damaged threads, and distortion. Inspect the C washers and the oil washers and retainers for damage. Remove corrosion or abrasions from the anchor bolts with crocus cloth. Replace damaged anchor bolts or related parts.

(4) Inspect the inlet fitting on the brake line. If the fitting is damaged, remove it.

f. Install Wheel Cylinder.

(1) If the inlet fitting was removed (*e*(4) above), install a new fitting on the brake line.

(2) Position the cylinder on the brake support (fig. 2-155), being sure to use the correct cylinder (*a* above). Install two lockwashers and bolts from the rear side of the brake support (fig. 2-155). Tighten the two bolts.

(3) Position the inlet fitting on the wheel cylinder, and install the gasket and bolt. Tighten the bolt.

g. Insall Brakeshoes.

(1) Apply a film of lubricant on the brakeshoe cams and inner sides of the guide springs. Position the two brakeshoes on the support plate with each shoe engaged in the guide spring (fig. 2-155) and the upper ends of the shoes in the boots at each end of the wheel cylinder.

(2) If the C washer and oil washers were removed from the anchor bolts (*e*(3) above), install a new C washer on each bolt. Apply a film of lubricant to the anchor bolts and install an oil washer retainer and oil washer on each bolt.

(3) Install the two anchor bolts from the brakeshoe side and install a lockwasher and nut on each anchor bolt. Position the anchor bolts so the arrows or punch marks are toward each other (fig. 2-138), and tighten the nuts fingertight.

(4) Engage one end of the brakeshoe return spring in the hole in one of the brakeshoes, and engage the other end in the opposite hole, using brake spring pliers and a rubber pad (fig. 2-155).

(5) Remove the wheel cylinder clamp.

h. Install Brakedrum.

(1) Apply a coating of water pump grease to the contacting surfaces of the brakedrum and the hub to prevent corrosion and to facilitate future removal.

(2) Position the drum on the hub, alining the bolt holes. Install the three flathead bolts (fig. 2-154). Tighten the bolts evenly.

i. Perform a Major Brake Adjustment. Refer to paragraph 2-129.

j. Install the Wheel and Tire. Refer to paragraph 2-142.

k. Bleed the Brake System. Refer to paragraph 2-127.

2-132. Brake Master Cylinder

a. Removal.

(1) Disconnect the cable connector (fig. 2-156) from the stop light.

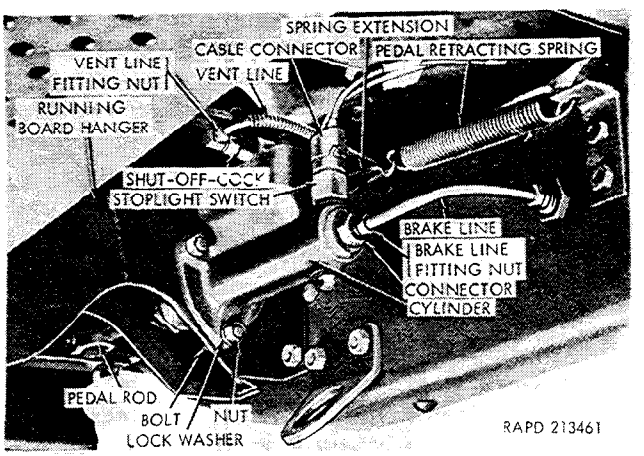


Figure 2-156. Brake master cylinder, installed.

(2) Unscrew the vent fitting nut from the elbow in the shutoff cock.

(3) Unscrew the brake line fitting nuts from the connector in the master cylinder and frame. Detach the brake line.

(4) Remove the cotter pin and clevis pin that attach the pedal rod to the brake pedal (fig. 2-152).

(5) Remove the three nuts, lockwashers, and bolts securing the master cylinder to the left running board hanger and pull the master cylinder out through the hanger.

(6) Remove the stop light switch, the vent line shutoff cock and attached elbow, and the brake line

connector. Unscrew the brake rod from the push rod. Remove the nut from the pedal rod if either part requires replacement.

b. Installation.

(1) Install the inverted flared tube connector (fig. 2-156) in the rear of the master cylinder. Tighten the connector.

(2) Install the vent line shutoff cock with attached elbow in the master cylinder cover. Tighten the shutoff cock.

(3) Install the stoplight switch.

(4) Position the master cylinder on the left running board front hanger and install three bolts, lockwashers, and nuts. Tighten the nuts evenly.

(5) Install the nut on the pedal rod, and screw the pedal rod into the master cylinder push rod (fig. 2-152). Connect the pedal rod to the brake pedal with the clevis pin. Do not install the cotter pin until the brake pedal free travel has been adjusted ((10) below).

(6) Connect the brake line to the master cylinder and frame, screwing the fitting nuts into the connectors.

(7) Connect the vent line to the elbow in the vent line shutoff cock, screwing the fitting nut to the elbow.

(8) Connect the cable connector to the stoplight switch.

(9) Fill the master cylinder with hydraulic brake fluid and bleed the brake system (para 2-127).

(10) Adjust the brake pedal free travel (para 2-128).

2-133. Brake Lines, Master Cylinder Vent Line, and Fittings

NOTE

The key letters noted in parentheses are figure 2-149 except where otherwise indicated.

a. General. If leaks develop in any of the brake lines or fittings or the master cylinder rear vent line (A), replace the affected parts as required.

b. Remove Brake Lines or Fittings.

(1) Disconnect the affected line at both ends, disengage or remove brake line clips and remove the line. Flexible lines to the front wheel cylinders and flexible lines from the frame cross members to the tees on the axles are replaced as assemblies. Disconnect all flexible lines at the brake line bracket end first (fig. 2-157). For other lines provided with covers, remove the cover from the line before discarding the line.

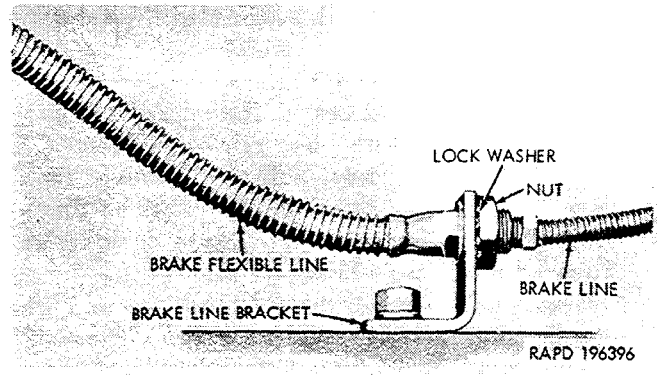


Figure 2-157. Brake flexible line installation.

(2) Removal procedure of tees, unions, and connectors will be apparent upon examination.

c. Install Brake Line from Master Cylinder to Frame Tee. Use seamless tubing and two fitting nuts. Install the nuts on the tubing and double flare the tubing at both ends, using a flaring tool. Shape the tube as required and screw the fitting nuts to the connector in the master cylinder (fig. 2-156).

d. Install Brake Lines from Frame Tee to Front and Rear Flexible Lines (Fig. 2-149).

(1) Use seamless tubing, flexible conduit cover, and two fitting nuts for each line. The line (B) from the frame tee (G) to the union (C) at the left frame side rail is 40¼-inches long for all models. The line (E) from the tee to the frame bracket (K) is in two sections, joined by a union at the right frame side rail. The front section is 43¾-inches long for all models. The rear section is 68½-inches long for the cargo truck M37; the corresponding line for the ambulance truck M43 or telephone maintenance truck M201 is 82½-inches long. The line (D) from this union to the front flexible line in 34¼-inches long for all models.

(2) Install the conduit cover and two fittings nuts on the tubing, double flare the tubing at both ends, using a flaring tool. Position the line and shape it as necessary. Screw the fitting nuts to the union and the frame tee or the front or rear flexible line. Install any clips that were removed and engage the line in the clip.

e. Install Brake Flexible Lines. All flexible lines (fig. 2-157) are installed in the same manner, but are not interchangeable.

(1) Connect the flexible line to the tee on the axle or to the inlet fitting at the wheel cylinder.

(2) Insert the threaded fitting of the brake flexible line through the brake line bracket on the

frame crossmember or front axle. Install a lockwasher and nut and tighten.

(3) Screw the brake line fitting nut to the flexible line.

f. Install Lines from Axle Tees to Wheel Cylinders.

(1) For the line (P) (fig. 2-149) use a suitable length of seamless tubing, flexible conduit cover, and two fitting nuts. Install the cover and two fitting nuts on the tubing and double flare both ends of the tubing, using a flaring tool. Form the tube as necessary and connect one end of the line to the tee on the rear axle, and the other end to the inlet fitting at the left rear wheel cylinder. Engage the line in the two clips on the axle.

(2) Install the line (L) (fig. 2-149) for the right rear wheel in the manner described in (1) above, using a suitable length of seamless tubing. Only one clip is used to secure this line to the axle.

(3) For the line from the front axle tee to the bracket at the left side of the axle (fig. 2-144) use approximately a 25½-inch length of tubing, flexible conduit cover, and two fitting nuts. Assemble the line as described in (1) above. Connect one end of the front line to the front axle tee and the other end to the flexible line for the left front wheel. Engage the line in the two clips on the axle.

(4) Install the line for the right side (fig. 2-144) (*f*(3) above), using approximately a 14-inch length of seamless tubing. Engage the line in the clip on the axle.

g. Bleed the Brake System (Para 2-127).

h. Replace Master Cylinder Rear Vent Line (A, Fig. 2-149).

(1) Disconnect the vent line from the elbow at the shutoff cock (fig. 2-156) and from the flexible line below the generator and remove the vent line. Remove the conduit cover from the line.

(2) Use a suitable length of seamless tubing, flexible conduit, and two 3/16-inch inverted flared tube fitting nuts. Assemble the tubing, cover, and fitting nuts (*f* (1) above). Install the line, shaping it as required, and connect it to the flexible line below the generator and the elbow at the shutoff cock (fig. 2-156).

2-134. Handbrake Band, Cam Levers, and Spacer Link

a. Removal.

(1) Remove the cotter pin and clevis pin which attach the handbrake control rod to the brake cam levers (fig. 2-153).

(2) Remove the cotter pin which attaches the spacer link to the spacer link stud in the brake support on the transfer, and remove the spacer link from the stud.

(3) Remove the two jamnuts and lockwasher from the brake adjusting screw, and remove the screw.

(4) Remove the two jamnuts and plain washer from the adjusting J bolt and remove the bolt, with attached cam levers and spacer link from the brake band and brake support, catching the two adjusting bolt springs as the bolt is withdrawn.

(5) Remove the locking wire from the anchor screw, and remove the anchor screw. Pull the band from the brake support, catching the anchor screw spring as the band is removed.

(6) If the adjusting J bolt, cam levers, or spacer link requires replacement, remove the cotter pin and clevis pin that attach the two levers and the spacer link to the J bolt. If the spacer link stud in the brake support requires replacement, remove the nut, lockwasher, and stud.

b. Inspection.

(1) Clean the parts that were removed and the brakedrum.

(2) Inspect the cam levers and link spacer for cracks, distortion, and elongated clevis pin holes.

(3) Inspect the adjusting J bolt, adjusting screw, anchor screw, and spacer link stud for cracks and damaged threads.

(4) Inspect all springs for cracks, distortion, and weakness.

(5) Inspect the drum for scoring and cracks. Report a damaged drum to direct support maintenance personnel.

(6) Replace all parts that are unfit for further service.

c. Installation.

(1) If the spacer link stud was removed, install the stud in the brake support and install the lockwasher and nut. Tighten the nut.

(2) Assemble the adjusting J bolt and related parts with a cam lever at each side of the bolt and the spacer link next to the left lever, alining the clevis pin holes in the link and two levers with the eye in the adjusting J bolt. Install the cam lever clevis pin and cotter pin.

(3) Position the anchor screw spring in the anchor clip on the band and install the band on the brake support. Install the anchor screw but do not tighten it at this time.

(4) Position an adjusting bolt spring at each side of the brake support between the support and the band ends, and install the adjusting J bolt and attached cam levers and spacer link, inserting the bolt through the band ends, two springs, and brake support. Install the washer and two jamnuts on the lower end of the bolt, but do not tighten them at this time.

(5) Attach the front end of the spacer link to the spacer link stud and install the cotter pin.

(6) Install the adjusting screw up through the band lower end and the brake support and install

the lockwasher and two jamnuts. Do not tighten the nuts at this time.

(7) Adjust the band and control rod (para 2-130).

2-135. Handbrake Control Rod and Lever

a. Remove Handbrake Control Rod.

(1) Remove the cotter pins and clevis pins that attach the control rod to the cam levers (fig. 2-153) and the control rod yoke to the handbrake lever (F, fig. 2-70) and remove the control rod.

(2) If the control rod yoke or yoke nut requires replacement, remove the yoke and nut from the rod.

b. Install Handbrake Control Rod.

(1) Install the nut and the yoke on the threaded end of the control rod.

(2) Attach the yoke to the handbrake lever (F, fig. 2-70) with the clevis pin and cotter pin.

(3) Adjust the rod in the yoke (para 2-130).

c. Remove Handbrake Lever and Sector.

(1) Remove the transmission access cover (para 2-75 *g*).

(2) Detach the control rod yoke from the handbrake lever (*a* (1) above).

(3) Remove the three screws and lockwashers that secure the transfer lever bracket (fig. 2-79). Remove the handbrake lever and attached sector.

(4) Remove the two nuts and the bolt that secure the handbrake lever to the sector and remove the sector.

d. Inspection.

(1) Inspect the sector for wear, cracks, and distortion.

(2) Inspect the handbrake lever pawl for wear. Check the action of the button, rod, and pawl for ease of operation and correct spring action.

(3) Replace the sector and lever, as necessary.

e. Install Handbrake Lever and Sector.

(1) Depress the hand lever button and position the sector in the lower end of the lever with the narrow end of the sector toward the rear. Aline the center bolt hole in the sector with the upper holes in the end of the lever; install the sector bolt from the left side of the lever and release the lever button.

(2) Install the plain nut and jamnut on the sector bolt, and tighten both nuts.

(3) Position the sector and the transfer lever bracket on the transmission (fig. 2-96), alining the screw holes in the bracket and sector with those in the transmission case. Install three lockwashers and capscrews. Tighten the screws evenly.

(4) Install the transmission access cover (para 2-76 *d*).

Section XXIV. CLUTCH

2-136. General

The clutch (fig. 2-158) consists of the disk and pressure plate, clutch release bearing, and release fork which is actuated by the clutch pedal. The disk is splined to the transmission shaft and the pressure plate is bolted to the engine flywheel. Organizational maintenance of the clutch includes adjustment of the clutch pedal, replacement of the clutch pan and pan plate, and emergency replacement of the release bearing, disk, and pressure plate (para 2-139).

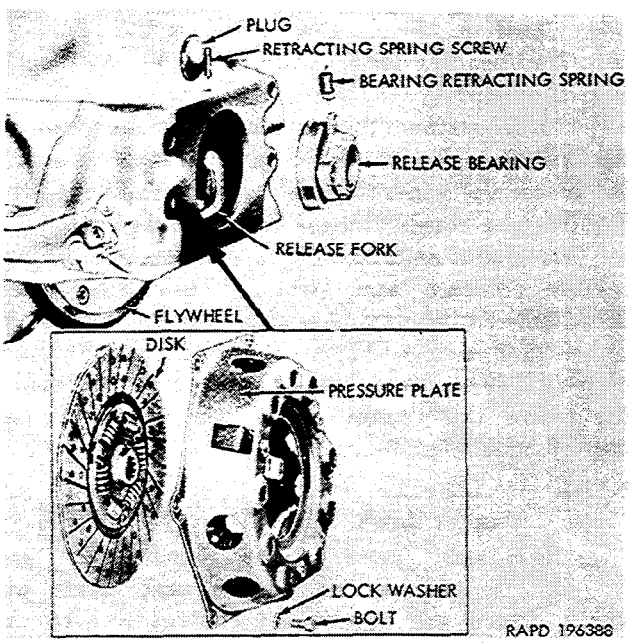


Figure 2-158. Clutch parts—exploded view.

2-137. Clutch Pedal Adjustment

a. General. Correct clutch pedal free travel is 1 inch. Adjustment is accomplished by changing the position of the clutch pedal in relation to the clutch pedal adjusting collar. Two adjusting bolts (fig. 2-152) are provided for this purpose.

b. Adjustment.

(1) Loosen the adjusting bolt nuts on the upper and lower adjusting bolts (fig. 2-152).

(2) Turn the bolts in or out of the collar to provide 1-inch free travel of the pedal. Loosen the upper bolt and tighten the lower bolt to increase free travel; loosen the lower bolt and tighten the upper bolt to decrease free travel.

(3) Tighten the nuts on both adjusting bolts after making the adjustment.

2-138. Clutch Housing Pan and Pan Plate (Fig. 2-159)

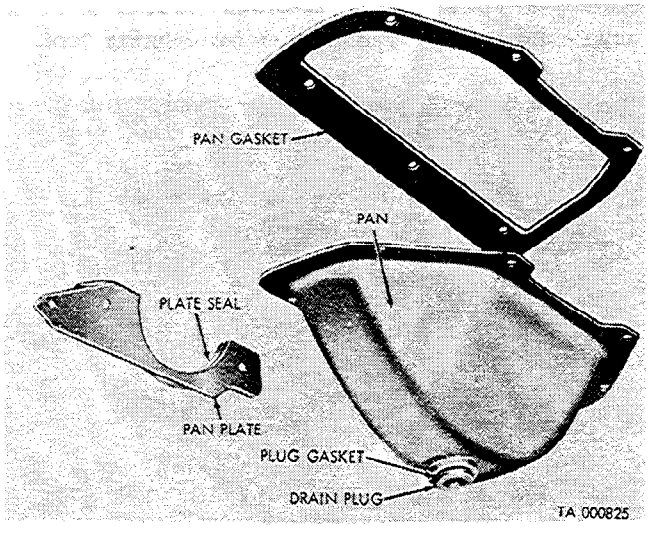


Figure 2-159. Clutch housing pan and pan plate (late type).

a. General. Design changes in the clutch housing pan and pan plate provide a change in the pan drain plug and the pan plate seal. The drain plug in the clutch pan on early vehicles is a pipe plug, while the drain plug (fig. 2-159) for pans on later vehicles is of a different type and is provided with a gasket. The clutch pan plate on early vehicles has two seals riveted to the plate, while the plate on later vehicles has a one-piece seal cemented to the plate. Removal and installation procedures are the same for both types of pan and plate.

b. Removal.

(1) Remove the four bolts and lockwashers that secure the pan plate to the front side of the clutch housing and remove the plate with seal.

(2) Remove the six bolts and lockwashers that secure the pan to the clutch housing, and remove the pan and pan gasket.

(3) Remove the drain plug from the pan. If a gasket is provided with the plug, remove the plug gasket.

c. Inspection.

(1) Clean all parts, including the mating surfaces of the clutch housing and housing pan with drycleaning solvent or volatile mineral spirits.

(2) Inspect the pan for cracks, damaged flange surfaces, distortion, and damaged threads.

(3) Inspect the pan plate for cracks, distortion, and damaged, loose, and deteriorated seals. Remove damaged seals.

(4) Replace all parts that are unfit for further service.

d. Installation.

(1) If the pan plate seal or seals were removed (*c* (3) above) install new seal or seals. For the late type plate, cement the seal to the flange side of the plate with synthetic rubber cement. For the early type plate, position the upper seal on the flange side of the plate and the lower seal on the opposite side. Install ten split rivets with the rivet heads next to the seals.

(2) Apply a coating of liquid type gasket cement to both sides of the pan gasket, and position the gasket on the pan, alining the bolt holes. Position the pan and gasket on the clutch housing and install six lockwashers and bolts. Tighten the bolts evenly. Install the pan drain plug gasket (if required) and the drain plug.

(3) Position the pan plate at the front of the housing with the upper seal toward the front of the engine, and the front portion of the pan gasket (late type) down. Install a lockwasher and bolt in the upper bolt hole at each side of the plate, and a lockwasher and bolt for each lower bolt hole. Tighten the four bolts.

2-139. Clutch Release Bearing, Pressure Plate, and Disk

a. Coordination with Direct Support Maintenance Unit. Replacement of the clutch disk, pressure plate, and release bearing is normally a direct support maintenance operation, but may be performed in an emergency by the using organization, provided authority is obtained from the responsible commander. Replacement parts, tools, and instructions may be obtained from the direct support maintenance unit.

b. Remove Clutch Release Bearing (fig. 2-158).

(1) Remove the transmission (para 2-105 *b*).

(2) Detach the retracting spring from the release bearing and from the retracting spring screw, and remove the spring through the transmission shaft opening in the clutch housing.

(3) Disengage the release bearing from the fork, and remove the bearing through the transmission shaft opening.

(4) Remove the retracting spring screw if it must be replaced.

c. Inspection. Wipe the release bearing with a clean cloth, and inspect it for wear, roughness in the bearing, and damaged bearing sleeve.

CAUTION

Do not clean the bearing with drycleaning solvent or volatile mineral spirits.

Inspect the retracting spring for cracks and distortion. Inspect the retracting spring screw for damaged threads. Replace parts that are unfit for further service.

d. Install Clutch Release Bearing (fig. 2-158).

(1) If the retracting spring screw was removed, install the screw in the clutch housing.

(2) Install the release bearing in front of the bearing fork, with the larger diameter of the bearing sleeve toward the front and the retracting spring hole at the top.

NOTE

A new clutch release bearing is prelubricated.

(3) Attach the retracting spring to the spring screw and to the release bearing sleeve.

(4) Install the transmission (para 2-150 *b*).

(5) Adjust the screw so there is slight tension on the spring when the fork is in the released position.

e. Remove Clutch Pressure Plate and Disk.

(1) Remove the transmission (para 2-105 *b*).

(2) Remove the clutch housing pan and pan plate (para 2-138 *b*).

(3) Remove the clutch release bearing (*b* above).

(4) Loosen the six bolts that secure the pressure plate to the flywheel, rotating the flywheel to gain access to the bolts. Remove the six bolts and lockwashers, and remove the pressure plate and the clutch disk.

f. Cleaning and Inspection.

(1) Clean the parts thoroughly with drycleaning solvent or volatile mineral spirits. Clean the pilot bearing (bushing type) in the end of the crankshaft and inspect for wear or damage. Clean the disk-contacting surfaces and the flywheel. If the pilot bearing or flywheel is worn or scored, notify direct support maintenance personnel.

(2) Inspect the disk for worn, glazed, or loose facings, damaged hub splines, damaged springs, or distortion.

(3) Inspect the pressure plate for scored disk-contacting surface, distortion, and damaged springs and fingers.

(4) Inspect the clutch release bearing (*c* above).

(5) Replace all parts that are unfit for further service.

g. Install Cltuch Pressure Plate and Disk.

(1) Position the disk and the pressure plate (fig. 2-158) on the flywheel. Install the six special bolts and lockwashers. Do not tighten the bolts until all are installed and the clutch parts are alined ((2) below).

(2) Insert the clutch alining tool through the pressure plate, disk, and into the pilot bearing to aline the parts (fig. 2-160). Tighten the six bolts evenly to 15 to 20 foot-pounds torque, using a torque-indicating wrench. Remove alining tool.

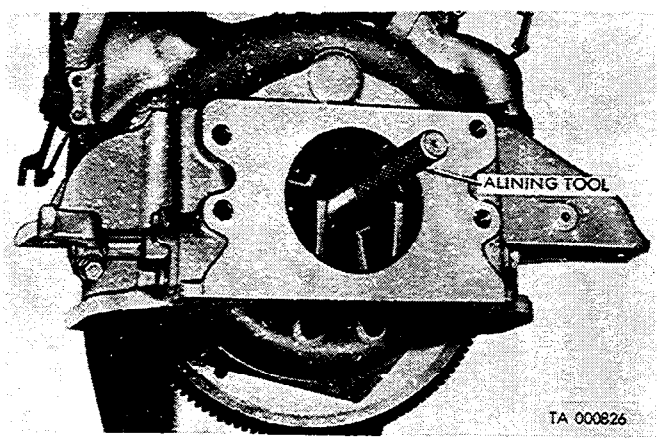


Figure 2-160. Alining clutch parts.

(3) Install the clutch release bearing (*d* above).

(4) Install the clutch housing pan and pan plate (para 2-138 *d*).

(5) Install the transmission (para 2-105 *c*).

(6) Adjust clutch pedal (para 2-137 *b*).

h. Record Replacement. Record the clutch replacement on appropriate forms in accordance with TM 38-750.

Section XXV. WHEELS, HUBS, AND TIRES

2-140. General

The disk type steel wheels are fitted with mud and snow tread pneumatic tires and tubes. Wheels and tires are interchangeable. The hubs are mounted on opposed tapered roller bearings. Oil seals are provided to retain lubricant Organizational maintenance operations include wheel bearing adjustment, and replacement of wheels, hubs, hub bearings, oil seals, tires, and tubes.

2-141. Wheel Bearing Adjustment

a. Front Wheel Bearings. The procedure is the same for both front wheels.

(1) Jack up the wheel and remove the drive flange and flange gasket (para 2-117 *c*).

(2) Remove the outer bearing adjusting nut, using the wrench (fig. 2-135). Remove the adjusting nut lock (fig. 2-136).

(3) Using the wrench, turn the inner adjusting nut in until the bearings are tight. Then back the nut off one-sixth of a turn. Rotate the wheel to test the tightness of the bearings.

(4) Install the adjusting nut lock, engaging the lock pin on the adjusting nut in one of the holes in the lock. If the lock does not engage the lock pin, reverse the position of the lock.

(5) Install the outer bearing adjusting nut, and tighten securely with the wrench (fig. 2-135).

(6) Install the flange gasket and the flange (para 2-118 *c*).

b. Rear Wheel Bearings. Both rear wheel bearings are adjusted in the same manner.

(1) Jack up the wheel and remove the axle drive shaft and the flange gasket (para 2-121 *a*).

(2) Remove and discard the outer oil seal and the other flange gasket.

(3) Remove the outer bearing adjusting nut, using the wrench (fig. 2-135), and remove the adjusting nut lock (fig. 2-136).

(4) Adjust the rear bearings in the manner described in *a* (3) above.

(5) Install the adjusting nut lock (*a* (4) above).

(6) Install the outer bearing adjusting nut and tighten securely with the wrench.

(7) Prepare a new oil seal by soaking it in neats-foot oil for approximately 30 minutes. Position a new flange gasket and the oil seal on the flange studs with the shoulder of the seal in the counterbore of the hub.

(8) Install another new flange gasket and the axle drive shaft (para 2-121 *b*).

WARNING

When inflating the tire, turn the side ring away from any person nearby to prevent injury in the event the ring flies off.

2-142. Removal and Installation

a. Removal. All wheels are removed in the same manner.

(1) Apply the handbrake, jack up the wheel to be removed and block the other wheels to hold the vehicle.

(2) Remove the five cap nuts that secure the wheel to the wheel hub studs (fig. 2-135) and remove the wheel.

NOTE

Cap nuts for both left wheels have left-hand threads.

b. Installation.

(1) Position the wheel on the wheel studs with the dished side next to the hub.

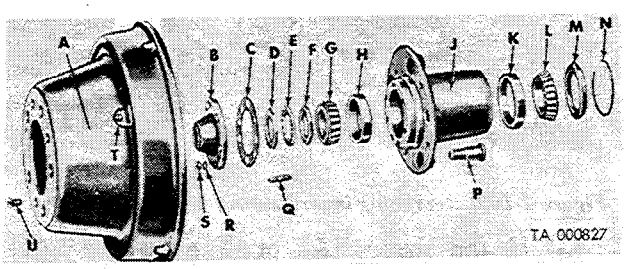
(2) Install the five cap nuts with the tapered side toward the wheel (see *a* (2) above).

(3) Tighten the nuts to 200 to 225 foot-pounds torque.

2-143. Hub, Hub Bearings, and Oil Seal

NOTE

The key letters noted in parentheses are in figure 2-161, except where otherwise indicated.



A Drum
B Drive flange
C Gasket
D Outer bearing adjusting nut
E Adjusting nut lock
F Inner bearing adjusting nut
G Outer bearing cone
H Outer bearing cup
J Hub
K Inner bearing cup
L Inner bearing cone
M Oil seal
N Snapring
P Wheel stud
Q Flange stud
R Lockwasher
S Nut
T Inspection hole cover
U Screw

Figure 2-161. Hub, drum, and related parts—exploded view.

a. General. Hubs for all wheels are identical and are serviced in the same manner. An outer bearing oil seal is provided for each rear hub. All hubs have an inner oil seal and inner and outer bearings. Wheel studs for the left wheels have left-hand threads.

b. Remove Hub and Drum.

(1) Remove the wheel and tire (para 2-142 *a*).

(2) Remove the front axle drive flange (para 2-117 *c*), rear axle drive shaft (para 2-121 *a*), and the flange gasket. For the rear hub, remove the outer bearing oil seal and gasket.

(3) Remove the hub and drum (para 2-117 *d*).

c. Disassemble Hub and Drum.

(1) Remove the snapring (N) that secures the oil seal (M).

(2) Insert the drift, with handle (fig. 2-162) in the hub from the outer end, so the drift bears against the inner bearing cone. Drive the inner bearing cone and inner oil seal from the hub in one operation. Remove the drift and handle.

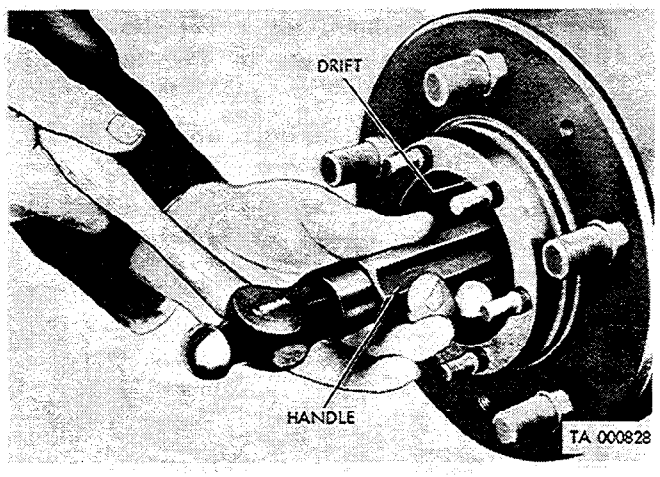


Figure 2-162. Removing inner bearing cone and oil seal.

(3) If the drum (A) or hub (J) requires replacement, remove the drum (para 2-130).

d. Inspection.

(1) Clean all parts in drycleaning solvent or volatile mineral spirits and dry.

(2) Inspect the hub (J) for cracks, loose and damaged wheel studs (P) and flange studs (Q), damaged flange surfaces, and loose and damaged bearing cups (H and K). Tighten loose wheel or flange studs. Remove damaged studs.

(3) Inspect the inner and outer bearing cones (G and L) for wear, chipping, and roughness. Inspect the inner and outer bearing cups (H and K) in the hub for scoring and pitting. If either of the bearing cups require replacement, remove the cups by driving them out with a brass drift and hammer. If either cup or cone requires replacement, replace both items.

(4) Inspect the inner and outer bearing adjustment nuts (D and F) for cracks and damaged threads, and a damaged lock pin on the inner nut. Inspect the adjusting nut lock (E) for cracks and distortion.

(5) Inspect the drum (A) (para 2-131 *e*).

(6) Replace all parts that are unfit for further service.

e. Assemble Hub and Drum.

(1) If the wheel studs (P) were removed (*d* (2) above), or if a new hub is to be installed, install new riveted type studs, matching the flat surface of the stud head with the shoulder on the hub. Press the studs into place with an arbor press.

NOTE

Wheel studs for the left hubs have left-hand threads. Be sure to use correct studs.

(2) If the flange studs (Q) were removed (*d* (2) above), install new flange studs in the hub and tighten.

(3) If the bearing cups (H and K) were removed (*d* (3) above) install new cups in the hub, using an arbor press. Make certain that the cups are bottomed in the hub counterbores.

NOTE

Bearing cups are already installed in a new hub.

(4) Install the brake drum (para 2-131 *h*).

