Washington 25, D. C., ATTN: ORDFM, using DA Form 468, Unsatisfactory Equipment Report. Such suggestions are encouraged in order that other organizations may benefit.

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

Section II. DESCRIPTION AND DATA

4. Description

a. General. This manual describes and illustrates the ¼-ton 4 x 4 utility truck M38A1 (figs. 1, 2, and 3), and the ¼-ton 4 x 4 front line ambulance M170 (figs. 4 and 5). With the exception of the differences discussed in paragraph 5, both vehicles are similar. The descriptions of individual components listed below apply to both models.

b. Engine (fig. 36). Power is supplied by an F-head, four-cylinder, four-cycle, water-cooled, gasoline-type engine. This type of engine is a combination valve-in-block and valve-in-head construction and is three-point mounted on the frame.

c. Transmission. The synchromesh transmission (fig. 126) is mounted on the rear of the engine. The transmission has three forward speeds and one reverse speed, all manually selected by means of the transmission gearshift lever (X, fig. 11) mounted on top of the transmission and extending into the driver's compartment.

d. Transfer. The transfer (fig. 126) is a two-speed unit driven by the transmission and distributes power to the front and rear axles through propeller shafts. The transfer is manually controlled by the transfer front wheel drive, and the high and low range gearshift levers (T, fig. 11), located on top of the transfer and extending into the driver's compartment. These levers provide for engaging or disengaging the front axle and selecting the high or low transfer ratio.

e. Front Axle and Suspension.

(1) The front axle (fig. 152) is a full-floating, single reduction type equipped with a conventional differential with hypoid drive gears. The axle shafts (fig. 136) are fitted to universal joints which revolve within steering knuckles constructed as part of the axle housing. The front propeller shaft transmits power from the transfer to the front axle.

(2) The front suspension consists of two semielliptic-type leaf springs (fig. 164). The rear of the springs are shackled to the underside of the frame by U-bolt-type shackles. Pivot bolts are used to secure the front ends of the springs to the frame brackets on the frame underside. U-bolts secure the

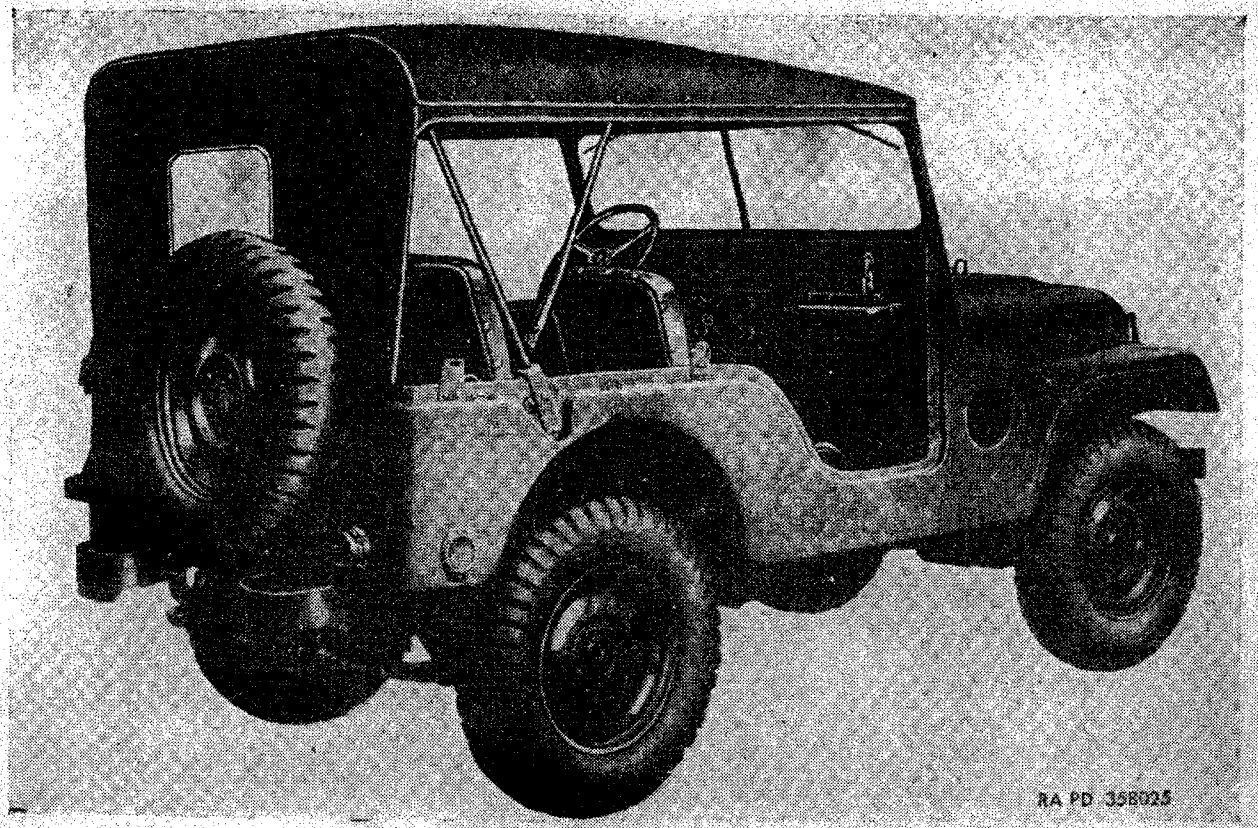


Figure 2. ¼-ton 4 x 4 utility truck, M38A1—right rear view.

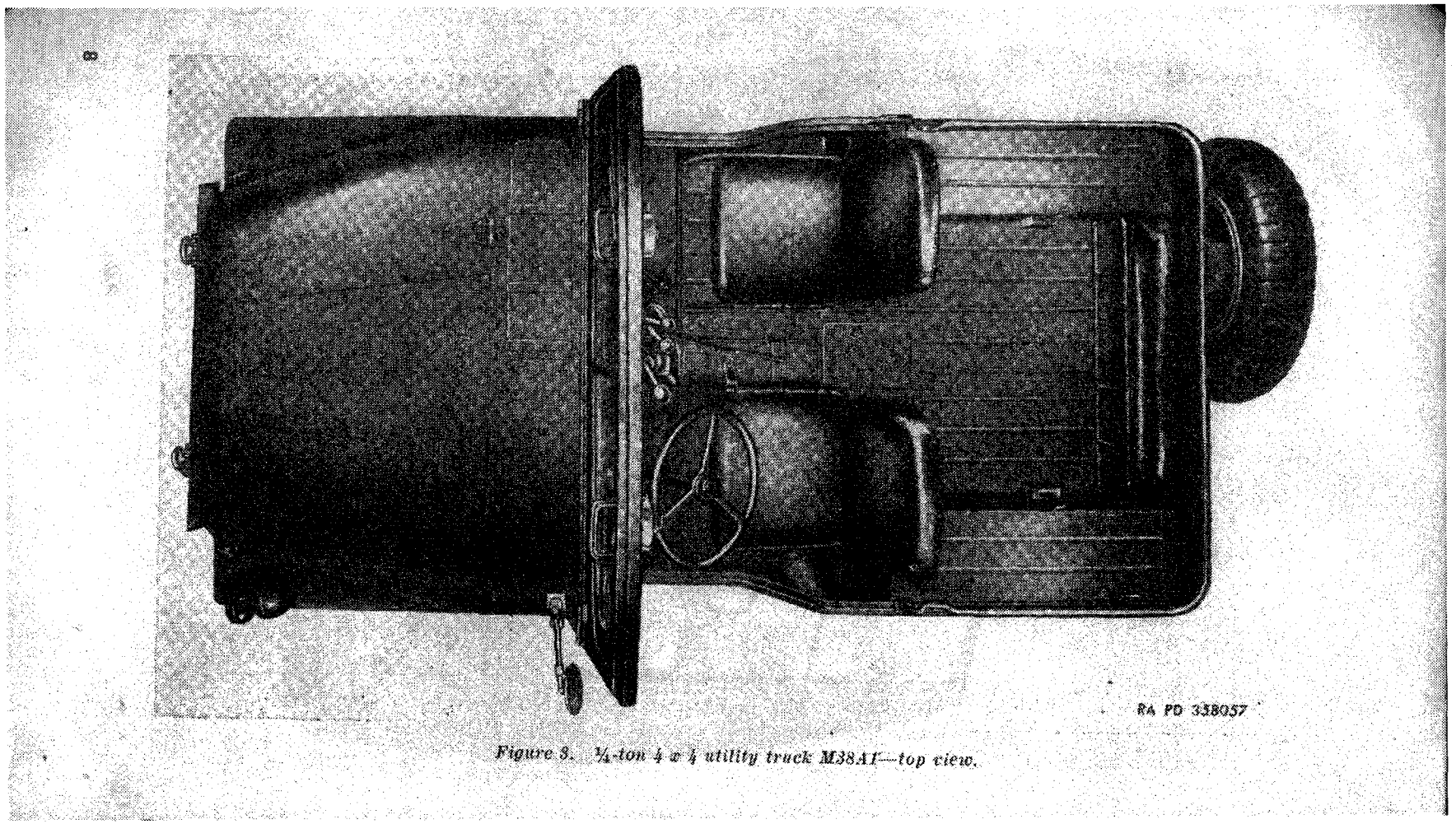


Figure 3. ¼-ton 4 x 4 utility truck M38A1—top view.

Figure 4. ¼-ton 4 x 4 front line ambulance M170—right front view.

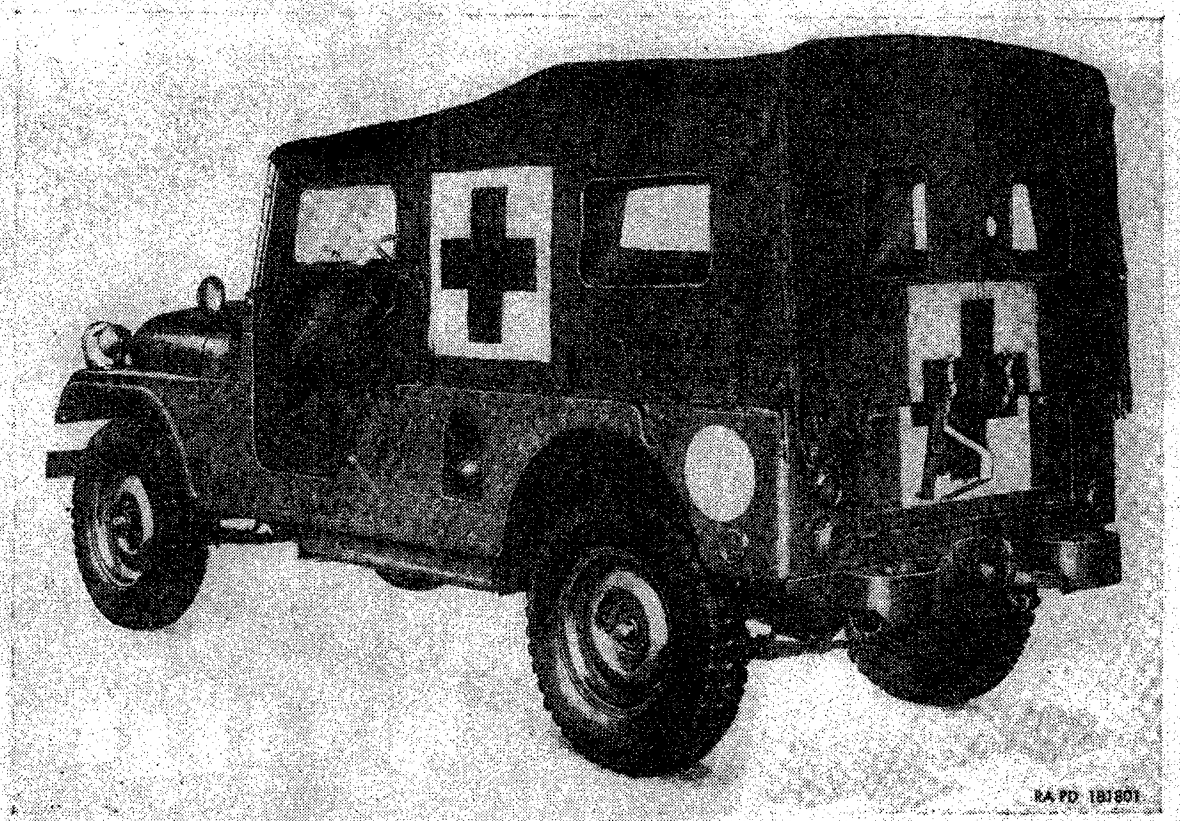


Figure 5. ¼-ton 4 x 4 front line ambulance M170—left rear view.

springs to the axle housing. Two direct-action, two-way control shock absorbers are provided for dampening the front spring action.

f. Rear Axle and Suspension.

(1) The rear axle (fig. 152) is a semifloating, single-reduction-type equipped with a conventional differential with hypoid drive gears. The rear propeller shaft transmits power from the transfer to the rear axle.

(2) The rear suspension consists of two semielliptic-type leaf springs (fig. 165). The rear ends of the springs are shackled to the frame brackets on the frame underside by U-bolt-type shackles. Pivot bolts are used to secure the front ends of the springs to the frame brackets on the frame underside. U-bolts secure the springs to the axle housing. Two direct-action, two-way control shock absorbers are provided for dampening the rear spring action.

g. Brake Systems.

(1) The service brake system (fig. 162) consists of hydraulic actuated brakes on all four wheels. Each brake assembly is of the floating, two-shoe design. Braking action (fig. 158) is controlled by the service brake pedal (N, fig. 13) in the driver's compartment.

(2) The mechanical hand brake system serves primarily as a parking brake but can also be used to slow or stop the vehicle should the service brakes fail. The hand brake is shown installed in figure 163. The hand brake handle (Q, fig. 13), mounted within the driver's compartment, is connected to the operating lever mounted on the transfer beneath the vehicle.

h. Electrical System (figs. 75, 88, and 95). The electrical system is a 24-volt submersible-type equipped with two 12-volt lead-and-acid-type batteries, connected in series. All electrical components are waterproofed for operation while completely submerged. A trailer electrical coupling connector is located on the rear of the body on the M38A1 and an emergency reel lamp is located in the inside of the body, behind the driver's seat on the M170.

i. Vehicle Nomenclature. The terms "left" and "right" and "front" and "rear" are established with reference to the operator sitting in the driver's seat. "Right" indicates the direction to the right of the operator; "Left" the direction to the left of the operator. "Front" indicates the direction toward the radiator end of the vehicle; "Rear" the direction toward the back of the vehicle.

5. Differences Between Models

a. The front line ambulance M170 can be distinguished from the utility truck M38A1 by its longer body and frame, designed for use

as an ambulance. The M170 longer wheel base and body provides accommodation for three litters. The litter carriers can be removed to convert the vehicle to a personnel carrier, accommodating six ambulatory patients in addition to the driver.

b. The ambulance tailgate can be lowered to facilitate loading of the litters. To permit tailgate lowering, the spare wheel, mounted on the right rear of the utility truck, is carried inside the ambulance at the right side of the front passenger seat.

c. The ambulance is equipped with lower rate springs and shock absorbers for easier riding. The hand brake has been modified to avoid interference with the left lower litter. Additional accessories, included with the ambulance, consist of crash pads and an interior emergency light.