(5) Lubricate the inner bearing cone (L) with grease GAA, using a roller bearing lubricator or kneading the grease into the bearing rollers with the fingers. Position the cone in the inner bearing cup.

(6) Immerse a new inner bearing oil seal (M) in clean neats-foot oil for about 30 minutes to soften the leather. Remove the seal from the oil and roll with a smooth steel bar to condition the seal.

(7) Position the seal (M) in the hub with the lip of the seal next to the inner bearing cone (L). Fit the replacer (fig. 2-163) over the seal and drive the seal into position.

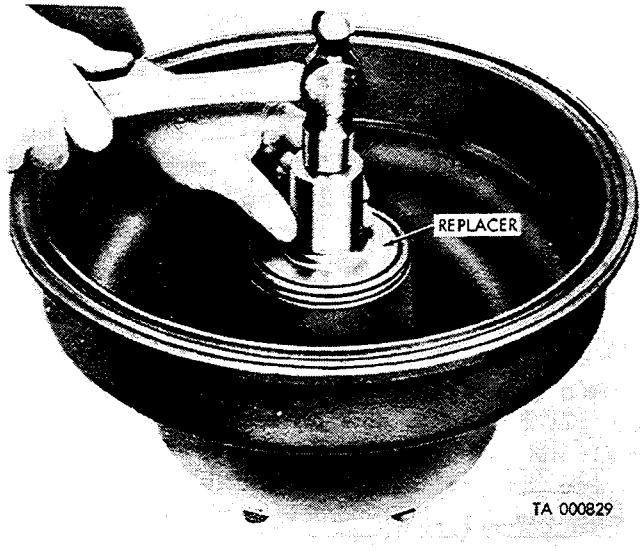


Figure 2-163. Installing inner bearing oil seal.

NOTE

Do not drive the seal into the hub beyond the snapring groove to prevent interference between the seal and the bearing cone.

Remove the replacer and install the snapring (N), making certain that the ring seats properly.

f. Install Hub and Drum. Refer to paragraph 2-117 *b*.

g. Install the Wheel and Tire. Refer to paragraph 2-142 *b*.

h. Adjust Wheel Bearings. Refer to paragraph 2-141.

i. Install Front Wheel Drive Flange or Rear Outer Bearing Oil Seal and Axle Drive Shaft. Refer to paragraph 2-117 *b*, 2-141 *b*, and 2-121 *b*.

2-144. Tire and Tube

a. Removal.

(1) Remove the wheel and tire (para 2-142 *a*).

(2) Remove the valve cap, unscrew and remove the valve core from the valve stem, and deflate the tube.

(3) Lay the wheel on the floor with the outer side up. Insert a pry bar between the tire and one of the bead clips, and press downward until tension on the clip is relieved. Tap the clip with a hammer to disengage it from the ring.

(4) Repeat the operation in (3) above for each of the other five clips. Drive a bar between clips and rim to break the tire bead from the rim.

(5) Insert a pry bar between the ends of the ring and pry the end nearest the first cutout in the ring (fig. 2-164) enough to permit a second pry bar to be inserted in the cutout. Work the ring from the wheel flange, prying at the cutouts in the ring, and remove the ring. Remove the six bead clips from the outer side of the tire.

(6) Mark the location of the valve stem on the tire if the original mark has been obliterated and remove the tire, tube, and six inner bead clips. Remove the tube from the tire.

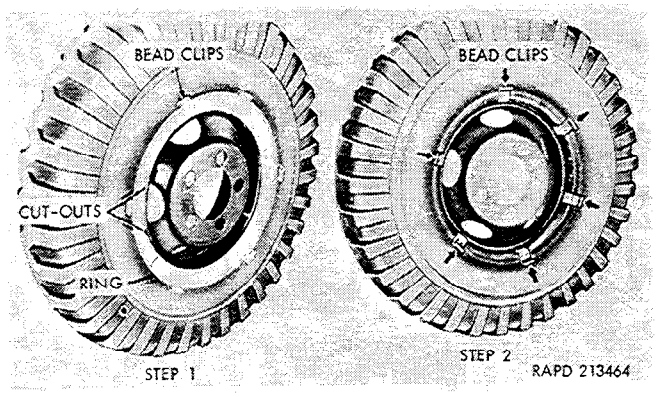


Figure 2-164. Removing tire.

b. Inspection.

(1) Clean the wheel and inspect for distortion, damage, and corrosion. If the wheel is corroded, remove the corrosion and paint the flange surface. Replace a damaged wheel.

(2) Inspect the inside of the tire for penetrating objects and broken cords. Inspect the tread for cuts, abrasions, cupping, and wear. Remove nails or other sharp objects from the tire. Replace the tire if it is worn or damaged.

(3) Inspect the tube for cuts or damaged valve stem. Repair the tube as instructed in TM 9-2610-200-20, or replace with a new one as required.

(4) Inspect the bead clips for breaks or distortion. Replace damaged clips.

(5) Inspect the side ring for cracks and distortion. Replace a damaged ring.

c. Installation.

(1) Install a new valve core in the tube valve stem and inflate the tube slightly. Install the tube in the tire with the valve stem in alinement with the marking on the tire (*a* (6) above).

(2) Place six bead clips on each bead of the tire, spacing them evenly and alternating the clips on one bead with those on the other.

(3) Position the tire on the wheel with the valve stem extending through the hole in the wheel toward the outside of the wheel.

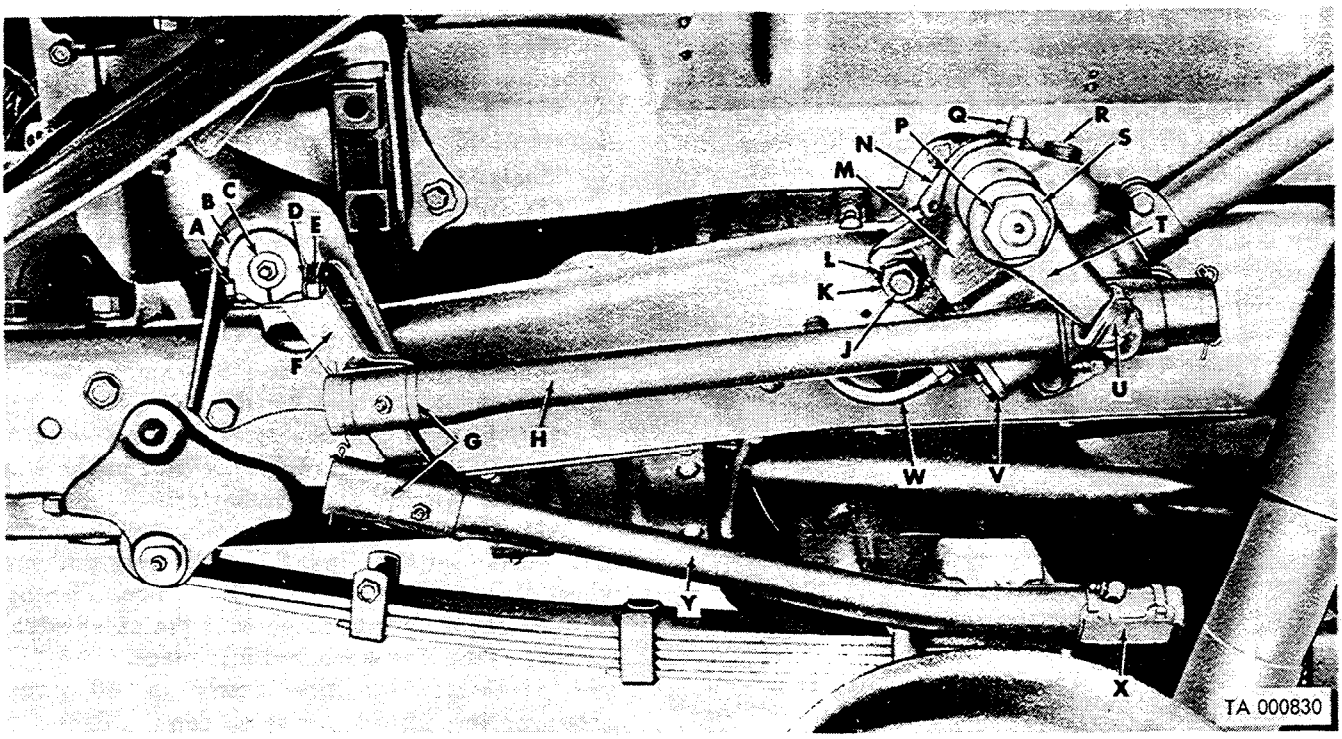
(4) Install the ring on the wheel with the split between two of the clips. Force the ring under the wheel flange, working around the tire. The bead clips should snap into place over the outer edge of the ring as the ring is worked into place.

(5) Inflate the tire slowly to 40 pounds pressure, and install the valve cap.

(6) Install the wheel and tire (para 2-142 *b*).

2-145. General

The steering gear (fig. 2-165) is of the worm and sector type. The worm operates in tapered roller bearings and the sector or pitman arm shaft is mounted in bronze bushing type bearings. A vent in the steering gear housing prevents build-up of excess pressure in the housing. The two drag links act in conjunction with the idler arm to provide correct steering geometry. Organizational maintenance operations include alinement and adjustment of the steering gear and replacement of the drag links, idler arm, dust covers, steering gear, pitman arm, steering wheel, tie rod, and tie rod ends. Replacement of the tie rod and tie rod ends is described in paragraph 2-115.



A Clamp bolt
B Idler arm bracket
C Idler arm shaft
D Lockwasher
E Nut
F Idler arm
G Outer dust cover
H Idler arm-to-steering gear drag link (upper).
J Steering gear bolt
K Nut
L Lockwasher
M Steering gear housing
N Pitman arm shaft adjusting screw
P Pitman arm nut
Q Vent
R Filler plug
S Lockwasher
T Pitman arm
U Dust cover
V Lower cover
W Horn button cable
X Dust cover retainer
Y Idler arm-to-steering arm drag link (lower).

Figure 2-165. Steering gear and controls.

2-146. Steering Gear Alinement and Adjustments

a. General. Correct alinement of the steering gear must be established to prevent binding of the parts when the vehicle is turned to left or right. Adjustments include adjustment of the worm bearings and the control of backlash.

b. Check and Correct Alinement.

(1) Disconnect the upper drag link from the pitman arm (para 2-149) (T, fig. 2-165).

(2) Turn the steering wheel back and forth, and note whether it turns freely throughout the full range. If the wheel does not turn freely, check the position of the steering gear at the instrument panel ((3) and (4) below).

(3) Remove the four lockwasher screws that secure the steering column cut-out access cover to the instrument panel, and remove the cover (fig. 2-55).

(4) Loosen the nuts on the two bolts that

secure the steering post clamp and bracket to the instrument panel (fig. 2-55), and note whether the steering gear has a tendency to move to one side when the bolts are loosened. If it does, loosen the nuts on the three steering gear bolts (J, fig. 2-165), and allow the steering gear to assume correct alinement. Tighten the nuts on the steering gear bolts to 140-150 foot-pounds torque.

(5) Position the bracket and clamp on the instrument panel (fig. 2-55), making sure that the rubber collar is correctly positioned on the steering gear, and tighten the nuts on the two bolts securely. The bolt holes in the instrument panel are elongated to provide for this adjustment. Install the access cover on the instrument panel with the four lockwasher screws.

(6) When the adjustment has been completed, attach the upper drag link to the pitman arm (para 2-149) (T, fig. 2-165).

c. Adjust Worm Bearings.

(1) Remove the upper idler arm-to-steering gear drag link (para 2-149) (H, fig. 2-165).

(2) Remove the four screws that secure the lower cover to the steering gear housing and pull the cover down to expose the shims.

NOTE

On vehicles of early production, two covers are used with a gasket between. Be careful not to damage the gasket when making the adjustment.

(3) Remove one thin shim from between the cover and the housing.

(4) Install the cover (or covers) on the housing, and install the four special cover screws. Tighten the screws.

(5) Turn the steering wheel to check the adjustment. There should be a slight resistance as the wheel is turned in either direction.

(6) Repeat (2) and (3) above, if necessary, until correct adjustment is obtained.

(7) Install the upper idler arm-to-steering gear drag link (para 2-149) (H, fig. 2-165).

(8) Lubricate the steering gear. Refer to lubrication order LO 9-2320-212-12.

d. Adjust Backlash.

(1) Remove the upper idler arm-to-steering gear drag link (para 2-149) (H, fig. 2-165).

(2) Turn the steering wheel to the left or right as far as possible. Turn the wheel in the opposite direction as far as it will go, and count the number of turns. Then turn the wheel back one-half the total turns.

NOTE

The steering wheel must be properly positioned before adjustment of backlash, since a high spot is provided on the worm for the midposition.

(3) Working from the engine compartment, remove the nut and lock plate from the pitman arm shaft adjusting screw.

(4) Using a screwdriver, turn the adjusting screw in to decrease backlash or out to increase backlash. Adjust the screw to provide a slight drag as the steering wheel is turned through the midposition.

(5) Install the lock plate on the adjusting screw, making certain that the plate is engaged with the button on the housing cover. Install the nut and tighten it. Check the backlash to make certain that the adjustment has not changed.

(6) Install the upper idler arm-to-steering gear drag link (para 2-149) (H, fig. 2-165).

2-147. Steering Wheel

a. Removal (fig. 2-166).

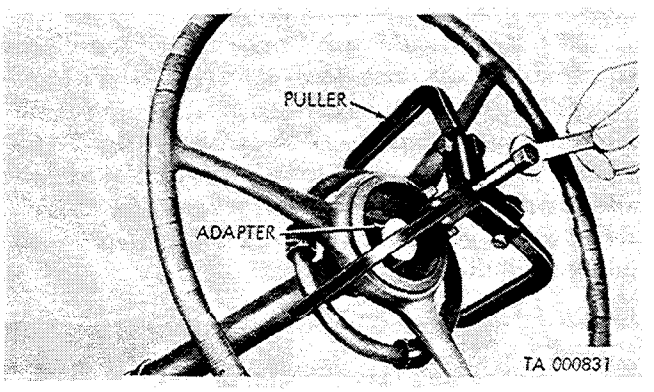


Figure 2-166. Removing steering wheel.

(1) Remove the horn button cable (para 2-54*b*).

(2) Remove the steering wheel nut and the horn button lower retaining plate.

(3) Install the adapter and puller on the steering wheel (fig. 2-166) with the three rubber pads on the ring bearing against the three wheel spokes, and the three puller jaws spaced midway between spokes.

(4) Tighten the puller screw in against the adapter. If the puller screw is difficult to turn, strike the end of the screw smartly with a medium hammer to dislodge the wheel from the steering shaft.

NOTE

The steering wheel is of molded rubber and may be distorted if excessive pressure is exerted on the puller before the wheel is dislodged.

(5) Remove the wheel, the wheel puller, and adapter.

b. Installation.

(1) With the front wheels pointing straight ahead, position the steering wheel on the steering shaft so that the spoke adjacent to the two square indentations points down. Force the wheel into position, and install the lower button retaining

plate and the wheel nut. Tighten the nut to 60-70 foot-pounds torque.

(2) Install the horn button cable and horn button (para 2-54 *d*).

2-148. Steering Idler Arm

NOTE

The key letters noted in the parentheses are in figure 2-168, except where otherwise indicated.

a. Removal.

(1) Open the clips of the two outer dust covers (D) at the idler arm (F, fig. 2-165). Remove the cotter pin (H) that secures the plug at the front end of each drag link, and unscrew the plugs (A) enough to permit the links to be pulled from the arm. Remove the inner and outer dust covers (D and E) and dust cover seals (F) from the idler arm balls.

(2) Remove the nut, lockwasher, and clamp bolt from the idler arm bracket (B, fig. 2-165).

(3) Remove the lubrication fitting from the idler arm shaft, and install the adapter (fig. 2-167) in the fitting opening. Install the puller on the adapter and remove the idler arm shaft (fig. 2-167). Remove the idler arm (F, fig. 2-165). Remove the puller and the adapter.

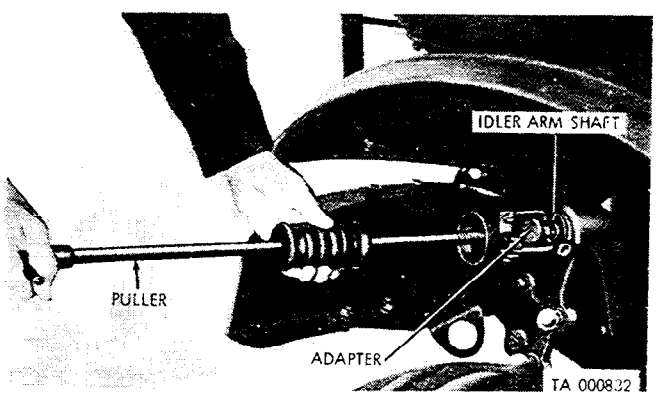


Figure 2-167. Removing idler arm shaft.

(4) Inspect the parts removed for wear or other visual damage. Replace parts as necessary.

b. Installation.

(1) Position the idler arm in the idler arm bracket, alining the shaft opening in the arm with those in the bracket. Apply a film of lubricant to the shaft and install the shaft, alining the clamp bolt groove with the bolt holes in the bracket.

(2) Install the clamp bolt, lockwasher, and nut. Tighten the nut.

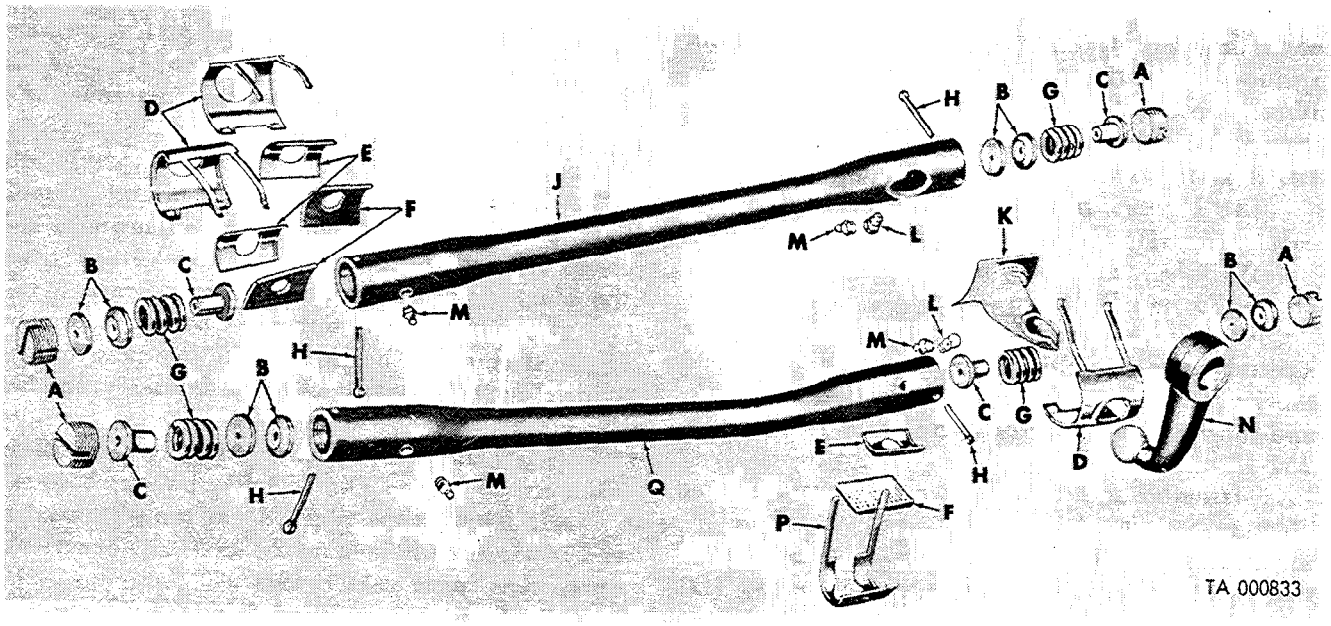
(3) Install a lubrication fitting in the idler arm shaft, and lubricate the shaft.

(4) Install an outer dust cover (D), inner dust cover (E), and dust cover seal (F) over each idler arm ball. Position the upper drag link over the upper ball with the ball between the two ball seats in the drag link. Tighten the plug using a drag link bit-and-socket wrench. Back the plug out one-half turn from the nearest cotter pin hole and install a cotter pin. Attach the lower drag link to the lower ball in the same manner.

2-149. Drag Link

NOTE

The key letters noted in parentheses are in figure 2-168, except where otherwise indicated.



A Plug
B Ball seat
C Bumper
D Outer dust cover
E Inner dust cover
F Dust cover seal
G Spring
H Cotter pin
J Steering gear to idler arm drag link
K Pitman arm dust cover
L Lubrication elbow
M Lubrication fitting
N Pitman arm
P Steering arm dust cover
Q Idler arm to steering arm drag link

Figure 2-168. Drag links and related parts—exploded view.

a. Remove and Disassemble Drag Link from Pitman Arm to Idler Arm.

(1) Remove the two lubrication fittings (M) and the lubrication elbows (L) from the drag link and open the outer dust cover at each end of the steering gear to idler arm drag link (J).

(2) Remove the cotter pin (H) that secures the plug (A) at each end of the steering gear to idler arm drag link (J) and loosen the plugs, using a drag link bit-and-socket wrench. Pull the drag link from the pitman arm ball and the idler arm ball.

(3) Remove the dust cover seals and related parts as necessary.

(4) Remove the plug (A) from each end of the steering gear to idler arm drag link (J), and remove the bumpers (C), springs (G), and ball seats (B).

b. Remove and Disassemble Drag Link from Idler Arm to Steering Arm. Procedure for removal and disassembly of the idler arm to steering arm drag link is the same as *a* above.

c. Inspection.

(1) Clean the parts in volatile mineral spirits or drycleaning solvent and dry with compressed air.

(2) Inspect the drag links (J and Q) for wear, cracks, distortion and damaged threads.

(3) Inspect the ball seats (B) and bumpers (C) for abrasions, corrosion, wear, and cracks.

(4) Inspect the plugs (A) for damaged threads.

(5) Inspect the balls on the idler arm, pitman arm, and steering arm for abrasions, wear, and cracks.

(6) Remove minor abrasions and corrosion with crocus cloth. Replace either drag link, the pitman arm, or idler arm if the parts are damaged. Report a damaged steering arm to direct support maintenance personnel.

d. Assemble and Install Drag Link from Idler Arm to Steering Arm.

(1) Apply a film of lubricant to the ball seats.

(2) Install an outer dust cover (D), inner dust cover (E), and dust cover seal (F), on the lower ball of the idler arm and the steering arm dust cover (P), dust cover seal (F), and inner dust cover (E) on the ball of the steering arm.

(3) Place a spring (G) over the smaller diameter of one of the bumpers (C), and install the parts in the steering arm end of the drag link (Q), with the spring toward the outside. Install a ball seat (B) with the cupped side out.

(4) Install a ball seat (B) in the idler arm end of the drag link (Q) with the cupped side out.

(5) Position the drag link on the idler arm ball and the steering arm ball, making certain that the cupped surfaces of the ball seats contact the balls.

(6) Install a ball seat (B) in the steering arm end of the drag link (Q) with the cupped side in and install the plug (A) in the end of the tube.

(7) Install a ball seat (B) in the idler arm end of the drag link (Q) with the cupped side in. Place a spring (G) over the smaller diameter of the bumper (C) and install the parts in the idler arm end of the drag link (Q) with the spring toward the ball seat. Install a plug (A) in the end of the tube.

(8) Tighten the plugs and install the two cotter pins (H) (para 2-148 *b*. (4)).

(9) Close the dust idler and steering arm covers (D and P).

(10) Install lubrication elbow (L) in the steering arm end of the drag link (Q) and lubrication fitting (M) in each end of the drag link, and lubricate the drag link. Refer to LO 9-2320-212-12.

c. Assemble and Install Drag Link from Pitman Arm to Steering Idler Arm.

(1) Insert the pitman arm dust cover (K) through the opening in the outer dust cover (D) from the concave side, and install the covers on the pitman arm ball.

(2) Place the outer dust cover (D), inner dust cover (E), and dust cover seal (F) over the upper ball of the idler arm.

(3) Install a bumper (C), spring (G), and ball seat (B) in the idler arm end of the drag link (J) *(d* (3) above).

(4) Install a ball seat (B) in the pitman arm end of the drag link (J), with the cupped side out.

(5) Position the drag link on the pitman arm ball and the idler arm ball.

(6) Install a ball seat (B), spring (G), and bumper (C) in the pitman arm end of the drag link (J), and install a plug (A) in the end of the tube *(d* (7) above).

(7) Install a ball seat (B) in the idler arm end of the drag link (J) with the cupped side in, and install a plug (A) in the end of the tube.

(8) Install the plugs (A) and cotter pins (H) (para 2-148 *b* (4)).

(9) Close the outer dust covers (D) at the idler arm end of the drag link and the pitman arm. Secure the pitman arm dust cover (K) with locking wire.

(10) Install the lubrication elbow (L) and fittings (M) (*d* (10) above), and lubricate the drag link. Refer to LO 9-2320-212-12.

2-150. Pitman Arm

NOTE

The key letters noted in parentheses are in figure 2-168, except where otherwise indicated.

a. Removal.

(1) Remove the nut and lockwasher that secure the pitman arm to the steering gear (fig. 2-165).

(2) Remove the pitman arm from the shaft, using a suitable puller.

(3) Open the outer dust cover (D) at the pitman arm, remove the cotter pin (H), loosen the plug (A), and remove the pitman arm. Remove the outer dust cover and pitman arm dust cover (K) from the arm.

b. Installation.

(1) Position the dust covers on the pitman arm (para 2-149 *e* (1)). Insert the pitman arm ball in the drag link between the two ball seats. Tighten the plug enough to hold the pitman arm.

(2) Install the pitman arm on the pitman arm shaft, alining the locating marks on the arm and shaft. Turn the steering wheel, if necessary, to aline the marks.

(3) Install a lockwasher and nut on the shaft. Tighten the nut to 140-150 foot-pounds torque.

(4) Tighten the plug (A) at the pitman arm end of the drag link (para 2-149 *b* (4)). Secure the dust cover (para 2-149 *e* (9)).

(5) Lubricate the drag link (LO 9-2320-212-12).

2-151. Steering Gear

(Fig. 2-165.)

a. Removal.

(1) Remove the steering wheel (para 2-147 *a).*

(2) Remove the four lockwasher screws that secure the steering column cutout access cover to the instrument panel and remove the cover (fig. 2-55).

(3) Remove the nuts and lockwashers from the two bolts that secure the steering post clamp and bracket to the instrument panel (fig. 2-55) and remove the clamp, bracket, and the rubber insulator. Apply a light coating of grease to the jacket and remove the jacket collar (at toe-board).

(4) Remove the pitman arm (para 2-150 *a).*

(5) Remove the nuts and lockwashers from the three steering gear bolts. Remove the bolts and plain washers from the inner side of the frame and remove the steering gear from the underside of the fender.

b. Installation.

(1) Insert the steering gear up through the opening in the cowl panel from underneath the left front fender. Position the steering gear housing on the frame left side rail, alining the bolt holes in the housing with those on the frame. Install plain washer on each of the three steering gear bolts and install the bolts from the frame side. Install a lockwasher and nut on each steering gear bolt (J, fig. 2-165), but do not tighten.

(2) Install the jacket collar over the steering column jacket and position the collar at the toeboard. Install the rubber insulator over the jacket. Position the clamp and clamp bracket on the instrument panel so there is no binding of the steering gear at the clamp (fig. 2-55). Install a lock-

washer (fig. 2-58) and nut on each clamp bracket bolt, but do not tighten the nuts.

(3) Tighten the nuts on the three steering gear bolts to 140-150 foot-pounds torque. Tighten the nuts on the clamp bracket bolts.

(4) Position the access cover on the instrument panel and install the four lockwasher screws (fig. 2-55).

(5) Install the steering wheel (para 2-147 *b*).

(6) Install the pitman arm (para 2-150 *b*).

(7) Check the lubricant level in the steering gear housing and replenish as warranted (LO 9-2320-212-12).

XXVII. WINCH AND WINCH DRIVE SHAFT

2-152. General

The winch (fig. 2-169), on vehicles so equipped, is mounted at the front of the vehicle and is supported by brackets attached to the frame side rails and the front bumpers. The drive shaft has a universal joint at each end, with a shearpin in the front universal joint which prevents damage to the driving mechanism in the event the winch is overloaded. A safety brake is provided to hold a load in any desired position or in the event the shearpin breaks. Organizational maintenance includes adjustment of the safety brake, replacement of the cable, the drive shaft universal joints and shearpin, and the winch.

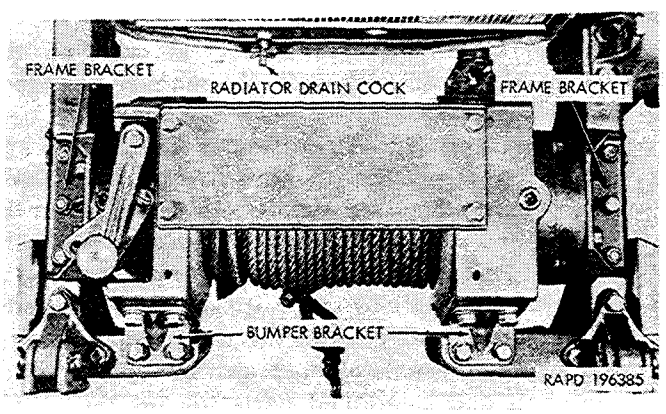


Figure 2-169. Winch—top view.

2-153. Safety Brake Adjustment

a. Disconnect Drive Shaft.

(1) If the drive shaft is equipped with a collar, remove the locking wire from the collar setscrew at the rear universal joint, loosen the setscrew, and slide the collar forward. Later production vehicles are not equipped with a collar, and none is required.

(2) Remove the locking wire (fig. 2-170) from the drive shaft shearpin (fig. 2-170), and remove the shearpin.

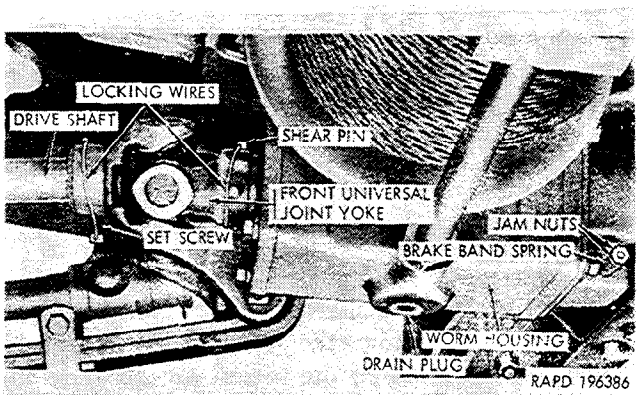


Figure 2-170. Winch—bottom view.

(3) Slide the front universal joint yoke (fig. 2-170) toward the rear, far enough to clear the wormshaft.

b. Adjust Safety Brake.

(1) Remove the outer jamnut (fig. 2-170) from the brake band end.

(2) Insert a long punch through the shearpin hole in the wormshaft. Oscillate the shaft with the punch, and at the same time tighten the inner jamnut on the brake band end until a noticeable drag is felt when the wormshaft is rotated in one direction.

(3) Hold the inner jamnut, and install the outer jamnut. Tighten the outer nut to hold the adjustment.

c. Connect Drive Shaft.

(1) Remove the punch from the shearpin hole in the wormshaft and position the universal joint front yoke on the wormshaft, alining the shearpin holes. Install the shearpin and secure with locking wire (fig. 2-170).

(2) If the drive shaft is equipped with a collar, position the collar to provide ⅜-inch clearance between the collar and the front end of the drive shaft rear universal joint yoke, tighten the collar setscrew, and secure with locking wire.

2-154. Drive Shaft Shearpin

a. General. Since breakage of the shearpin usually occurs as a result of overloading the winch, it is important that the winch load be lessened before attempting to move or support it after replacing the shearpin.

CAUTION

Support the load or make certain that the safety brake is properly adjusted (para 2-153 *b*) to hold the winch load while replacing the shearpin.

b. Replacement.