6. Name, Data, Caution, and Instruction Plates

a. Name and Data Plates.

(1) *Vehicle identification plate* (figs. 6 and 7). This identification plate, located on the instrument panel at the right of the instrument cluster, includes vehicle name, serial number,

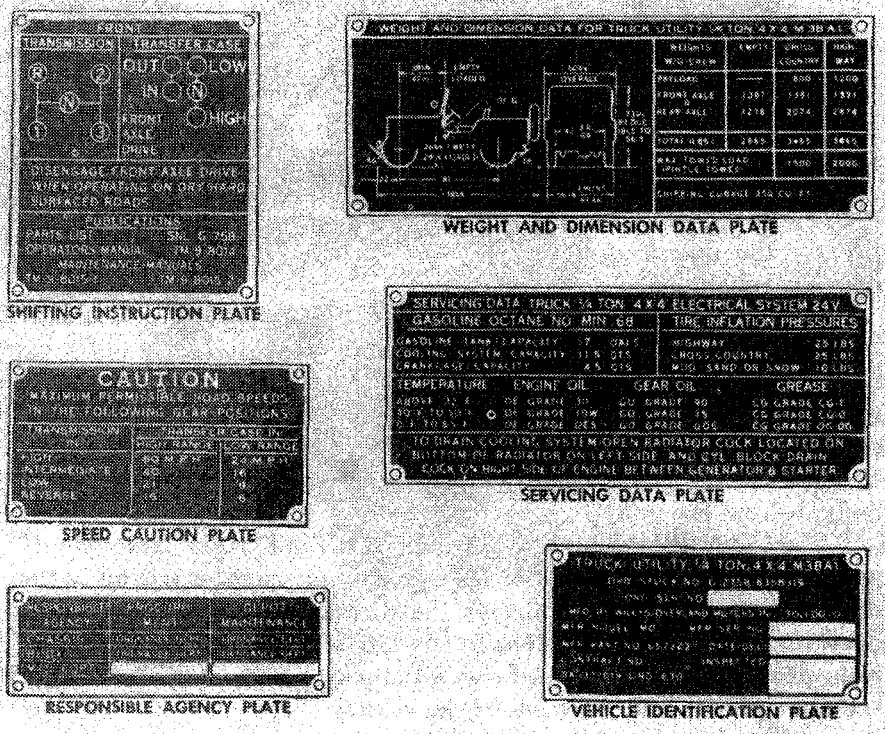


Figure 6. Name, data, caution, and instruction plates on instrument panel (M38A1).

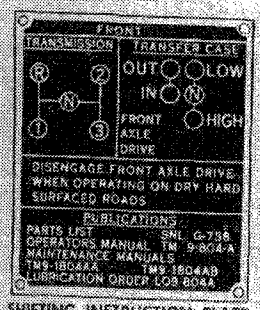
manufacturer's name, part number, model number, contract number, and ordnance stock number.

(2) *Servicing data plate* (figs. 6 and 7). This data plate, located on the instrument panel at the right of the instrument cluster, includes servicing information on the electrical system, fuel octane, tire inflation pressures, engine and gear oils, chassis grease, and cooling system, gasoline tank, and crankcase capacities.

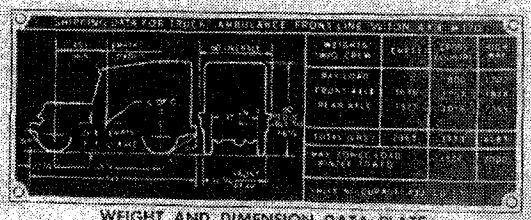
(3) *Responsible agency plate* (figs. 6 and 7). This data plate, located on the instrument panel to the right of the instrument cluster, provides a list of the agencies responsible for maintenance of various parts of the vehicle.

(4) *Weight and dimension data plate* (figs. 6 and 7). This data plate, located on the instrument panel at the right of the instrument cluster, includes information on the vehicle dimensions, weights, and maximum towed loads.

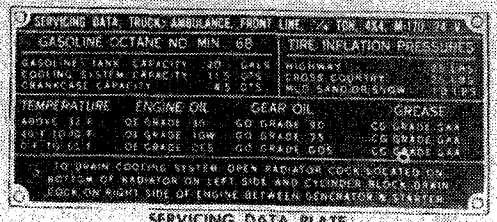
(5) *Engine serial number* (fig. 8). The manufacturer's serial number is stamped on the cylinder block behind the water pump and below the thermostat housing at the front of the engine.



SHIFTING INSTRUCTION PLATE

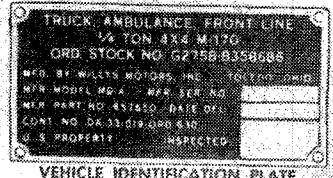

WEIGHT AND DIMENSION DATA PLATE

SPEED CAUTION PLATE



SERVICING DATA PLATE

RESPONSIBLE AGENCY PLATE



VEHICLE IDENTIFICATION PLATE

RA PD 181803

Figure 7. Name, data, caution, and instruction plates on instrument panel (M170).

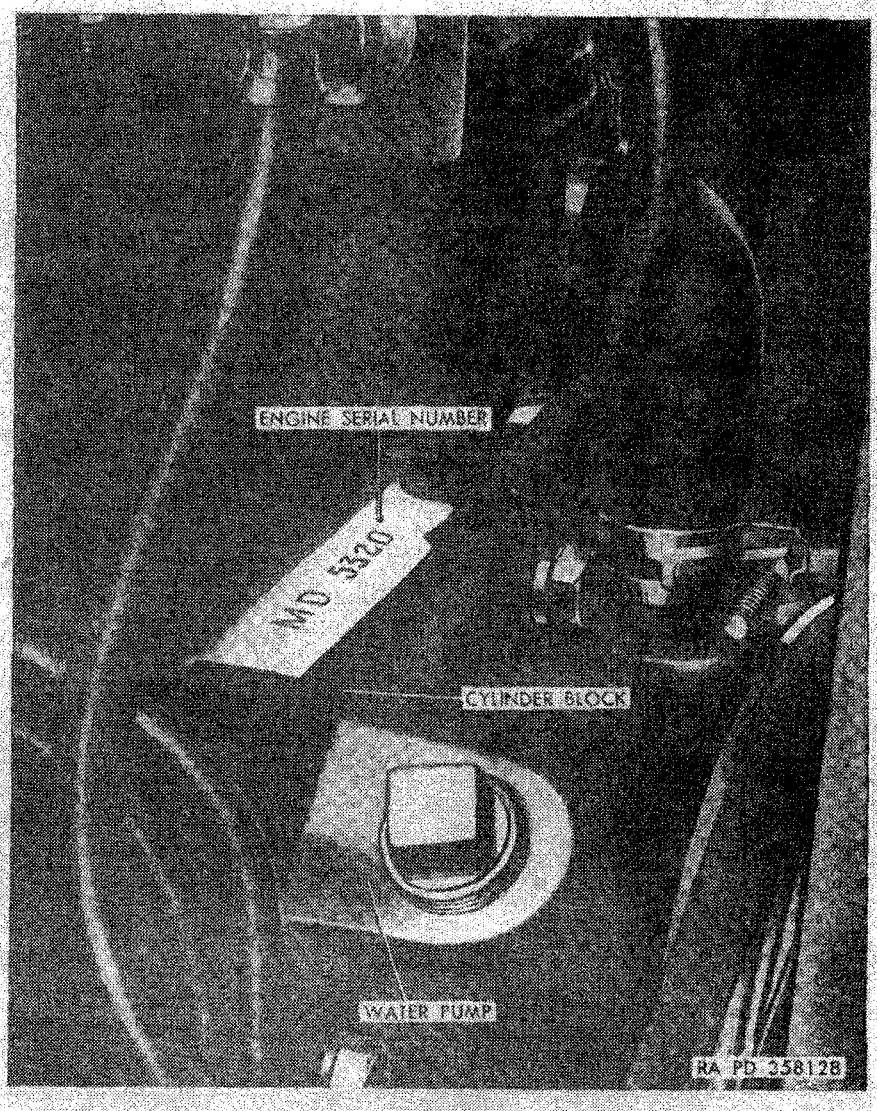


Figure 8. Engine serial number.

(6) *Transmission, name, model, and serial number* (fig. 12b). The transmission serial number (manufacturer's) is stamped on the top right rear corner of the transmission case. The transmission name and model number is stamped on the right rear side of the transmission case.

(7) *Transfer name, model, and serial number* (fig. 12b). The transfer serial number (manufacturer's) is stamped on top of the transfer case. The transfer name and model number are stamped on the rear of the transfer case.

(8) *Distributor and ignition coil name and data plate* (fig. 10). This name and data plate, located on the right side of the

distributor and coil assembly, includes manufacturer's name, model number, voltage data, and ordnance number.

(9) *Starter name and data plate* (fig. 10). This name and data plate, located on the left side of the starter, includes voltage, direction of rotation, ordnance part number, manufacturer's name, model number, and serial number.

(10) *Generator name and data plate* (fig. 10). This name and data plate, located on the right side of the generator, includes ordnance part number, manufacturer's name, model number, voltage, amperage, and serial number.

(11) *Generator regulator data plate* (fig. 10). This data plate, located on the right side of the generator regulator base, includes voltage rating, serial number, model number, ordnance number and capacity. The unit name is stamped on the generator regulator cover.

(12) *Carburetor name and model number* (fig. 44). The carburetor name and model number is stamped on the side of the carbruetor float bowl.

(13) *Front axle shaft identification plate* (fig. 10). This plate, held by two of the screws securing the steering knuckle oil seal assemblies, identifies the type of joint used in the front axle assembly.

(14) *Truck name, patent, and serial number plate* (fig. 9). This plate, attached to the top-front of the right rear wheel housing (immediately behind the front passenger seat), includes the truck name, patent number and serial number.

(15) *Horn name and data plate* (fig. 10). This plate is attached to the horn bracket.

b. Caution Plates.

(1) *Speed caution plate* (figs. 6 and 7). This caution plate, is located on the instrument panel to the right of the instrument cluster, provides information on permissible road speeds for various gear positions of the transmission and transfer.

(2) *Generator regulator warning* (fig. 9). A warning is stamped on the front edge of the generator regulator cover and in the form of a decalcomania on the right front fender. This is a warning to disconnect the battery ground lead before working on generator or the generator regulator installations.

c. Instruction Plates and Decalcomania.

(1) *Shifting instruction plate* (figs. 6 and 7). This instruction plate, located on the instrument panel at the right of the instrument cluster, provides a shifting diagram for the transmission and transfer. It also illustrates the shifting diagram to engage and disengage the front axle. A list of the applicable publications issued for the vehicle are also provided on this plate.

Figure 9. Name, caution, instruction plates and decalcomania.

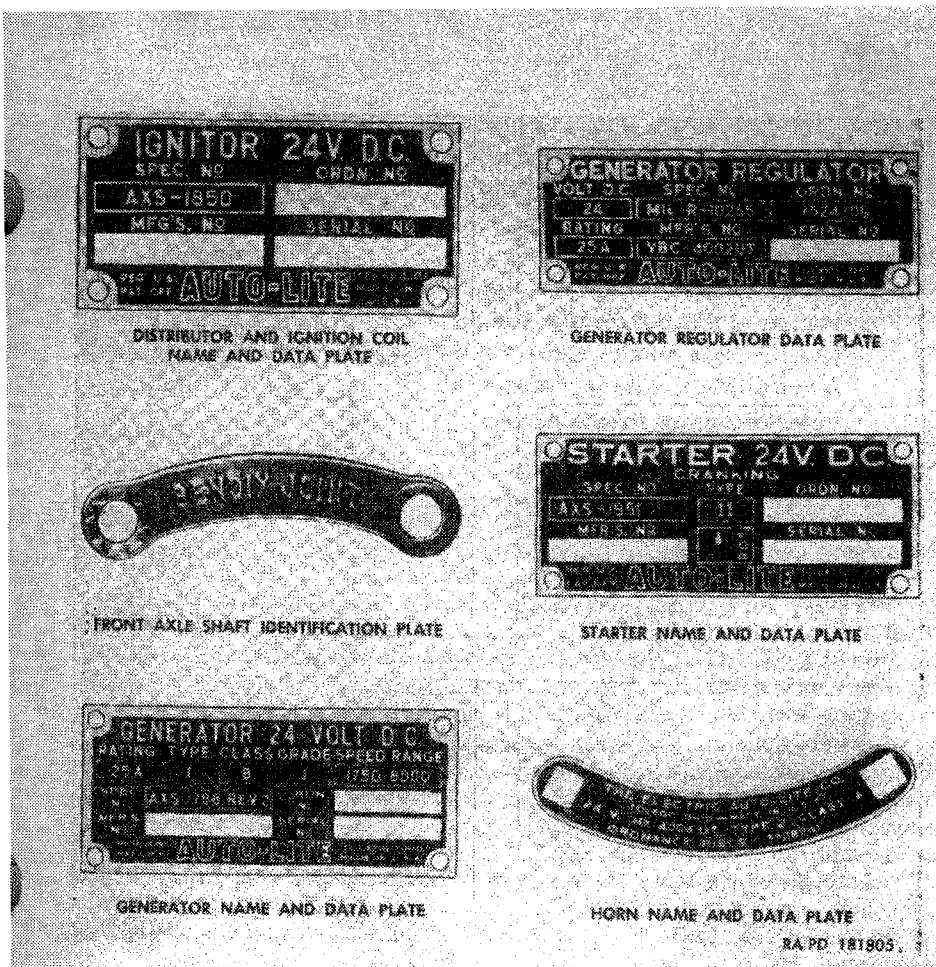


Figure 10. Name, data, control, and identification plates.

(2) *Ignition switch instruction plate* (fig. 9). This plate, attached to the instrument panel just in front of the ignition switch lever, has OFF and ON imprinted on it to aid the operator in locating the correct positions of the ignition switch lever.

(3) *Fuel tank filler cap caution* (fig. 9.) The fuel tank filler cap caution, embossed in the top of the filler cap, states that the fuel system is pressurized and instructs the operator to open the filler cap slowly.

(4) *Radiator filler cap caution* (fig. 9). The radiator filler cap caution, embossed in the top of the cap, states to remove the cap slowly.

(5) *Bell housing drain plug decaloomania* (fig. 9. This decalcomania, located on the bottom of the windshield assembly in the driver's compartment, states the stowage place of the bell housing drain plug, that the drain plug must be installed prior to fording, and that the plug must be removed after fording.

(6) *Air precleaner decalcomania* (fig. 9). This decalcomania, located on the body of the air precleaner, states to attach the precleaner to inlet of air cleaner for regular operation and to transfer precleaner and its clamp to end of air inlet tube for underwater operation.

(7) *Oil filter decalcomanias* (fig. 66). The oil filter name decalcomania, located on the side of the filter, gives the manufacturer's name, model number, and part number. The oil filter service decalcomania, located on the head of the filter, provides servicing instructions.

7. Tabulated Data

a. General data.