(1) If the pieces of the broken shearpin cannot be removed cleanly from the universal joint yoke and the wormshaft, disconnect the yoke (para 2-153 *a*), and remove the pieces.

(2) Position the universal joint yoke on the winch wormshaft, and connect the drive shaft (para 2-153 *c*).

2-155. Drive Shaft and Universal Joints

a. Removal.

(1) If the drive shaft (fig. 2-171) is equipped with a collar, remove the locking wire from the collar setscrew, loosen the setscrew, and slide the collar forward.

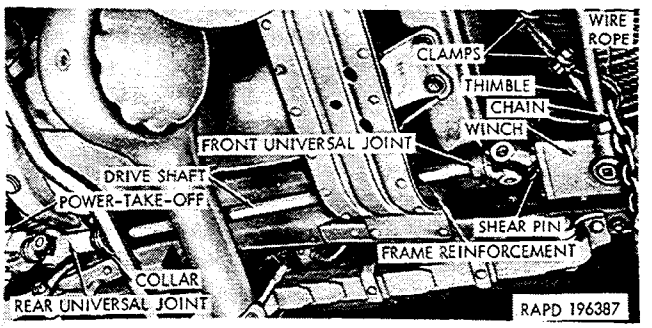


Figure 2-171. Winch drive shaft and universal joints.

(2) Remove the locking wire from the shearpin (fig. 2-170), and remove the shearpin. Push the shaft and assembled parts to the rear, and remove the front universal joint yoke (fig. 2-170) from the wormshaft.

(3) Remove the 10 bolts and lockwashers that secure the winch brackets to the frame side rails and front bumpers, and raise the left side of the winch sufficiently to permit removal of the drive shaft.

(4) Pull the shaft forward to disengage the splined end of the shaft from the front yoke of the rear universal joint, and remove the shaft. Remove the collar (if so equipped) as the shaft is removed.

(5) Remove the locking wire from the setscrew in the rear universal joint yoke, loosen the setscrew, and remove the universal joint from the power-takeoff. Remove the woodruff key from the power-takeoff shaft. Remove the front universal joint from the drive shaft in the same manner.

b. Inspection.

(1) Clean all parts.

(2) Inspect the drive shaft for distortion, cracks, and damaged splines.

(3) Inspect both universal joints for wear, binding, and damaged splines (front yoke of rear joint).

NOTE

The front yoke should slide freely on the shaft to insure the safety feature of the shearpin.

(4) Inspect the power-takeoff drive shaft and the switch wormshaft for corrosion damage and burs. Remove minor scratches and burs with crocus cloth.

(5) Inspect the collar and all setscrews for cracks and damaged threads.

(6) Replace parts that are unfit for further service.

c. Installation.

(1) Install a No. 817 or 127 woodruff key in the keyway at the front end of the drive shaft. Install the rear yoke of the front universal joint on the shaft, alining the keyway in the yoke with the key. Install the setscrew, tighten, and secure with locking wire (fig. 2-170).

(2) Install the rear universal joint on the power-takeoff drive shaft in the manner described in *c* (1) above.

(3) Apply a light coating of automotive and artillery grease to the splines of the drive shaft. With the winch raised as in *a* (3) above, insert the splined end of the shaft through the opening in the frame reinforcement from the front. Install the collar on the shaft (if so equipped), and insert the shaft in the front yoke of the rear universal joint, alining the journals of both universal joints. Push the shaft and assembled parts toward the rear.

(4) Lower the winch into position, and aline the front universal joint front yoke with the wormshaft. Install the yoke on the wormshaft, alining the shearpin holes. Install the shearpin and secure it with locking wire.

(5) Install six lockwashers and bolts for the winch frame brackets and four lockwashers and bolts for the bumper brackets. Tighten the bolts evenly.

(6) If the drive shaft is equipped with a collar, position the collar to provide 5/8-inch clearance between the collar and the front end of the universal joint yoke; tighten the collar setscrew, and secure it with locking wire.

2-156. Winch Cable

a. Removal. Place the winch clutch shifter

handle in the DISENGAGED position (fig. 2-172) and unwind all the cable from the drum. Remove the setscrew that secures the cable to the drum, and remove the cable.

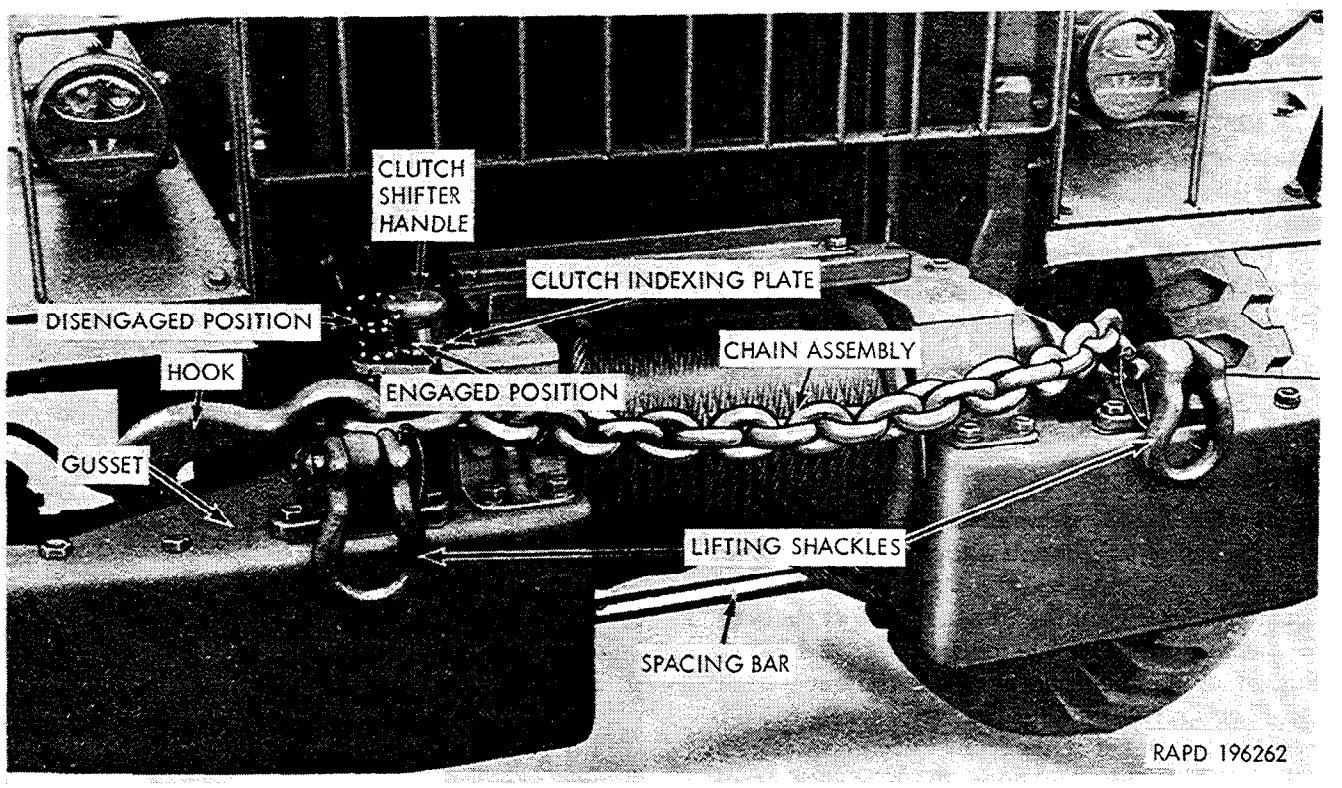


Figure 2-172. Winch installed.

b. Inspection. Inspect the wire rope for broken strands and rust or corrosion. Inspect the chain for damaged links or hook. Inspect the thimble and two clamps for wear or damage. Replace parts that are unfit for further service.

c. Installation.

(1) Install the thimble on the chain, thread the wire through the chain link, and fit it on the thimble. Secure the rope with the two clamps and tighten the clamp nuts.

(2) Clean the winch drum and apply a film of engine oil to the drum surface. Install the rope on the drum by passing it under the winch and around the drum at the rear so the cable will wind correctly. Attach the end of the wire rope to the drum with the setscrew. Wind the rope under power (para 2-156 *d*); apply engine oil to the rope as it winds on the drum.

d. Securing Winch.

(1) Start the engine and run at idle speed or slightly faster until normal operating temperature is reached.

(2) Place the winch clutch shifter handle in the engaged position.

(3) Apply the handbrake lever (S, fig. 2-91).

(4) Release the clutch pedal and depress the accelerator pedal.

(5) Operate the engine at an even speed to wind the cable.

(6) To stop the cable, depress the clutch pedal and release the accelerator pedal. The winch safety brake will hold the load.

(7) Place the power-takeoff shift lever in the wind (forward) position. If all the cable has been unreeled from the drum, guide the cable as it winds to keep the first layer of coils as close together as possible, thus preventing the next layer from pressing in between the coils of the preceding layer. After winding the cable on the drum, route the winch chain assembly under and over the left frame member, extend it across the front of the winch, and hook it over the right gusset (fig. 2-172). After the chain assembly has been secured, place the clutch shifter handle in the engaged position to prevent free spooling of drum. Clean and lubricate the cable and drum as prescribed in the lubrication order (LO 9-2320-212-12).

2-157. Winch

a. Removal.

(1) Disconnect the winch drive shaft (para 2-153 *a*).

(2) Remove the four bolts and lockwashers that secure the winch to the bumper brackets (fig. 2-169) and to the front bumpers.

(3) Remove the six bolts and lockwashers that secure the winch to the frame brackets and to the frame side rails, and remove the winch.

(4) Remove the two bolts and lockwashers that secure each bumper bracket, and remove the brackets. Remove the four nuts and lockwashers that secure each frame bracket and remove the brackets.

b. Installation.

(1) Install the two frame brackets on the studs in the winch. Install the four lockwashers and 9/16-18NF nuts for each bracket. Tighten the nuts.

(2) Install the two bumper brackets on the front of the winch and install two lockwashers and bolts for each bracket. Tighten the bolts.

(3) Position the winch on the frame side rails with the bolt holes in the frame brackets alined with those in the frame. Install three lockwashers and bolts for each bracket. Install two lockwashers and bolts for each bumper bracket. Tighten all bolts evenly.

(4) Connect the winch drive shaft front universal joint and install the shearpin (para 2-153 *c*).

(5) Position the collar (if so equipped) (para 2-155 *c* (6)).

(6) Adjust the winch safety brake (para 2-153-*b*).

Section XXVIII. PINTLE, LIFTING SHACKLES, AND SPARE WHEEL CARRIER

2-158. General

A pintle (fig. 2-173) is mounted on the frame rear crossmember of all models except the ambulance truck M43. All vehicles are equipped with four lifting shackles, two at the front and two at the rear. The hinged type wheel carrier (fig. 2-174) is mounted at the left side of the ambulance truck M43. The spare wheel for the cargo truck M37 is carried on a bracket at the front body panel (fig. 2-175), and for the telephone maintenance truck M201 it is stowed in a compartment in the body (fig. 2-176).

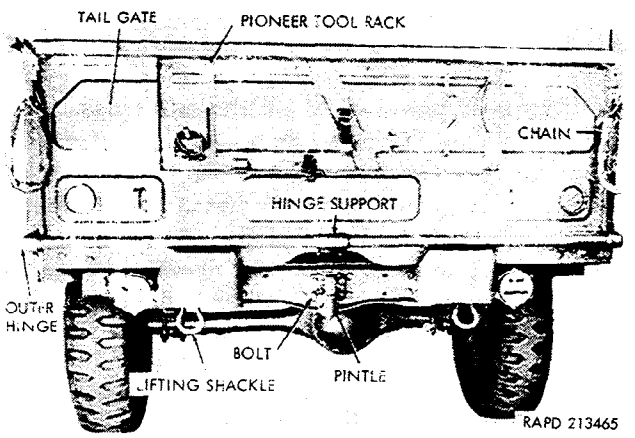


Figure 2-173. Tailgate, pintle, and lifting shackles.

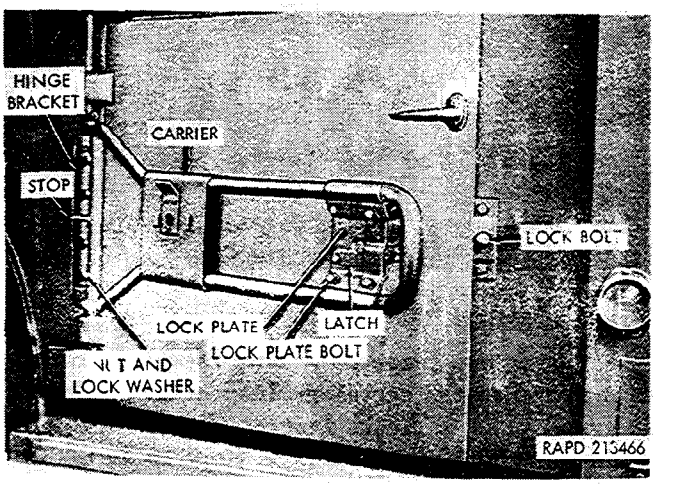


Figure 2-174. Spare wheel carrier (ambulance truck M43).

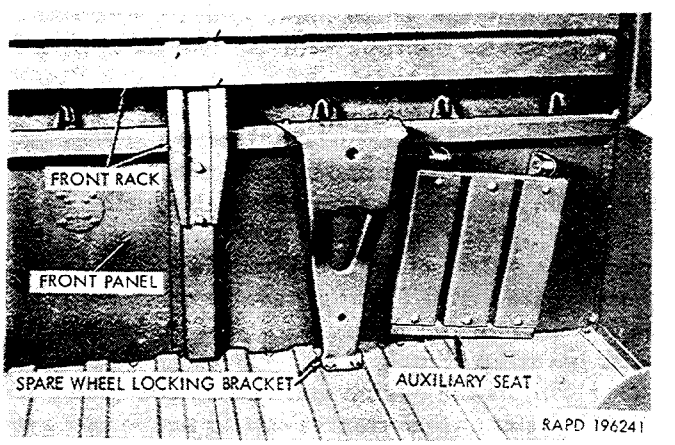


Figure 2-175. Front body panel and related parts (cargo truck M37).

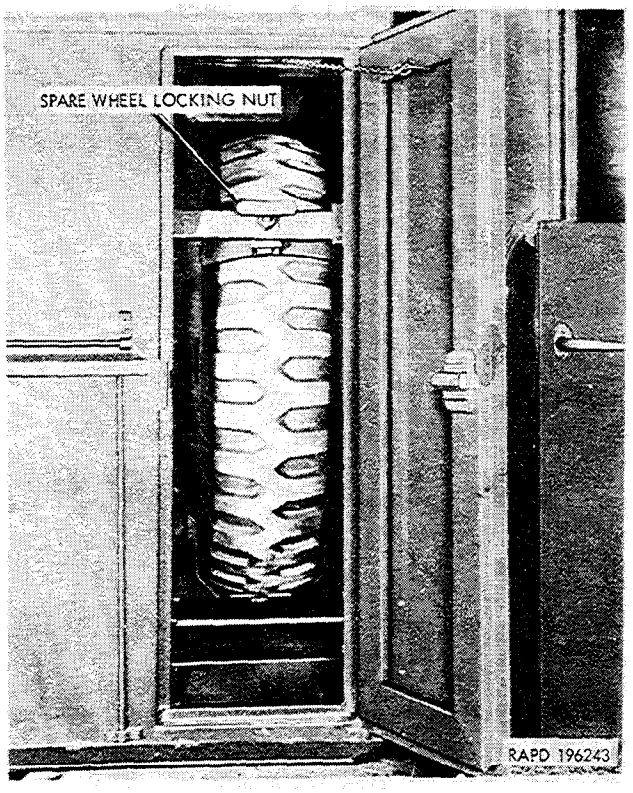


Figure 2-176. Spare wheel stowage compartment (telephone maintenance truck M201).

2-159. Responsibility

Organizational maintenance operations include replacement of the pintle, lifting shackles, and the spare wheel carrier (ambulance truck M43 only).

2-160. Pintle

a. Removal.

(1) Remove the cotter pin, slotted nut, and plain washer from the front end of the pintle adapter, and remove the pintle and adapter.

(2) Remove the four nuts, lockwashers, and bolts (fig. 2-173) that secure the pintle to the adapter, and remove the adapter.

(3) Inspect the lubrication fitting in the adapter flange. If the fitting is damaged, remove it.

b. Installation.

(1) If the lubrication fitting was removed from the adapter flange (*a* (3) above), install a male lubrication fitting.

(2) Position the pintle adapter on the pintle, alining the four bolt holes. Install four adapter bolts (from the pintle side), and install a lockwasher and nut on each bolt. Tighten the nuts evenly.

(3) Install the adapter through the frame crossmember and the adapter flange. Install the adapter washer and slotted nut on the pintle. Tighten the nut to permit free rotation of the adapter in the flange without end play, and install the cotter pin.

(4) Lubricate the pintle (LO 9-2320-212-12).

2-161. Lifting Shackle

a. Removal. All lifting shackles are removed and installed in the same manner. Remove the cotter pin and shackle pin that attach the shackle to the shackle bracket, and remove the shackle.

b. Installation. Position the shackle in the shackle bracket. Install the shackle pin and cotter pin.

2-162. Spare Wheel Carrier (Ambulance Truck M43)

a. Remove Spare Wheel Carrier.

(1) Remove the spare wheel locking nut, and remove the spare wheel.

(2) Remove the four nuts and lockwashers (fig. 2-174) that secure the carrier hinge bracket on the bolts through the cowl left pillar.

(3) Disengage the lock from the lock bolt, and remove the spare wheel carrier.

b. Remove Lock Bolt and Related Parts.

(1) Remove the nut from the inner end of the lock bolt, disengage the lock bolt spring from the handle and the bracket, and remove the handle and spring (fig. 2-177).

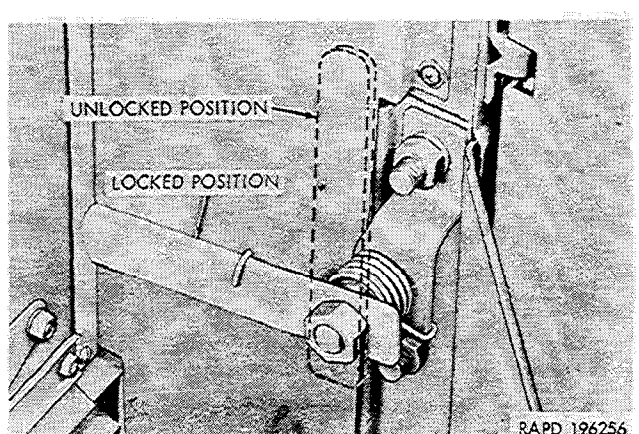


Figure 2-177. Hinged type spare wheel carrier inside lock lever (ambulance truck M43).

(2) Remove the other nut and plain washer from the lock bolt and remove the lock bolt from outside the driver's compartment. Remove the spacer washer from the bolt.

c. Install Lock Bolt and Related Parts.

(1) Install the spacer washer on the lock bolt and install the lock bolt from outside with the slot down.

(2) Install a lock bolt nut on the bolt to provide slight end play for the bolt (fig. 2-177).

(3) Position the spring over the lock bolt and engage the short end of the spring in the front of the inner bracket. Install the handle on the bolt

(pointing toward the rear); wind the spring sufficiently to engage the long end of the spring over the handle (fig. 2-177).

(4) Install the other lock bolt nut on the end of the lock bolt, and tighten against the handle (fig. 2-177).

d. Install Spare Wheel Carrier.

(1) Position the spare wheel carrier hinge bracket on the four bolts in the cowl left pillar and engage the carrier lock with the lock bolt.

(2) Install a lockwasher and nut on each of the four bolts. Tighten the nuts.

(3) Operate the spare wheel carrier to check the alinement of the lock plate and lock bolt. If the hole in the lock plate does not aline with the lock bolts, loosen the four lock plate bolts (fig. 2-174); move the plate forward or back as required, and tighten bolts. (The bolt holes are elongated to provide for the adjustment.)

(4) Mount the spare wheel on the carrier and install the locking nut (fig. 2-178).

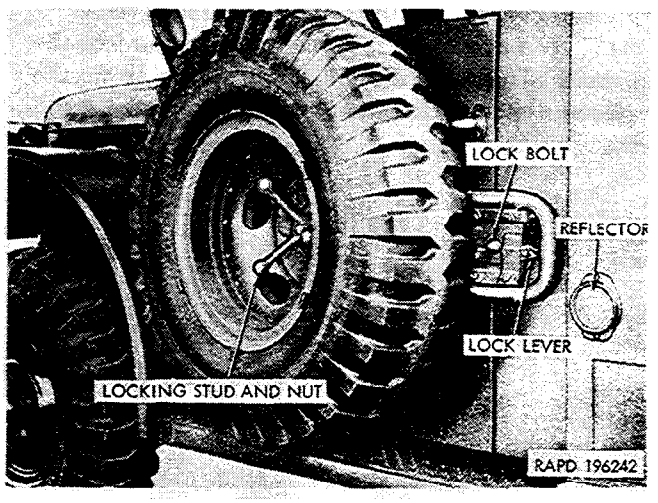


Figure 2-178. Hinged type spare wheel carrier (ambulance truck M43).

(5) Lubricate lock bolt regularly as specified in lubrication order, LO 9-2320-212-12, to minimize wear on the locking lever. In the event the lever is worn and does not hold the tire carrier securely, repair the lever by building up the wear surface with acetylene welding. Use a welding rod and grind or file excess weld. Clean, prime, and paint.

Section XXIX. SPRINGS AND SHOCK ABSORBERS

2-163. Description and Responsibility

a. Description.

(1) Semielliptical springs are provided at front and rear of all models. All springs are mounted in shackles at the rear end and in brackets at the front end.

(2) Front and rear shock absorbers are of the telescoping hydraulic type.

(3) Proper maintenance of the springs is very important, since the springs affect the steering geometry of the vehicle. Constant flexing of the springs and repeated shock under severe operating conditions may cause loosening of spring clips (U bolts) or breakage of center bolts or leaves, resulting in hard steering and excessive tire wear.

b. Responsibility. Organizational maintenance operations include tightening spring clip nuts (U bolt) replacement of springs, spring clips, U bolt shackles, spring bolts, shock absorbers, shock absorber bearings, and bearing retainers. A visual inspection will indicate whether replacement of parts is necessary.

2-164. Front Springs and Related Parts

a. Removal. Both front springs are removed and installed in the same manner.

(1) Place the vehicle on a level floor, apply the hand brake, and block the rear wheels.

(2) Remove the two nuts and lockwashers from each spring clip (J, fig. 2-144) U bolt.

(3) Place a jack under the frame side rail just back of the front spring shackle, and raise the frame enough to relieve the load on the spring.

(4) Remove the cotter pin and slotted nut from the spring bolt at the front bracket.

(5) Remove the lubrication fitting from the front spring bolt (fig. 2-179). Remove bolt with drift and hammer.

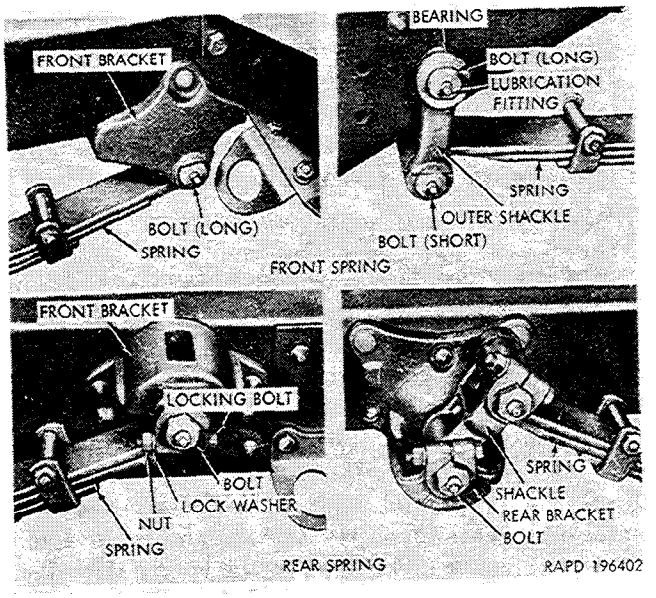


Figure 2-179. Spring bolts and shackles.

(6) Remove the bolt that secures the rear end of the spring to the shackles (fig. 2-179 (4) and (5) above).

(7) Support the spring clip (U bolt) plate with blocking from the underside (left side only) and remove the two spring clips (U bolts) and the axle bumper. Remove the spring.

(8) If the spring shackles or the shackle bolt require replacement, remove the shackle bolt ((4) and (5) above) and remove the shackles.

b. Inspection.

(1) Clean the parts in drycleaning solvent or volatile mineral spirits and dry with compressed air.

(2) Inspect the spring for worn and damaged bearings, weak and broken spring leaves, and loose and broken center bolt. Replace the spring, as necessary.

(3) Inspect the spring bolt and shackle bolts for wear, damaged threads, and corrosion.

(4) Inspect the inner and outer shackles for wear, cracks, or distortion.

(5) Inspect the rear bracket bearing in the frame for wear or damage. Report an excessively worn or damaged bearing to direct support maintenance personnel.

(6) Inspect the spring clips (U bolts) for cracks, distortion, or damaged threads.

(7) Inspect the front axle bumper for cracks or deterioration.

(8) Replace all parts that are unfit for further service.

c. Installation.

NOTE

When installing front springs, be sure to install the correct spring for the vehicle. Refer to tabulated data in paragraph 1-8.

(1) Apply a film of lubricant to all spring bolts to facilitate installation.

(2) If the shackles were removed (*a* (8) above, position the outer shackle (fig. 2-179) over the bearing in the frame side rail with the offset down and toward the frame. Install a long shackle bolt through the shackle and the frame, with the flat side of the bolt head aline with the locking boss on the shackle. Install the inner shackle on the shackle bolt with the offset down and facing the outer shackle. Install a triple slotted nut on the bolt and tighten fingertight.

(3) Position the spring on the axle with the center bolt head in the recess in the axle housing and the front end in the front bracket (fig. 2-179). Aline the bolt opening in the spring and bracket and install a long spring bolt, with the flat side of the bolt head alined with the locking boss on the bracket. Install a triple slotted nut on the bolt and tighten fingertight.

(4) Aline the rear end of the spring between the inner and outer shackles, and install a short bolt with the flat side of the bolt head alined with the locking boss on the outer shackle. Install a triple-slotted nut on the bolt.

(5) Tighten the nuts on the spring bolt in the front bracket to 40-50 foot-pounds torque. Install a cotter pin.

(6) Tighten the nuts on the shackle bolts sufficiently to overcome end play when the spring is checked with a pry bar.

NOTE

Do not tighten the shackle bolt nuts excessively, since it will cause spring breakage.

(7) Position the front axle bumper on the spring over the center bolt nut with the offset side of the bumper toward the inside, and install the two spring clips (J, fig. 2-144) U bolts.

NOTE

Clips for the right front spring are longer than those for the left front spring.

(8) Lower the frame and remove the jack.

(9) Install two lockwashers and two clip nuts

on each clip. Remove the blocking from the clip plate (left spring only). Tighten each spring clip nut to 130-140 foot-pounds torque.

(10) Install a lubrication fitting in each bolt and lubricate the bolts (LO 9-2320-212-12).

(11) Remove the blocking from the rear wheels.

2-165. Rear Springs and Related Parts

a. General. Two types of rear spring bolts have been used. On early production vehicles, the spring bolts are plain, whereas a groove is provided for the locking bolt on late production vehicles.

b. Removal. Both rear springs are removed and installed in the same manner.

(1) Place the vehicle on a level floor, apply the hand brake, and block the front wheels.

(2) Remove the two nuts and lockwashers from each of the two spring clips (J, fig. 2-144) U bolts.

(3) Place a jack under the frame side rail just ahead of the front bracket of the spring to be removed and raise the frame enough to relieve the load on the spring.

(4) Remove the nuts, lockwashers, and locking bolts that secure the spring bolts in the front bracket and the shackle (fig. 2-179).

(5) Remove the lubrication fittings from the two spring bolts. Unscrew and remove the two bolts.

(6) Support the spring clip plate (fig. 2-180) from the underside and remove the two spring clips and the spring clip seat. Remove the spring.

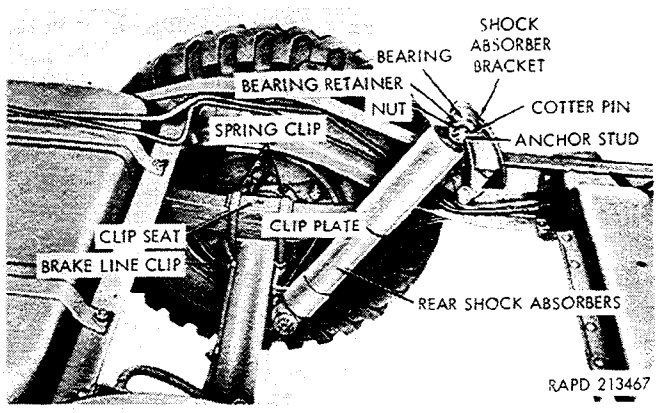


Figure 2-180. Rear spring and shock absorber.

(7) If the shackle (fig. 2-179) requires replacement, remove the bolt ((4) and (5) above) and remove the shackle.

c. Inspection.

(1) Inspect the spring for worn and damaged bearings, weak and broken spring leaves, and loose and broken center bolt. Replace the spring, if necessary.

(2) Inspect all bolts for wear, damaged threads, and corrosion.

(3) Inspect the shackle for worn and damaged bearings, damaged threads, cracks, and distortion.

(4) Inspect the spring clips (U bolts) for cracks, distortion, and damaged threads.

(5) Replace all parts that are unfit for further service.

d. Installation.

NOTE

When installing rear springs, be sure to install the correct spring for the vehicle. Refer to data (para 1-8).

(1) If the shackle was removed (*a* (7) above), position the shackle in the rear bracket (fig. 2-179). Install the spring bolt through the bracket and shackle, and tighten the bolt sufficiently to permit installation of the locking bolt. Install a locking bolt in the bracket, and a lockwasher and nut on the bolt.

NOTE

On early production vehicles, tighten the spring bolts in the frame bracket to 140-160 foot-pounds torque.

(2) Position the spring on the axle with the center bolt head in the recess in the axle housing. Install the clip seat (fig. 2-180) over the spring and install the two spring clips (U bolt) over the spring clip (U bolt) seat, and through the holes in the clip plate, being careful not to damage the brake line.

(3) Aline the front end of the spring with the front bracket (fig. 2-179) and install the bolt. Tighten the bolt and install the locking bolt ((1) above).

(4) Aline the rear end of the spring with the spring shackle and install the bolt and locking bolt ((1) above).

NOTE

On early production vehicles, check action of the shackle with a pry bar to make certain that the spring does not bind. Loosen the bolt slightly, if adjustment is too light.

(5) Tighten the nuts on the three locking bolts.

(6) Lower the frame and remove the jack.

(7) Install two lockwashers and two spring clip (U bolt) nuts on each spring clip (U bolt) (fig. 2-148). Remove the blocking from the spring clip (U bolt) plate. Tighten each spring clip (U bolt) nut to 130-140 foot-pounds torque.

(8) Install a lubrication fitting in each of the spring bolts, and lubricate the bolts (LO 9-2320-212-12).

(9) Remove the blocking from the front wheels.

2-166. Shock Absorber

a. General. All shock absorbers are serviced in the same manner. They are stamped FRONT or REAR to identify their positions.

b. Removal.

(1) Remove the cotter pin, slotted nut, and bearing retainer that attach each end of the shock absorber to the anchor stud (fig. 2-180).

(2) Remove the shock absorber and the four rubber bearings from the anchor studs.

(3) If either anchor stud requires replacement, remove the cotter pin and slotted nut that secure the stud to the shock absorber bracket or the spring clip plate, and remove the stud and inner bearing retainer.

c. Inspection.

(1) Inspect the shock absorber for evidence of leaks, broken and damaged welds at the eyes, and distortion.