Capacities:	
Cooling system	11½ qt
Crankcase (refill)	4½ qt
Differential (each)	2½ qt
Fuel tank (M38A1)	17 gal
Fuel tank (M170)	20 gal
Transmission	1 qt
Transfer	3 pt
Crew (operating)	1
Cylinders	4
Dimensions (M38A1):	
Height, overall, maximum	73¾ in.
Height, lowest operable (over steering wheel)	56½ in.
Length, overall, maximum	138⅝ in.
Width, overall, maximum	60⅞ in.
Dimensions (M170):	
Height, overall, maximum	78 in.
Height, lowest operable (over steering wheel)	56¼ in.
Length, overall, maximum	155 in.
Width, overall, maximum	60½ in.
Electrical system	24 volt
Ground clearance, minimum	9⅝6 in.
Loading height (empty) (M38A1)	28 in.
Loading height (empty) (M170)	27¾ in.
Number of batteries	2
Payload (maximum) (M38A1):	
Cross country	800 lb
Highway	1,200 lb
Passengers (including crew) (M38A1)	4
Passengers (including crew) (M170)	
Litter patients	4
Ambulatory patients	7
Tires:	
Pressure	28 psi
Size	7.00 x 16
Towing pintle height (center of pintle)	21½ in.
Tread:	
Front	49⅛ in.
Rear	49⅝6 in.

Weight w/o crew (M38A1):

Cross country	3,465 lb
Empty	2,665 lb
Highway	3,865 lb

Weight w/o crew (M170):

Cross country	3,763 lb
Empty	2,963 lb
Highway	4,163 lb
Wheelbase (M38A1)	81 in.
Wheelbase (M170)	101 in.

b. Performance.

Allowable speed:

	1st	2d	3d	Reverse
Transfer—high range	21	40	60	16 mph
Transfer—low range	9	16	24	6 mph

Angle (M38A1):	
Approach	46°
Departure	34°
Cruising range (loaded)	280 mi
Cruising speed	55 mph
Engine horsepower: (brake horsepower) at 4,000 rpm	72 hp
Fording depth	37½ in.
Recommended towed load, maximum:	
Cross country	1,500 lb
Highway	2,000 lb
Turning circle, diameter (M38A1):	
Left	38 ft
Right	38 ft 8 in.
Turning circle, diameter (M170):	
Left	24 ft 2 in.
Right	24 ft 7 in.

c. Detailed Data References. Additional detailed tabular data pertaining to individual components and systems are contained in the following paragraphs:

	Paragraph
Batteries and lighting system	161
Body and frame (M38A1)	253
Body and frame (M170)	262
Brake systems	231
Clutch	190
Cooling system	126
Engine	104
Exhaust system	143
Front axle	206
Fuel and air intake system	133
Generating system	157
Ignition system	147
Propeller shafts with universal joints	201
Rear axle	215
Springs and shock absorbers	239
Starting system	154
Steering system	222
Transfer	197
Transmission	192
Wheels and tires	248

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

8. Purpose

a. When a new or reconditioned vehicle is received by the using organization, it is necessary for the organizational mechanics to determine whether the vehicle has been properly prepared for service by the supplying organization and is in condition to perform any mission to which it may be assigned when placed in service. For this purpose, inspect all assemblies, subassemblies, and accessories to be sure they are properly assembled, secured, clean, and correctly adjusted and/or lubricated. Check all tools and equipment (pars. 65–68) to be sure every item is present, in good condition, clean, and properly mounted or stowed.

b. In addition, perform a "break-in" of a least 500 miles on all new or reconditioned vehicles and a sufficient number of miles on used vehicles to completely check their operation (par. 10).

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

9. Preliminary Services

a. General Inspection and Servicing Procedures.

(1) Uncrate vehicle, if crated. Remove metal strapping, plywood, tape, seals, wrapping paper, and dehydrant bags. If exterior surfaces are coated with rust-preventive compound, remove it with dry-cleaning solvent or volatile mineral spirits.

(2) Read Preparation Record for Storage or Shipment tag and follow all precautions checked thereon. This tag should be in the driver's compartment attached to the steering wheel or steering levers or to the switch.

(3) Using a suitable socket wrench and extension, crank engine by hand, at least two revolutions, before turning ignition on, to test for hydrostatic lock. (This precaution is taken because there might be an excess of preservative oil in the

combustion chambers or, possibly, coolant may have leaked into them.)

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

(4) Follow the general procedures given in paragraph 76*b*. These procedures apply to both first and second echelon preventive maintenance services and to all inspections and are just as important as the specific procedures.

b. Specific Procedures. Perform the semiannual mileage D (6-month or 6,000-mile) preventive maintenance services (par. 79), with the following variations:

(1) Line out the other services on the work sheet (DA Form 461) and write in "New (or Rebuilt) Vehicle Reception."

(2) Before starting engine, tighten cylinder-head nuts with a torque-indicating wrench to 65–75 foot-pounds torque and in the sequence prescribed in figure 48.

(3) Perform item 27 before starting the road test. If a processing tag (*a*(2) above) on the engine or vehicle states that the engine contains preservative oil that is suitable for 500 miles of operation, and of the correct seasonal viscosity, check the level but do not change the oil; otherwise change the oil. Lubricate all points, regardless of interval, except as noted in (6) below. Check the levels of the lubricant in all gear cases. If the gear lubricant is known to be of the correct seasonal grade, do not change it; otherwise change it.

(4) When the engine has been thoroughly warmed up to operating temperature, recheck the tightness of the cylinder-head nuts with a torque-indicating wrench to 65–75 foot-pounds torque in the sequence shown in figure 48.

(5) Perform item 35. "Inspect breaker points, dressing should not be necessary.

(6) Perform item 39. Look at wheel bearings. If lubrication appears to be adequate, do not clean and repack. Do not adjust brakes unless necessary.

10. Break-In

a. Operating Vehicle. Refer to paragraph 41 through 52 for operation under usual conditions. After the preliminary service has been performed (par. 9), the break-in period (500 miles) may be accomplished in normal service of the vehicle under the supervision of a competent driver. The driver will be cautioned against excessive speeds, skipping speeds in shifting gears, rapid acceleration, or in any way loading the engine or power train to capacity during the break-in period. If the vehicle was driven to the using organization, consider the mileage so traveled as break-in mileage.

b. Service After 500 Miles. After 500 miles of vehicle operation, perform the mileage "C" (1,000 mile) preventive maintenance service (par. 79), with the following variations:

(1) Line out the other services on the work sheet (DA Form 461) and write in "New (or Rebuilt) Vehicle 500-Mile Service."

(2) Change the engine oil.

c. Service After 1,000 Miles. When the vehicle has been driven 1,000 miles, it will be placed on the regular preventive maintenance schedule and will be given the first regular mileage "C" (1,000 mile) preventive maintenance service (par. 79).

11. Correction of Deficiencies

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

b. Serious deficiencies, which appear to involve unsatisfactory design or material, will be reported on DA Form 468. The commander of the using organization will submit the completed form to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM.

Section II. CONTROLS AND INSTRUMENTS

12. General

a. This section describes, locates, and illustrates, the various controls and instruments provided for the proper operation of the vehicle.

b. All pedal and hand lever controls, instruments, gages, and switches are grouped in the driver's compartment (figs. 11 and 13) and are readily accessible to the driver for the operation of the vehicle. The major graduations, letters, figures, and pointer tips on all instruments and gages grouped in the instrument cluster (J, fig. 11) are coated with luminous paint for visibility during night operation.

13. Steering Wheel

The steering wheel (D, fig. 11 and A, fig. 13), located on the left side of the driver's compartment, turns the front wheels and thereby steers the vehicle. Turn the steering wheel clockwise for a right turn and counterclockwise for a left turn.

14. Service Brake Pedal

The service brake pedal (BB, fig. 11 and N, fig. 13) located on the upper-front floor pan cover to the right of the steering gear jacket and is accessible to the driver's right foot. This pedal controls the hydraulic service brakes on all four wheels. Depress the service brake pedal to apply the brakes. The degree of brake application is dependent upon the amount of physical effort applied to the brake pedal. Release the pedal to release the brakes.

24. Light Switch

(fig. 15)

a. General. The light switch (E, fig. 13), located on the instrument panel directly in front of the steering gear jacket, is a three lever-type with main switch, auxiliary switch, and mechanical switch levers. The light switch controls all the lights on the vehicle.

(1) *Main switch lever.* The five-position main switch lever, located at the top of the light switch with the switch lever pointing up, can be positioned to energize the circuit to all the vehicle lights including the instrument panel and parking lights.

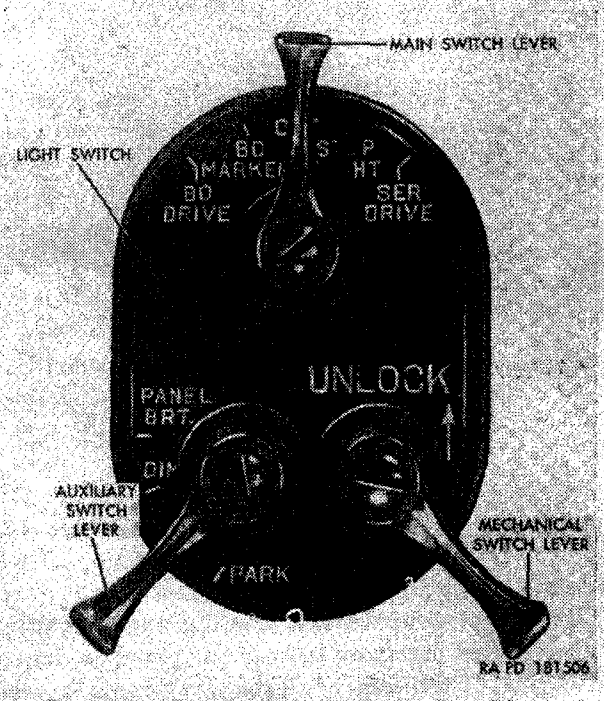


Figure 15. Light switch—levers in off positions.

(2) *Auxiliary switch lever.* The auxiliary switch lever, located at the left and below the main switch lever, controls the instrument panel and the parking lights. It is inoperative when the main switch lever is in OFF position.

(3) *Mechanical switch lever.* The mechanical switch lever, located below and to the right of the main switch lever, locks the main switch lever to prevent accidentally turning on the STOPLIGHT, SER DRIVE and BO DRIVE circuits. This lever must be held in the UNLOCK position before the main switch lever can be moved to STOPLIGHT, SER DRIVE, and from BO MARKER to BO DRIVE.

b. Operation.

(1) *OFF position.* Turn the main switch lever to the OFF position to turn off all the vehicle lights. Switch lever can be moved from any position to OFF without placing mechanical switch lever in UNLOCK position.

(2) *Blackout marker position.* Turn the main switch lever to the left to the BO MARKER position to turn on the signal marker and service parking lights, and energize the circuit for the blackout tail and stoplight and the blackout light of the service tail and stoplight. If instrument panel lights are desired, turn the auxiliary switch lever to either the DIM, PANEL BRT, or PARK position.

(3) *Blackout drive position.* Hold the mechanical switch lever up in the UNLOCK position. Turn the main switch lever to the left to the BO DRIVE position to turn on the blackout driving light, signal blackout marker and service parking lights, the blackout taillight of the service tail and stoplight, and the blackout taillight of the blackout tail and stoplight. If instrument panel lights are desired, turn the auxiliary switch lever to either the DIM, PANEL BRT or PARK position.

(4) *Stoplight position.* Hold the mechanical switch lever up in the UNLOCK position. Turn the main switch lever to the right to the STOPLIGHT position to energize the service tail and stoplight circuit for daylight hours. In the STOPLIGHT position, no other light circuits besides the service tail and stop, and the instrument panel are energized.

(5) *Service drive position.* Hold the mechanical switch lever up in the UNLOCK position. Move the main switch lever to the right to the SER DRIVE position to turn on the headlights and the service tail and stoplight. Move the auxiliary switch lever to DIM or PANEL BRT for instrument panel lights, if desired.

(6) *Parking position.* With the main switch lever in the SER DRIVE position, turn the auxiliary switch lever to the right to the PARK position to turn on the dim instrument panel lights and the service tail and stoplight.

25. Headlight Dimmer Switch

The headlight dimmer switch (FF, fig. 11) is located to the left of the clutch pedal. This foot-operated switch, accessible to the driver's left foot, is used to control the high and low beams of the headlights. With bright lights on (high beam), depress the dimmer switch to change to low beam and dim lights. To switch to bright lights, de-

press the dimmer switch. The headlight high beam indicator light (AA, fig. 11) indicates when high beam or bright lights are on.

26. Windshield Locks

Two windshield locks (C, figs. 11 and 13) are provided on the windshield assembly to hold it in the vertical position. To disengage windshield locks from the windshield locking clamp catches on the instrument panel, pull locks out at the bottoms. To engage windshield locks, position locks over the windshield locking clamp catches and push bottoms of locks toward instrument panel. Lowering and raising of the windshield assembly is described in paragraph 254.

27. Glove Compartment Door Lock

The glove compartment door lock (B, fig. 11 and D, fig. 13) is located on the top of the glove compartment door on the extreme left of the instrument panel. To open glove compartment door, press button in center of the lock and pull door open. To close the glove compartment door, swing the door up against instrument panel. The lock will automatically latch when door is closed.

28. Tool Compartment Lid Handle

The tool compartment is located under the front passenger seat on the right side of the driver's compartment and provides for vehicular tool stowage. To gain access to tool compartment, swing front passenger seat up and forward. To open tool compartment lid, turn the tool compartment lid handle (R, fig. 11) 90° and pull upward. To close tool compartment lid, lower lid making sure handle is turned 90° to clear flange of tool compartment, and lock the lid by turning handle 90° toward front of vehicle.

29. Medical Supplies Stowage Compartments Handles (M170)

Two compartments, one in each rear wheel house, provide for medical supply stowage. To gain access to the stowage compartments, lift the front cushion of the left-rear passenger seat and the rear cushion of the right-rear passenger seat. To open the compartment lid, turn the medical supplies stowage compartment lid handle 90° and pull upward. To close the lid, lower lid making sure handle is turned to clear the compartment flange, and lock the lid by turning the handle 90°.

30. Windshield Wiper Air Regulating Valve

The windshield wiper air regulating valve (A, fig. 11 and B, fig. 13) is located on the windshield assembly at the left of the steering wheel. This valve controls the operation of the windshield wiper motors. To turn the motors on, turn the valve lever counterclockwise. To turn the motors off, turn the valve lever clockwise.

31. Windshield Wiper Manual Control Handles

A windshield wiper manual control handle (E, fig. 11) is mounted on each windshield wiper motor for manual operation of the windshield wiper blade. To operate blade, move handle back and forth as necessary.

32. Horn Button Cap

The horn button cap (F, fig. 11) is located in the center of the steering wheel. Depress cap to sound the horn. Release cap pressure to stop sounding of horn.

33. Ammeter (M38A1) and Battery Generator Indicator (M170)

The ammeter (M38A1) (K, fig. 11) and the battery generator indicator (M170) (J, fig. 12) are located in the upper-left corner of the instrument cluster. The ammeter indicates the amount of current flowing to and from the batteries, depending upon whether the battery is being charged or discharged. The ammeter dial (M38A1) is calibrated to register from DIS to CHG, with zero at the midfront of the needle swing. The battery generator indicator (M170) is a combination voltmeter and ammeter. When the ignition switch is turned on, before the engine is started, the position of the needle indicates the voltage available in the battery: red, low voltage; yellow, normal voltage; and green, high voltage. After the engine is started, the indicator functions as an ammeter. The ammeter will generally show a charge when the engine is first started and continue to show a charge as engine speed is increased, depending upon the amount of electrical power being used. Abnormal readings (par. 86), when engine is operating at normal speed, indicates an inoperative generating system. If improper operation of generating system is indicated by ammeter, stop engine and investigate cause (par. 90*a*).