(2) To check the operation of the shock absorber, clamp the lower end in a vise with the absorber in an upright position, operate the shock absorber several full strokes to expel air from the pressure cylinder, and observe the amount of resistance offered when the shock absorber is moved in either direction. If the shock absorber is operating properly, there will be noticeable resistance to any movement, without lost motion. Rotate the dust shield and observe whether it rotates freely without binding. Binding indicates distortion or damage of internal parts.

(3) Inspect the rubber bearings for wear, cracks, and deterioration. Inspect the bearing retainers for cracks and distortion.

(4) Inspect the anchor studs for wear, distortion, and damaged threads. Inspect the nuts for cracks and damaged threads.

(5) Replace all parts that are unfit for further service.

d. Installation. Be sure to install the correct shock absorber (*a* above).

(1) If the anchor studs and inner retainers were removed (*b* (3) above), install retainers and new studs in the shock absorber bracket and the spring clip plate. Install a triple slotted nut on the stud, tighten, and install a cotter pin for each stud.

(2) Place a bearing in each side of each eye of the shock absorber with the small diameter of each bearing toward the eye. Install the shock absorber (large end up) with the bearings on the anchor studs (fig. 2-180).

(3) Install a bearing retainer and a triple slotted nut on each stud. Tighten the nuts and install a cotter pin for each stud.

Section XXX. CAB AND BODIES

2-167. Description and Responsibility

a. Cab. A steel cab with removable top cover is used for the cargo truck M37, and telephone maintenance truck M201. Organizational maintenance operations include adjustment of the doors and door glass and replacement of windshield, toeboards, seat cushions and seat back cushions, top cover, rear view mirror, liquid container strap and chape, various weather seals, and cab holddown bolts and springs.

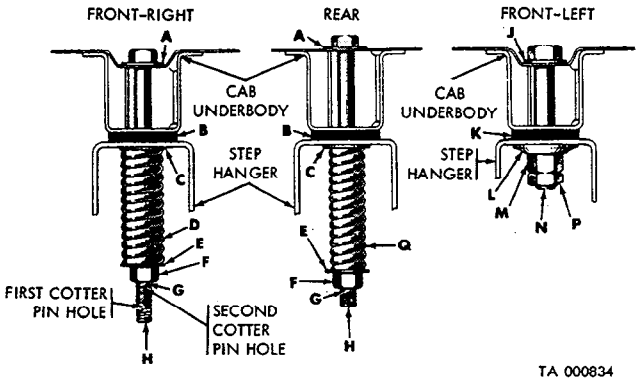
b. Body (Cargo Truck M37 and Telephone Maintenance Truck M201). Organizational maintenance operations include replacement of body holddown bolts, reflectors, and canvas items for both trucks; and replacement of roof bows, ridge pole, safety strap, pioneer tool rack, tailgate, and tool compartment door handles for the cargo truck M37.

c. Body (Ambulance Truck M43). Organizational maintenance operations for the ambulance truck M43 include adjustment of the driver's compartment door and door glass, and the patient's compartment rear door; and replacement of body holddown bolts, litter stowage, holddown, and safety straps, blackout curtains, ventilator blower motors and switches, rear door hinges, the personnel heater and related parts, various weatherseals in the driver's compartment, toeboards, and cushions for the driver's and attendant's seats and seat backs. Items in the driver's compartment which are identical to corresponding parts in the cab (*a* above) are serviced in the same manner.

2-168. Cab and Body Holddown Bolts and Related Parts

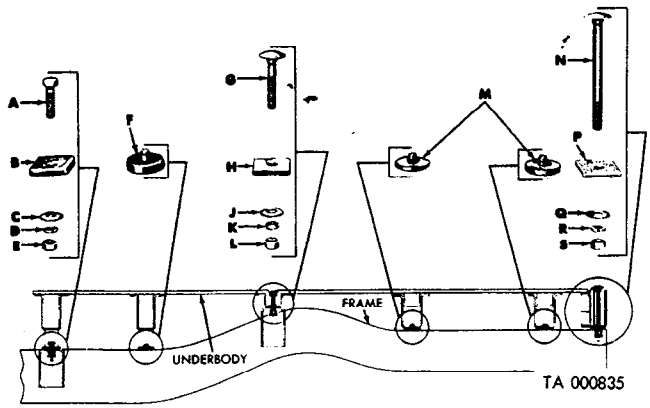
a. General. If any of the cab or body holddown bolts or related parts are lost or damaged, they must be replaced.

b. Replacement. Remove broken or damaged parts and install new parts as required. Figure 2-181 shows holddown bolts and related parts for the cab. Figure 2-182 shows body holddown bolts and related parts for the cargo truck M37. Figure 2-183 shows body holddown bolts and related parts for the ambulance truck M43 and figure 2-184 shows body holddown bolts and related parts for the telephone maintenance truck M201. Refer to the correct illustration for the parts to be replaced and the sequence of removal and installation. Tighten all parts.



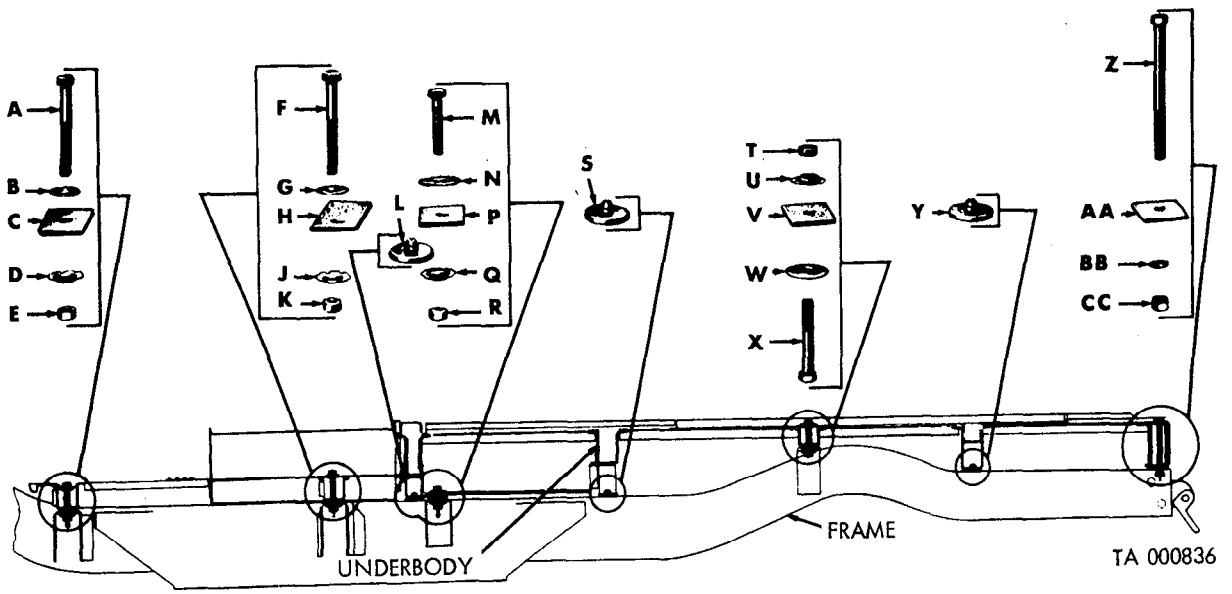
A Plain washer
B Pad
C Plain washer
D Compression spring
E Plain washer
F Nut
G Cotter pin
H Holddown bolt
J Plain washer
K Pad
L Lockwasher
M Nut
N Capscrew
P Nut
Q Compression spring

Figure 2-181. Cab holddown bolts and related parts.



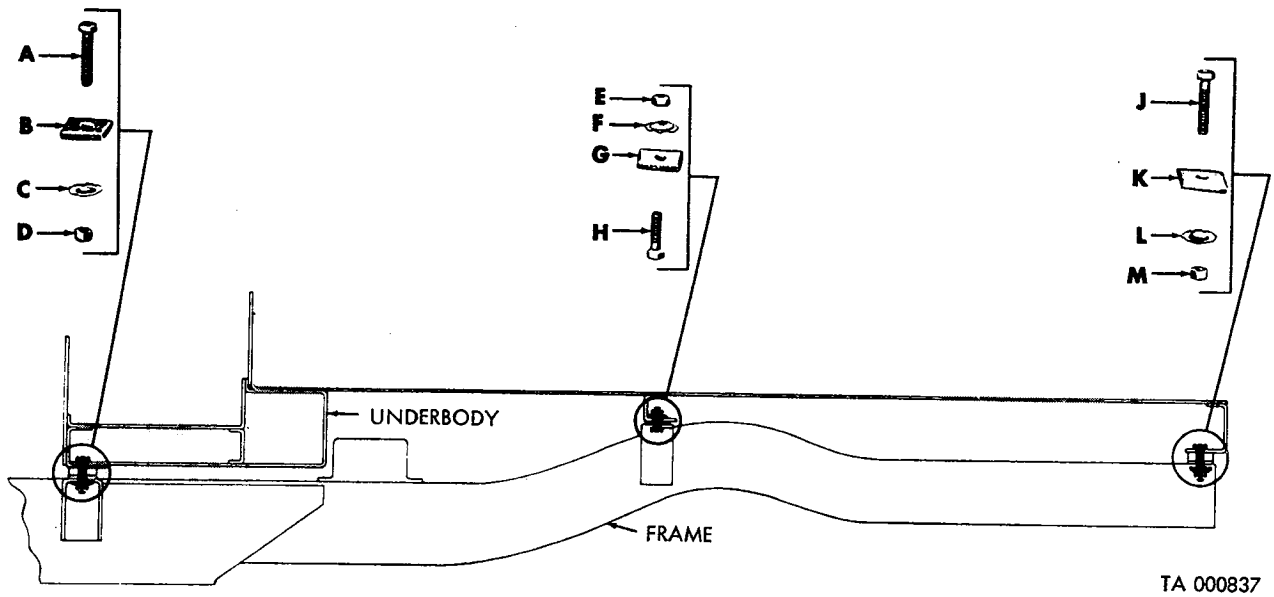
A Capscrew
B Pad
C Plain washer
D Lockwasher
E Nut
F Pad
G Step bolt
H Pad
J Plain washer
K Lockwasher
L Nut
M Pad
N Step bolt
P Pad
Q Plain washer
R Lockwasher
S Nut

Figure 2-182. Body holddown bolts and related parts (cargo truck M37).



A Body holddown bolt
B Plain washer
C Pad
D Lockwasher
E Nut
F Body holddown bolt
G Plain washer
H Pad
J Lockwasher
K Nut
L Pad
M Body holddown bolt
N Plain washer
P Pad
Q Lockwasher
R Nut
S Pad
T Nut
U Lockwasher
V Pad
W Plain washer
X Body holddown bolt
Y Pad
Z Body holddown bolt
AA Pad
BB Lockwasher
CC Nut

Figure 2-183. Body holddown bolts and related parts (ambulance truck M43).



A Body holddown bolt
B Pad
C Lockwasher
D Nut
E Nut
F Lockwasher
G Pad
H Capscrew
J Body holddown bolt
K Pad
L Lockwasher
M Nut

Figure 2-184. Body holddown bolts and related parts (telephone maintenance truck M201).

2-169. Driver's Compartment Door, Door Glass, Frame, and Weatherseals

a. General.

(1) The door lock strikers, dovetails, hinges, and the door glass and weatherseals must be correctly adjusted to insure proper closing of the doors and effectiveness of the weatherseals. Elongated screw holes in the door lock strikers, dovetails, door hinges, weatherseal retainers, door glass frame lower channel and the regulator support provide for such adjustment for all models. In addition, all models except the ambulance truck M43 provide for adjustment at the top side rail rear supports and brackets, and the windshield pivot brackets, clamp brackets, and stops.

(2) It is seldom necessary to perform all of the adjustments described in this paragraph. However, when a new door, door glass, or windshield is installed, check all points of alinement and adjust as necessary.

NOTE

Doors must be properly fitted before attempting any adjustment of the door glass, since a change in the position of the door affects the contact of the glass frame with the weatherseals.

b. Check Alinement of Door and Door Glass (Fig. 2-185).

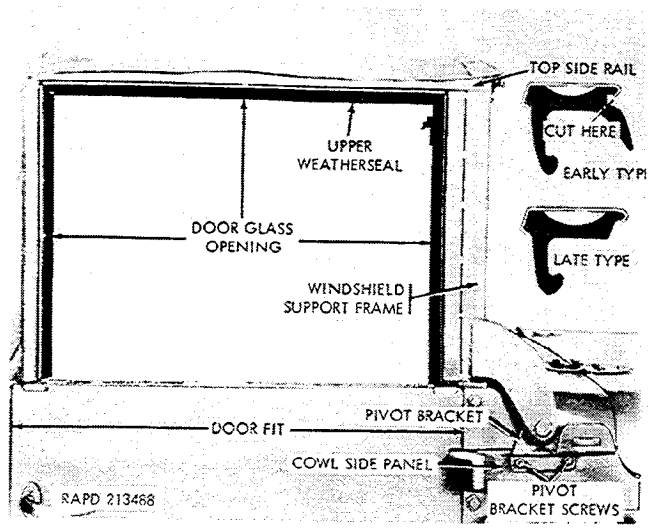


Figure 2-185. Alinement of driver's compartment door and door glass.

(1) Observe the fit of the door in the door opening. The door lock should engage the lock striker on the lock pillar so the door weatherstrips contact the door opening at all points. The female dovetail in the door must engage with the male dovetail on the lock pillar. The vertical edges of the

door should be a uniform distance from the door pillars. If adjustments are required, refer to *c* and *d* below.

(2) Close the door and roll the door glass up to within approximately one-fourth inch of the upper weatherseal. Check the fit of the door glass frame in the weatherseals at the top and each side. The sides and top of the frame should be a uniform distance from the weatherseal retainers and should contact the weatherseals at all points. If adjustments are required, refer to *e* through *j* below.

c. Adjust Door Lock Striker and Dovetail (Fig. 2-186). The door lock striker and dovetail adjustments are made to provide proper engagement of the door lock and the dovetails to insure correct closing and correct seal at the door weatherstrips. To adjust the striker, loosen the two lockwasher screws that secure the striker to the lock pillar and move the striker in or out, as required. To adjust the dovetail, loosen the two lockwasher screws that secure the male dovetail to the lock pillar and move the dovetail up or down, as required. Tighten the screws after making the adjustments.

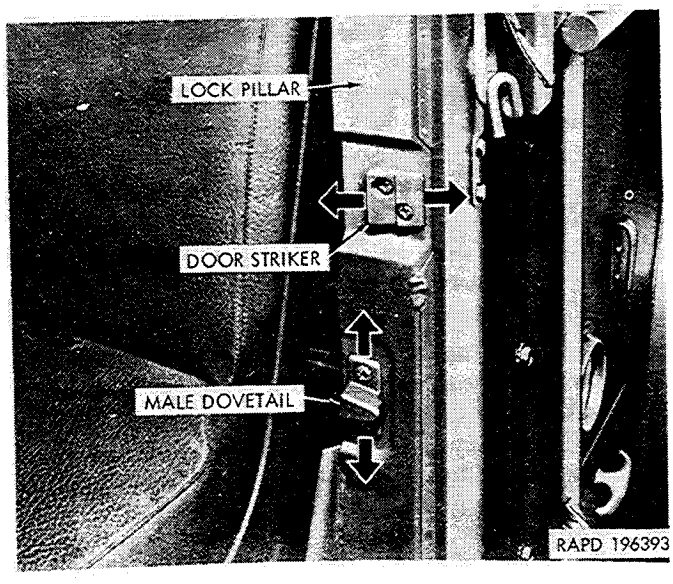


Figure 2-186. Door striker and dovetail adjustments.

d. Aline Door in Door Opening. If the spaces between the vertical edges of the door and the door opening (fig. 2-185) very considerably, bend the two hinges on the hinge pillar (fig. 2-187) using a bending tool.

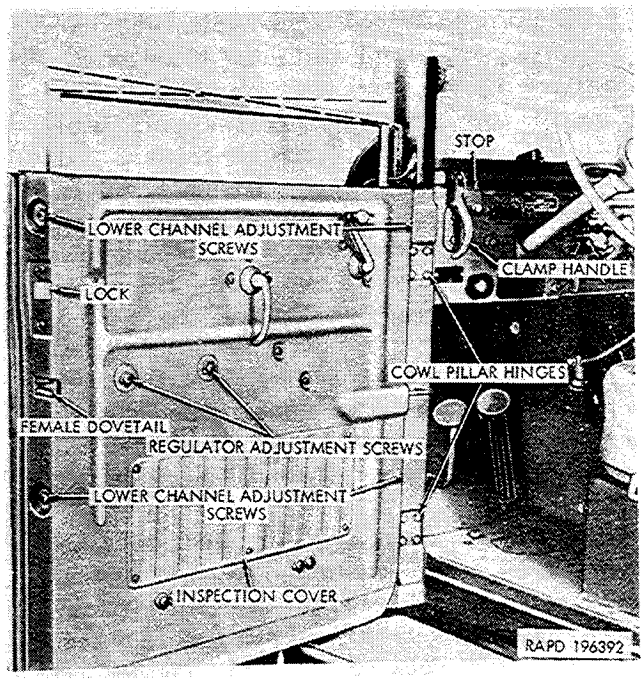


Figure 2-187. Door and glass adjustments.

e. Aline Windshield Support Frame (except Ambulance Truck M43). The windshield support frame can be adjusted to obtain proper contact between the front edge of the door glass frame and the weatherseal.

(1) Loosen slightly the two pivot bracket screws that secure the pivot bracket to the cowl side panel (fig. 2-185) and the two screws that secure the top side rail to the rear support (fig. 2-188).

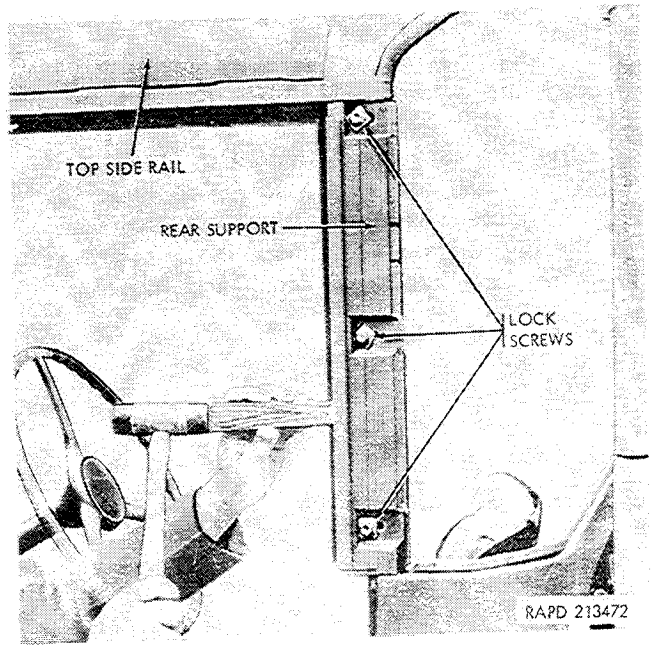


Figure 2-188. Top side rail rear support adjustment.

(2) Place a hardwood block against the pivot bracket (fig. 2-185), and strike the block with a hammer to move the bracket the required distance and direction to aline the windshield support frame.

(3) Tighten the pivot bracket screws.

(4) If the angle of the windshield support frame requires adjustment to provide uniform vertical alinement, release the two clamp handles (fig. 2-187), and loosen the two screws that secure each windshield stop. Move the top of the windshield support frame in or out, as required to provide the correct angle of the windshield support frame. Correctly position the stops, tighten the two screws that secure each stop, and the two screws that secure each top side rail. Lock the windshield clamp handles.

(5) If the two clamp handles (fig. 2-187) are too tight or too loose, loosen the two screws that secure each clamp bracket to the instrument panel, and move the brackets up or down, as required, using a hardwood block and hammer. Tighten the two screws for each bracket and lock the windshield clamps.

f. Aline Door Glass. If the space at the top of the door glass frame is not uniform, loosen the two regulator adjustment screws (fig. 2-187), and move either corner of the door glass up or down, as required. Tighten the two screws.

g. Adjust Top Side Rail Rear Support (Fig. 2-188) (Except Ambulance Truck M43). The top side rail rear support may be adjusted to provide proper clearance between the door glass frame and the support weatherseal.

(1) Loosen the three adjustment lock screws that secure the rear support.

(2) Move the support forward or back, as required, using a hardwood block and hammer. Tighten the three lock screws.

h. Adjust Weatherseal Retainers (Fig. 2-189). If the inner sides of the door glass frame do not make complete contact with the weatherseals, move the weatherseal retainers in or out, as required, using a hardwood block and hammer.

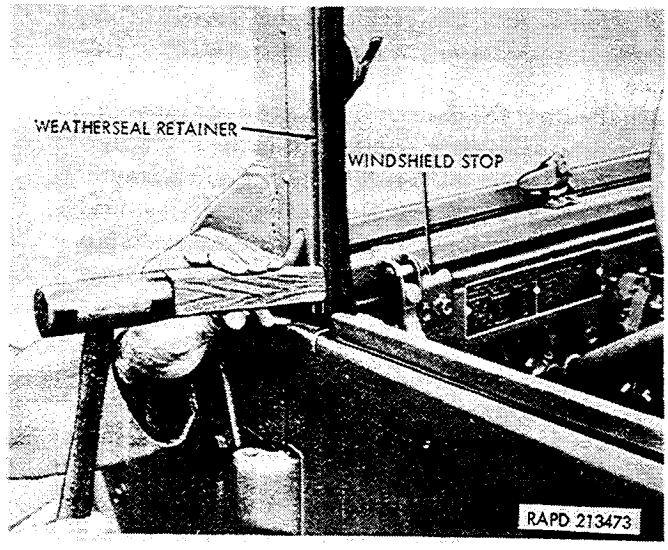


Figure 2-189. Weatherseal retainer adjustment.

i. Adjust Door Glass Angle. If the adjustment of the weatherseals fails to provide correct contact of the door glass frame and the weatherseals, adjust the angle of the door glass.

(1) Loosen the four lower channel adjustment screws (fig. 2-187) that secure the door glass channels.

(2) Move the top or bottom of either channel in or out, as required, to provide the correct angle of the glass.

(3) Tighten the four adjustment screws.

j. Adjust Door Hinges (Fig. 2-187). If the door glass frame does not contact the upper weatherseal after the adjustments (*h* and *i* above) have been performed, adjust the position of the cowl pillar hinges. If the top of the door must be tilted in, loosen the four screws in the lower hinge, force the lower hinge out, and tighten the screws. Then loosen the screws in the upper hinge, correct any distortion caused by adjustment of the lower hinge, and tighten the screws in the upper hinge.

NOTE

The upper weatherseal (fig. 2-185) on some early production vehicles is a U-shaped seal, necessitating slight lowering of the glass to open or close the door. The outer edge of this type of weatherseal may be removed with a sharp knife or razor blade. Seal the cut edge of the weatherseal with rubber cement or paint to prevent fraying of the fabric.

2-170. Patient Compartment Rear Doors (Ambulance Truck M43)

a. General. The rear door strikers and the door and body pillar hinges must be correctly adjusted to insure proper closing of the doors and effectiveness of the door weatherseals. Elongated screw holes in the hinges and the strikers provide for such adjustment.

b. Check Alinement of Doors. Raise the rear folding step, close both doors and observe whether the door weatherseals contact the door openings at all points, and whether the spaces between the outer vertical edge of each door and the door pillar are equal and uniform from top to bottom. Observe the space at the top and bottom of each door for uniformity. If the doors are not properly alined, perform the necessary adjustments (*c*, *d*, and *e*) below).

c. Adjust Vertical Position of Door (Fig. 2-190). Both doors are adjusted in the same manner.

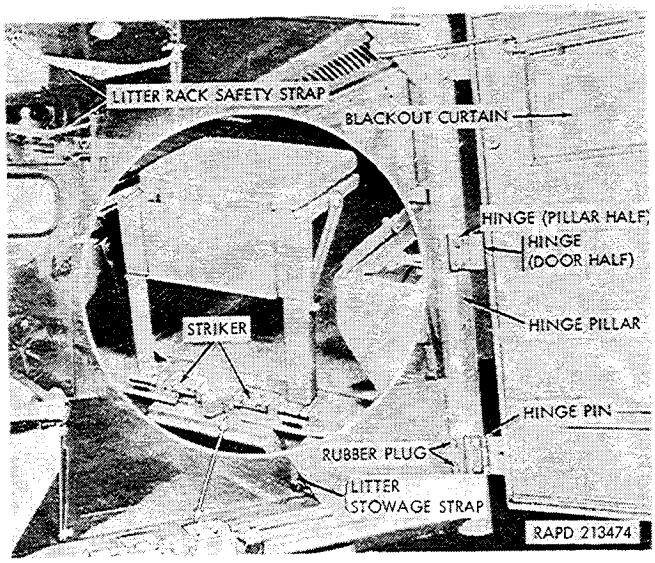


Figure 2-190. Patient compartment rear door adjustments.

(1) Open the door and remove the two rubber plugs at each pillar hinge.

(2) Loosen the four lockwasher screws that secure each hinge to the hinge pillar.

(3) Raise or lower the door, as required, to provide equal and uniform space at top and bottom.

(4) Tighten the four lockwasher screws at each pillar hinge.

(5) Install the two rubber plugs for each pillar hinge.

d. Adjust Horizontal Position of Doors (Fig. 2-190). Both doors are adjusted in the same manner.

(1) Loosen the four lockwasher screws that secure each door hinge to the door.

(2) Move the door to left or right, as required, to provide uniform contact at the weatherseals and equal and uniform space at the outer edges of both doors. If the horizontal adjustment required is excessive, adjust both doors.

(3) Tighten the four lockwasher screws for each door hinge.

e. Adjust Rear Door Strikers (Fig. 2-190). If the rear doors close hard, or if the contact at the weatherseals is unsatisfactory, adjust the rear door strikers located at the top and bottom of each door opening. All strikers are adjusted in the same manner.

(1) Loosen the two screws that secure the striker to the striker plate.

(2) Move the striker forward or back on the serrated striker plate, as required, until proper closing of the door is obtained. Tighten the screws.

2-171. Driver's Compartment Door Glass

a. Removal (fig. 2-191). The glass for both doors is serviced in the same manner.

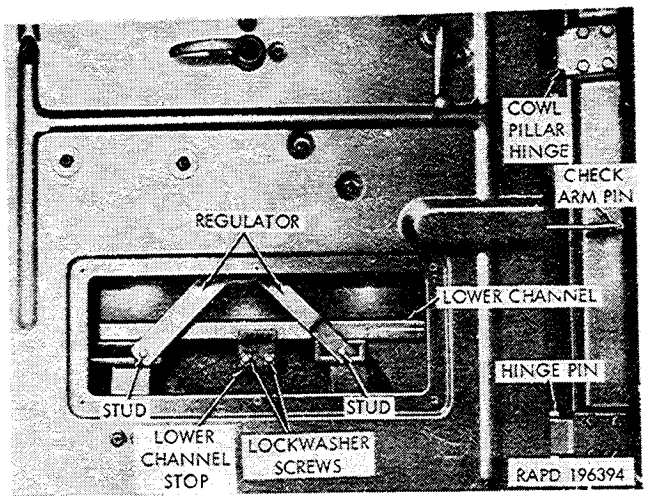


Figure 2-191. Replacing glass in driver's compartment door.

(1) Remove the six lockwasher screws that secure the inspection cover (fig. 2-187) on the inside panel of the door, and remove the cover.

(2) Lower the glass. Remove the two lockwasher screws that secure the door glass lower channel stop, and remove the stop.

(3) Remove the two retainers that secure the lower channel to the regulator arms.

(4) Disengage the regulator from the door glass lower channel and remove the door glass from the top of the door.

b. Replacement. Refer door glass and frame to direct support maintenance personnel for replacement of glass.

2-172. Cab Top Cover and Related Parts (Except Ambulance Truck M43)

a. Removal.

(1) Unhook the cab top cover holddown rope from the hooks on the cab rear panel.

(2) Remove the two cab top cover bow-to-windshield straps (fig. 2-192).

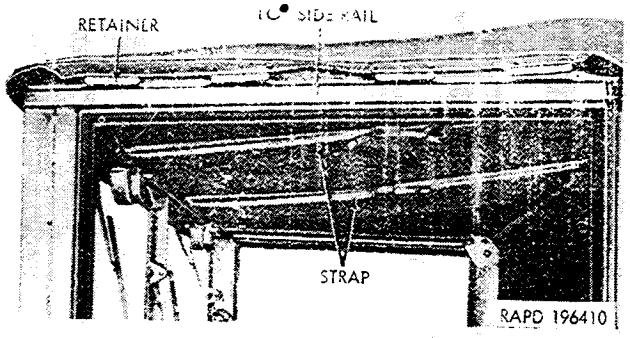


Figure 2-192. Top cover removed from top side rail.

(3) Pull the cover out from the left and right top side rails to disengage the retainers from the side rails (fig. 2-192).

(4) Pull the cover up to remove it from the retainers on the left and right side rail rear supports (fig. 2-193).

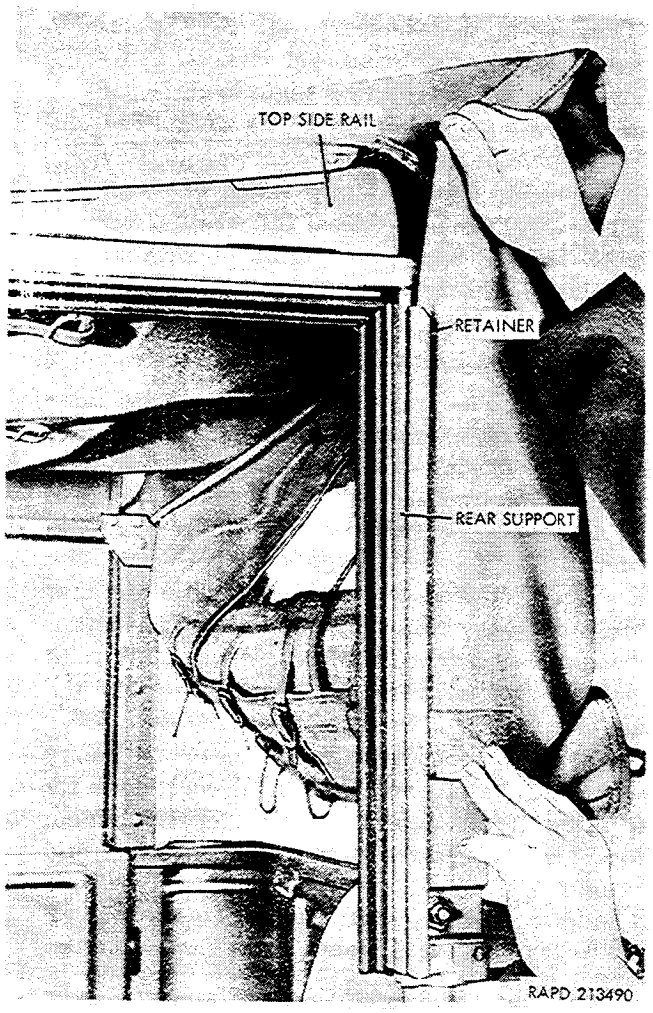


Figure 2-193. Removing top cover from side rail support.

(5) Fold the cover toward the windshield and pull the cover from the left side of the windshield support frame retainer (fig. 2-194).

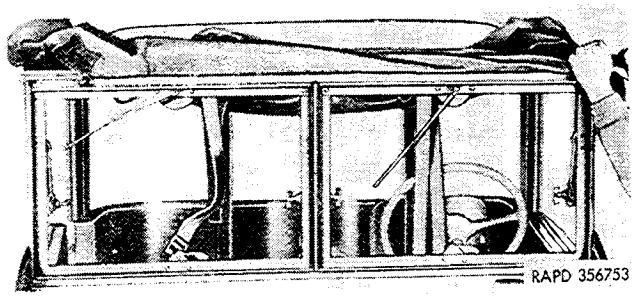


Figure 2-194. Removing top cover.