34. Fuel Gage

The fuel gage (N, fig. 11), located in the upper right corner of the instrument cluster, indicates the amount of fuel in the fuel tank. The gage dial is marked with E, ¼, ½, ¾ and F. The fuel gage functions only when the ignition switch is on. If gage is inoperative, refer to paragraph 90*b*.

35. Oil Pressure Gage

The oil pressure gage (P, fig. 11), located in the lower right corner of the instrument cluster, indicates the engine oil pressure when the engine is running.

Note. Engine oil pressure does not indicate amount of oil in the engine crankcase.

The gage dial is marked from 0 to 120 psi in graduations of 30 psi. Oil pressure under normal operating conditions is 30 to 35 psi and

approximately 10 psi when engine is idling. Absence of oil pressure when engine is running indicates a faulty engine lubrication system or an inoperative gage circuit. If improper operation of lubrication system or gage circuit is indicated, stop engine immediately and investigate cause (pars. 81*i* and 90*d*).

Note. When engine is started cold, oil pressure may indicate slightly high but, under normal condition, will return to normal reading (30 to 35 psi) after engine has warmed up.

36. Water Temperature Gage

The water temperature gage (CC, fig. 11) is located in the lower left corner of the instrument cluster. The gage dial is marked from 60° to 260° F. This gage, which is actuated by the engine water temperature sending unit mounted on the engine, indicates the engine coolant temperature. Normal operating temperature is 160° to 180° F. If temperature rises suddenly during warmup or normal operation, stop engine and investigate cause (par. 88). Temperature below 140° F., during normal operation indicates an inoperative cooling system. If temperature is below 140° F., stop engine and investigate cause (par. 88). For inoperative gage, refer to paragraph 90*c*.

37. Instrument Panel Lights

Two instrument panel lights (L, fig. 11) are located on the instrument cluster below, and one to either side of the speedometer. These lights provide illumination for the instruments and gages during night operation. The auxiliary switch lever on the light switch (fig. 15) actuates these lights and permits them to be turned off, on dim, or on bright. Metal shields over the panel light lamps prevent reflection during night operation.

38. Headlight High Beam Indicator Light

The headlight high beam indicator light (AA, fig. 11), located on the instrument cluster below the speedometer, indicates when the high beam of the headlights is on. This light will go out when headlights are returned to low beam by operation of the headlight dimmer switch (par. 25).

39. Speedometer

The speedometer (M, fig. 11), located in the center of the instrument cluster, indicates vehicle speeds in miles per hour and records the total mileage (on odometer) the vehicle has been driven. The speedometer face is graduated from 0 to 60 in units of 1 mph and the odometer is calibrated from 0 to 99,999 miles.

40. Emergency Reel Lamp Switch (M170)

The emergency reel lamp switch (fig. 109) is located in the lamp handle. Current is supplied to the switch only when one of the light switch levers (fig. 15) is in any position except OFF. The lamp unit is protected by an adjustable cover that can be partially closed for blackout use.

Section III. OPERATION UNDER USUAL CONDITIONS

41. General

This section contains instructions for the mechanical steps necessary to operate the ¼-ton 4 x 4 utility truck M38A1 and the ¼-ton 4 x 4 front line ambulance M170 under conditions of moderate temperature and humidity. For operation under unusual conditions, refer to section V, this chapter.

42. Starting the Engine

a. The driver must become familiar with the purpose and location of the various controls and instruments described in section II (pars. 12 through 38) before he makes any attempt to start the engine. In conjunction with starting and warming up the engine, the driver must perform the prescribed before-operation services listed in table II.

b. Position the transmission gearshift lever (X, fig. 11 and R, fig. 13) in the NEUTRAL position indicated on the shifting instruction plate (fig. 6).

c. If the vehicle is being operated at night, turn on the instrument panel lights (par. 24*a*(1) and (2)).

d. Pull the choke control (EE, fig. 11) all the way out. If engine has been recently operated and is still warm, choking will not be necessary.

e. Turn the ignition switch clockwise to ON position.

f. Depress clutch pedal (DD, fig. 11 and P, fig. 13) to disengage clutch. Hold clutch pedal down until engine is started.

g. Depress starter pedal (V, fig. 11 and U, fig. 12) until starter operates to crank engine. Release pedal as soon as engine starts.

Caution: Do not hold starter engaged for periods in excess of 30 seconds to avoid overheating and resultant damage to starter. If starter has been engaged without results, wait for 15 seconds; then crank engine again. If, after several attempts, the engine fails to start, determine the cause (par. 81*b*).

h. After engine starts, use the throttle control or accelerator pedal to speed up engine if it shows signs of stopping. Release the clutch pedal. Push the choke control in to a point at which engine is running smoothly. As soon as engine is properly warmed up, push choke control all the way in.

lid ring and turn it 90° either clockwise or counterclockwise to unlock lid and lift lid to open position. To lock lid, lower lid until it rests on the flanges of the compartment and lock the lid in place by turning the lid ring 90° either clockwise or counterclockwise from its open position.

Note. Lid ring faces center of vehicle when in locked position.

After locking lid, lower the wheel house cushion until it rests on top of the wheel house.

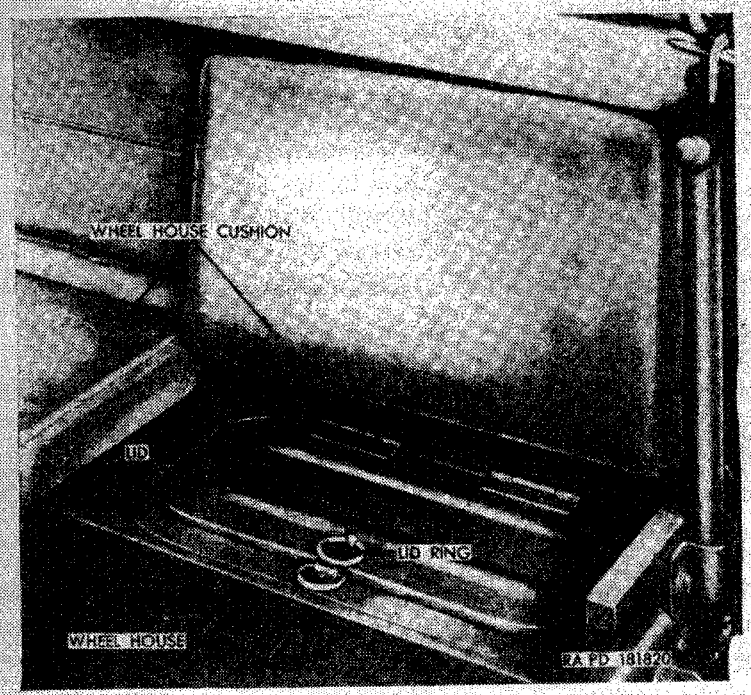


Figure 26. Medical supplies stowage compartment in right wheel house (M170).

58. Top Cover With Rear Curtain and Side Curtains

(fig. 27)

The rear curtain is equipped with three zippers. Each side of the rear curtain is secured to its respective side curtain by a zipper. The two halves of the rear curtain are also secured together by a zipper. All three zippers can be zipped or unzipped from either the outside or inside of the vehicle. Stowage straps are provided to secure the rear curtain and the side curtains in rolled-up position. Two openings are provided in the rear curtain to permit the handles of the litter on the upper litter rack to protrude outside the vehicle when the rear curtain is down.

60. Extreme Cold Weather Conditions

a. General Problems.

(1) Extensive preparation of materiel scheduled for operation in extreme cold weather is necessary. Generally, extreme cold will cause lubricants to thicken or congeal, freeze batteries or prevent them from furnishing sufficient current for cold weather starting, crack insulation and cause electrical short circuits, prevent fuel from vaporizing and properly combining with air to form a combustible mixture for starting, and will cause the various construction materials to become hard, brittle, and easily damaged or broken.

(2) The cooling system should be prepared and protected for temperatures below +32° F., in accordance with instructions given in TM 9-2855 on draining and cleaning the system and the selection, application, and checking of antifreeze compounds to suit the anticipated conditions.

(3) TM 9-2855 also describes the method of correcting specific gravity readings for batteries exposed to extreme cold.

(4) For description of operations in extreme cold, refer to TM 9-2855.

Caution: It is imperative that the approved practices and precautions be followed. TM 9-2855 contains information which is specifically applicable to this vehicle as well as to all other vehicles. It must be considered an essential part of this manual, not merely an explanatory supplement to it.

b. Winterization Equipment. Special equipment is provided for the vehicle when protection against extreme cold weather (0° to −65° F.) is required. This equipment is issued as specific kits. Each kit contains a technical bulletin which provides information on description, installation instructions, and methods of use. TM 9-2855 contains general information on winterization equipment and processing.

c. Fuels, Lubricants, and Antifreeze Compound (Storage, Handling, and Use).

(1) The operation of equipment at arctic temperatures will depend to a great extent upon the condition of the fuels, lubricants, and antifreeze compounds used in the equipment. Immediate effects of careless storage and handling or improper use of these materials are not always apparent, but any deviation from proper procedures may cause trouble at the least expected time.

(2) In arctic operations, contamination with moisture is a source of many difficulties. Moisture can be the result of snow getting into the product, condensation due to "breathing" of a partially filled container, or moisture condensed

from warm air in a partially filled container when a product is brought outdoors from room temperature. Other impurities will also contaminate fuels and lubricants so their usefulness is impaired.

(3) Refer to TM 9-2855 for detailed instruction on storage, handling, and use.

61. Extreme Cold Weather Operation

a. General.

(1) The drive must always be on the alert for indications of the effect of cold weather on the vehicle.

(2) The driver must be very cautious when placing the vehicle in motion after a shutdown. Congealed lubricants may cause failure of parts. Tires frozen to the ground or frozen to the shape of the flat spot while underinflated must be considered. One or more brake shoes may be frozen fast and require preheating to avoid damage to the clutch surfaces. After warming up the engine thoroughly, place transmission in first gear, transfer in low range, and engage front driving axle (par. 43) and drive vehicle slowly approximately 100 yards, being careful not to stall the engine. This should heat gears and tires to a point where normal operation can be expected.

(3) Constantly note instrument readings. If instrument reading consistently deviates from normal, stop the vehicle and investigate cause. A special engine thermostat provided in the arctic winterization kit opens at 180° F., and at this temperature the engine will give best results. If engine temperature gage reading consistently exceeds 200° F., adjust flap on radiator winterfront cover to admit more air.

b. At Halt or Parking.

(1) When halted for short shutdown periods, the vehicle should be parked in a sheltered spot out of the wind. If no shelter is available, park so that the vehicle does not face into the wind. For long shutdown periods, if high ground is not available, prepare a footing of planks or brush. Chock in place if necessary.

(2) When preparing a vehicle for shutdown periods, place all control levers in neutral position to prevent possible freezing in an engaged position. Freezing may occur when water is present due to condensation.

(3) Clean all parts of the vehicle of snow, ice, and mud as soon as possible after operation. Refer to table II for detailed after-operation procedures. If the winter front cover is not installed, be sure to protect all parts of the engine and engine accessories against entrance of loose, drifting snow during the

halt. Snow flurries penetrating the engine compartment may enter the crankcase filler-vent, etc. Cover and shield the vehicle but keep the ends of the canvas paulins off the ground to prevent them from freezing to the ground.

(4) If no power plant heater is present, the battery should be removed and stored in a warm place.

(5) Refuel immediately in order to reduce condensation in the fuel tank. Prior to refueling, open fuel tank drain and drain off accumulated water.

(6) When the vehicle is equipped with a power plant heater as provided by the arctic winterization kit, immediately after engine "shutdown," start the power plant heater and check to be sure it operates effectively. The heater should avoid the necessity of removing the battery to warm storage, and is designed to operate unattended during overnight stops: instructions for operation of winterization equipment is contained in pamphlet packed with the kit.

(7) Correct tire inflation pressure is prescribed in paragraph 248*b*.

(8) When drain plugs have been removed or drain cocks opened to remove liquid from the cooling system of any equipment, the drains will be inspected to be sure none are obstructed. if the drain hole has become obstructed by foreign material, a soft wire should be used to clear the hole of the obstruction. This is particularly important before leaving a vehicle that has had the engine drained to protect the block from freezing. The draining of an engine cooling system to prevent freezing will be done only when no approved antifreeze is available.

62. Operation in Extreme Hot Weather Conditions

a. General. Continuous operation of the vehicle at high speeds or long hard pulls in low gear positions on steep grades or in soft terrain may cause the vehicle to register overheating. Avoid the continuous use of low gear ratios whenever possible. Continuously watch the temperature and halt the vehicle for a cooling-off period whenever necessary and the tactical situation permits. Frequently inspect and service cooling system (par. 127), oil filter (par. 114), and air cleaner (par. 136). If the engine temperature consistently rises above 200° F., look for dust, sand, or insects in radiator fins and blow out any accumulation with compressed air or water under pressure. Flush cooling system if necessary (TM 9-2858).

b. At Halt or Parking.

(1) Do not park the vehicle in the sun for long periods, as the heat and sunlight will shorten the life of the tires. If possible, park vehicle under cover to protect it from sun, sand, and dust.

(2) Cover inactive vehicles with paulins if no other suitable shelter is available. Where entire vehicle cannot be covered, protect window glass against sand etching, and protect engine compartment against entry of sand.

(3) Correct tire inflation pressure is prescribed in paragraph 248*b*.

(4) Vehicles inactive for long periods in hot humid weather are subject to rapid rusting and accumulation of fungi growth. Make frequent inspections and clean and lubricate to prevent excessive deterioration.

(5) Exterior surfaces which are not painted should be coated with a light film of engine lubricating oil.

63. Operation on Unusual Terrain

a. General.

(1) Vehicle operation on snow or ice and in deep mud requires the use of tire chains. Tire chains must be installed in pairs (front and rear) to prevent power train damage and wear. Select a gear ratio low enough to move vehicle steadily and without imposing undue driving strain on engine and power train. However, racing of the engine for extended periods must be avoided.

Note. Avoid excessive clutch slippage.

(2) Operators must at all times know the position in which the front wheels are steering, as the vehicle may travel straightahead even though the wheels are cramped right or left. A piece of string tied to the front portion of the steering wheel rim in "straightahead" position will indicate to the driver whether the front wheels are "ploughing." This ploughing action may cause the vehicle to stall or suddenly veer to right or left.

(3) If one or more wheels become mired and others spin, it may be necessary for the vehicle to be winched or towed by a companion vehicle or to jack up the wheel which is mired and insert planking or matting beneath it. Do not jam sticks or stones under a spinning wheel, as this only forms an effective block and will wear the tire tread unnecessarily.

(4) Operation in sand requires daily cleaning of air cleaner, (par. 136), fuel filter (par. 139), and oil filters (par. 114). Engine vents and other exposed vents should be covered with cloth.

(5) At high altitudes, coolant in vehicles boils at proportionately lower points than 212° F., thus, it will be necessary to keep a close watch on the engine temperature during the summer months.

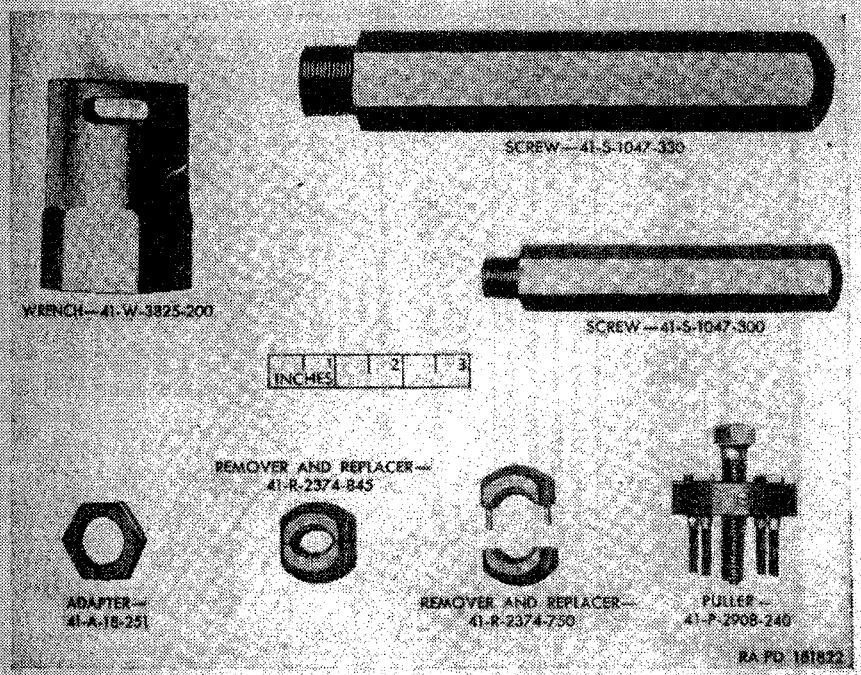


Figure 28. Special tools and equipment for operation and organizational maintenance.

Section II. LUBRICATION AND PAINTING

69. Lubrication Chart

The lubrication chart (figs. 29 and 30) prescribes cleaning and lubricating procedures as to locations, intervals, and proper materials for these vehicles. When the revised official lubrication order is available, it will be issued with each vehicle and is to be carried with it at all times. In the event the vehicle is received without a copy, the using organization will immediately requisition one. See DA Pamphlet 310–4 for lubrication order of current date. Lubrication which is to be performed by ordnance maintenance personnel is listed on the lubrication chart in the NOTES.

70. General Lubrication Instructions

a. General. Special lubricating instructions required for specific mechanism or parts are covered in the pertinent section.

b. Usual Conditions. Service intervals specified on the lubrication chart are for normal operation and where moderate temperature, humidity, and atmospheric conditions prevail.

c. Lubrication Equipment. Each vehicle is supplied with lubrication equipment adequate for its maintenance. Operate the lubricating

LUBRICATION CHART

TRUCK, ¼-TON 4x4, M38A1, M170

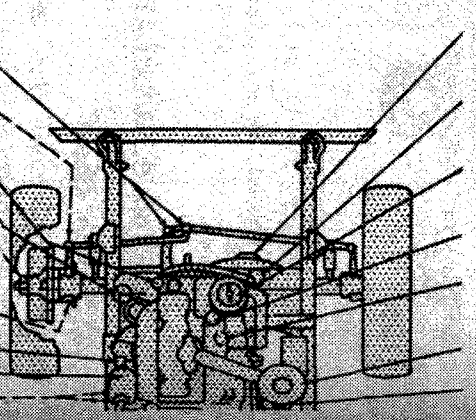
References TM 9-8014, ORD 9 SNL G-758

Intervals are based on normal operation. Reduce to compensate for abnormal operation, severe conditions or contaminated lubricants. During inactive periods, intervals may be extended commensurate with adequate preservation. Relubricate after washing or fording.

Clean fittings before lubricating. Clean parts with THINNER, paint, volatile mineral spirits (TPM) or SOLVENT, dry cleaning (SD). Dry before lubricating. Lubricate dotted arrow points on both sides of the equipment.

Interval • Lubricant

E, F, fig. 31	Tie Rod (Inner)	GAA	1
D, fig. 31	Tie Rod (Outer)	GAA	1
B, fig. 31	Steering Bellcrank	GAA	1
C, fig. 31	Drag Link	GAA	1
T, fig. 33	Front Wheel Bearings (Every 12,000 miles or annually, remove, clean, dry and repack)	GAA	12
U, fig. 33	Universal Joint and Steering Knuckle Bearings (See note 6)	GAA	1
CC, fig. 34	Drag Link	GAA	1
W, fig. 33	Steering Gear	GO	1
A, fig. 31	Spring Shackle	GAA	1



Lubricant • Interval

W	GO	Front Differential Fill and Level (Check level)	Z, fig. 34
12		Front Differential Drain (Drain and refill. Cap. 2½ pts.) (See note 5)	AA, fig. 34
D		Oil Filter (Turn handle one complete turn) (See note 3)	S, fig. 32
D	OE	Crankcase Fill and Level (Check level)	R, fig. 32
6		Crankcase Drain (Drain and refill. Cap. 5 qts.) (See note 2)	BB, fig. 34
D	OE	Air Cleaner (See note 1)	X, fig. 33
S		Distributor (See note 4)	Y, fig. 33

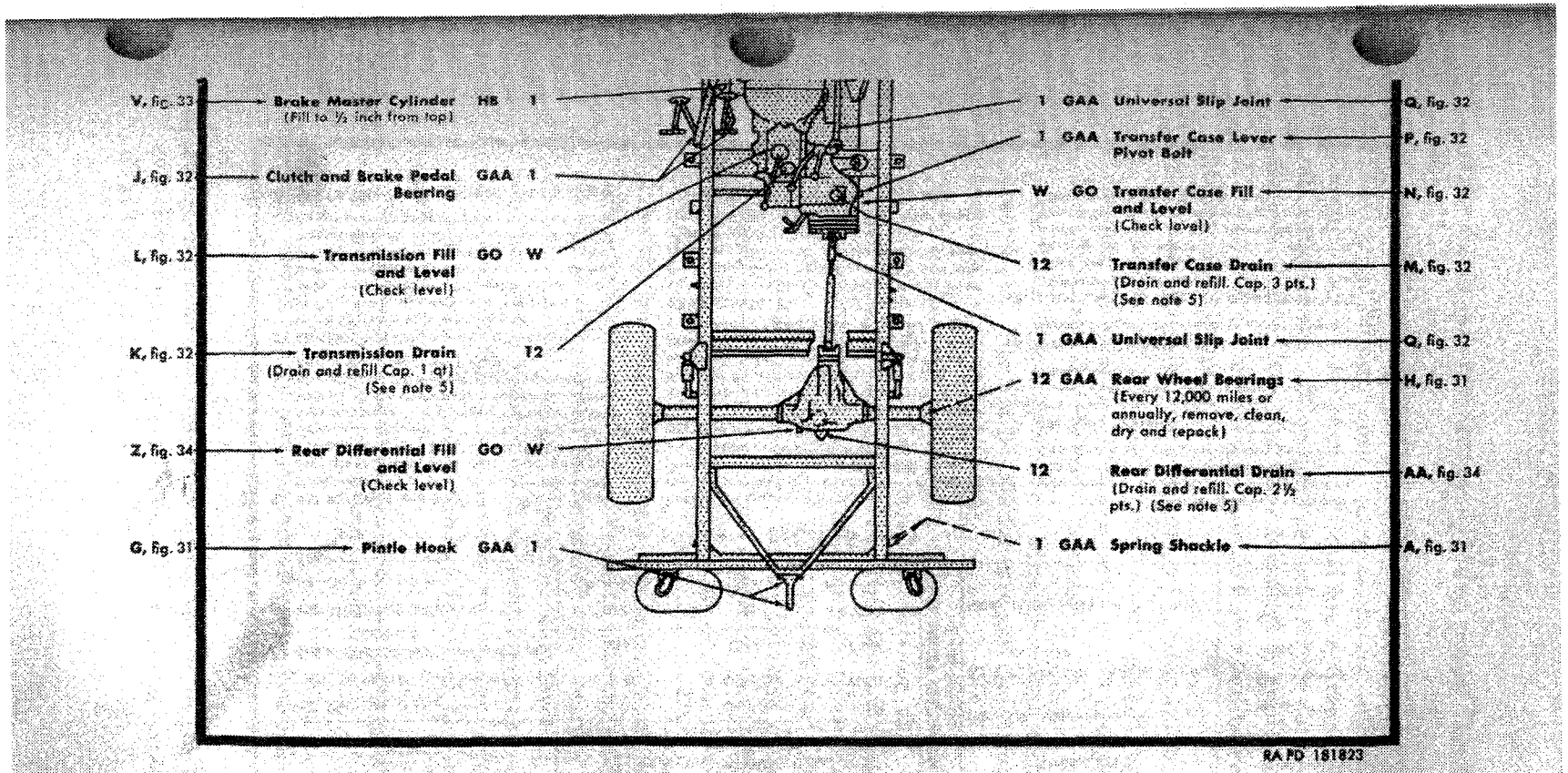


Figure 29. ¼-ton 4 x 4 utility truck M38A1 and ¼-ton 4 x 4 front line ambulance M170 lubrication chart.

KEY

LUBRICANTS	EXPECTED TEMPERATURES		
	above +32° F	+40°F to –10°F	0°F to –65°F
OE—Oil, lubr, engine	OE 30	OE 10	OES
GO—LUBRICANT, gear, universal	GO 90	GO 75	GOS
GAA—GREASE, lubr, automotive and artillery	GAA	GAA	GAA
HB—FLUID, hydraulic brake	HB	HB	HBA
PL—Oil, lubr, preservative	PL (Med)	PL (Special)	PL (Special)

FOR ARCTIC OPERATION refer to TMP 2855

LUBRICANTS	INTERVALS
OES—Oil, lubr, engine, sub-zero	D—Daily
GOS—LUBRICANT, gear, universal, sub-zero	W—Weekly
HBA—FLUID, hydraulic brake, arctic	S—Semiannually
	1—1,000 Miles
	6—6,000 Miles
	12—12,000 Miles

NOTES

1. **AIR CLEANER** and *Breather*—(Oil Bath Type) Daily, replenish to bead level with OE, crankcase grade. Every 1,000 miles, clean oil reservoir and refill with OE as above. Disassemble, clean all parts, refill with OE as above whenever crankcase oil is changed. For desert or extremely dusty operation, disassemble, clean all parts and refill with OE once every operating day or more frequently if required.
2. **CRANKCASE**—Drain every 6,000 miles or semiannually. Drain only when engine is hot. Refill to FULL mark. Run engine a few minutes, recheck level. For satisfactory operation on heavy duty engine oil, engine thermostat must be operating properly to maintain engine coolant temperature at 140° F *minimum*. CAUTION: Be sure pressure gauge indicates oil is circulating.
3. **OIL FILTER**—Every 1,000 miles, remove plug in bottom of case and drain sediment. Every 6,000 miles or semiannually, while crankcase is being drained, remove, clean and inspect element, clean inside of case, install element.
4. **DISTRIBUTOR**—Semiannually, wipe breaker cam lightly with GAA and lubricate breaker arm pivot and wick under rotor with 1 to 2 drops of PL. Remove distributor, remove plug and wick under name plate, soak felt wick in preservative oil. Fill cavity with GAA. Insert wick, remove excess grease and install plug.
5. **GEAR CASES**—Drain every 12,000 miles or annually. Drain only when hot after operation. Fill to plug levels before operation and after draining. Clean vents weekly and after operation in water or mud.
6. **UNIVERSAL JOINT AND STEERING KNUCKLE BEARINGS**—Every 1,000 miles, remove plug and fill to level. When wheels are removed for packing, remove steering knuckles, clean and repack universal joint housing. Do not disassemble constant velocity universal joint.
7. **OIL CAN POINTS**—Every 1,000 miles, lubricate hand brake linkage, clutch and brake pedal linkage, pintle hook if not equipped with fittings, with PL.
8. **DO NOT LUBRICATE**—Shock absorbers, springs, clutch release bearing, water pump.
9. **LUBRICATED AT TIME OF DISASSEMBLY BY ORDNANCE PERSONNEL**—Ventilator dual valve control, throttle control, choke control, steering column bearing (upper), generator, starter, clutch fulcrum ball, clutch release bearing carrier, clutch pilot bearing, hand brake cable, speedometer flexible shaft.

RA PD 181824

Figure 30. ¼-ton 4 × 4 utility truck M38A1 and ¾-ton 4 × 4 front line ambulance M170 lubrication chart.

guns carefully and in such a manner as to insure a proper distribution of the lubricant.

d. Points of Application.

(1) Lubrication fittings, grease cups, oilers and oilholes are shown in figures 31 through 34 and are referenced to the lubrication chart. Wipe these devices and the surrounding surfaces clean before and after lubricant is applied.

(2) A ¾-inch red circle should be painted around all lubricating fittings and oilholes.

(3) Clean and lubricate unsealed bearings as shown below.

(*a*) Wash all the old lubricant out of the bearings and from the inside of the hubs with volatile mineral spirits or dry-cleaning solvent and dry the parts thoroughly.

Caution: Bearings must not be dried or spun with compressed air. See TM 37-265 for care and maintenance of bearings.

(*b*) Pack the bearings by hand or with a mechanical packer, introducing the lubricant carefully between the rollers. Do not smear grease only on the outside of the bearings and expect it to work in. Great care must be exercised to insure that dirt, grit, lint, or other contaminants are not introduced into the bearings. If the bearings are not to be installed immediately after repacking, they should be wrapped in clean oilproof paper to protect from contaminants.

(*c*) After the bearings are properly lubricated, pack the hub with a sufficient amount of lubricant to uniformly fill it to the inside diameters of the inner and outer bearing races. Coat the spindles and hub caps with a thin layer of lubricant (not over one-sixteenth of an inch) to prevent rusting. Do not fill the hub caps to serve as grease cups under any circumstances. They should be lightly coated, however, to prevent rusting.

Note. For normal operation, lubricate wheel bearings at 12,000 miles or at annual intervals, whichever comes first.

e. Reports and Records.

(1) Report unsatisfactory performance of prescribed petroleum fuels, lubricants, or preserving materials, using DA Form 468.

(2) Maintain a record of lubrication of the vehicle on DA Form 461, Preventive Maintenance Service and Inspection for Wheeled and Half-Track Vehicles.