(6) Loosen the upper rear support adjustment lock screws (fig. 2-188) at the right and left sides, and remove the top bow from the side rail rear supports.

(7) Loosen the nuts on the J bolt and U bolt in each cab lock pillar. Remove the two lockwasher screws that secure each top side rail to the windshield frame and remove the two side rails and side rail rear supports as units. Remove the nuts and lockwashers from the J bolts and U bolts. Remove the bolts.

(8) Remove the two lockwasher screws which secure each top side rail to the rear support, and separate the two.

b. Inspection.

(1) Inspect the cab cover for wear and damage. Inspect the straps and the holddown rope for breaks, wear, and damage.

(2) Inspect the J bolts and U bolts for wear, distortion, and damaged threads.

(3) Inspect the top bow for cracks and distortion.

(4) Replace parts that are unfit for further service.

c. Installation.

(1) Install the left and right top side rails on the left and right rear supports respectively, and install the two lockwasher screws in each side.

(2) Place the J bolt and U bolt in each cab lock pillar, and aline them for installation of the top side rail with rear supports. Install the left and right rear supports. Install but do not tighten the two lockwasher screws to secure each support to the windshield frame. Install the two lockwashers and nuts on each J bolt and each U bolt. Tighten the nuts.

(3) Install the top bow in the left and right side rail rear supports, and tighten the two adjustment lock screws (fig. 2-188).

(4) Check the door glass alinement, and adjust as necessary (para 2-169).

(5) Insert the front of the top cover in the left end of the retainer on the windshield frame (fig. 2-194), and pull the cover into the retainer from left to right.

(6) Insert the sides of the cover in the upper ends of the retainers on the left and right rear supports (fig. 2-193), and pull the cover down.

(7) Insert the metal retainers at each side of the cover in the slots in the top rail (fig. 2-192).

(8) Install the two cab top cover bows to windshield straps (fig. 2-192).

(9) Attach the cab cover holddown rope to the hooks on the cab rear panel and buckle the two cover straps.

2-173. Body Cover and Related Parts (Cargo Truck M37)

a. Removal (fig. 2-195).

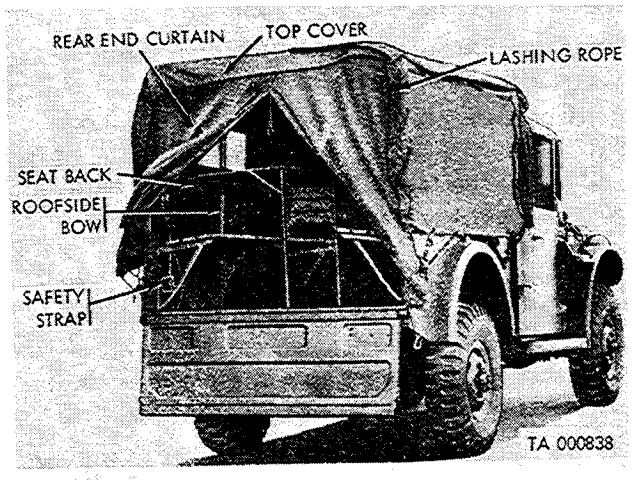


Figure 2-195. Top cover and curtains (cargo truck M37).

(1) Detach the body cover ropes from the three hooks on each side panel, and remove the body cover.

(2) Detach the end curtain holddown ropes from the two hooks on the tailgate or the hooks on the front of each side panel.

(3) Remove the lashing rope that secures each curtain to the roof bow, and remove the end curtains.

(4) Remove the nut, lockwasher, and bolt that secure each roof side bow to the seat back supports, and remove the bows and ridge pole as a unit.

b. Inspection.

(1) Inspect the body cover and end curtains for wear, damage, and deterioration. Inspect all ropes for wear and damage.

(2) Inspect the top bows, side bows, and ridge pole for breaks, and the bow corners and ridge pole brackets for damage and missing or damaged retaining parts.

(3) Replace parts that are unfit for further service.

c. Installation.

(1) If any of the bow corners require replacement, install a new corner and attach it to the top bow and side bow with two carriage bolts, lockwashers, and nuts for each bow. Attach the cover rollup strap with the top bolt for the side bow.

(2) Install the assembled bows and ridge pole on the body, inserting the side bows in the seat back supports. Aline the bolt holes in the side bows with those in the supports, and install the nut for each side bow. Tighten the nuts.

(3) Secure the end curtains to the front and rear top bows with lashing ropes, using ¼-inch ropes. Attach the front curtain holddown ropes to the hooks on the front of side panel. Attach the rear curtain holddown ropes to the two hooks on the tailgate.

(4) Install the body cover and secure the cover ropes to the hooks on the side panels.

2-174. Safety, Storage, and Holddown Straps, and Blackout Curtains

a. Replace Safety Strap and Eye Bolts (Cargo Truck).

(1) Detach the safety strap (fig. 2-195) from the two eyebolts in the seat back lower boards, and remove the strap.

(2) Remove the nut and lockwasher from each eyebolt, and remove the two bolts and flat washers.

(3) Place a flat washer on each eyebolt. Install the eyebolt through the upper hole at the rear of the seat back lower board. Install a lockwasher and nut on each eyebolt. Tighten the nuts.

(4) Attach the safety strap snaps to the eyebolts.

b. Replace Litter Stowage and Holddown Straps (fig. 2-190) (Ambulance Truck M43).

(1) Remove the two nuts, lockwashers, and screws that secure the bracket for each lower stowage strap to the side compartment, and remove the strap and bracket. Remove the bracket from the strap. The buckle strap is removed in the same manner.

(2) Engage the strap in the strap bracket, position the bracket on the side compartment, and install the two flathead screws, lockwashers, and nuts for each bracket.

c. Replace Litter Holddown Straps (P, fig. 2-50) (Ambulance Truck M43). All litter holddown straps are replaced in the same manner. Remove the pin that secures the strap and remove the strap. Position the new strap and install the strap retaining pin.

d. Replace Litter Rack Safety Straps (fig. 2-190) (Ambulance Truck M43). The four-litter rack safety straps are all replaced in the same manner. Detach the strap from the litter rack, and remove the strap from the bracket in the roof panel. Install the new strap in the bracket in the roof panel, and attach the hook to the litter rack or the opposite bracket in the roof.

e. Replace Blackout Curtains (fig. 2-190) (Ambulance Truck M43). The blackout curtains on the rear door and on the partition door are all replaced in the same manner.

(1) Detach the curtain from the two fasteners at the lower edge. Remove the three screws and plain washers that secure the curtain to the door panel, and remove the curtain.

(2) Position the new curtain on the door with the unfinished side toward the glass. Install the three plain washers and tapping screws. Tighten the screws. Secure the lower edge of the curtain with the two fasteners or roll it and secure it with the two rollup straps.

2-175. Tailgate and Pioneer Tool Rack

(Fig. 2-173.)

a. Replace Pioneer Tool Rack.

(1) Remove the tools from the rack.

(2) Remove the four nuts, lockwashers, and bolts that secure the rack to the tailgate, and remove the rack.

(3) Position the new rack on the tailgate with the axe blade pocket at the left. Aline the bolt holes and install the four bolts, lockwashers, and nuts. Tighten the nuts evenly.

(4) Install the tools in the tool rack.

b. Remove Tailgate.

(1) Remove the pioneer tool rack (*a* (1) and (2) above).

(2) Remove the two lockwasher screws that secure the tailgate hinge support to the floor rear cross sill.

(3) Remove the two lockwasher screws that secure each tailgate outer hinge to the body side panel.

(4) Unhook the two tailgate chains, and remove the tailgate.

(5) If the tailgate chains or chain covers require replacement, open the link that secures each chain to the body side panel, and remove the chains. Remove the chain covers.

c. Install Tailgate.

(1) If the tailgate chains and chain covers were removed (*b* (5) above), install a new cover on each chain. Attach a chain to each body side panel, and close the link.

(2) Position one of the tailgate outer hinges on the body left side panel, and install the two lockwasher screws. Tighten the screws.

(3) Apply a coating of lubricant to the tailgate hinge bearings. Insert the left end of the tailgate tube in the left outer hinge on the body. Place the outer hinge on the tube, and position the parts on the body, alining the screw holes in the outer hinge

with those in the side panel. Install the two lockwasher screws and tighten.

(4) Close the tailgate and position the hinge support on the floor rear cross sill. Install the two lockwasher screws to secure the support and tighten them.

(5) Install the pioneer tool rack (*a* (3) and (4) above).

2-176. Windshield Wipers, Rear View Mirror, and Reflectors

a. General. Maintenance of the windshield wipers includes replacement of the wiper blades, arms, wiper hose, and wiper motors. Both wiper motors are serviced in the same manner.

b. Replace Windshield Wiper Blade and Arm.

(1) To replace the windshield wiper blade, unhook the blade from the arm, and install a new blade, engaging the blade in the arm.

(2) To replace the arm, remove the nut that secures the arm to the motor shaft, and remove the blade. Install a new arm on the motor shaft, alining the arm with the windshield wiper handle. Install the wiper arm nut and tighten. Install a new blade in the arm.

c. Replace Wiper Hose.

(1) Remove the wiper hose from the manifold to wiper line in the engine compartment and from the wiper line hinge tube at the left pillar. Pull the hose out through the grommet in the cowl panel.

(2) Cut approximately a 24-inch length of rubber tubing. Insert one end of the tubing through the grommet in the cowl panel, and attach it to the line at the left pillar. Attach the other end of the hose to the manifold-to-wiper line.

d. Replace Wiper Motor.

(1) Remove the wiper arm and blade (*b* (2) above).

(2) Remove the nut and lockwasher that secure each of the two motor studs at the front of the windshield frame.

(3) Detach the wiper line from the wiper motor, and remove the motor.

(4) Position the new motor on the inner side of the windshield frame, inserting the two studs and the shaft through the holes in the frame. Attach the wiper line to the wiper motor.

(5) Install a lockwasher and nut on each of the two motor studs.

(6) Install the wiper arm and blade (*b* (2) above).

e. Replace Rear View Mirror (fig. 2-196). Remove the blind nut and lockwasher that secure the mirror to the mirror arm, and remove the mirror. Position the new mirror on the arm and install the lockwasher and low crown blind nut. Tighten the nut.

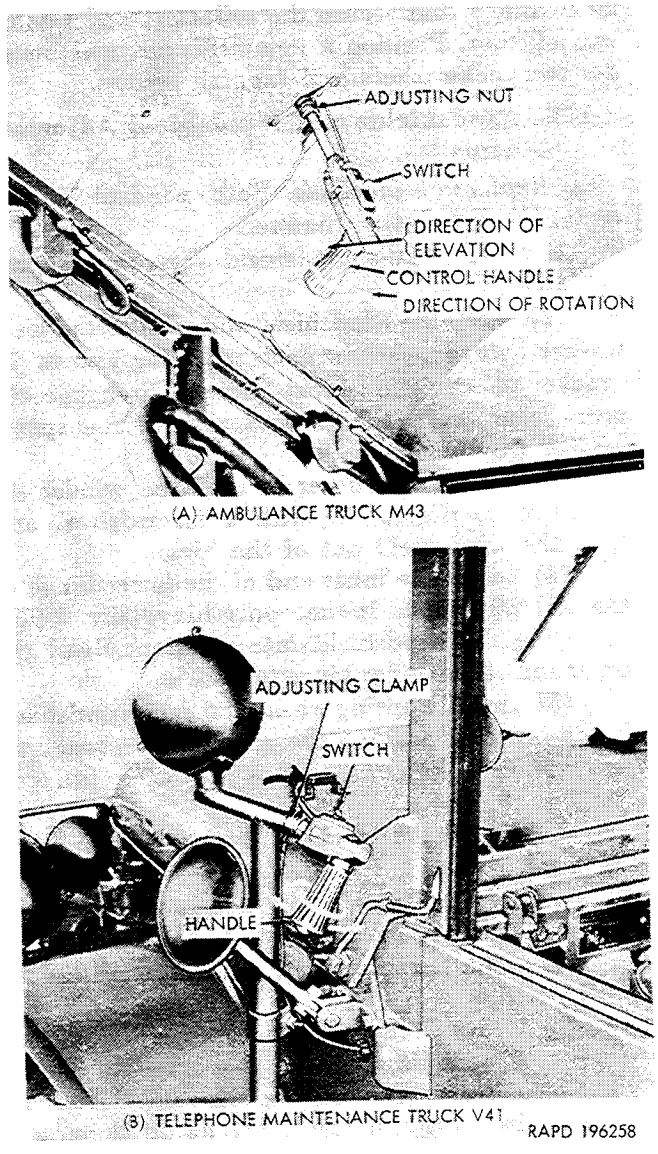


Figure 2-196. Spotlight controls.

f. Replace Reflectors. An amber reflector is mounted at each side of the body (fig. 2-178) just back of the driver's compartment door. A ruby reflector is mounted at each side of the body near the rear and at each side of the tailgate (fig. 2-47) for each rear door. Reflectors for all models except the ambulance truck M43 are serviced in the same manner.

(1) To replace any of the reflectors (all models except ambulance truck M43), remove the two nuts, lockwashers, and bolts that secure the reflector, and remove the reflector. Install two roundhead bolts from the inner side of the body or tailgate. Position the reflector on the two bolts and install a lockwasher and nut on each bolt. Tighten the nuts.

(2) To replace any of the reflectors on the ambulance truck M43, remove the two screws and

lockwashers that secure the reflector, and remove the reflector. Position a new reflector, and install the two lockwashers and tapping screws.

2-177. Windshields and Windshield Adjusting Arms

a. Replace Windshield. Both windshields are replaced in the same manner.

(1) Remove the windshield wiper motor (para 2-176 *d*).

(2) Open the windshield and remove the lockwasher bolt that secures each adjusting arm to the bracket on the windshield frame. Disengage the arms from the brackets, and remove the spring washer from each bracket.

(3) Spread the outer end of the windshield upper hinge (fig. 2-93) with a screwdriver, and slide the windshield out of the hinge.

(4) Insert the inner end of the lower hinge of the new windshield in the upper hinge (fig. 2-93), and slide the windshield into position. Bend the outer end of the upper hinge to close it.

(5) Install a spring washer on each windshield frame bracket, position the arms on the brackets, and install a lockwasher bolt for each bracket. Tighten the bolts.

(6) Install the windshield wiper motor (para 2-176 *d*).

b. Replace Windshield Adjusting Arm. All adjusting arms are replaced in the same manner.

(1) Open the windshield and support it in the open position.

(2) Remove the two lockwasher bolts that secure the adjusting arm to the brackets on the windshield frame and on the windshield support frame. Disengage the arm from the brackets, and remove the arm. Do not lose the spring washer at each bracket.

(3) Position the spring washer on each bracket, and install a new adjusting arm on the two brackets with the longer arm at the windshield frame. Install a lockwasher bolt for each bracket and tighten.

(4) Close the windshield.

2-178. Weatherseals, Toeboards, and Seat Cushions

a. Replace Cowl Ventilator Door Weatherseal.

(1) Open the cowl ventilator door.

(2) Remove the door weatherseal from the cowl and clean the trough.

(3) Apply a coat of synthetic rubber cement to the trough and to the lower (flat) edge of a new weatherseal. Allow the cement to dry for 10 minutes.

(4) Install the weatherseal in the trough in the cowl with the lip at the inner edge up. Press the seal firmly into the trough.

(5) Close the ventilator door.

b. Replace Gear Shift Lever Weatherseal.

(1) Remove the nut, lockwasher, and bolt that secure the transmission gear shift upper lever to the lower lever, and remove the upper lever.

(2) Remove the weatherseal from the transmission access cover (fig. 2-96).

(3) Install a new weatherseal over the transmission gear shift lower lever, and fit it into the opening in the transmission access cover (fig. 2-96).

(4) Position the gear shift upper lever on the lower lever and install bolts, lockwasher, and nut. Tighten the nut.

c. Replace Brake and Transfer Lever Weatherseal.

(1) Remove the four lockwasher screws that secure the weatherseal retainer and weatherseal to the transmission access cover (fig. 2-96). Remove the retainer and weatherseal.

(2) Place a new weatherseal and weatherseal retainer over the hand brake lever and transfer levers, and position them on the transmission access cover, alining the screw holes. Install the four lockwasher screws and tighten.

d. Replace Winch Lever Weatherseal (on Vehicles so Equipped). Disengage the weatherseal from the opening in the transmission access cover (fig. 2-197) and remove it. Place a new weatherseal over the winch lever and fit it into the opening in the access cover.

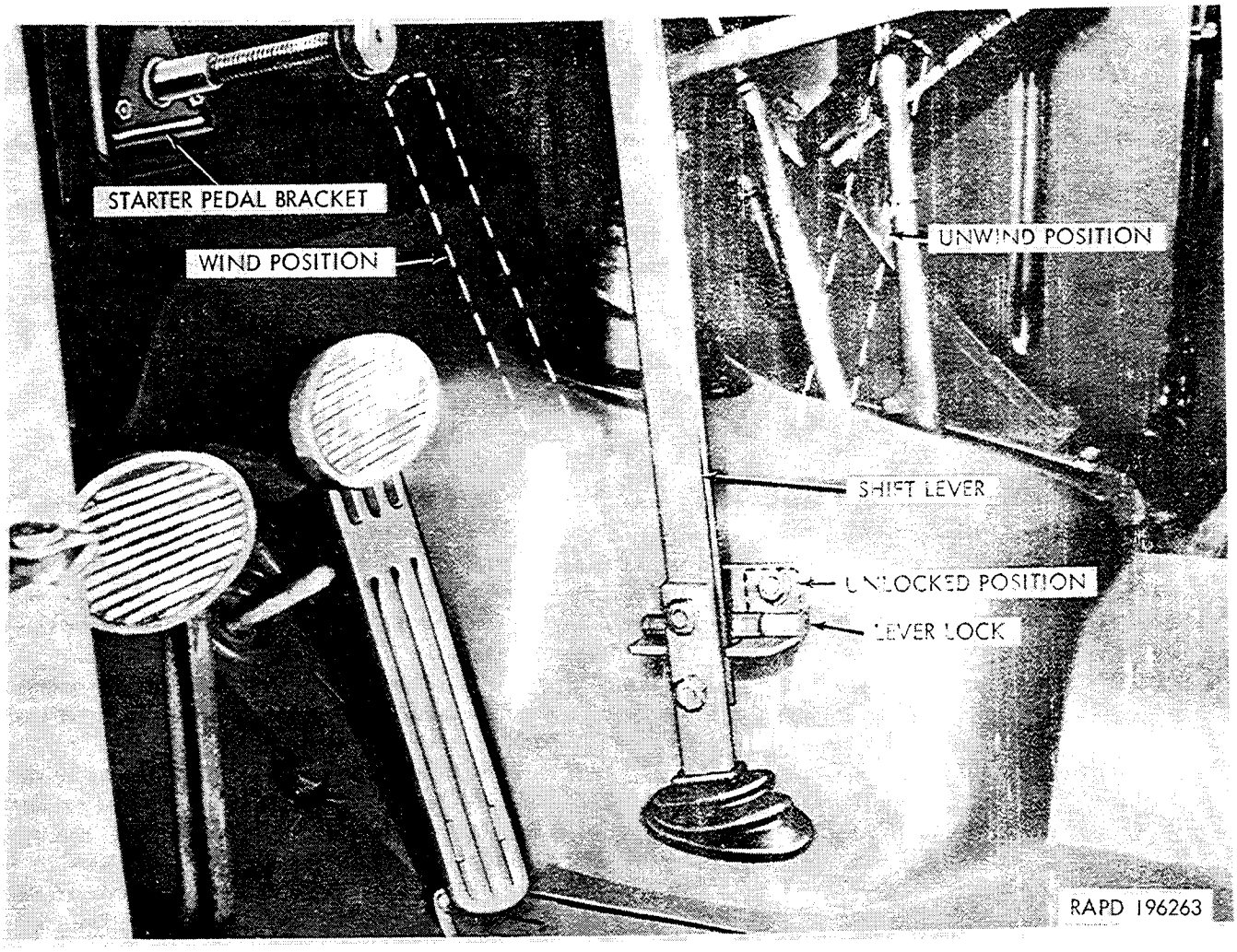


Figure 2-197. Power-takeoff shift lever positions.

e. Replace Toeboards.

(1) Remove the eight lockwasher screws that secure the lower toeboard (fig. 2-96), and remove the toeboard.

(2) Remove the three lockwasher screws that secure the upper toeboard, and remove the toeboard.

(3) Remove the two lockwasher screws that secure the clutch pedal stop to the upper toeboard, and remove the stop.

(4) Position the clutch pedal stop on the new upper toeboard and install the two lockwasher screws. Tighten the screws.

(5) Position the upper toe board, alining the screw holes, and install the three lockwasher screws in the three upper screw holes. Tighten the screws fingertight.

(6) Position the lower toeboard (fig. 2-96) on the floor panel and upper toeboard, alining the screw holes. Install the eight lockwasher screws, and tighten all screws evenly.

f. Replace Driver's Seat Cushion and Seat Back Cushion.

NOTE

The passenger's seat cushions for the ambulance truck M43 are serviced in the same manner as the driver's seat cushions.

(1) Tilt the seat forward, and remove the two bolts and lockwashers from the seat cushion board. Remove the cushion.

(2) Remove the two bolts and lockwashers that secure the seat back cushion to the seat back panel. Lift the cushion up and out of the panel.

(3) Position the seat back cushion in the seat back panel, engaging the upper portion of the cushion in the anchor clips on the panel. Aline the bolt holes in the cushion clips with those in the seat back panel, and install the two lockwashers and two bolts. Tighten the bolts.

(4) Position the seat cushion on the seat board, alining the bolt holes in the seat board with the weld nuts in the cushion. Install the two lock-

washers and bolts. Tighten the bolts and tilt the seat back.

g. Replace Passenger's Seat Cushion and Seat Back Cushion (Except Ambulance Truck M43).

(1) Unhook the toggle lock which secure the seat cushion to the seat riser, raise the front side of the cushion to disengage it from the dowel at each front corner, and remove the seat cushion.

(2) Remove the two lockwasher screws that secure the seat back cushion to the cab rear panel, lift the cushion to disengage it from the two anchor clips, and remove the cushion.

(3) Position the seat back cushion on the cab rear panel with the two clip brackets engaged in the anchor clips on the panel. Aline the screw holes in the two retaining brackets with those in the cab rear panel, and install the two lockwasher screws. Tighten the screws.

(4) Position the seat cushion on the seat riser with the dowels engaged in the dowel holes at the front corners of the cushion. Engage the toggle lock in the catch on the cushion.

Section XXXI. FRONT FENDERS, GUARDS, AND FRONT FENDER REAR SPLASH SHIELDS

2-179. Front Fenders and Guards

a. Removal.

(1) Remove the liquid container and disengage the liquid container strap from the bracket at the right side of the cowl (fig. 2-198).

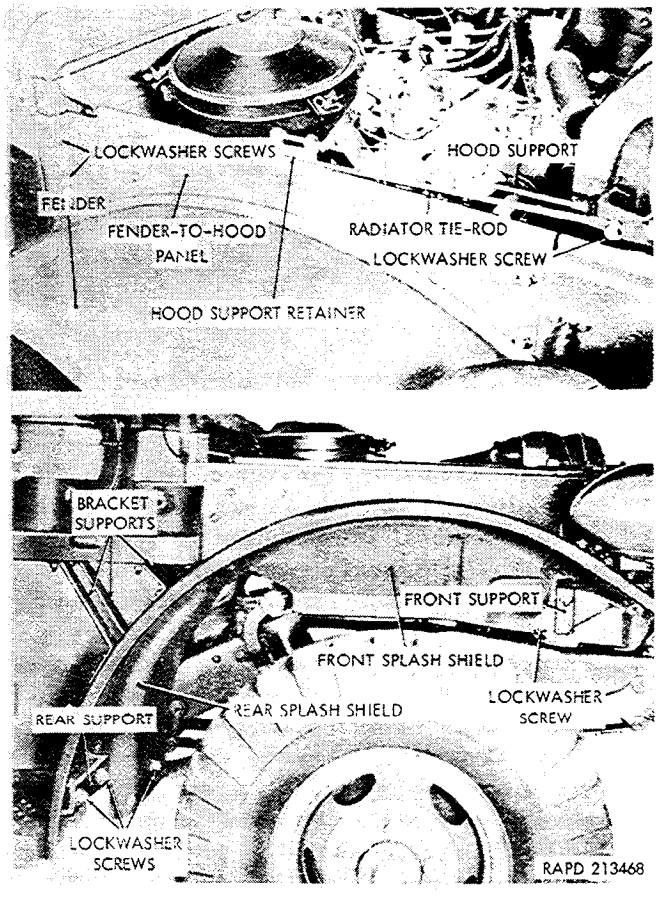


Figure 2-198. Front fender and panel disconnect points.

(2) For the telephone maintenance truck M201 remove the four nuts, lockwashers, and bolts that secure the spotlight support to the left front fender (fig. 2-196).

(3) Open the hood and secure it in the open position.

(4) Remove the four lockwasher screws that secure each fender-to-hood panel (fig. 2-198), and remove the two panels.

(5) Disengage the cables from the cable clips (fig. 2-52) on the left front fender, three cables from the clips on the left splash shield, and three cables from the clips on the right splash shield.

(6) Remove the cable connectors from the connector clips (fig. 2-55) near the front of each splash shield and separate the four cables at each side. Remove the cable connectors from the connector clips near the rear of the right splash shield, but do not separate the cables.

(7) Remove the horn button cable connector (fig. 2-52) from the clip on the left splash shield.

(8) Remove the lockwasher screw (fig. 2-198) that secures each radiator tie rod to the radiator support.

(9) Remove the two lockwasher screws (fig. 2-198) that secure each fender front support to the radiator support.

(10) Remove the three lockwasher screws (fig. 2-198) that secure each fender and rear splash shield to the rear support.

(11) Remove the assembled front fenders and guards as a unit.

b. Installation.

NOTE

Install all attaching parts only fingertight until the fenders are properly alined.

(1) Position the assembled front fenders and guards on the vehicle, alining screw holes in the fender front supports with their respective holes on the radiator support and the fender and rear splash shields with the rear supports.

(2) Install the three lockwasher screws at each rear support and the two lockwasher screws for each front support (fig. 2-198).

(3) Install the lockwasher screw for each radiator tie rod (fig. 2-198).

(4) Engage the horn cable connector (fig. 2-52) in the clip on the left splash shield.

(5) Engage the cable connectors in the connector clips at the rear of the right splash shield.

(6) Connect the cables (fig. 2-52) near the front of each splash shield, matching the numbers on the cables. Engage the cable connectors in the clips.

(7) Engage the cables in the three cable clips (fig. 2-52) on the right splash shield, three clips on the left splash shield, and on the left fender.

(8) Position the two fender-to-hood panels, and install the four lockwasher screws (fig. 2-198) for each panel.

(9) Lower the hood and check the alinement of the fenders, panels, and radiator guard side supports with the hood (*c* below).

(10) For the telephone maintenance truck M201, position the spotlight support (fig. 2-196) on the left fender, and install the four bolts, lockwashers, and nuts. Tighten the nuts.

(11) Engage the liquid container strap in the bracket at the cowl, install the liquid container, and secure it with the strap.

c. Alinement. Before alining the fenders, make certain that the hood is correctly positioned on the cowl.

(1) With the fender attaching parts loosely installed (*b* above), close the hood and observe the position of the hood in relation to the two panels and the radiator guard. There should be a uniform clearance of one-fourth inch between the outer edges of the hood and each fender-to-hood panel, and the front edge of the hood should be flush with the outer edge of the radiator guard.

(2) To establish correct clearance at the hood and hood-to-fender panels, raise or lower the fenders at the front or rear supports, as necessary. Tighten the lockwasher screws at each fender support and the radiator tie rods.

(3) If the radiator guard is not flush with the front edge of the hood at all points, loosen both nuts on each radiator tie rod at the brackets on the cowl. Turn the front or rear nuts as required to aline the guard. Tighten both nuts after completing the adjustment.

(4) Check the headlight aiming and adjust accordingly, (para 2-38).

2-180. Front Fender Rear Splash Shield.

a. Remove Front Fender Rear Splash Shield (fig. 2-198). Both front fender rear splash shields are removed in the same manner. Remove the four lockwasher screws that secure the splash shield to the fender and rear support, and remove the splash shield.

b. Install Front Fender Rear Splash Shield (fig. 2-198). Position the splash shield on the fender and rear support, alining the screw holes, and install the four lockwasher screws. Tighten the screws.

Section XXXII. RADIO INTERFERENCE SUPPRESSION

2-181. Purpose.

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, therefore, that vehicles with, as well as without, radios be suppressed properly to prevent interference with radio reception of surrounding vehicles, or to prevent disclosing locations to the enemy.

2-182. Methods Used to Attain Proper Suppression

a. General. Essentially, suppression is attained by providing a low resistance path to ground for the stray currents. The methods used include shielding the ignition and high-frequency wires, and grounding the frame with bonding straps at the generator-regulator brackets, the clutch housing, and frame side rail. In addition, capacitors, resistors, and an ignition filter which serves to eliminate radiation from nonshielded wires are used.

b. Radio Interference Suppression of Components. Radio interference suppression is accomplished in the electrical subassemblies of vehicles by use of shielding, feed-through type capacitors, teeth type lockwashers, suppressed spark plugs, and braided bond straps.

c. Ignition and Starting System Radio Interference Suppression. The high tension harness assemblies and the cable to each spark plug are

individually shielded utilizing molded rubber-covered, woven, metallic hose shielding terminated at all joints with appropriate threaded fittings. Each spark plug is integrally shielded and suppressed with a 10,000-ohm built-in resistor-suppressor.

2-183. Radio Interfernece Suppression Bonding

a. General. Bond straps are used to unite all parts, and thereby form a shield about the entire powerplant.

b. Description. The following is a list of locations of the bonding straps surrounding the powerplant.

(1) The upper brush guard support brackets are bonded to each fender by a tinned copper braid bond strap and plated-teeth type lockwashers.

(2) The radiator is bonded to the engine support brackets on each side by a tinned copper braid bond strap and plated-teeth type lockwashers.

(3) The engine cylinder head is bonded to the firewall in a similar manner.

(4) The transmission is bonded to the frame sidemember by a tinned copper braid bond strap and plated-teeth type lockwashers.

2-184. Test for Radio Interference

The overall efficiency of the radio interference suppression system may be tested as follows:

a. Position a radio-equipped vehicle within 25 feet of the truck to be tested. Shut off the radio-equipped vehicle's engine, and turn on the truck's radio equipment for maximum sensitivity.

b. Turn on the radio equipment in the test truck, if so equipped.

c. Start the truck engine and turn on all auxiliary equipment. No increase in background noise in either the truck equipment or the nearby vehicle should be heard.

d. If noise is heard in either radio equipment, turn off or disconnect electrical generating or operating components one at a time until the noise stops.

e. When a component is found which causes interference, check it carefully for loose connections, insecure mountings, missed toothed washers, or damaged or broken metal housing.

f. If the interference cannot be eliminated with thorough cleaning and minor repairs, replace the component.

g. If radio interference still is present, repeat operation *d* above. More than one component may be causing interference.

2-185. Generator System Radio Interference Suppression

a. General. The generator mounting bracket is bonded to the engine with plated toothed lockwashers. The generator itself is bonded to its mounting bracket in similar manner, and is integrally shielded and suppressed. The armature and field lead from the generator to the regulator is inclosed in rubber-covered flexible metallic hose and terminated at each end utilizing appropriate threaded fittings. The generator regulator is integrally shielded and suppressed, and its mounting is bonded to the firewall of the vehicle with plated-teeth type lockwashers.

b. Maintenance.

(1) *Generator capacitor.* Since generator capacitor replacement requires generator disassembly, the capacitor will not be removed while the generator is mounted on vehicle. Notify direct support maintenance personnel.

(2) *Generator-regulator capacitor.* Generator-regulator capacitor replacement requires regulator disassembly; therefore, the capacitor will not be removed while the regulator is mounted on vehicle. Notify direct support maintenance personnel.