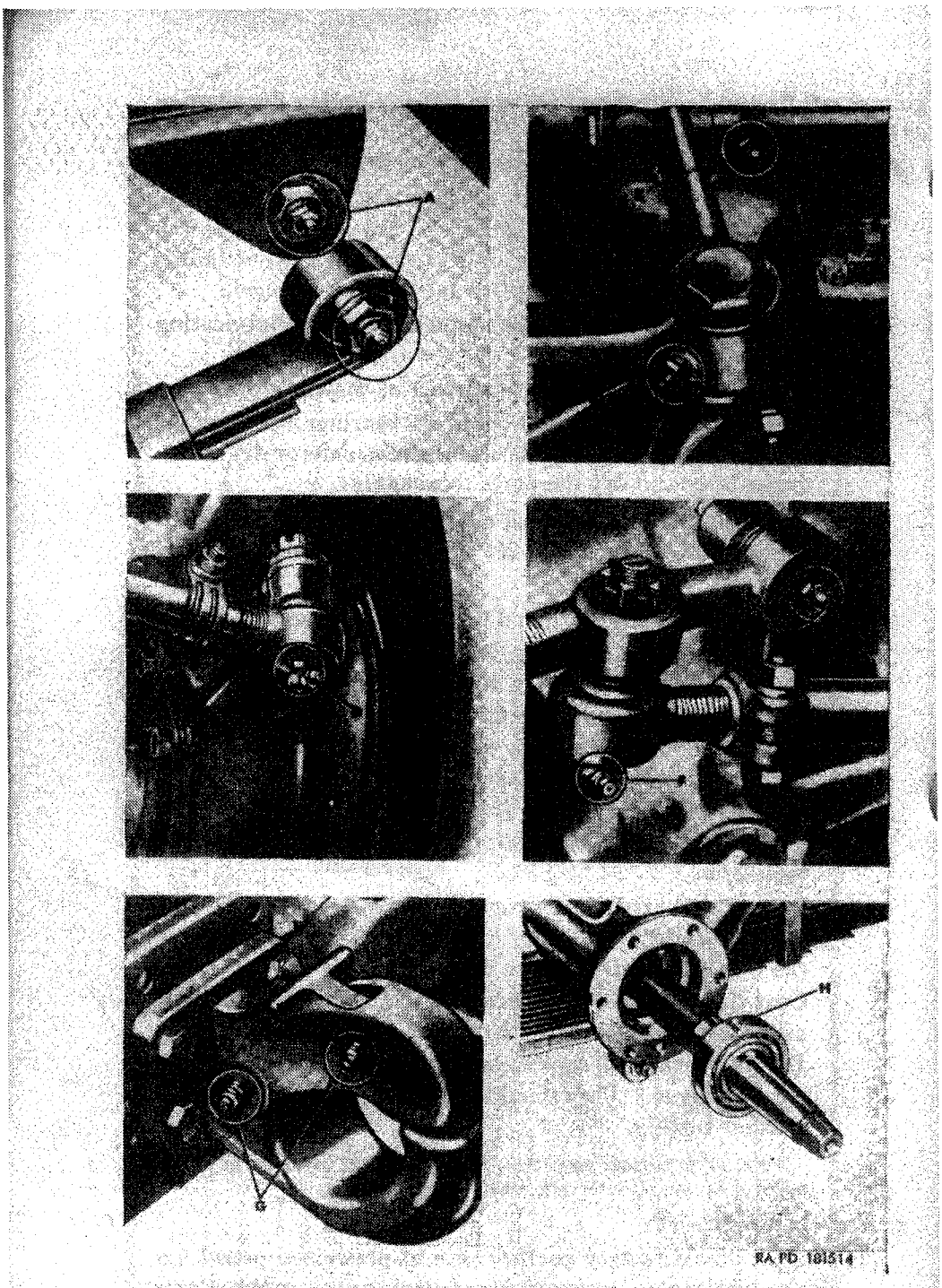


Figure 31. Localized lubrication points A through H.

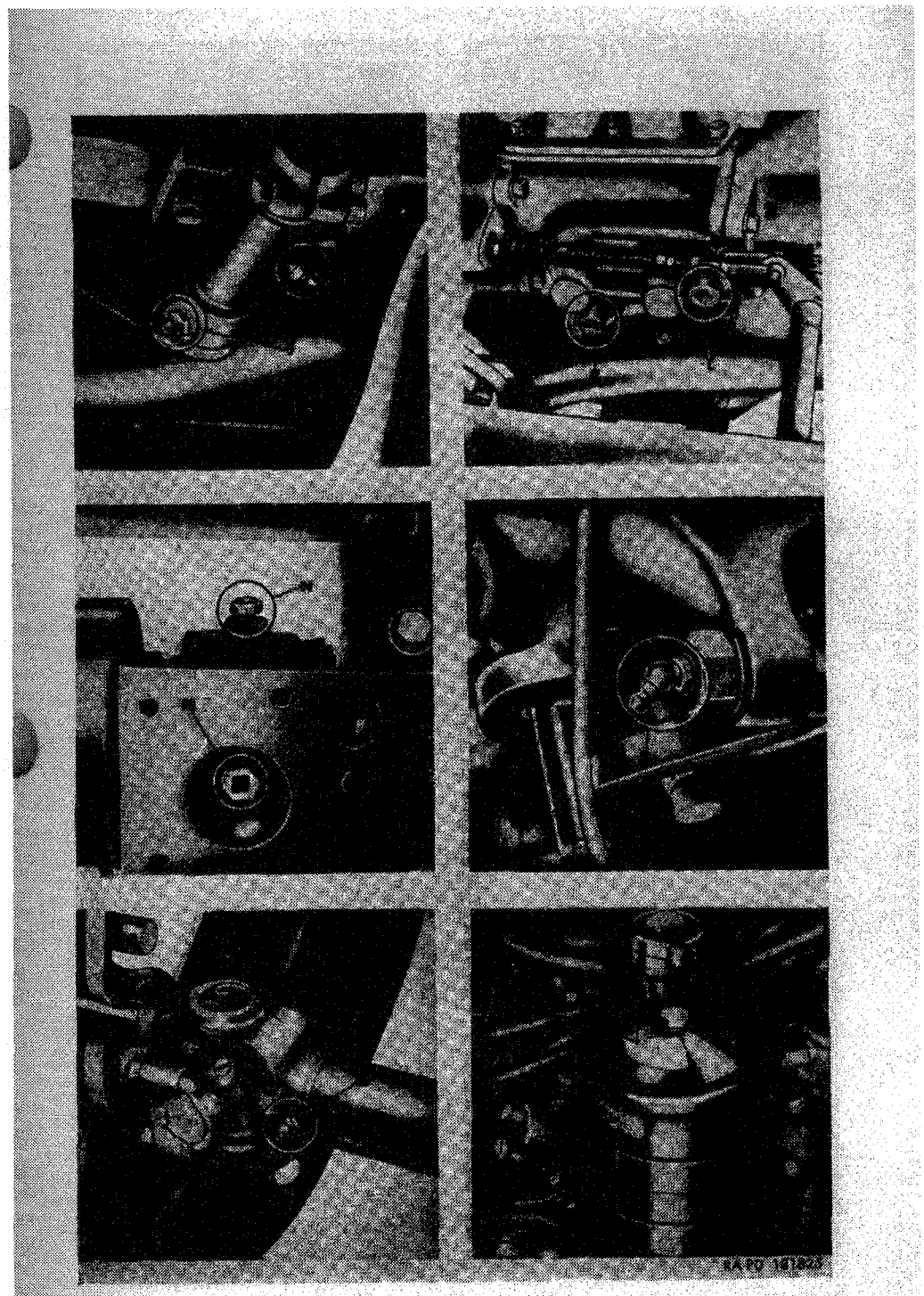


Figure 32. Localized lubrication points J through S.

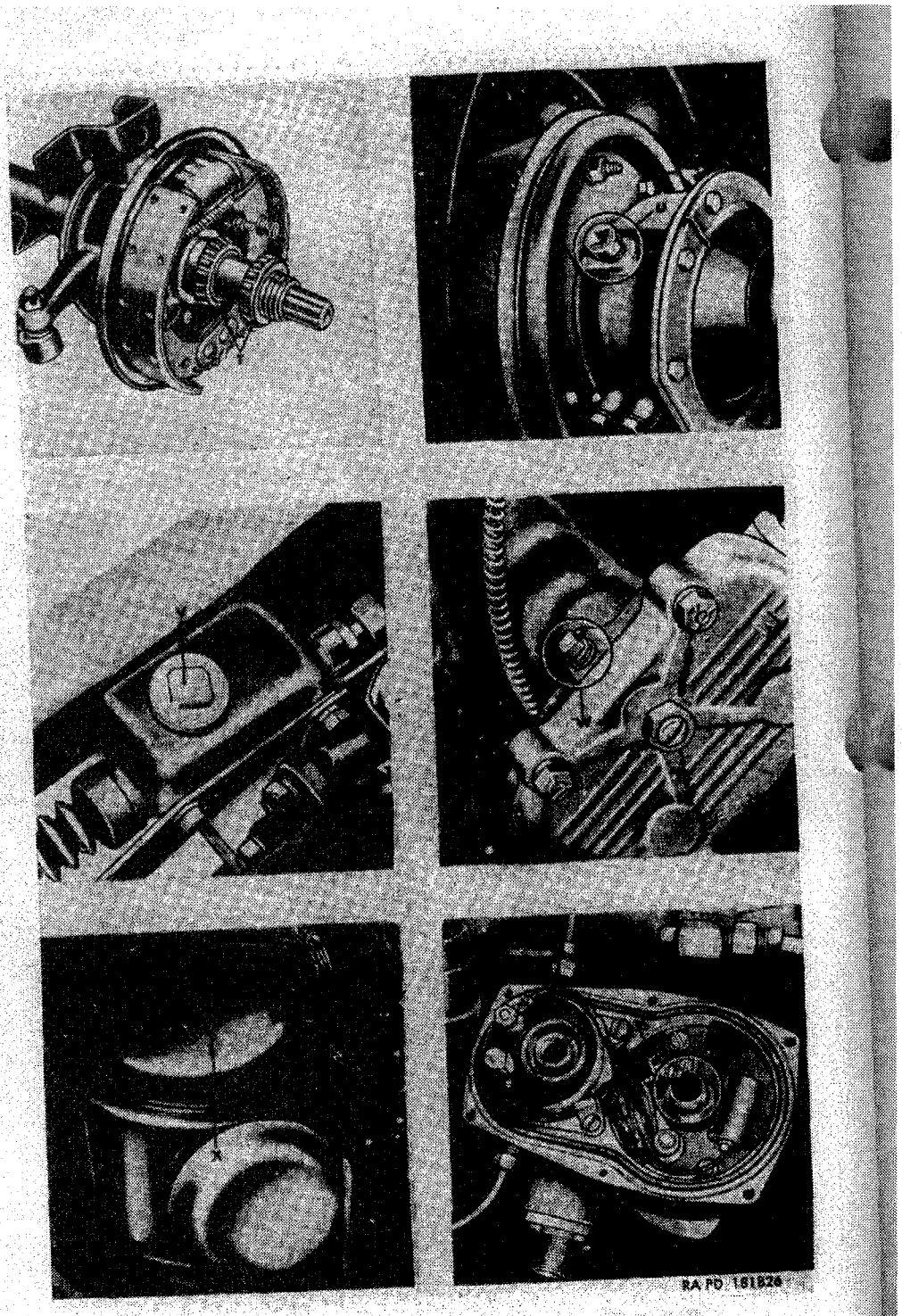


Figure 33. Localized lubrication points T through Y.

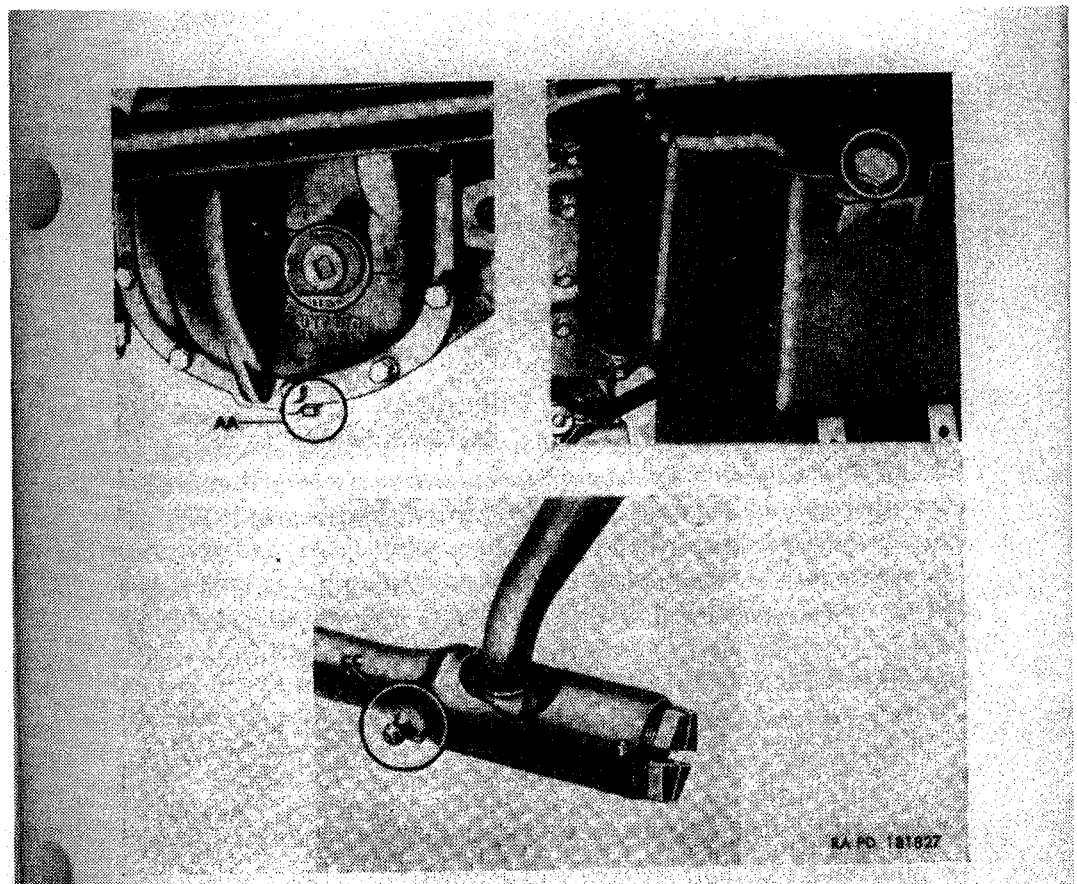


Figure 34. Localized lubrication points Z through CC.

71. Lubrication Under Unusual Conditions

a. Unusual Conditions. Reduce service intervals specified on the lubrication chart, i. e., lubricate more frequently, to compensate for abnormal or extreme conditions, such as high or low temperatures, prolonged periods of high speed operations, continued operation in sand or dust, immersion in water, or exposure to moisture. Any of these operations or conditions may cause contamination and quickly destroy the protective qualities of the lubricants. Intervals may be extended during inactive periods, commensurate with adequate preservation.

b. Changing Grade of Lubricants. Lubricants are prescribed in the "Key" (fig. 30) in accordance with three temperature ranges: above +32° F., +40° to −10° F., and from 0° to −65° F. Change the grade of lubricants whenever weather forecast data indicates air temperatures will be consistently in the next higher or lower temperature range or when sluggish starting caused by lubricant thickening occurs. No change in grade will be made when a temporary rise in temperature is encountered.

c. Maintaining Proper Lubricant Levels. Lubricant levels must be observed closely and necessary steps taken to replenish in order to maintain proper levels at all times.

72. Lubrication for Continued Operation Below 0° F.

Refer to TM–2855 for instructions on necessary special preliminary lubrication of the vehicle, and to TB 9–2855–3 for instructions on installation of the winterization kit.