Section XXXIII. FIELD EXPEDIENT REPAIRS

2-186. General

Organizational maintenance troubles may occur while the vehicle is operating in the field where supplies and repair parts are not available for normal corrective action. The following expedient repairs may be made in emergencies, but vehicles must be removed from operation as soon as possible for proper repairs. Additional field repairs are noted in TM 9-2320-212-10.

2-187. Procedures

Once the trouble is isolated, refer to table 2-5 to find a possible expedient repair.

Table 2-5. Field Expedient Repairs

Trouble	Expedient remedy
1. Front differential noisy	Remove front propeller shaft and axles and operate the vehicle without front-wheel drive.
2. Defective differential	Remove intermediate-to-rear axle propeller shaft and rear axle shafts. When axle shafts are removed, the openings in the ends must be covered securely to keep out dirt and foreign matter.
3. Noisy intermediate or rear axle wheel bearings.	
a. Burned-out wheel bearings (intermediate axle).	*a.* Move the disabled wheel onto a rock, log, or similar object to raise the wheel as high as possible if jack is not available. While the wheel is raised, tie the axle as tight as possible to the frame with a chain. Caution should be exercised to prevent the chain from causing damage to the brake lines. Remove axle shaft from axle housing and cover opening to keep out foreign matter. Repeat operation on opposite side of vehicle. **NOTE** When wheels are tied up, the vehicle should not be loaded too heavily.
b. Burned-out wheel bearings (rear axle).	*b.* Repeat operation described above for intermediate-to-rear axle propeller shaft instead of axle shafts.
4. Intermediate differential noisy. Defective differential.	Remove transfer-to-intermediate and intermediate-to-rear axle propeller shafts. Remove axle shafts from axles with defective differentials. Vehicle will operate on power supplied by the front axle. **NOTE** When power is supplied by the front axle only, the vehicle should not be loaded too heavily.

Section XXXIV. MAINTENANCE UNDER UNUSUAL CONDITIONS

2-188. Extreme-Cold Weather Maintenance Problems

a. The importance of maintenance must be impressed on all concerned, with special emphasis on organizational (preventive) maintenance. Maintenance of mechanical equipment in extreme cold is exceptionally difficult in the field. Even shop maintenance cannot be completed with normal speed, because the equipment must be allowed to thaw out and warm up before the mechanic can make satisfactory repairs. In the field, maintenance must be undertaken under the most difficult of conditions. Bare hands stick to cold metal. Fuel in contact with the hands results in super-cooling due to evaporation, and the hands can be painfully frozen in a matter of minutes. Engine oils, except subzero grade, are unpourable at temperatures below —40° F. Ordinary greases become as solid as cold butter.

b. These difficulties increase the time required to perform maintenance. At temperatures below -40° F., maintenance requires up to five times the normal amount of time. The time required to warm up a vehicle so that it is operable at temperatures as low as —50° F. may approach 2 hours. Vehicles in poor mechanical conidition probably will not start at all, or only after many hours of laborious maintenance and heating. Complete winterization, diligent maintenance, and well-trained crews are the key to efficient arctic-winter operations.

c. Refer to TM 9-207 for general information on extreme-cold weather maintenance procedures.

CAUTION

It is important that the approved maintenance procedures be followed. TM 9-207 contains general information which is specifically applicable to these vehicles as well as other vehicles. It must be considered an essential part of this manual, not merely an explanatory supplement to it.

2-189. Extr me-Cold Weather Maintenance

Refer to TM 9-207 for instructions on the application of antifreeze compounds, arctic type

lubrication, handling of storage batteries in extreme cold, and dewinterization procedures.

2-190. Extreme-Hot Weather Maintenance

a. Cooling System. Thoroughly clean and flush cooling system (para 2-93) at frequent intervals and keep system filled to within 2¼ inches of the top of the filler neck with clean water when operating in extremely high temperatures. Formation of scale and rust in the cooling system occurs more rapidly during operation in extremely high temperatures, therefore, corrosion-inhibitor compound should always be added to the cooling liquid. Avoid the use of water that contains alkali or other substances which may cause scale and rust formations. Use soft water whenever possible.

b. Batteries.

(1) *Electrolyte level.* In torrid zones, check level of electrolyte in cells daily and replenish, if necessary, with pure distilled water. If this is not available, rain or drinking water may be used. However, continuous use of water with high mineral content will eventually cause damage to batteries and should be avoided.

(2) *Specific gravity.* Batteries operating in torrid climates should have a weaker electrolyte than for temperate climates. Instead of 1.280 specific gravity as issued, the electrolyte (sulphuric acid, sp gr 1.280) should be diluted to 1.200 to 1.240 specific gravity (TM 9-6140-200-14). This is the correct reading for fully-charged batteries. This procedure will prolong the life of the negative plates and separators. Batteries should be recharged at about 1.160 specific gravity.

(3) *Self-discharge.* A battery will self-discharge at a greater rate if left standing for long periods at high temperatures. This must be considered when operating in torrid zones. If necessary to park for several days, remove the battery and store in a cool place.

NOTE

Do not store acid type storage batteries near stacks of tires, since the acid fumes have a harmful effect on rubber.

c. Chassis and Body.

(1) In hot, dry climates, a careful watch must be kept for evidence of the presence of moths and termites.

(2) In hot, damp climates, corrosive action will occur on all parts of the vehicle and will be accelerated during the rainy season. Evidences will appear in the form of rust and paint blisters on metal surfaces, and mildew, mold, or fungus growth on wood, fabrics, leather, and glass.

(3) Protect all exposed exterior painted surfaces from corrosion by touchup painting, and keep a film of preservative lubricating oil (medium) on unfinished exposed metal surfaces. Cables and terminals should be protected by ignition-insulation compound.

(4) Make frequent inspections of idle, inactive vehicles. Remove corrosion from exterior metal surfaces with abrasive paper or cloth and apply a protective coating of paint, oil, or suitable rust preventive.

2-191. Maintenance After Fording

a. General. Although the vehicle unit housings are sealed to prevent the free flow of water into the housings, it must be realized that, due to the necessary design of these assemblies, some water may enter, especially during submersion. The following services should be accomplished on all vehicles which have been exposed to some depth of water or completely submerged, especially in salt water. Precautions should be taken as soon as practicable to halt deterioration and avoid damage before the vehicle is driven extensively in regular service.

b. Body and Chassis. Drain and clean out body, engine, and tool compartment; clean and dry all tools and equipment; clean all exposed painted surfaces and touchup paint them where necessary. Coat unpainted metal parts with engine lubricating oil (OE-10). Lubricate the chassis thoroughly as directed in the lubrication order (LO-9-2320-212-12). Do more than the usual lubrication job, making sure the lubricant is forced into each lubrication point to force out any water present.

c. Engine, Transmission, Transfer Case, and Axles. Check the lubricant in the engine, transmission, transfer case, and axles. Should there be evidence that water has entered, drain, flush, and refill with the correct lubricant. Remove the vents from the transfer and front and rear axle housing. Clean and check the operation of the vent valves. Replace damaged vents. Remove and clean engine oil filter.

d. Wheels and Brakes. Remove the front wheels, and flush out the steering knuckle flanges with a half-and-half mixture of engine oil (OE-10) and drycleaning solvent or volatile mineral spirits. Refill with the correct lubricant. Remove the rear wheels. Wash all wheel bearings thoroughly with drycleaning solvent or volatile mineral spirits, after which repack, assemble, and adjust. While the wheels are removed, dry out brake linings and clean rust and scum from brakedrum face. Check brake system for presence of water.

e. Batteries. Check the batteries for quantity and specific gravity of electrolyte to be sure no water entered through the vent caps. This is of special importance should the vehicle have been submerged in salt water.

f. Steering Gear. Remove and disassemble the steering gear. If the lubricant is contaminated,

clean the housing thoroughly with a half-and-half mixture of engine oil (OE-10) and drycleaning solvent or volatile mineral spirits. Assemble, refill with the correct grade of lubricant, and adjust (para 2-146).

g. Electrical Connections. Check all electrical connections for corrosion, particularly the bayonet type connectors.

h. Fuel System. Drain fuel tank of any accumulated water, and clean fuel filter and lines as necessary. If water is found in the air cleaner, clean and refill it with oil.

i. Condensation. Although most units are sealed, the sudden cooling of the warm interior air upon submersion may cause condensation of moisture within the cases or instruments. A period of exposure to warm air after fording should eliminate this condition. Cases which can be opened may be uncovered and dried.

j. Aluminum or Magnesium Parts. If the vehicle remains in salt water for any appreciable length of time, aluminum or magnesium parts which were exposed to the water will probably be unfit for further use and must be replaced.

k. Deep-Water Fording. Refer to TM 9-238 for deepwater fording information.

2-192. Maintenance After Operation on Unusual Terrain

a. Mud. Thorough cleaning and lubrication of all parts affected must be accomplished as soon as possible after operation in mud, particularly when a sea of liquid mud has been traversed. Clean the radiator fins and the interior of the engine compartment. Repack wheel bearings if necessary. Clean, oil and stow tire chains in the vehicle.

b. Sand or Dust. Clean engine and engine compartment. Touch up all painted surfaces damaged by sandblasting. Lubricate completely to force out lubricants contaminated by sand or dust. Air cleaners, and fuel and oil filters must be cleaned at least daily. Radiator fins must be cleaned daily with compressed air when operating in dusty terrain. Engine grills and other exposed vents should be covered with cloth at all times. When halted, the engine grills should be covered to protect the engine against entrance of sand or dust.

CHAPTER 3

MATERIEL USED IN CONJUNCTION WITH MAJOR ITEMS

Section I. GENERAL

3-1. Scope

This chapter contains instructions for organizational maintenance on vehicle special purpose kits and materiel used in conjunction with major items.

Section II. 100-AMPERE, 28-VOLT GENERATING SYSTEM

3-2. General

a. Description. The 100-ampere, 28-volt generating system is comprised of batteries, generator (alternator), rectifier, generator regulator, and necessary connecting cables. The three-phase, alternating current produced by the generator (alternator) is changed to direct current by the rectifier and transmitted through the generator regulator. The regulator maintains the voltage at a proper level for charging the batteries and for operating the vehicle electrical system by controlling the output of the generator (alternator).

b. Checking Procedure. Coordinate checking procedures with direct support maintenance personnel.

c. Diagrams. The external wiring diagram (fig. 2-58) outlines the test points to be used. The schematic diagram of the system is shown in figure 2-59.

3-3. Voltage Output Test and Adjustment

NOTE

The voltage regulator has two openings with removable plugs which provide access to the voltage rheostat. The plug in the side of the regulator box can be removed and a screwdriver inserted in the slotted shaft in the regulator box to turn the rheostat. Removing the plug in the regulator cover will reveal a knurled knob on the same rheostat shaft. Turn the shaft or the knob attached to it clockwise to increase the voltage, counterclockwise to decrease the voltage.

NOTE

When installing plug, coat the threads with nonhardening sealing compound (FSN 8030-656-1426, 1 pt. can, MIL-S-45180).

a. Testing Present Adjustment. With the meter set at 50 volts, connect voltmeter across the battery leads or from the starter post to ground. Start the engine. While the engine is idling, read the voltmeter. If the meter reading is between 27 and 28 volts, the generating system is performing satisfactorily.

b. Adjust Voltage. If the voltage output is not satisfactory, run the engine at a fast idle for 15 minutes with the lights on to charge the battery under load and to warm up the generating system. Then adjust the regulator until the meter indicates 27.5 volts. If the voltage cannot be adjusted to 27.5 volts by this method, go on to the following tests to determine the cause.

NOTE

If the results of any check or test or any component do not agree with the figures given, the faulty component will be replaced and the voltage adjustment repeated.

3-4. Visual Check

a. Check Belts. Check all belts for breaks or looseness. Check to insure that the alternator turns when the engine is operating.

b. Check Components. Inspect for burned components. Check the rectifier for evidence of blistering, flaking, and reddened burn spots. Damaged areas over 1-inch in diameter indicate a faulty rectifier.

NOTE

When necessary to clean the rectifier to perform a proper inspection, use a soft bristle brush or a soft, dry cloth. Never scratch the coating on the plates.

c. Check Wiring. Check the wiring for corrosion, breaks, and loose connections. Pay particular attention to battery connections. They must be clean and immovable with hand pressure.

3-5. Wiring Test

Check each harness as a part of the test of each major component. Check receptacle connections at the same time. If visual inspection discloses a harness that appears faulty check as follows:

a. Check Continuity. With the harness disconnected at each end and the meter set on the R x 100 scale, check each harness from each pin to its

socket on other end. No resistance should be indicated.

NOTE

Not all pins and sockets are used. See the external wiring diagram (fig. 2-58), and check only those circuits in use.

b. Check for Grounds. With the meter set on the R x 100 scale, check each harness from metal harness shielding. The meter should indicate infinite resistance (open circuit).

3-6. Generator Tests

a. Check Three-Phase Winding Continuity. With the ignition off, disconnect the generator-to-rectifier harness at the generator. With the meter set on the R x 1 scale, check from the large pin A to the large pins B and C, then check from large pin B to large pin C. The meter should indicate no resistance.

b. Check for Grounds. With the meter set on R x 100 scale, check pins A, B, and C to generator ground (or frame). The meter should indicate infinite resistance (open circuit).

c. Check Field Resistance. Remove the generator belts from the generator pulley. With the meter set on the R x 1 scale, check the reading from pin D to pin E on the generator receptacle and record the reading. Turn and stop the generator five times, recording each reading. If the most frequent reading (i.e., at least 3 out of 5) is less than 4 ohms, field resistance is presumed correct.

d. Test Receptacle and Harness. Reconnect the harness to the generator, and disconnect the same harness at the rectifier. Repeat tests *a* through *c* above. Results should be the same. This procedure tests continuity through the receptacle and harness, and tests the harness for grounds.

3-7. Rectifier Test

a. Test Reverse Current Resistance. With the ignition off, disconnect the harness assemblies at the rectifier. Set the meter on the R x 100 scale, and connect the red lead (+) to pin D on rectifier-to-regulator receptacle of the rectifier. Touch the other lead to each of three large sockets (A, B, and C), in turn, on the rectifier-to-generator receptacle of the rectifier. Record the meter readings. A variation of more than 25 ohms between any two readings indicates a faulty rectifier. This test checks one side of the rectifier. To test the other side place the black lead (—) of meter on pin C of rectifier-to-regulator receptacle and again touch the other lead to each of the three large sockets (A, B, and C) of the rectifier-to-generator receptacle. Record three readings. Variation between any two readings should not exceed 25 ohms. In addition, variation between any two readings in both sides of the rectifier should not be more than 25 ohms.

b. Test Field Circuit Through Rectifier. With meter set on R x 100 scale, check from small pin B to socket D and from small pin E to socket E on the rectifier receptacles. The meter should indicate no resistance.

c. Test Receptacle and Harness.

(1) Reconnect both harnesses to the rectifier. Then disconnect the same harnesses at the regulator and the generator. Repeat tests *a* and *b* above through the harnesses. The results should be the same.

(2) Disconnect both harnesses completely and make a ground test of each (para 3-5).

3-8. Regulator Test

a. Test Load Relay. Connect the entire system. Disconnect the rectifier-to-regulator harness at the regulator. With the meter set on the 50-volt dc scale, connect the leads to small B and small E of the receptacle, and turn on the ignition. The Load relay should close with an audible click, and the meter should show battery voltage (22 to 24 volts).

b. Check 5-Ohm Adjustable Resistor Resistance. Disconnect the battery-to-regulator harness. With the meter set on the R x 1 scale and with the engine off, check from socket C to socket D on the voltage regulator. With the adjustable voltage control set at its fully clockwise position, the meter should indicate 26 ± 1 ohms. With the voltage control set at its fully counterclockwise position, the meter should indicate 21 ± 1 ohms.

c. Check Carbon Pile Resistance. Check from socket C to socket B. The meter should indicate approximately 1 ohm.

d. Test Receptacle and Harness.

(1) Reconnect the rectifier-to-regulator harness at the regulator. Disconnect the same harness at the rectifier. Repeat tests *a* through *c* above through the harness. The results should be the same.

(2) Remove both ends of rectifier-to-regulator harness and test them for grounds (para 2-33).

e. Check Line Switch Resistance. Disconnect the regulator-to-battery harness at the voltage regulator. With the meter set on the R x 100 scale, check from pin A to socket C on the regulator; the meter should indicate infinite resistance (open circuit).

f. Check Load Relay Coil Resistance. With the meter set on the R x 100 scale, check from pin F to pin C on the regulator. The meter should read 175 ± 10 ohms.

g. Check Jumper Continuity. Next, check pin A to pin B on the regulator. No resistance should be indicated.

3-9. Battery Test

a. Check Battery Voltage. With the meter set on the 50-volt dc scale, check the no-load battery

voltage. The meter should read approximately 24 ± 1 volts.

b. Test Battery Capacity. Crank the engine with the ignition off. The meter should read 18 volts or higher during cranking.

CAUTION

Do not crank longer than 30 seconds.

c. Test Battery Cable.

(1) Check from contact A of the battery harness to ground. The meter should indicate battery voltage.

(2) Connect a jumper from contact A to B of the regulator-to-battery harness. Turn on the ignition, and check from contact F to ground; the meter should indicate battery voltage.

3-10. Generator, Generator Mounting Bracket, Cable, and Generator Regulator

a. Remove Generator.

(1) Disconnect the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-23).

(2) Disconnect the generator-to-rectifier cable at the generator receptacle (fig. 3-1), using a suitable wrench.

(3) Remove the adjusting arm bolt, flat washer, and lockwasher securing the adjusting arm to the generator. Push the generator toward the engine, and remove four drive belts from the generator pulley.

(4) Remove the two nuts, lockwashers, and bolts securing the generator to the mounting bracket, and remove the generator.

NOTE

Removal and installation instructions for the generator mounting bracket are provided in paragraph 2-33.

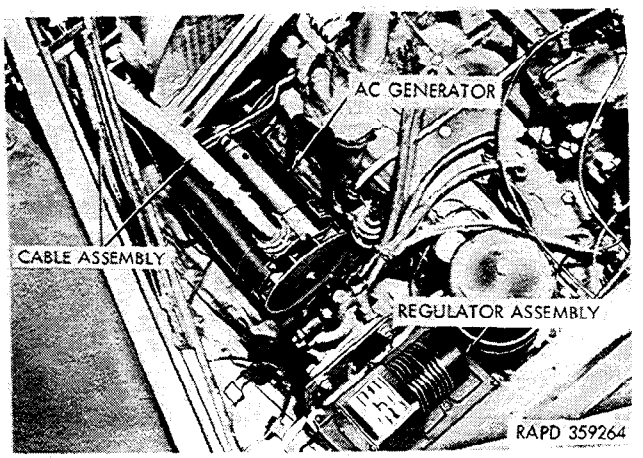


Figure 3-1. Generator and regulator, installed.

b. Remove Generator Pulley.

(1) Remove the self-locking nut and lockwasher securing the generator pulley to the armature shaft.

(2) With a suitable puller, remove the pulley from the shaft. Remove the woodruff key.

c. Install Generator Pulley. Install the woodruff key in the armature shaft, and install the pulley on the shaft (hub toward the generator), alining the keyway in the pulley with the key. Install the washer and self-locking nut. Tighten the nut to 75 to 80 foot-pound torque.

d. Install Generator.

NOTE

Before installing the generator, see that the generator mounting bolts and nuts are thoroughly clean and the contacting surfaces of the bracket and generator heads are clean to insure a good ground connection.

(1) Mount the generator in position on the mounting bracket and install the bolts, lockwashers, and nuts removed in *a* (4) above. Do not tighten the nuts.

NOTE

Install the bolts with their heads toward the front of the vehicle.

(2) Attach the adjusting arm to the generator with the bolt, washer, and lockwasher removed in *a* (3) above. Push the generator toward the engine, and place the four drive belts on the pulley.

(3) Pull the generator outward and tighten the adjusting arm. Adjust the tension on the drive belts as required until 20-25 foot-pounds of torque are required, on a torque wrench applied to the generator pulley nut, to cause the pulley to slip.

(4) Tighten the hexagon-head bolts securing generator to the generator mount to 60-70 foot-pounds torque.

(5) Tighten the adjusting arm-to-engine-block bolt to 30 to 35 foot-pounds torque.

(6) Tighten the adjusting arm-to-generator bolt to 35 to 40 foot-pounds torque.

(7) Connect the generator-to-rectifier cable to the generator receptacle. Tighten the cable connector securely, using a suitable wrench.

e. Replace Generator-to-Rectifier Cable.

(1) *Removal.* Disconnect the cable from the generator and rectifier receptacles, using a suitable wrench. Remove the cable.

(2) *Installation.* Determine which end of cable matches the rectifier receptacle, and install it on the rectifier; and then install the opposite end on the generator. Tighten the connectors, using a suitable wrench.

(3) Connect the battery-to-ground cable to the negative (—) post of the outer battery (fig. 2-23).

f. Generator Regulator.

(1) *Removal.*

(a) Disconnect the battery-to-ground cable from the negative (—) post of the outer battery (fig. 2-23).

(b) Disconnect the rectifier-to-regulator and regulator-to-battery cables from the regulator receptacles with a suitable wrench. Remove the cable from the receptacle.

(c) Remove the four nuts and washers securing the regulator to the bracket, and remove the regulator.

(2) *Installation.*

(a) Connect the rectifier-to-regulator and regulator-to-battery cables to their respective receptacles on the regulator.

(b) Install the regulator on the support bracket, and secure it with the nuts and washers removed in *a* (3) above.

(c) Tighten the rectifier-to-regulator and regulator-to-battery cables connectors at the receptacles using a suitable wrench.

(d) Connect the battery-to-ground cable to the negative (—) post of the outer battery (fig. 2-23).

3-11. Rectifier

a. Removal.

(1) Disconnect the generator-to-rectifier and rectifier-to-regulator cables from the rectifier with a suitable wrench.

(2) Remove the radiator brush guard and the rectifier from the vehicle.

(3) Remove the two nuts, lockwashers, and screws securing the rectifier to the brush guard, and the remove rectifier.

b. Installation.

(1) Install and secure the rectifier to the brackets on the radiator brush guard with the two screws, lockwashers, and nuts removed in *a* (3) above.

(2) Install and secure the radiator brush guard to the vehicle with the bolts, lockwashers, and nuts removed in *a* (2) above.

(3) Connect the generator-to-rectifier and rectifier-to-regulator cables to their respective receptacles on the rectifier, and tighten the connectors with a suitable wrench.

3-12. Rectifier-To-Regulator Cable

a. Removal. Disconnect the cable from the rectifier and regulator, using a suitable wrench. Remove the cable.

b. Installation. Determine which end of the cable matches the rectifier receptacle; and connect the cable to the rectifier, and then the opposite end to the regulator. Tighten the connectors with a suitable wrench.

3-13. Fan Drive Pulley

Remove and install the fan drive pulley as described in paragraph 2-96. Adjust the fan belts (para 3-10 *d* (3)).

NOTE

The fan drive pulley for the 100-ampere generator has four grooves.

3-14. Fan and Generator Belt Set

a. Removal.

(1) Loosen the generator-to-generator support attaching bolts. Loosen the adjusting arm capscrew at the engine block. Loosen the generator adjusting arm capscrew.

(2) Push the generator toward the engine block and remove the fan and generator belts from the generator fan pulley.

(3) Remove each belt from the water pump pulley and the crankshaft pulley.

NOTE

Belts are supplied in matched sets and should be replaced in sets.

b. Installation.

(1) Install each belt on to the crankshaft pulley and onto the water pump and generator pulleys.

(2) Adjust belt tension as prescribed in paragraph 3-10 *d* (3).

(3) Continue to secure the generator at its mounting points as prescribed in paragraph 3-10 *d* (4), (5), and (6).

3-15. Jumper Cables

The following procedure should be strictly adhered to when starting an engine in a vehicle equipped with an ac-dc, 100-ampere, 28-volt, generating system by use of jumper cables from another vehicle battery.

a. Connect the battery jumper cables; positive to positive and negative to negative.

b. Proceed in the usual manner to start the engine.

c. Remove the battery jumper cables immediately after engine has started, removing negative cable first.

Section III. PERSONNEL SHELTER HEATER KIT

3-16. Description

The components of the personnel shelter heater kit are:

a. Engine Primer System. A hand-operated, plunger pump is provided to introduce a fine spray of gasoline into the engine intake manifold to facilitate starting the engine in extremely cold weather. The priming action complements the

action of the carburetor choke and is only required to start engines that are cold-soaked. Normal starting by use of the choke control alone will be employed in all possible cases.

NOTE

On late vehicles, the engine primer set is not issued as a component of the personnel heater kit, but as a supplementary conversion kit if required. Vehicles not provided with a primer pump by the manufacturer will be so equipped when the personnel heater kit is installed.

b. Radiator Winterfront Cover. A radiator winterfront cover is provided to reduce the flow of cold air entering the engine compartment through the radiator. An adjustable flap permits manual control of the flow of cold air through the radiator, in accordance with the readings on the engine temperature gage. In this manner, the engine temperature can be quickly raised and kept at normal operating levels in subzero weather areas.

c. Personnel Heater. The personnel heater is of the blower type. It distributes heated air through ducts and a heat diverter to the body of the vehicle and to the windshield glass for defrosting purposes. Fuel for the heater is drawn from the vehicle fuel system. A damper in the heat diverter provides for distribution of heated air to the vehicle cab compartment and / or to the windshield glass in the proportions desired. Operation of the heater is controlled electrically by a heater control box.

3-17. Application

a. The personnel heater kit is for use in areas where the normal temperature during the coldest period of the year is 5° F. and lower.

b. The personnel heater kit is installed on vehicles equipped with either a soft-top of hardtop closure. A separate personnel heater kit of the same type is installed in the body (patients' compartment) of the ambulance truck at the time of manufacture.

3-18. Responsibility

The concern of the organizational unit is restricted to tests and adjustments only.

3-19. Tests

a. Initial Starting.

(1) Turn on the heater fuel shutoff cock at the fuel pump, under the engine hood.

(2) Start the engine.

(3) If the kit is equipped with a heater control box SW-G486267, proceed as in *(a)* below) if heater control box SW-G486824 is used, proceed as in *(b)* below.

(a) Turn the heat control thermostat to the high position. Hold the safety valve switch in its RESET position for about 30 seconds and release it. Snap the heater switch to ON. Warm air should be felt at the heat outlet within 3 minutes. Adjust the thermostat for desired temperature.

(b) Turn the HI-LO switch to HI. Hold the safety valve switch in its RESET position for about 30 seconds and release it. Snap the heater switch to ON. Warm air should be felt at the heat outlet within 3 minutes. Move the HI-LO switch to HI or LO for desired temperature.

(4) After the heater has been in full operation for 3 or 4 minutes, turn the switch to OFF for a check. Burning in the heater should stop within 45 seconds, but both blowers should continue to operate for about 2 minutes to cool and purge the heater.

NOTE

If the heater is started while the unit is still purging, ignition will not take place until the purge period is over.

b. Heater Fails to Start. If no warm air is felt at the heat outlet within 4 or 5 minutes, proceed as in (1) and (2) below.

(1) If heater control box SW-G486267 is used, push in the circuit breaker reset button, and make a second attempt to start (*a* (3) *(a)* above). If the heater fails to start after the third attempt, make no more attempts to start it. The heater requires servicing.

(2) If heater control box SW-G486824 is used, make a second attempt to start (*a* (3) *(b)* above). If the heater fails to start on the third attempt, make no more attempts to start it. The heater requires servicing.

c. Operation of Heater. After the heater has been started and satisfactorily checked the first time, it will only be necessary to start the engine and turn the heater switch on for subsequent starts, if shut-down periods are not sufficiently long to chill the system.

d. Stopping the Heater.

(1) Snap the heater switch to OFF.

(2) Burning in the heater should stop in about 25 seconds, but both blowers will continue to operate for 2 or 3 minutes to cool and purge the heater of unburned gases. The blower motors will stop when the heater is sufficiently cool.

e. Heater Fails to Start. Follow instructions on the operating instruction plate (fig. 3-2). If the heater still fails to start, perform the checks described in (1) through (4) below, using the low voltage circuit tester.

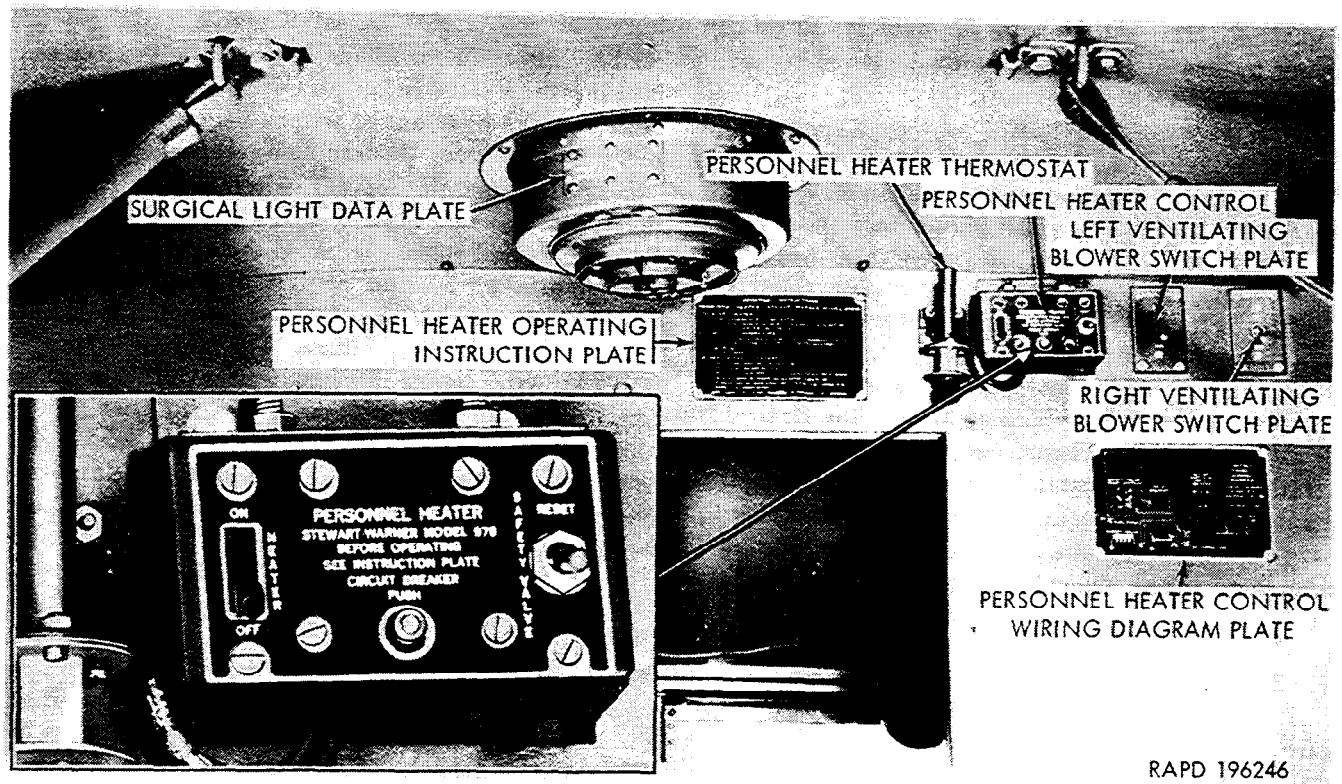


Figure 3-2. Data and instruction plates in patient compartment (ambulance truck M43).

(1) Check for current at heater (fig. 3-3).

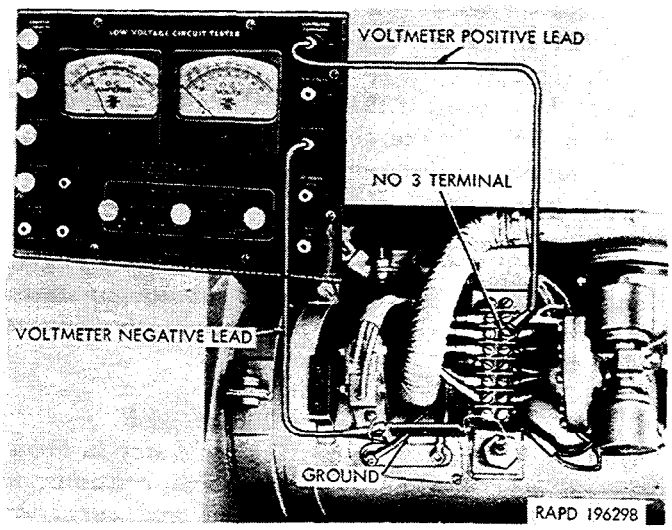


Figure 3-3. Checking for current at heater.

(a) Remove the guard from the top of the heater to provide access to the electrical connections.

(b) Connect the voltmeter positive (+) test lead to the voltmeter positive (+) terminal, and attach the clip end of the lead to the No. 3 connection on the heater terminal strip.

(c) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester, and attach the clip end of the lead to a suitable ground on the heater case.

(d) Observe the voltmeter lower scale. If the voltmeter does not show battery voltage (approximately 24 volts), proceed with (2) below.

(2) *Check for current through the heater circuit breaker.*

(a) Disconnect the cable (400) from the heater circuit breaker.

(b) Refer to paragraph 2-37 *b* (2) for the method of checking for current through the circuit breaker.

(c) If the voltmeter stays at zero and current is not flowing through the circuit breaker, proceed with (3) below. If current is flowing through the circuit breaker, proceed with (4) below.

(3) *Check for current to circuit breaker.*

(a) Remove the cable (11) from the heater circuit breaker.

(b) Refer to paragraph 2-37 *b* (3) for the method of checking for current to the circuit breaker.

(c) If battery voltage is indicated on the lower scale of the voltmeter, replace the circuit breaker. If the voltmeter stays at zero and current is not flowing to the circuit breaker, notify direct support maintenance personnel.

(d) Connect the voltmeter negative (—) test

lead to the 50 VOLTS terminal of the tester, and attach the clip end of the lead to a suitable ground on the blower.

(c) Observe the voltmeter lower scale. If the voltmeter indicates battery voltage (approximately 24 volts), an open circuit between the cable connector and the heater is indicated. Notify direct support maintenance personnel.

(4) *Check heater control.* If current to the heater is indicated by (1) above, or if it is established by corrective measures prescribed in (2), (3), and (4) above, and the heater will not start, the heater control is faulty. Notify direct support maintenance personnel.

(5) *Heater faulty.* If the heater will not start after (1) through (5) above have been performed, notify direct support maintenance personnel.

(6) *Remove testing equipment.* When the checks have been completed, remove the testing equipment, connect all cables, and install the blower inspection cover, the instrument cluster, and the heater guard.

f. Heater Starts but Will Not Burn.

(1) *Fuel does not reach the heater control valve.* Check for fuel flow to the heater control valve.

(a) Disconnect the fuel line at the heater control valve, and attach a length of hose to the open fuel line. Insert the other end of the hose in a suitable container.

(b) Turn the heater switch on and note whether fuel flows into the container.

(c) If no fuel flows or if flow appears to be insufficient, check for a restricted fuel filter or fuel lines, or an inoperative fuel pump.

(2) *Igniter faulty.* If sufficient fuel is reaching the control valve, and the combustion motor runs when the switch is turned on, the igniter is faulty.

(3) *Heater faulty.* If the heater fails to burn after (1) and (2) above have been performed, notify direct support maintenance personnel.

(4) *Check for current to heater control cable (Fig. 3-4).* If current flows through the heater circuit breaker, but does not reach the heater, proceed as outlined in *(a)* through *(c)* below.

(a) Remove the right ventilating blower inspection cover at the upper corner of the driver's compartment.

(b) Disconnect cable 400-B at the cable connector.

(c) Connect the voltmeter positive (+) lead to the positive (+) terminal of the low voltage circuit tester, and attach the clip end of the lead to the terminal of cable 400-B.

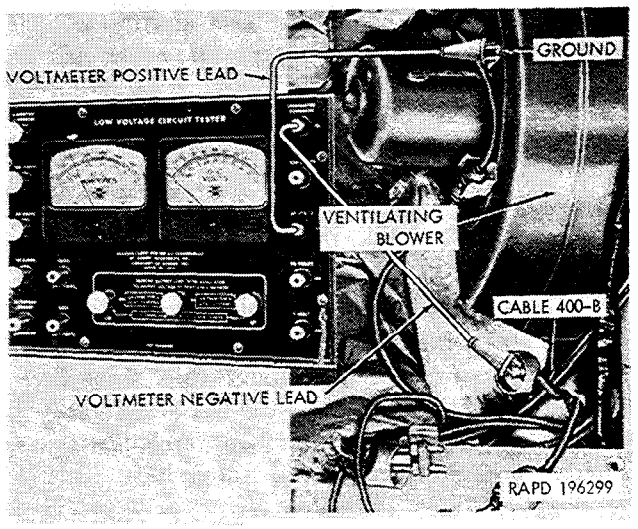


Figure 3-4. Checking for current at heater cable.

g. Thermostat Does Not Control Temperature (Heater Operates Satisfactorily). Replace thermostat (para 2-95).

h. Post-Test Protection. Spray all components of the winterization kit with ignition insulation compound.

3-20. Adjustment of Radiator Winterfront Cover

a. During stand-by periods, the winterfront cover must be completely closed.

b. During vehicle operation, the driver should constantly note the reading on the temperature gage. To perform the work for which it is designed, in an efficient and economical manner, the engine must operate at temperatures ranging from 170° to 180° F. Extreme cold will adversely affect engine performance by preventing the coolant (and working parts) from attaining the desired temperature. Continuous operation at relatively low engine temperatures wastes fuel, increases engine wear, and causes sludge that affects engine performance and reduces power.

c. Keep the winterfront cover fully closed until the engine temperature increases beyond 180° F., at which point the engine thermostat starts to open.

d. If the temperature exceeds 180° F., raise the flap on the winterfront cover, and strap it in position. If the temperature continues to increase consistently beyond 180° F., after the flap is fully open, remove the radiator winterfront cover completely to prevent overheating of the engine.

NOTE

If the hood blanket cover provided with the powerplant heater kit is installed, it should first be removed and the tests continued. When the radiator winterfront cover is removed, it must be stowed safely and carefully in the vehicle with canvas curtains for future use. Care must be taken not to lose or misplace the retaining springs and hooks.

Section IV. VENTILATOR BLOWER MOTORS AND SWITCHES (AMBULANCE TRUCK M43)

3-21. General

The left and right ventilator blower motors and switches are serviced in the same manner. The blower motors are not interchangeable, since they rotate in opposite directions—the left motor rotates clockwise and the right motor counterclockwise as viewed from the rear end of the motor shaft.

3-22. Removal and Installation of Ventilator Blower Motors and Switches

a. Remove blower motor (Fig. 3-5 and 3-6).

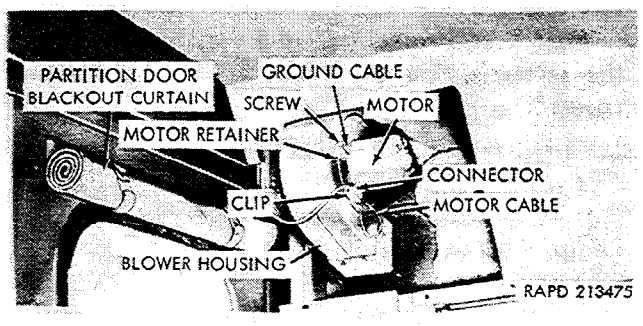


Figure 3-5. Removal or installation of ventilator blower motor.

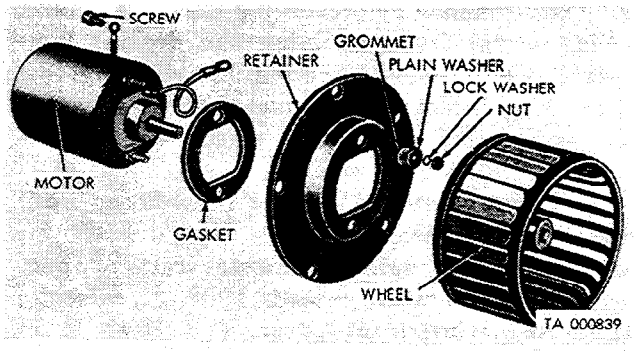


Figure 3-6. Blower motor, wheel, and related parts—exploded view.

(1) Remove the five lockwasher screws that secure the blower inspection cover in the driver's compartment, and remove the cover.

(2) Disengage the motor cable connector from the connector clip, and disconnect the cable at the connector.

(3) Remove the five screws that attach the motor retainer to the blower housing (one of the screws attaches the motor ground cable and another the cable connector clip). Pull the motor and retainer from the blower housing.

(4) Loosen the setscrew that secures the blower wheel on the motor shaft, and remove the wheel.

(5) Remove the nut, lockwasher, plain washer, and grommet from each of the two studs in the motor, and remove the motor retainer and motor gasket.

b. Install Blower Motor (figs. 3-5 and 3-6). Be sure to install the correct motor for the blower being serviced (*a* above).

(1) Position the motor gasket and the motor retainer over the shaft end of the motor. Install a motor grommet, a plain washer, a lockwasher, and a nut on each motor stud, and tighten the two nuts.

(2) Place the blower wheel on the motor shaft with the open end of the wheel away from the motor.

NOTE

Left and right blower wheels are not interchangeable. The blower wheel blades must slant in the direction of motor rotation.

Aline the setscrew opening with the flat on the shaft, and position the wheel so that the hub of the wheel is flush with the chamfer on the end of the motor shaft. Tighten the setscrew.

(3) Position the motor retainer and motor in the blower housing with the motor cable at the top for the right blower or bottom for the left blower.

Install the five panhead tapping screws, attaching the motor ground cable and connector clip. Tighten the screws evenly. Connect the blower motor cable, and insert the connector in the clip.

(4) Position the blower inspection cover at the corner of the driver's compartment. Install a panhead lockwasher screw for each of the other four holes. Tighten the screws.

c. Replace Ventilator Blower Switch. Both ventilator blower switches are serviced in the same manner and are identical.

(1) Remove the two screws that secure the heater control panel inspection cover to the front side of the partition. Remove the three cable connectors from the connector clips on the inner side of the cover, and remove the cover.

(2) Separate the switch cables at the cable connectors (one cable to the blower motor and one to the double connector). Remove the grommet and bushing from each cable and remove the cables from the connector shells.

(3) Remove the four screws that secure the switch plate to the rear side of the partition (fig. 3-2), and remove the switch plate with attached switch and cables. Remove the two screws that secure the switch to the plate, and remove the switch.

(4) Position the new switch on the switch plate, and install the two roundhead screws. Tighten the screws.

(5) Insert the two cables through the opening in the partition, position the switch plate, and install the four screws (fig. 3-2). Tighten the screws. Be sure the switch is in the OFF position.

(6) Insert one cable terminal through the double connector shell, install the bushing and grommet, and connect the cable terminal. Engage the double connector shell. Install the connector shell, bushing, and grommet on the other cable, and connect the cable to the motor cable.

(7) Install the three cable connectors in the connector clips on the inspection cover. Position the inspection cover on the partition and install the two capscrews. Tighten the screws.

d. Ventilating Blowers Inoperative. If either ventilating blower fails to start when the motor switch is turned on, perform the checks described below, using the low voltage circuit tester.

(1) Check for current to the ventilating blower motor (fig. 3-7).

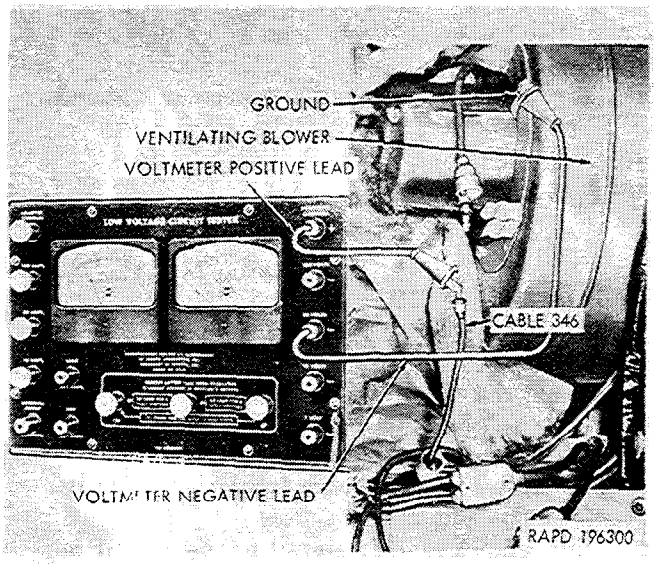


Figure 3-7. Checking for current to ventilating blower motor and switch.

(a) Remove the ventilating blower inspection cover at the upper corner of the driver's compartment.

(b) Remove the blower motor cable connector from the clip on the blower, and disconnect the cable (346) (right blower) or (347) (left blower) at the cable connector.

(c) Connect the voltmeter positive (+) test lead to the positive (+) terminal of the low voltage circuit tester, and attach the clip end of the lead to the cable terminal.

(d) Connect the voltmeter negative (—) test lead to the 50 VOLTS terminal of the tester, and attach the clip end of the lead to the motor ground strap screw on the blower.

(e) Turn the blower switch on and observe the reading on the voltmeter lower scale. If the voltmeter shows battery voltage (approximately 24 volts), replace blower motor (para 3-21 *a* and *b*). If no voltage reading is indicated, proceed with (2) below.

(2) *Check for current to blower switch.*

(a) Current for both the ventilating blowers and the personnel heater is supplied by cable 400-B. Check for current (para 3-19 *f* (4) above).

(b) Observe the voltmeter lower scale. If the voltmeter shows battery voltage (approximately 24 volts), replace the ventilator blower switch (para 3-22 *d*). If no voltage reading is indicated, check for

current at the circuit breaker *(a* (2) above,, and correct as necessary.

(c) When the checks have been completed, remove the testing equipment, and install the blower inspection cover.

Section V. POWER PLANT HEATER KIT

3-23. Description

The chief components of the powerplant heater kit are described in *a* through *e* below.

a. Engine Thermostat. For extremely low temperatures, the standard bellows type thermostat in the engine cooling system, which starts to open within 140° to 155° F. and is fully open at 170°, is replaced by one that starts to open at 180°. Either the bellows type or element type thermostat may be used.

b. Slave Receptacle. The slave receptacle is provided to receive the plug of the service cable leading from the cold-starting aid kit (slave kit) M40. When auxiliary battery starting power is needed, boosting of batteries may be required in subzero temperatures, particularly when the vehicle batteries are cold-soaked from long exposure.

NOTE

The slave receptacle is installed on all early vehicles. Later production excluded this installation. When a slave receptacle is required it will be obtained separately.

c. Engine Heater. An electrically operated heater, using gasoline supplied by the heater fuel pump from the vehicle fuel system, is mounted on the rear of the right front fender. It heats the coolant in the engine cooling system to facilitate starting, and to maintain near-normal engine operating temperature during stand-by periods. Separate lines allow heater coolant to circulate through the battery-box heating pad in the bottom of the battery box. Exhaust gases from the heater pass through tubing to an oil pan shroud for warming the crankcase lubricant. The heater is not designed for use while the vehicle is in motion, but for overnight or stand-by heating of the coolant and crankcase lubricant when the engine is stopped.

d. Battery Box and Accessories. The components of this groupment are: The battery box, cover, and battery box heating pad used to maintain batteries at temperatures necessary for normal input and output voltages of the battery. The battery box heating pad and the engine heater are connected by hoses.

e. Hood Covers. Hood covers are attached to the engine hood and hood side panels to help retain heat in the engine compartment. The covers do not interfere with the opening of the hood.

3-24. Cold-Starting Aid Kit (Slave Kit) M40 (Fig. 3-8.)

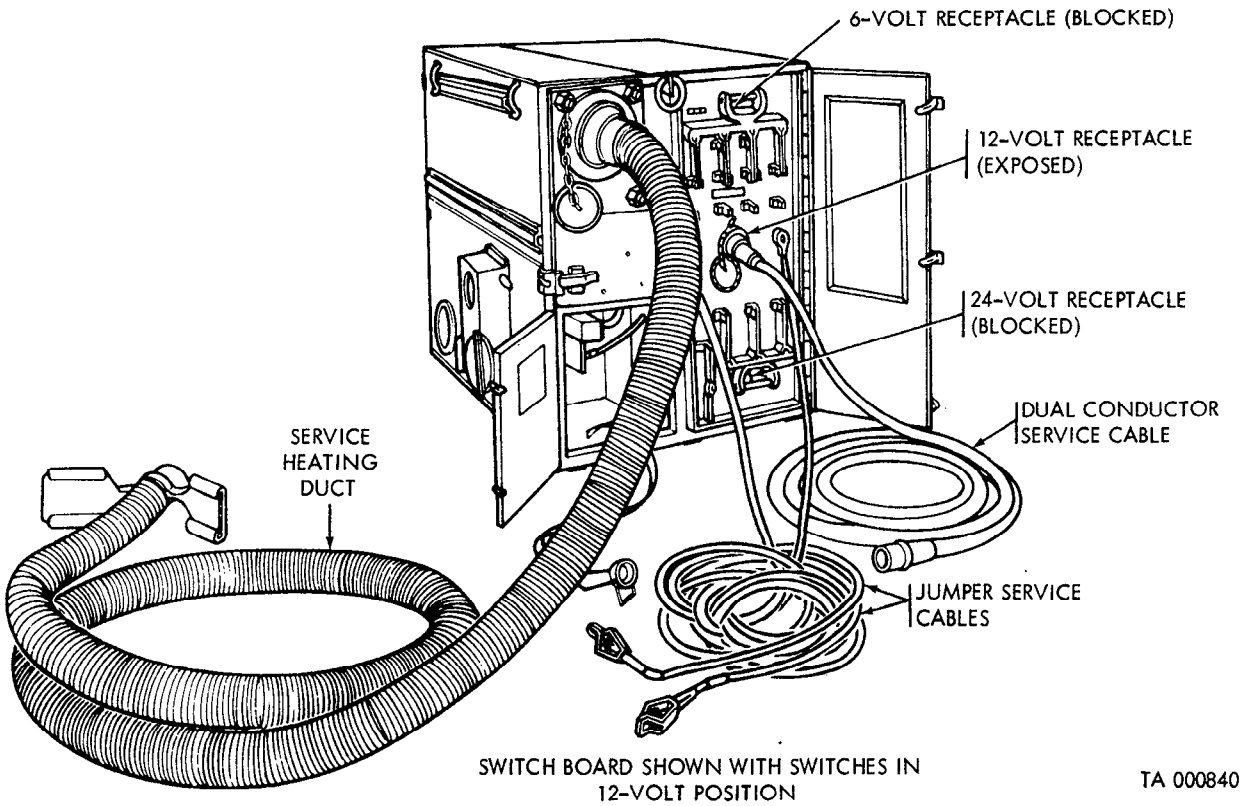


Figure 3-8. Cold-starting aid kit (slave kit) M40.

a. This portable unit, commonly called a slave kit, is not a part of the arctic winterization kit, but is provided for troop units equipped with winterized equipment.

b. The slave kit is designed to provide an auxiliary source of electrical energy to aid in starting engines, in ambient temperatures as low as —70° F., by providing booster starter current when vehicle batteries are cold and of low charge. A slave receptacle is provided (para 3-23 *b*) to receive the slave cable.

c. It also provides heat through a portable duct to the engine compartment, storage batteries, improperly lubricated sealed bearings, and other locations where lubricant may have congealed or ice may have formed sufficiently to impede proper functioning.

3-25. Application

The powerplant heater kit is for use in areas where the normal temperature during the coldest period of the year is —25° F. and lower. This kit is installed on truck M43 in conjunction with the personnel heater kit, and on trucks M37 in conjunction with the personnel heater kit and the hardtop closure kit.

3-26. Responsibility

The concern of the organizational unit is restricted to testing, adjustments, and the replacement of defective hoses and lines.

3-27. Tests

a. Preparation.

(1) The vehicle fuel tanks should be filled with arctic-grade fuel, and the shutoff cock in the heater fuel line should be open.

(2) The storage battery should be charged and properly connected.

b. Operating Cautions.

(1) Do not attempt to operate the engine heater until the cooling system is filled with coolant. When filling the coolant system, be sure that the shutoff cocks in the engine heater coolant system are open to allow the engine heater and the battery pad to fill with coolant.

(2) Immediately after installation of the kit, run the vehicle engine to insure complete removal of any air that may have been trapped in the coolant system.

(3) The shutoff cocks in the coolant lines of the engine heater system must be open at all times when the engine heater is operating.

(4) The shutoff cocks must be closed whenever the vehicle is operating in ambient temperatures above the minimum recommended in the locality of operation. This is to prevent overheating of the battery.

(5) Check electrical supply by pressing in the button marked PRESS TO TEST over the indicator light.

c. To Start.

(1) Open the coolant valves in the heater system, and the fuel valves on the engine heater and vehicle fuel filter.

(2) Press in the circuit breaker reset button.

(3) Hold heater switch in the START position until the indicator light glows, which indicates that heater has started.

NOTE

Do not hold in the switch to the START position for more than 3 minutes.

(4) Move heater switch to the RUN position.

(5) If heater fails to ignite on first trial, wait 1 minute to allow fuel to reach the top of the wick in the burner bowl, then repeat (para 3-27 *c*(3) or (4) above. If the heater fails to start within 5 minutes, move the heater switch to the OFF position; the heater requires servicing.

d. To Stop.

(1) Move the heater switch to the OFF position. Wait for indicator light to go out (approx. 5 min).

(2) Close fuel shutoff valves.

e. Manual Ignition. In the event of failure of the electric igniter, the heater can be ignited manually.

(1) Hold the heater switch in the START position for 1 to 2 minutes and then move it to OFF.

(2) Turn and remove the igniter plate (resistor retainer) at the bottom of the burner.

(3) Soak a small piece of waste or cloth in gasoline.

(4) Light the improvised torch with a match, push it up into the burner bowl, and immediately install the igniter plate.

(5) Move the heater switch to START and hold it until the indicator light glows.

(6) Throw the switch to RUN. The heater will operate normally.

f. Post-Test Protection. Spray all components of the kit with ignition insulation compound.

3-28. Use of the Slave Receptacle

When the cold-starting aid kit (slave kit) M40 is available, it is normally transported on a vehicle, on runners, or on skids.

a. To use the slave receptacle, the cover is first unscrewed from the receptacle and lowered, then the two-terminal plug on the extension cable from the slave kit switchboard is inserted into the receptacle. By plugging in (or attaching jumper wires) at the 24-volt position on the switchboard, connection is established between the switchboard on the slave kit and the storage battery of the vehicle.

NOTE

Cable terminal plugs designed for other than 24-volt current may be altered to fit into the slave receptacle by filing off the small rectangular tip on the plug.

b. In this manner, the slave kit batteries provide auxiliary, booster current to assist the vehicle battery in turning over and starting a cold, stiff engine.

c. Hot air provided from the heater of the slave kit can be used to warm parts of the vehicle before starting. Air is directed to desired points on the vehicle by means of a duct.

3-29. Adjustment of Hood Covers

a. During stand-by periods, all the hood covers must be completely closed.

b. During stand-by operation, the driver should constantly note the reading on the temperature gage. To perform the work for which the engine is designed, in an efficient and economical manner, it must operate at temperatures ranging from 170° to 180° F. Extreme cold will adversely affect engine performance by preventing the coolant (and working parts) from attaining the desired temperature. Continuous operation at relatively low engine temperatures wastes fuel, increases engine wear, and causes sludge that affects engine performance and reduces power.

c. Keep the hood cover fully closed until the engine temperature increases beyond 180° F., at which point the engine thermostat begins to open.

d. If the temperature exceeds 180° F., raise the flap on the cover and strap it in position. If the temperature continues to increase consistently beyond 180° F. after the flap is fully open, remove the cover completely to prevent overheating of the engine.

3-30. Replacement of Hoses and Lines

a. Disconnect and remove all unserviceable hoses and lines.

b. Replace the hoses and lines, and use a light coating of liquid cement.

Section VI. HARD TOP CLOSURE KIT

3-31. General

The hard top closure kit for the ¾-ton 4x4 cargo truck M37 and telephone maintenance truck M201 is installed (when the powerplant heater kit is installed) for use in areas where ambient air temperatures as low as —65° F. are anticipated.

3-32. Responsibility

The concern of the organizational unit is restricted to repair operations.

3-33. Preparation for Mounting the Hard Top Closure

a. Remove Spare Wheel. Turn the locknut counterclockwise and remove it. Lift off the lock plate. Roll the wheel to the rear of the body.

b. Remove Body Front Rack. Lift the body front rack from the vehicle.

c. Remove Cab Cover (fig. 3-9). Untie the lashing ropes from the lashing hooks on the back of the cab. Disconnect the cover at the sides by pulling it away from the side rails until the metal retainers are disengaged from the slots in the side rails. Disconnect the two straps from the rear top bow to the top-holding brackets on the windshield frame, and pull the rear portion of the cab cover up and out of the metal retainers on the rear supports. Fold the cab cover forward and pull it from the right side of the vehicle until the cover is disengaged from the metal retainer on the front of the windshield top support rail.

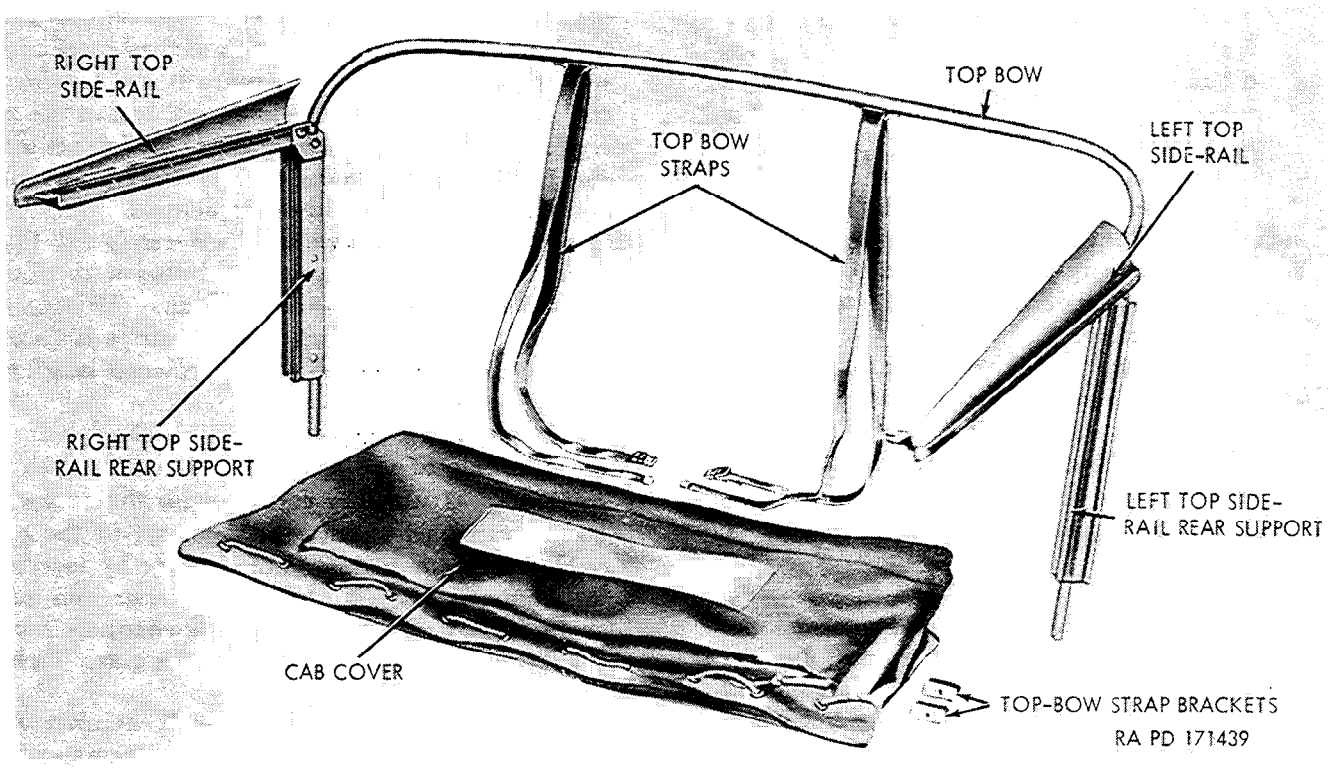


Figure 3-9. Items removed before installation of hardtop closure.

d. Remove Top Side Rails (fig. 3-9). Remove the capscrews from the front and rear of the right and left top side rails. Lift the side rails from the vehicle and discard them.

e. Remove Top-Bow Strap Brackets (fig. 3-9). Remove the capscrew and lockwasher which secure each of the brackets to the windshield. Remove the two brackets.

f. Remove Top Bow (fig. 3-9). Lift up on the top bow, disengaging it from each of the top side-rail rear supports.

g. Remove Top Side-Rail Rear Supports. Loosen the J bolts and U bolts located at the upper inside portions of the door-lock pillar. These bolts secure the tubular portion of the top side-rail rear supports. Lift the two supports from the body lower rear side panels.

3-34. Preparation of the Hard-Top Closure

Remove the screws fastening the inside header front panel to the closure header. Remove the panel.

3-35. Installation of the Hard-Top Closure

a. Apply a quantity of sealing compound across the top of the windshield frame and to the windshield frame side supports.

b. Position the hardtop closure on the cab, making certain that the two tubular supports are properly positioned in holes in the door-lock pillars and that the filler is properly seated over the edge of the cab rear and side panels. Make certain that the top of the closure is positioned over the windshield frame before the rear of the closure is forced down over the edge of the cab rear panel.

NOTE

It may be necessary to pry the bottom of the closure over the cab rear panel if these parts are not in alinement.

c. Loosely install two capscrews and washers at each corner of the windshield.

NOTE

Before these capscrews are tightened securely, make certain that the door openings are exactly square with each raised glass. Adjustments are provided at both the header plate and at the J and U bolts, which are the clamp bolts for the two tubular supports of the closure. Use a square at the door glass opening during this adjustment.

d. Using the five holes across the lower part of the closure rear panel as a template, drill five 3/8-inch holes through the lower body panel. Install five 5 / 16-inch capscrews in these holes so that the heads remain inside the cab. Install five lockwashers and nuts.

e. Position the inside header front panel, which was previously removed (para 3-34) in the roof of the closure, so as to permit access to the attaching screws on top of the windshield. Fasten the panel to the roof of the closure by installing the five retaining screws and lockwashers in the holes provided.

NOTE

The inside header front panel holes may no longer line up with the closure roof panel holes. If this occurs, use the header panel as a template and drill a new set of holes into the roof panel.

f. Drill a 0.159-inch hole (No. 21 drill) through each of the top-holding brackets at the top of the windshield as laid out from the two front holes in the inside header front panel. Install the two panhead screws.

NOTE

Test each window to see that it does not bind. Trim off the bottom of the door-glass weatherstrips if they protrude below the top of door. If the door glass is not in proper alinement with the weatherstrips when the closure is installed, it will be necessary to perform some or all of the door ar glass adjustments outlines in paragraph 3-36.

3-36. Adjustments

The cab doors and weatherstrip retainers are designed so that a proper fit of the door-glass weatherstrips can be easily accomplished. Elongated holes are provided for the attaching screws in the door-glass weatherstrip retainers, door-glass frame lower channels, door-glass regulator support, and door hinges.

a. Door-Lock Striker Plate. The striker plate can be adjusted inward and outward to provide a proper contact of the door with the weatherstrips. The striker plate can be easily moved to any desired position by loosening the two attaching screws.