73. Lubrication After Fording Operations

a. After any fording operation in water 12 inches or over, lubricate all chassis points to cleanse bearings of water or grit as well as any other points required in accordance with paragraph 276, for maintenance operations after fording.

b. If the vehicle has been in deep water for a considerable length of time or was submerged beyond its fording capabilities, precautions must be taken as soon as practicable to avoid damage to the engine and other vehicle components as shown below.

(1) Perform a complete lubrication service (par. 69).

(2) Inspect engine crankcase oil. If water or sludge is found, drain the oil and flush the engine with preservative engine oil PE–30. Before putting in new oil, drain the oil filter and install a new filter element (par. 114).

Note. If preservative engine oil is not available, engine lubricating oil OE–30 may be used.

(3) Operation in bodies of salt water enhances the rapid growth of rust and corrosion, especially on unpainted surfaces. It is most important to remove all traces of salt water and salt deposits from every part of the vehicle. For assemblies which have to be dissassembled, dried, and relubricated, perform these operations as soon as the situation permits. Wheel bearings must be disassembled and repacked after each submersion. Regardless of the temporary measures taken, the vehicle must be delivered as soon as practicable to the ordnance maintenance unit.

74. Lubrication After Operation Under Dusty or Sandy Conditions

After operation under dusty or sandy conditions, clean and inspect all points of lubrication for fouled lubricants and relubricate as necessary.

Note. A lubricant which is fouled by dust and sand makes an abrasive mixture that causes rapid wear of parts.

75. Painting

Instructions for the preparation of the materiel for painting, methods of painting, and materials to be used are contained in TM 9-2851. Instructions for camouflage painting are contained in FM 5-20B. Materials for painting are listed in ORD 7 SNL-758.

Section III. PREVENTIVE MAINTENANCE SERVICES

76. General

a. Responsibilities and Intervals. Preventive maintenance services are the responsibility of the using organization. These services consist generally of daily operator's services (daily A services) performed by the operator or crew; biweekly services (biweekly B services) performed by the crew (under supervision of the squad, section, and platoon leaders); and scheduled services to be performed by organizational maintenance personnel. (C and D services.) Intervals are based on normal operations. Reduce intervals for abnormal operations or severe conditions. Intervals during inactive periods may be extended accordingly.

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

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

(2) Inspection of a unit to see if it is "correctly assembled or stowed" is usually a visual inspection to see if the unit is in its normal position in the vehicle and if all its parts are present and in the correct relative positions.

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

(4) "Excessively worn" is understood to mean worn beyond serviceable limits, or likely to fail if not replaced before the next scheduled inspection. Excessive wear of mating parts or linkage connections is usually evidenced by too much play

(lash or lost motion). It includes illegibility as applied to markings, data and caution plates, and printed matter.

(5) Where the instruction "tighten" appears in the procedures, it means tighten with a wrench, even if the item appears to be secure.

(6) Such expressions as "adjust if necessary" or "replace if necessary" are not used in the specific procedures. It is understood that whenever inspection reveals the need of adjustments, repairs, or replacements, the necessary action will be taken.

77. Cleaning

a. General. Special cleaning instructions required for specific mechanisms or parts are contained in the pertinent section. General cleaning instructions are as shown below.

(1) Name plates, caution plates, and instructions plates made of steel rust very rapidly. When found to be in a rusty condition, they should be thoroughly cleaned and heavily coated with an application of lacquer.

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

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

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

(5) Before installing new parts, remove any preservative materials, such as rust-preventive compound, protective grease, etc.; prepare parts as required (oil seals, etc.); and for those parts requiring lubrication, apply the lubricant prescribed in the lubrication chart (par. 69).

b. General Precautions in Cleaning.

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

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

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

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

78. Preventive Maintenance by Driver or Operator

a. Purpose. To insure efficient operation, it is necessary that the vehicle be systematically inspected at intervals every day it is operated and biweekly, so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. All defects or unsatisfactory operating characteristics beyond the scope of the driver or operator(s) to correct must be reported at the earliest opportunity to the designated individual in authority.

b. Services. Driver's or operator's preventive maintenance services are listed in table II. Every organization must thoroughly school its personnel in performing the maitnenance procedures for this vehicle as set forth in this manual.

Table II. Driver's or Operator's Preventive Maintenance Services

Interval S					
Daily "A"				Biweekly "B"	Procedure
Before operation	During operation	At halt	After operation		
					Caution: Place all tags describing condition of vehicle in the driver's compartment in a conspicuous location so that they will not be overlooked.
X	------	X	X	X	*Fuel, oil, and water.* Check fuel, oil, and water levels. Check spare containers for contents. If water is added in cold weather, test solution with a hydrometer to determine if there is sufficient antifreeze.
X	------	------	------	X	*Tires.* Gage tires for correct pressure (par. 248*b*).
------	------	X	X	X	Remove penetrating objects such as nails or glass. Note any apparent loss of air, unusual wear, or missing valve caps.
X	------	X	X	X	*Leaks, general.* Look under vehicle and in engine compartment for any indication of fuel, engine oil, water, or brake fluid leaks.
X	------	------	------	------	*Vehicle equipment.* Visually inspect fire extinguishers and vehicle publications, including Standard Form 91 and DD Form 518.

Table II. Driver's or Operator's Preventive Maintenance Services—Continued

Interval S					Procedure
Daily "A"				Biweekly "B"	
Before operation	During operation	At halt	After operation		
				X	See that fire extinguishers are charged and sealed (if required).
X			X	X	Operate lights, horn (if tactical situation permits), and windshield wipers. Visually inspect mirrors, reflectors, body, towing connections, canvas items, tools, etc.
				X	Check for tampering or damage that may have occurred since last inspection.
X	X				*Instruments.* Observe for normal readings during warmup and during operation of vehicle.
					Caution: If it is necessary to add water to a radiator while the engine is overheated, run the engine at idling speed and slowly add the water. If oil pressure is zero or excessively low, shut off engine immediately and investigate cause (par. 81*i*).
	X				*General operation.* Be alert for any unusual noises or improper operation of steering, clutch, brakes, or gear shifting.
		X	X	X	*Operating faults.* Investigate and correct or report all faults noted during operation.
		X	X	X	*Springs and suspensions.* Look at springs and shock absorbers to see if they have been damaged.
			X	X	*Lubricate.* Lubricate items specified on lubrication chart (par. 69).
			X	X	*Clean.* Clean glass, vision devices, and inside of vehicle. Wipe off exterior of vehicle.
				X	Wash vehicle. Clean engine and engine compartment.
				X	*Battery.* Clean. Check water level. Inspect terminals for tightness and coating of grease (TM 9-2857).
				X	*Assemblies and belts.* Inspect assemblies such as carburetor, generator, starter, and water pump for looseness of mountings or connections. Test fan and generator drive belts to determine if tension is correct (par. 130*a*).
				X	*Electrical wiring.* Visually inspect, electrical wiring, conduits, and shielding.
				X	*Axle and transfer vents.* Inspect for clogging.

g. Engine Overheats (Normal Operating Temperature 160° to 180° F.).

(1) *Cooling system faulty.* Refer to paragraph 88.

(2) *Ignition timing incorrect.* Check the ignition timing and adjust if necessary (par. 149).

(3) *Insufficient oil in crankcase.* Check level of oil in crankcase and fill if necessary (par. 69).

h. Excessive Oil Consumption.

(1) *Leaks.* Inspect engine compartment and under front of vehicle for signs of engine oil leaks. Tighten leaking connections or replace damaged oil lines. If leak continues, notify ordnance maintenance personnel.

(2) *Crankcase overfilled.* Maintain oil at correct level (par. 69).

(3) *Operation at excessive high speeds.* Avoid unnecessary and excessively high speeds.

(4) *Excessive low-range driving.* Operate vehicle in proper gear for desired speeds and terrain.

(5) *Engine overheats.* Refer to *g* above.

(6) *Cylinder compression poor or uneven.* Refer to *b*(9) above.

i. Low Oil Pressure. Check engine oil level and grade of oil (par. 69). If the crankcase is properly filled with oil of the correct grade, check the oil pressure gage (par. 90*d*). If oil pressure gage is operating correctly, low oil pressure is caused by worn engine parts. Notify ordnance maintenance personnel.

82. Fuel and Air Intake System

a. Fuel Does Not Reach Carburetor.

(1) *Fuel shutoff valve closed.* Make sure the fuel shutoff valve (Q, fig. 55) is in the OPEN position (valve handle parallel to line).

(2) *Fuel tank empty.* Check fuel gage for level in fuel tank and refuel if necessary.

(3) *Fuel filter clogged.* Remove the fuel filter assembly (par. 138*a*) and replace element (par. 139). Make sure connections are tight.

(4) *Fuel line leak.* Check all fuel lines and fittings carefully for leaks (par. 142).

(5) *Fuel pump pressure incorrect.* Disconnect fuel line from outlet side of fuel and vacuum pump. Install a pressure gage (fig. 35) in the fuel and vacuum pump outlet. With ignition switch turned off, crank engine with starter until the pointer on the pressure gage reaches a maximum reading. Fuel pump pressure should be between 4½ and 5 psi. If pressure is incorrect, replace the fuel and vacuum pump assembly (par. 137). If pressure of new pump is incorrect, notify ordnance maintenance personnel.

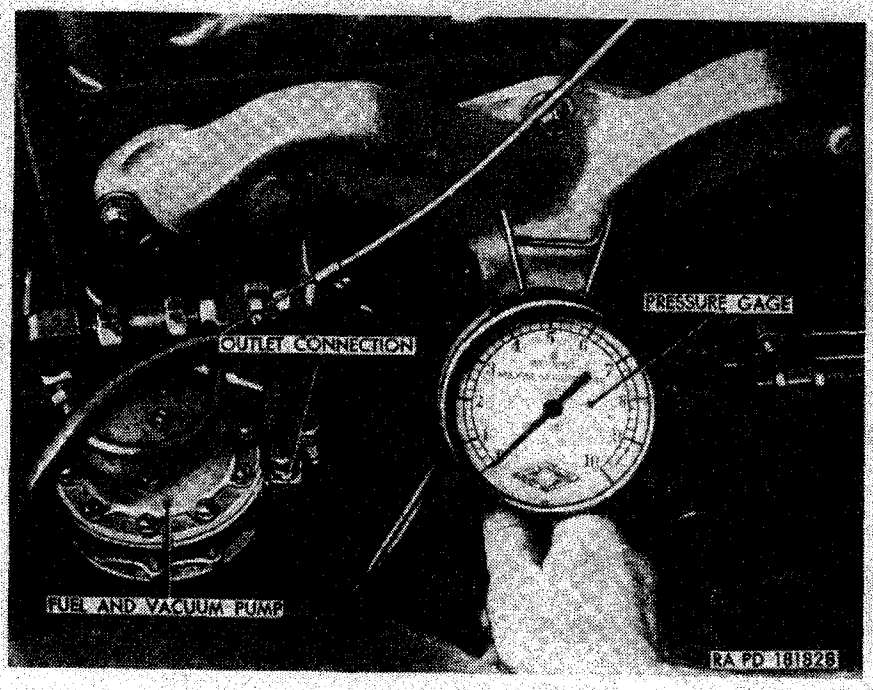


Figure 35. Testing fuel pump pressure.

(6) *Fuel lines clogged.* Disconnect fuel lines (par. 142) and blow out with compressed air.

b. Fuel Does Not Reach Cylinders. Disconnect fuel line (E, fig. 64) from inlet side of carburetor and crank engine with starter to make certain fuel is reaching carburetor. Connect fuel line to carburetor and disconnect the air intake hose at the top of the carburetor. Pour a small amount of fuel into the neck of the carburetor and try to start the engine. If the engine starts but stops quickly, fuel is not reaching the cylinders. Replace the carburetor (par. 134).

c. Engine Floods.

(1) *Air cleaner restricted or dirty.* Service air cleaner (par 69).

(2) *Carburetor choke control not fully open.* Remove the air intake hose (E, fig. 66) at the carburetor. Push the choke control in the driver's compartment all the way in. Look into the choke control body to make certain the choke control valve is fully open. If it is not fully open, adjust the choke control assembly (par. 135*i*(1)).

(3) *Fuel pump pressure incorrect.* Refer to *a*(5) above.

(4) *Carburetor adjustment incorrect.* Adjust carburetor (par. 134*a*).

(5) *Worn carburetor.* If engine continues to flood after (1) through (4) above have been checked, replace the carburetor (par. 134).

(7) *Steering gear mounting bolts loose.* Check and tighten steering gear mounting bolts if necessary.

c. Front End Shimmy.

(1) *Unequal tire pressure.* Inflate tires to correct pressure (par. 248*b*).

(2) *Steering gear mounting bolts loose.* Refer to *b*(7) above.

(3) *Front hub bearings worn or incorrectly adjusted.* Adjust bearings or replace if necessary (par. 208).

(4) *Wheel damaged.* Refer to paragraph 100.

(5) *Tie rod ends worn.* Refer to *b*(4) above.

(6) *Loose or worn steering knuckle flange bearings.* Replace if necessary (par. 213).

103. Windshield Wipers

a. Both Windshield Wipers Inoperative.

(1) *Restricted vacuum pump-to-tee line or air regulating valve-to-distributor tee line hose.* Inspect the vacuum line for dents or damage. Inspect the hose for cracks or signs of deterioration. Replace if necessary (par. 259*c*).

(2) *Loose connections.* Make certain all line and hose connections are tight.

(3) *Vacuum pump inoperative.* Replace fuel and vacuum pump with one known to be operating (par. 137).

(4) *Windshield wiper motor inoperative.* Replace wiper motor with one known to be operating (par. 259*c*).

b. Right Windshield Wiper Inoperative.

(1) *Center windshield wiper line loose or damaged.* Tighten connections or replace the line (par. 259*d*(2)).

(2) *Windshiled wiper motor inoperative.* Replace wiper motor with one known to be operating (par. 259*c*).

Section V. ENGINE DESCRIPTION AND MAINTENANCE IN VEHICLE

104. Description and Data

(fig. 36)

a. Description.

(1) *Engine.* The engtne is a four-cylinder, liquid-cooled, gasoline engine of the F-head design with a combination valve-in-head and valve-in-block construction. The engine can operate when totally submerged in water, provided it is equipped with a deep-water fording ventilation system. Parts for the fording system can be requisitioned as a kit. The intake valves are located in the cylinder head while the exhaust valves are located in the cylinder block. Intake

valves are operated through intake valve push rods and by overhead valve rocker arms. The exhaust valves, which are equipped with rotator caps, are operated by valve tappets in the cylinder block. The intake manifold is of the sealed in type, cast directly into, and considered a part of the cylinder head. The exhaust manifold assembly, a single case unit, is attached to the left side of the cylinder block. The power plant, including the engine, transmission, transfer, and radiator, is designed to be removed from the vehicle as a complete unit. The removal and installation of the power plant is described in paragraphs 120 and 124 for the M38A1, and paragraphs 121 and 125 for the M170.

(2) *Engine lubrication.* The engine is lubricated by a force feed, continuous circulating system. A planetary gear-type oil pump, driven by the camshaft, delivers oil under pressure to drilled oil passages and external oil pipes and lines which, in turn, direct oil to all moving parts of the engine. Oil is drawn through a floating-type oil strainer in the oil pan. The replaceable element-type oil filter is mounted on the right side of the engine. A portion of the engine oil is continuously passed through the filter where foreign materials are removed before the oil is returned to the oil pan.