NOTE

Always check the striker plate adjustment first, because any change in the position of the door will affect the fit of the door-glass frame side and upper weatherstrips.

b. Door-Glass Alinement. To check the alinement of the door glass in the cab opening, move the glass up within 1 inch of the top and note whether the glass frame is square in the opening. If the glass is not in proper alinement, loosen the two regulator adjusting screws in the lower left center of the door panel, and move either corner of the glass up or down. Tighten the two screws.

c. Door-Glass Frame to Weatherstrip Fit. There should be a complete contact between the door-glass frame and the weatherstrips. This is accomplished by moving the weatherstrips inward or outward, as required, using a hardwood block and small hammer.

d. Door-Glass Angle Adjustment. If repositioning of the weatherstrips above does not result in a satisfactory contact with the door-glass frame at the sides and top, a change in the glass angle may be necessary. This is done by loosening the channel attaching screws at inner and outer edges of the door, and moving the channels inward or outward to change the angle of the glass. Tighten the screws.

e. Door-Glass Frame to Upper Weatherstrip Fit. If the contact between the door-glass frame and the upper channel is not uniform, loosen the two regulator screws in the lower left center of the door panel, and aline the door glass as required. Tighten the screws.

f. Door-Hinge Adjustment. If the door-glass frame protrudes at the top, and proper alinement cannot be accomplished by adjustment of the weatherstrip retainers or the lower channels, it may be necessary to reposition the door hinges. This is done by loosening the four hinge attaching screws on the cowl hinge pillar since the screw holes in the hinges are elongated. If it is necessary to tilt the door inward at the top, loosen the lower hinge screws, force the lower hinge outward the desired amount, and retighten the screws. Loosen the top

hinge screws to correct any distortion that may have occurred at the top hinge. Tighten the screws.

3-37. Install of Body Front Rack and Spare Wheel

a. Rack Board. Place the body front rack into position on the vehicle.

b. Spare Wheel. Position the spare wheel on the carrier bracket and install the lock plate. Install the locknut and tighten it securely.

Section VII. HOT WATER PERSONNEL HEATER KIT

3-38. Description

a. The personnel heater kit is packaged under the title Kit, Hot Water Personnel Heater.

b. The personnel heater is a blower type hot water heater. It is secured to the top of the left front fender. Heated air is distributed from the heater to the vehicle cab and / or windshield defroster by a blower and heat diverter. Heat is controlled by a diverter control knob on the instrument panel, which in turn operates a butterfly or damper valve in the heat diverter assembly.

c. A canvas winterfront radiator cover is supplied with the kit to reduce flow of air to engine compartment. An adjustable aperture flap in the cover permits manual regulation of cold air through the radiator as conditions demand, in accordance with the engine temperature gage.

3-39. Application

The personnel heater kit is used in areas where the normal ambient temperature is +40° to —20° F. It is installed on vehicles provided with the soft- or hardtop closure.

3-40. Responsibility

The concern of the organizational unit is restricted to repair of easily removed and replaced items, such as: Hoses, lines, thermostat, and radiator cover.

NOTE

The key letters shown in parentheses in paragraph 3-41 refer to figure 3-10.

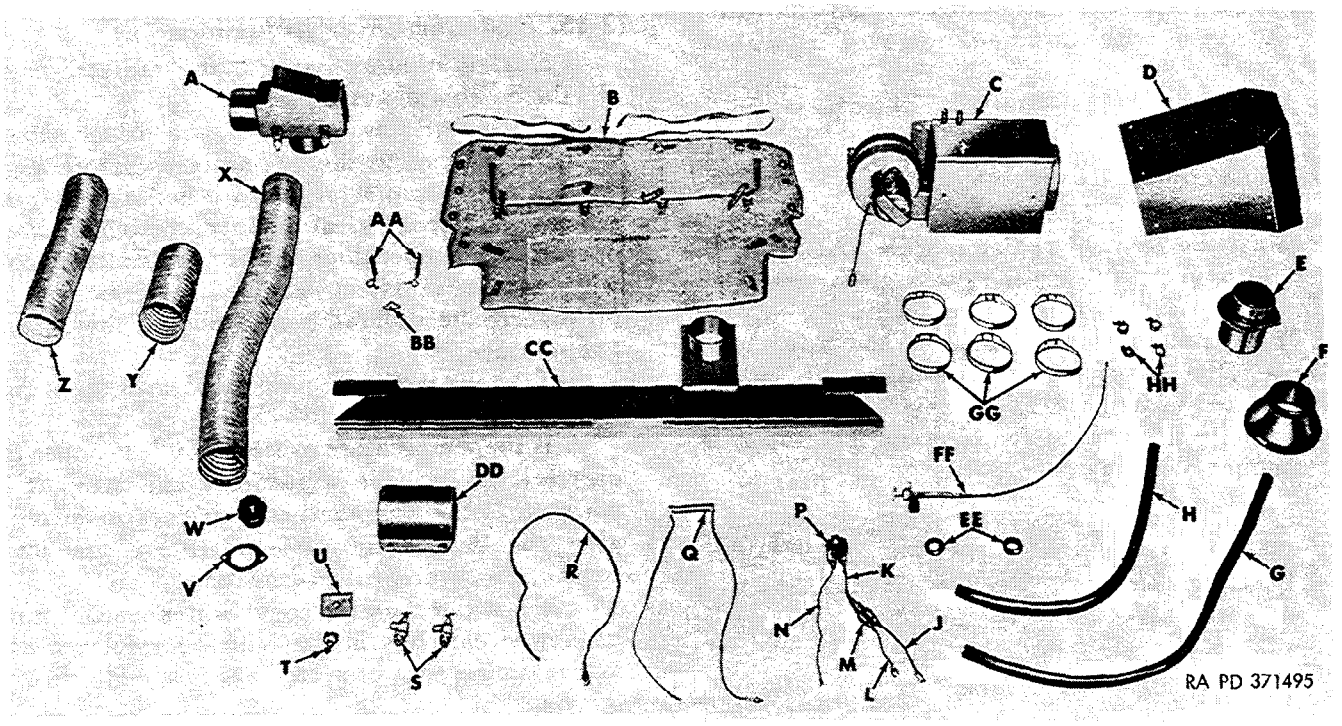


Figure 3-10. Hot water personnel heater kit.

3-41. Water Hose Installation

a. Remove the two pipe plugs located in the cylinder head behind the No. 6 spark plug and at the top of the bypass elbow.

b. Install a bushing and shutoff cock (S) in each hole.

c. Install a hose clamp (HH) on the hot water intake hose (G). Install the hot-water intake hose

on the water shutoff cock at the rear of the No. 6 cylinder. Tighten the clamp screws. Route the water intake hose over the engine and through the rear grommet in the left hood-to-fender panel. Install the hose clamp on the hose and install the hose on the heater inlet opening, and tighten the clamp screws.

d. Install the hose clamp on the hot water return hose (H), and install the hose on the water shutoff cock at the bypass elbow. Tighten the clamp screw. Route the water return hose over the engine and through the front grommet in the left hood-to-fender panel, and install the hose clamp on the hose. Install the hose on the heater outlet opening, and tighten the clamp screw.

NOTE

The key letters shown in parentheses in paragraph 3-42 refer to figure 3-10.

3-42. Thermostat Replacement

a. Remove the mounting screws from the engine water outlet and bypass elbows.

b. Lift the water outlet and bypass elbows from the engine, and remove the thermostat and thermostat gasket from the water outlet elbow.

c. Install a new 180° F. thermostat (W) and thermostat gasket (V) in the water outlet elbow.

d. Install a water outlet and bypass elbow, and secure them with the screws removed in *a* above.

NOTE

The key letters shown in parentheses in paragraph 3-43 refer to figure 3-10.

3-43. Radiator Cover Installation

a. Position radiator cover (B) as a template against the front of radiator grille and mark the location of the ten brass slotted grommets of the radiator cover on the radiator grille.

b. Remove the radiator cover and using a flat loop (BB) as a template, position the loop as illustrated in figure 3-11 and mark the loop holes on the radiator grille for each of the upper ten grommet positions.

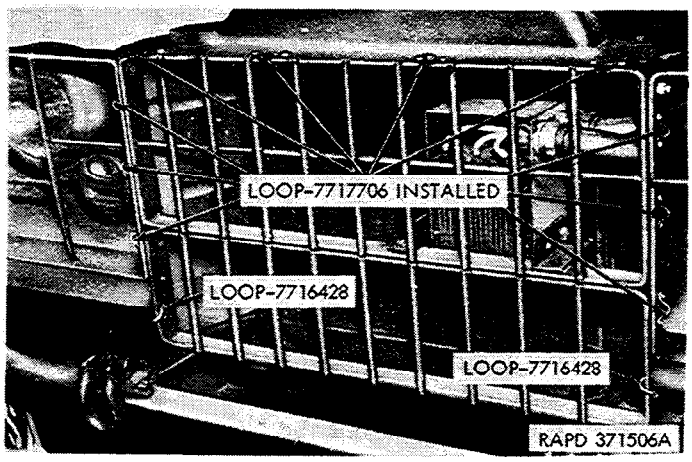


Figure 3-11. Radiator cover loops, installed.

c. Drill the 20 holes using a 1/8-inch drill.

d. Install and secure the ten flat loops with two tapping screws for each loop.

e. Install the radiator cover temporarily, and mark the position on the radiator grille of the two lower front grommets.

f. Remove the cover and using 90° loop 7716428 as a template, mark the loop holes.

g. Drill the four holes using a 1/8-inch drill.

h. Install and secure the two loops with two tapping screws for each loop.

i. Install the radiator cover on the loops. Fold the bottom flaps of the cover under the radiator, and install the radiator cover retaining springs (AA).

j. Lace the holddown straps through the loops and secure them.

k. Close the cooling system drain cocks, and replace the coolant in the vehicle radiator.

l. Connect the battery cables.

m. Close the hood and lock it.

3-44. Replacement of Hoses and Lines

a. Disconnect and remove all unserviceable hoses and lines.

b. Replace the hoses and lines, and use a coating of liquid cement.

3-45. Radiator Cover Adjustments

a. During standby periods, the radiator cover should be completely closed.

b. During vehicle operation, the driver should note the reading on the engine temperature gage. To perform the work for which it is designed in an efficient and economical manner, the engine must operate at a temperature of 180° F. Extreme cold will adversely affect engine performance by preventing the coolant from attaining the desired temperature.

c. Keep the radiator cover closed until the engine temperature reaches 180° F.

d. If the temperature exceeds 180° F., raise the aperture flap on the winterfront and strap it in position. If the temperature continues to increase after the flap is fully open, remove the cover completely to prevent overheating.

e. When the radiator cover is removed, it must be stowed carefully in the vehicle for further use. The retaining springs must be securely attached to the flaps.

APPENDIX A

REFERENCES

1. Publication Indexes and General References

The following indexes should be consulted frequently for the latest changes or references given in paragraphs 2 and 3 below, and for new publications relating to materiel covered in this technical manual:

Army Motion Pictures and Related Audio-Visual Aids	DA PAM 108-1
Military Publications:	
Index of Administrative Publications	DA PAM 310-1
Index of Blank Forms	DA PAM 310-2
Index of Doctrinal, Training, and Organizational Publications	DA PAM 310-3
Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders	DA PAM 310-4
Index of Supply Catalogs, and Supply Manuals (Excluding Types 7, 8, and 9)	DA PAM 310-6

2. Forms

The following forms pertain to this materiel. Also refer to DA PAM 310-2 for index of blank forms.

DA Form 9-1	Materiel Inspection Tag
DA Form 17	Requisition for Publications and Blank Forms.
DA Form 285	Accident, Report
DA Form 2402	Exchange Tag
DA Form 2404	Equipment Inspection and Maintenance Work-sheet.
DA Form 2405	Maintenance Request Register.
DA Form 2406	Materiel Readiness Report.
DA Form 2407	Maintenance Request.
DA Form 2408-Series	Equipment Log Assembly (Records)
DA Form 2409	Equipment Maintenance Log (Consolidated)
DA Form 6	Report of Packaging and Handling Deficiencies.

3. Other Publications

The following publications contain information pertinent to the materiel and associated equipment:

a. Vehicle.

Ordnance Maintenance: Engine (Dodge Model T245), Clutch (Borg and Beek Model 11828)	TM 9-1840A
Operator's Manual: Truck, Cargo ¾-Ton, 4X4, M37, M37B1; Truck Ambulance: 4X4, M43, M43B1; Truck Maintenance: 4X4, M201, M201B1.	
Organizational Maintenance Repair Parts and Special Tool Lists for Truck, Ambulance: ¾-Ton, 4X4, M43 WO / W (2310-835-8516), M43 W / W (2310-835-8617); M43B1 WO / W (2310-542-5634); Truck, Cargo: ¾-Ton, 4X4, M37 WO / W (2320-835-8322), M37 W / W (2320-835-8323), M37B1 WO / W (3430-542-4636), M37B1 W / W (2320-542-4632); Truck, Maintenance: ¾-Ton, 4X4, M201 WO / W (2320-835-8583) W / W (2320-392-3703), M201B1 W / W (2320-630-6801)	TM 9-2320-212-20P
Ordnance Field and Depot Maintenance Transmission, Mechanical, Assembly (2520-975-7081) (New Process Model No. 420)	TM 9-2520-232-35
Direct Support, General Support, and Depot Maintenance Manual for Power Train Body and Frame and 100-Ampere Generating System Installation for ¾-Ton, 4X4, Chassis, Truck: M53B1, M56, M56B1, M56C; Truck, Ambulance: M43, M43B1; Truck, Cargo: M37, M37B1; Truck, Maintenance: M201, M201B1 (Signal Corps Model V-41 / GT)	TM 9-8031-2
Truck, ¾-Ton, 4X4, M37, M37B1, M53B1, M56, M56C, M56B1, M43, M43B1, M201, M201B1, V-41 / GT	LO 9-2320-212-12

b. General.

Accident Reporting and Records	AR 385-40
Army Materiel Maintenance Concepts and Policies	AR 750-1
Basic Cold Weather Manual	FM 31-70
Northern Operations	FM 31-71
Operation and Maintenance of Army Materiel in Extreme Cold Weather (0° to —65° F.)	TM 9-207
Operator's Manual:	
Welding Theory and Application	TM 9-237
Deepwater Fording Ordnance Materiel	TM 9-238
Organizational Care, Maintenance and Repair of Pneumatic Tires and Inner Tubes	TM 9-2610-200-20
Operator, Organizational, Direct Support, and General Support Maintenance Manual:	
Storage Batteries, Lead-Acid Type	TM 9-6140-200-15
The Army Maintenance Management System (TAMMS)	TM 38-750
Administrative Storage of Equipment	TM 740-90-1
Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)	TM 750-244-3
General Supply: Winterization Equipment for Army Tank-Automotive Materiel	SB 9-16
Preservation, Methods of	MIL P-116

APPENDIX B

MAINTENANCE ALLOCATION CHART

1. General

The maintenance allocation chart (MAC) assigns authorized maintenance functions to each maintenance category. These functions are assigned to the lowest available maintenance category based on past experience in the following considerations:

a. Skills available.

b. Time required.

c. Tools and test equipment authorized. If the maintenance function is a replacement function only, the item is not listed in the MAC. Such an item, if included in the repair parts and special tool list for the end item, is automatic authority to replace at the lowest maintenance level to which the part is authorized. Deviation from maintenance operations as allocated in the MAC is authorized only upon approval of the army commander representative.

2. Explanations and Definitions

Maintenance functions will be limited to and defined as follows:

Inspect	To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.
Test	To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
Service	To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air.
Adjust	To rectify to the extent necessary to bring into proper operating range.
Aline	To adjust specified variable elements of an item to bring to optimum performance.
Calibrate	To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.
Install	To set up for use in an operational environment such as an emplacement, site, or vehicle.
Replace	To replace unserviceable items with serviceable assemblies, subassemblies, or parts.
Repair	To restore an item to serviceable condition. This includes, but is not limited to inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.
Overhaul	To restore an item to a completely serviceable condition as prescribed by maintenance servicability standards using the inspect and repair only as necessary (IROAN) technique.
Rebuild	To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.
SPTO	The letters SPTO are an abbreviation for special tools and are placed in column 4 of the maintenance allocation chart. Use of these letters indicates that the special tool(s) required for the assigned category of maintenance to perform the particular function is listed in the appropriate technical manual. When no more than one category is involved, distinction should be made under remarks in column 5.
TEQ	The letters TEQ are an abbreviation for test equipment, and are placed in column 4 of the maintenance allocation chart. Use of these letters indicates that the test equipment required for the assigned category of maintenance to perform the particular function is listed in the appropriate technical manual. When more than one category is involved distinction should be made under remarks in column 5.
C-O / C	This category is performed by the equipment operator or crew. Normally, this consists of daily checks, cleaning, performing lubrication, and making prescribed adjustment of the equipment. Repairs by the operator or crew are limited to minor adjustment and repair which will not require extensive disassembly and components.
O-CO / BN	Maintenance in this category is performed in the company and battalion by specially trained personnel who possess the capabilities and facilities beyond those of category C. Repairs in category O will normally be accomplished by replacement of designated unserviceable parts and assemblies that do not require major disassembly of surrounding components or extensive realinement and adjustment of components as part of the repair operation. Gaskets, water hose, and fuel lines may be fabricated from bulk material.
F-DS	Maintenance in category F is performed by specially trained personnel, usually for return of the equipment items to the user. Repairs will be accomplished by replacing parts and assemblies, repairing designated assemblies and components, and fabricating parts from bulk material.
H-GS	This category is performed by specially trained personnel serving lower categories of maintenance, usually by repairing items of equipment for return to supply stocks. Repairs will be accomplished by replacing parts and assemblies, repairing end items, fabricating from bulk supplies and overhauling assemblies and components.

D-Depot — This category is performed by specially trained personnel, whose activities usually involve overhaul / rebuild of materiel, major assemblies, and components for return to supply stocks. Other functions included are fabrications, modifications, and renovations. Depot maintenance is intended to support lower categories of maintenance when repairs are beyond the capabilities of direct support and general support maintenance units.

3. Explanation of Columns

a. Group Number (Column 1). This column lists the functional grouping codes as assigned in TB 750-93-1.

b. Functional Group (Column 2). This column lists approved noun names of components, assemblies, and subassemblies on which maintenance is authorized.

c. Maintenance Functions (Column 3). Refer to paragraph 2 above.

d. Tools and Equipment (Column 4). This column will either list the tool by code or provide a reference in the manual that outlines the procedure and tool required to perform the designated function. (Refer to paragraph 2 abbreviations SPTO and TEQ).

e. Remarks (Column 5). This column will list any special information or special conditions required, not defined elsewhere, and required for performance of the designated maintenance function.

4. Maintenance Allocation Chart for Truck: ¾-Ton, 4X4, M37, M37B1, M43, M43B1, M

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	
	GROUP 01—ENGINE POWERPLANT ASSY	O	O	C	O				F	F			
0100	ENGINE ASSEMBLY:	O	O	C	O				F	F	H	D	
	Mounting, engine	O			O				O				
	Attaching Parts	O			O				O				
0101	CRANKCASE: Block	O	O						H	H			
	Head Cylinder	O	O						O				
	Gasket, cylinder head								O				
	Cylinder Sleeve								H				
0102	CRANKSHAFT:	O							H	H			
	Bearing, crankshaft								H				
	Oil Seals	F							F				
	Pulley, drive	F							F				
0103	FLYWHEEL ASSEMBLY:	O							F	F			
	Gear, ring, flywheel								F				
0104	PISTON, PINS AND RINGS:								H				
	Bearing, connecting rod.								H				
	Rod, connecting								H				
0105	VALVES, CAMSHAFT TIMING SYSTEM:												
	Bearing, camshaft								H				
	Camshaft								H				
	Sprocket and Timing Chain.								F				
	Guide, valve								H	F			SPTO: TM9-1840A.	Repair limited to ream at 3.
	Seat, valve								H	F				Repair limited to ream at 3.
	Valves, intake and exhaust.				O				F	F				
	Valve, tappet				O				F					
	Screw, tappet adjusting.								F					
	Gasket, valve cover								O					
	Cover, valve								O					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 01—ENGINE—Continued													
0106	ENGINE LUBRICATING SYSTEM													
	Breather, crankcase	O		O					O					
	Element, oil filter	O							O					
	Filter Assembly, oil								O					
	Pan, oil								F					
	Gasket, oil pan								F					
	Pump, oil								F					
0108	INTAKE AND EXHAUST MANIFOLDS:													
	Valve, heat control				O				F					
	Manifold, intake and exhaust.								O					
	Gasket, manifold intake and exhaust.								O					
	GROUP 02—CLUTCH													
0200	CLUTCH ASSEMBLY:													
	Housing, clutch								F					
	Bearing, pilot (bushing type).								F					
	Pan, clutch housing								O					
	Disk Driven Clutch	O							F	F				
	Plate assy, pressure	O							F	H				
0202	CLUTCH RELEASE BEARING:	O							F					
	Pedal, clutch								O	O				
	Controls and Linkage, clutch.			O	O				O	O				
	Fork Release, clutch								F					
	Shaft, cross, clutch			O					F					
	GROUP 03—FUEL SYSTEM													
0301	CARBURETOR				O				O	F				
0302	PUMP, FUEL		O						O	F				
0304	CLEANER, AIR, ASSEMBLY:	O		O	C									
	Element, air cleaner	O		O					O					
	Lines, connection, and vents.								O	O				
0306	TANK, FUEL:								O	F				
	Lines and fittings	O							O	O				
0309	FILTER, FUEL:			O					O					
	Element, fuel filter			O					O					
0312	CONTROLS AND LINKAGE:													
	Accelerator			O	O				O					
	Controls, choke and throttle.			O	O				O					
	GROUP 04—EXHAUST SYSTEM													
0401	MUFFLER:	O							O					
	Pipe exhaust	O							O					
	Mounting, exhaust system.	O							O					
	GROUP 05—COOLING SYSTEM													
0501	RADIATOR:	C	O	C					O	F				
	Cap	C	O						O					
	Coolant Level	C	O	C					O					
0502	SHROUD, RADIATOR								O	O				
0503	HOSES, INLET AND OUTLET:	C							O					
	Thermostat	O	O						O					
0504	PUMP, WATER								O					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 05—COOLING SYSTEM —Continued													
0505	FAN BLADE AND PULLEY	C							O					
	Belt, fan	C			O				O					
	GROUP 06—ELECTRICAL SYSTEM													
0601	GENERATOR ASSEMBLY:		O		O				O	F	H			
	Armature	F	F						F					
	Bearing	F							F					
	Brushes	F							F					
	Seals	F							F					
0602	REGULATOR		O		O				O	F				
0603	STARTER ASSEMBLY:		O						O	F	H			
	Armature		F						F					
	Bearings								F					
	Brushes								F					
	Seals								F					
	Drive, starter								F	F				
	Switch, starter		O						O					
0605	DISTRIBUTOR ASSEMBLY:		O	O	O				O	F				
	Point set				O				O					
	Shaft, distributor								F					
	Coil		O						O					
	Spark Plugs		O	O	O				O					
	Wiring, ignition	O							O	O				
0607	INSTRUMENT PANEL:													
	Breaker Circuit	O	O						O					
	Switches		O						O					
	Instruments	C	O						O					
	Lamps	C	O						O					
	Lights, indicator	C	O						O					
	Control, direction signal.	C	O						O					
	Flasher		O						O					
0609	LIGHTS:													
	Lamp and Lamp Units	C	O						O					
	Lights	C			O				O	O				
0610	SENDING UNITS AND WARNING SWITCHES:													
	Switch, warning unit		O						O					
	Unit, sending		O						O					
0611	HORN:													
	Horn	C	O						O					
	Switch, horn button	C	O						O					
	Horn Wire	O							O					
0612	BATTERIES, STORAGE													
	Battery	C	O	C					O					
	Cable, battery	C		O					O	O				
	Box, battery	O							O	O				
0613	CAB OR CHASSIS WIRING HARNESS:													
	Harness, generator to regulator.	C	O						O	O				
	Cable Assy, ground, (engine, frame).	C							O	O				
	Harness, chassis wiring.	O	O						F	O				
	Harness, engine wiring.	C	O						F	O				

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(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 06—ELECTRICAL SYSTEM —Continued													
0613	CAB OR CHASSIS WIRING HARNESS—Continued													
	Harness, cab wiring	O	O						F	O				
	Receptacle, trailer coupling.	C	O						O	O				
	GROUP 07—TRANSMISSION													
0700	TRANSMISSION ASSEMBLY.	O		O					F	F	H	D		
0701	SHAFT INPUT								H					
	Seals, output shaft								O					
	Shaft, Gears, Bearings, and Clutch, output.								H					
	Countershaft Gears and Bearings.								H					
	Shaft, Gears, Bearings, and reverse idler.								H					
0704	COVER ASSY WITH SHIFTER SHAFTS AND FORKS.								F	F				
	GROUP 08—TRANSFER													
0801	TRANSFER ASSEMBLY:	O		O					F	F	H	D		
	Shaft, Gears, Bearings Rollers, and Input Washer.								H					
	Shaft, Gears, Bearings, Spacers, and Idler Washer								H					
	Shaft, Clutch, Gears and Bearing, output (front).								H					
	Shaft, Bearing, speedometer; gear, output shaft.								H					
	Seals, output shaft								O					
	Seals, shifter shaft								O					
	Seal, support, hand brake.								O					
0803	CONTROLS AND LINKAGE:	O		O	O				O	O				
	Forks, shifter shaft	O			O				H					
	GROUP 09—PROPELLER SHAFTS													
0900	PROPELLER SHAFTS:													
	Shaft, propeller	O		O					O	O				
	Joint Kit, universal	O							O					
	GROUP 10—FRONT AXLE													
1000	AXLE, ASSEMBLY	O		O					F	F		D		
1002	DIFFERENTIAL	F			H				F	H		H		
1004	ARMS AND FLANGES:								F					
	Bearings				F				F					
	Knuckle								O					
	Flange, drive								O					
	Shaft, axle								O					
	Seal, retainer and spring								O					
	GROUP 11—REAR AXLE													
1100	AXLE ASSEMBLY	O		O					F	F		D		
1102	DIFFERENTIAL	F		H					F	H		H		
1104	SHAFT, AXLE								O					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 12—BRAKES													
1201	BAND: Hand brake	O			O				O	F				
	Drum, hand brake	O							O	F				
	Linkage			O	O				O	O				
1202	SHOE: Brake, (service)	O							O	F				
1204	CYLINDER: Master	O		O					O					
	Cylinder, wheel	O							O					
	Lines, Fittings, and Brake Hoses								O	O				
1206	CONTROLS AND LINKAGE:													
	Brake			O	O				O	O				
	Pedal, brake			O					O	O				
	GROUP 13—WHEELS, HUBS, AND DRUMS													
1311	HUB, Wheel	O							O	F			SPTO; TM 9-2320-212-20, par 2-113 and 2-141.	
1311	BEARINGS:	O		O	O				O				SPTO; TM 9-2320-212-20, para 2-143.	
	Seal, oil								O				SPTO; TM 9-2320-212-20, para 2-143.	
	Studs, wheel and hub	O							O					
	Drums, brake, (service).	O							O	F				
	Wheel	O							O	F				
	Ring, retaining	O							O					
1313	TIRE:	C		C					O	O		D		
	Tube	O							O	O				
	Chain Assembly, tire.	O						C	O	O				
	GROUP 14—STEERING													
1401	ARM, IDLER			O					O	O			SPTO; TM 9-2320-212-20, para 2-148 and 2-164.	
	Bearing, idler arm	O							O					
	Shaft, idler arm	O							O					
	Link, drag	O		O	O				O	O				
	Seals, drag link	O							O					
	Rod, tie	O							O					
	End, tie rod	O							O					
	Wheel, front (adjust-toe-in).	C		O	F									
	Arm, pitman	O							O					
	Gear, steering	O		O	F				F	H				

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 15—FRAME, TOWING ATTACHMENTS, AND DRAWBARS													
1501	FRAME ASSEMBLY:	O								F				
	Bumpers	O							F	O				
	Brackets and Hangers	O							O	F				
	Attaching Parts	O							O					
	Guard, radiator and light.	O							F	O				
1503	PINTLE	C		O					O	F				
1504	BRACKETS, LEVERS, SPARE TIRE CARRIER								O	O				
	GROUP 16—SPRING AND SHOCK ABSORBERS													
1601	SPRING: Front, assembly.	O		O					O	F				
	SPRING: Rear, assembly.	O		O					O	F				
	SHACKLES AND BOLTS	O							O					
1604	ABSORBERS: Shock	O	O						O					
	Brackets, shock absorber.	O							O	O				
	GROUP 18—BODY CAB AND HOOD													
1801	CAB									F				
	Door				O	O			F	F				
	Glass, door				O	O			F					
	Hood								F	F				
1802	FENDER								F	O				
	Hanger, running board.								F	O				
	Shield, engine								O	F				
	Windshield Assembly	C							O	F				
	Glass, windshield	C							F					
1806	CUSHION: Seat	C							O	F				
	Seat and Racks	C							O	F				
1808	STOWAGE, RACKS, REELS:	C							O	O				
	Boxes, Brackets, and Straps.	C							O	O				
1810	BODY, CARGO, DUMP	C								F				
	Tailgate	C							F	F				
1812	SPECIAL PURPOSE BODIES:													
	Body Assy, wrecker	O							F	F				
	Body Assy, ambulance.	O							F	F				
	Receptacle, power, electrical.	O	O						O	F				
	Heating Units (other than personnel or winterization heaters.	O	O	O					O	F	H			
	All parts peculiar to ambulance body.	O		O					F	F				
	Attaching Parts, wrecker body.	O		O					F	F				
	Body Assy, telephone maintenance.	O							F	F				
	All parts peculiar to telephone maintenance body.	O							F	F				
	GROUP 20—HOIST, WINCH, AND POWER TAKEOFF													
2001	CYLINDER: Hydraulic Hoist	O	O						F	F		H		
	Pump Assy, hydraulic	O	O						F	F		H		
	Lines, Hose, and Fittings, hydraulic.	O	O						O	O				
	Controls and Linkage, hydraulic	O		O	O				O	O				

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(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	
	GROUP 20—HOIST, WINCH, AND POWER TAKEOFF—Continued												
2001	WINCH ASSEMBLY:	O		O	O				O	F		D	
	Shaft Assy, winch drive.	O		O					O	O			
	Joint, univ, winch drive shaft.	O		O					O	O			
	Controls, linkage, winch.	O		O	O				O	O			
2004	POWER-TAKEOFF ASSEMBLY	O							F	H		H	
	Controls, linkage, PTO.	O		O	O				O	O			
	GROUP 22—BODY, CHASSIS, AND HULL ACCESSORY ITEMS												
2201	CANVAS RUBBER OR PLASTIC ITEMS.	C						C	O	F			
	BOWS	C						C	O	F			
2202	ACCESSORY ITEMS:												
	Mirror Assembly	C							O	O			
	Reflectors	C							O				
	Motor Assy, windshield wiper.	O	O						O	F			
	Arm and Blade, windshield wiper.	C							O				
	Defrosters	O			O				O	O			
	Arm Assembly, mirror.	C			O				O	O			
2210	DATA PLATES AND INSTRUCTION PLATES	C							O				
	GROUP 26—TOOLS AND TEST EQUIPMENT												
2604	SPECIAL TOOLS	F							O				
	GROUP 33—SPECIAL PURPOSE KITS												
3301	REUSEABLE SHIPPING CONTAINERS.	F							F	F			
3303	KIT: Arctic, fuel burning (for cab).	C	O		O			F		F			
	KIT, Cab, closure arctic.	C						F		O			
	KIT: Heater, personnel shelter.	C	O		O			F		F			
	KIT: Personnel heater (hot water).	C						F		O			
3305	KIT: Deep water fording	C						F		O			
3307	KIT: Installation, ammunition and communication, M29 weapon system.							F		F			
	KIT: Generator 100-ampere.	C						F		F			
	Generator, 100-ampere (alternator).		O		O				O	F			
	Rectifier	O	O		O				O	F			
	Pulley, generator								O				
	Pulley, crankshaft								F				
	Pulley, water pump								O				
3307	BELT SET:				O				O				
	Regulator		O		F				O	F			
	Harness	C							O	O			
	Kit, slave receptacle	C						O	O	O			

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(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 47—GAGES (NON-ELECTRICAL) WEIGHING AND MEASURING DEVICES													
4701	SPEEDOMETER ASSEMBLY:	O						H		F				
	Core, flex shaft, speedometer.	O		O						O				
	Housing, flex shaft, speedometer.	O								O				

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