(3) *Engine nomenclature.* The fan end of the engine will be referred to as the "front." The flywheel end of the engine will be referred to as the "rear." The terms "left" and "right"

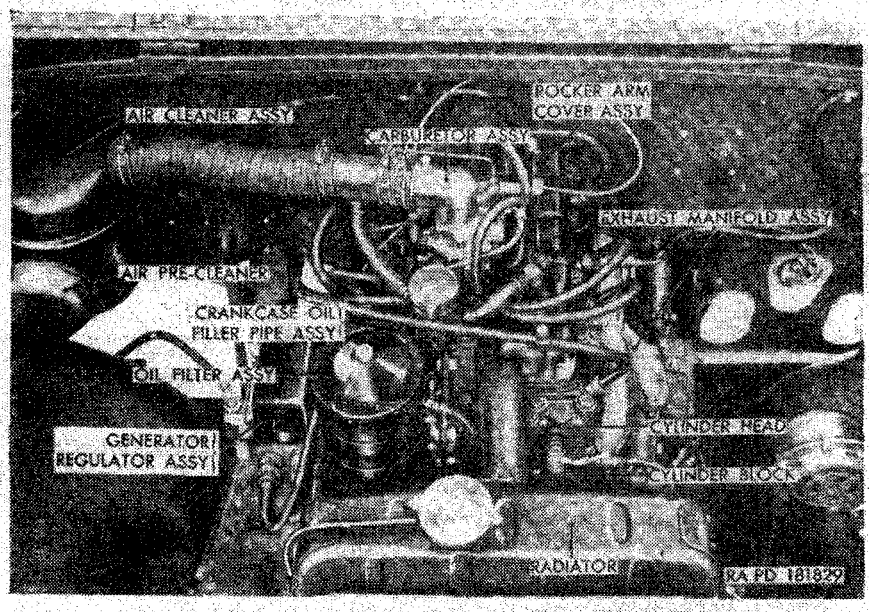


Figure 36. Engine installed in vehicle (M38A1).

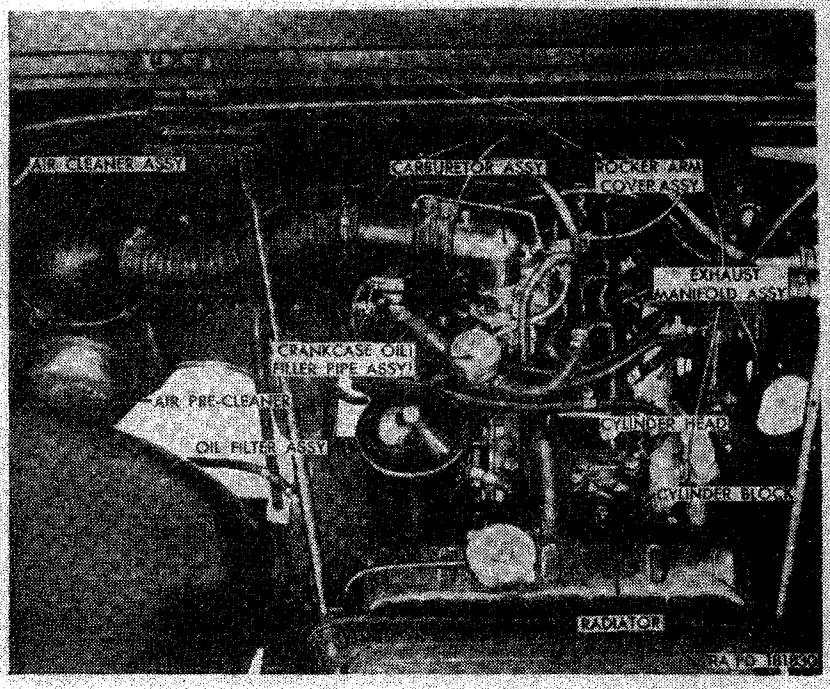


Figure 37. Engine installed in vehicle (M170).

are used with reference to the engine as viewed from the rear. Cylinders are numbered from the front. The crankshaft rotates in a clockwise direction when viewing the engine from the front.

b. Data.

Type	F head
Make	Willys
Number of cylinders	4
Bore	3⅛ in.
Stroke	4⅜ in.
Compression ratio	7.4 to 1
Compression pressure	135 psi at 185 rpm
Displacement	134.2 cu-in.
Maximum brake horsepower	72 at 4,000 rpm
Maximum torque	114 foot-pounds at 2,000 rpm
Firing order	1–3–4–2
Valve clearance:	
Intake	0.018 in.
Exhaust	0.016 in.
Weights:	
Power plant	680.81 lb
Engine, dry weight complete with flywheel and accessories	499.65 lb
Engine, dry weight complete with flywheel, less accessories	365.15 lb
Oil capacities:	
With oil filter	5 qt
Without oil filter	4 qt

105. Operations Performed With Engine in Vehicle

Most of the organizational maintenance operations on the engine and engine accessories can be performed with the engine installed in the vehicle. These maintenance operations, with a reference to the specific paragraph for detailed instructions, are listed below:

	Paragraph
Air cleaner assembly	136
Batteries and cables	162
Carburetor assembly	134
Carburetor controls (accelerator, throttle, and choke)	135
Cooling system	126–132
Cylinder compression test	106
Cylinder head gasket	111
Exhaust manifold	112
Exhaust manifold gaskets	113
External lines and fittings	118
Fan and generator drive belts	130
Fuel and vacuum pump assembly	137
Generator assembly	158
Generator regulator assembly	159, 160
Ignition system	147–153
Manifold vacuum test	107
Oil filler pipe assembly	117
Oil filter assembly	115
Oil filter element	114
Rocker arm cover assembly and gasket	108
Starter and starter switch assemblies	155, 156
Valve clearance adjustment	110
Valve compartment cover and gasket	109

106. Cylinder Compression Test

a. Start engine (par. 42) and run until normal operating temperature (160° to 180° F.), is reached. Stop the engine and tighten the cylinder head screws to a torque of 60–65 foot-pounds in the sequence shown in figure 48.

b. Remove spark plugs (par. 153*c*).

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

d. Shut off the fuel flow by turning the fuel shutoff valve (Q, fig. 55) off.

e. Insert a conventional-type compression gage (fig. 38) into the spark plug holes, one at a time, beginning with the number one cylinder, and crank the engine with the starter. Record the highest compression reading from each cylinder on DA Form 461.

f. Compare the compression pressures of the cylinders. Normal compression pressure is 125 psi at a starter speed of 185 rpm. The minimum compression allowable is 100 psi. Readings of cylinder pressure should not vary more than 10 psi. A low compression reading on two adjacent cylinders indicates the possibility of a leak from

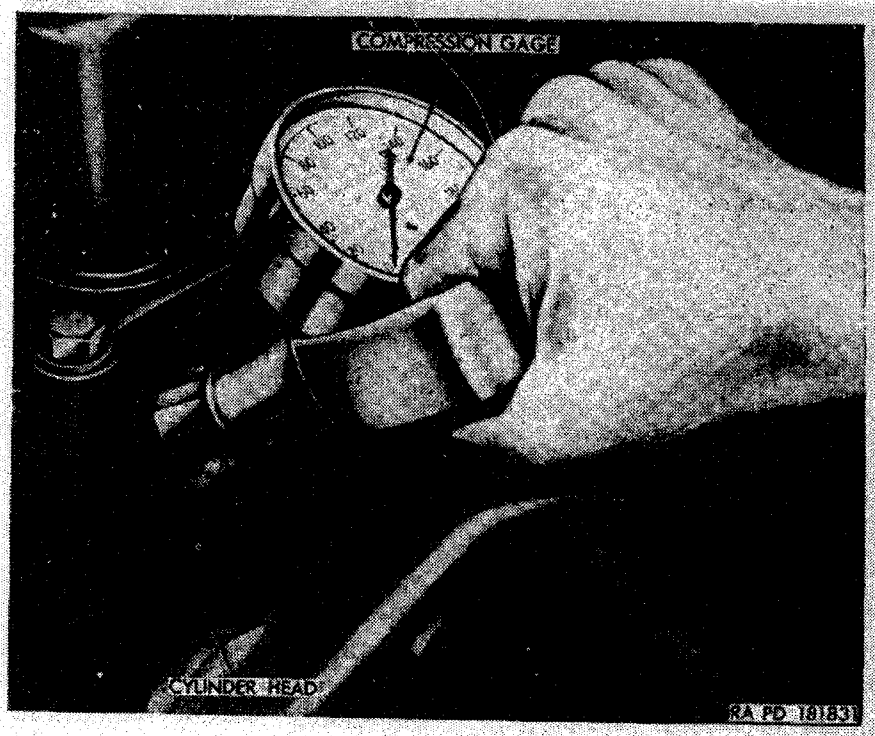


Figure 38. Checking cylinder compression.

one cylinder to the other at the cylinder head gasket. The leakage may be caused by improperly tightened cylinder head screws or a faulty cylinder head gasket. Tighten the cylinder head screws to a torque of 60–65 foot-pounds in the sequence shown in figure 48. Check cylinder compression again. If compression is still low on adjacent cylinders, there may be leakage because of a faulty cylinder head gasket. Before replacing the gasket (par. 111), check the manifold vacuum (par. 107) to see if there is leakage at the gasket.

g. If compression readings are uniformly low, the low compression may be due either to leakage at the valves or piston rings, or incorrect valve timing. Perform the manifold vacuum test (par. 107) to determine the cause of low compression.

h. If compression pressures of cylinders vary more than 10 psi, or are lower than 100 psi (after corrections indicated by the vacuum test have been made), notify ordnance maintenance personnel.

i. After completing the compression test, turn the fuel shutoff valve on and install the spark plugs (par. 153*d*).

107. Manifold Vacuum Test

a. Raise the hood (par. 255*a*). Remove the pipe plug installed in the top of the cylinder head, below and to the front of the carburetor assembly. Using suitable connectors and adapters, connect the hose

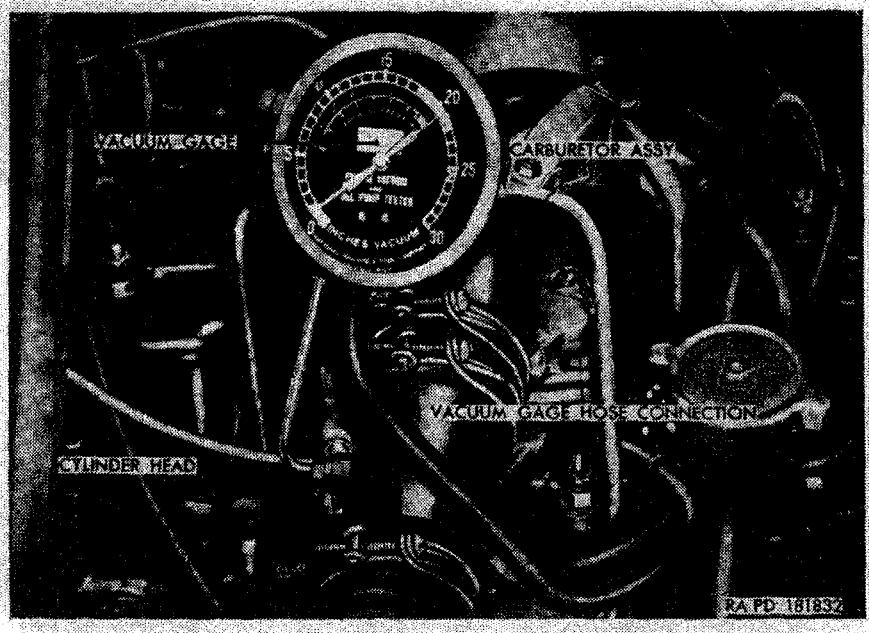


Figure 39. Checking manifold vacuum.

of a conventional vacuum gage to the opening in the cylinder head (fig. 39). Be sure all connections are tight, as even a slight leak will result in a false reading.

b. Start engine (par. 42) and run at idling speed until minimum operating temperature (160° F.) is reached. Check carburetor adjustments (par. 134*a*).

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

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

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

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

g. Leakage at the carburetor gasket is indicated by a steady reading of 3 to 4 inches. Leakage of compression between the cylinders is indicated by the gage hand drifting regularly between 5 and 10 inches. Worn or poorly fitted piston rings or scored pistons and cylinder walls are indicated by the gage hand remaining lower than normal, at approximately 15 inches.

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

h. After performing the manifold vacuum tests, disconnect the vacuum gage hose from the connectors and adapters in the cylinder head. Remove the connectors and adapters from the cylinder head and install the ¼-inch pipe plug. Tighten the plug.

i. Close the hood (par. 255*b*).

108. Rocker Arm Cover Assembly and Gasket

a. Removal.

(1) Disconnect the spark plug cables from plugs and free the cables from the clips (fig. 40) that retain them.

(2) Loosen the screw (N, fig. 64) in the throttle control wire stop with screw assembly (M, fig. 64) and pull the stop off the end of the throttle control wire (S, fig. 64). Remove the two lockwasher screws securing the throttle control conduit clamp (V, fig. 65) to the top of the carburetor. Swing the control wire and clamp out of the way of the rocker arm cover assembly.

(3) Remove the cotter pins and flat washers securing the throttle rod (B, fig. 65) to the accelerator upper bellcrank assembly

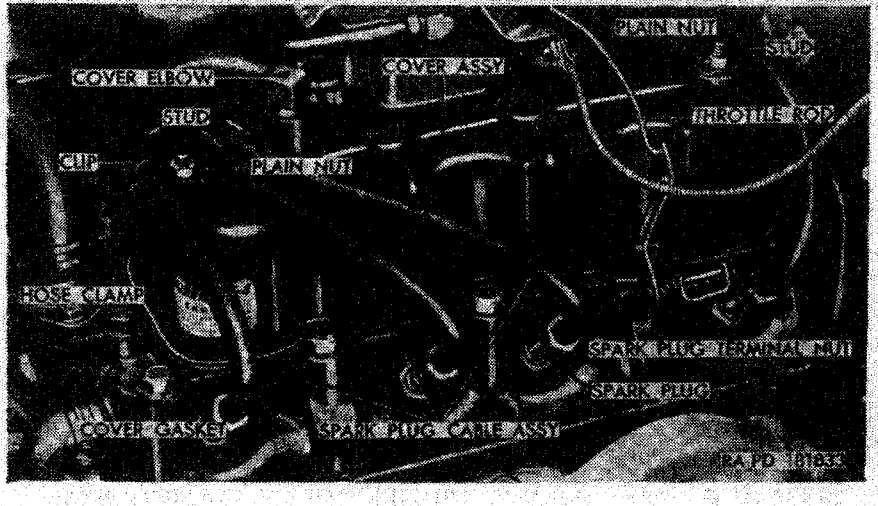


Figure 40. Rocker arm cover assembly installed.

(D, fig. 65) and the carburetor throttle valve lever (U, fig. 65), and remove the rod.

(4) Remove the hose clamp securing the oil filler tube-to-rocker arm cover hose to the rocker arm cover elbow. Pull the hose free of the elbow.

(5) Remove the two plain nuts securing the rocker arm cover to the studs installed in the rocker arm shaft brackets mounted on the cylinder head. Lift the three clips off the front stud and one off the rear stud. Remove the gasket-type copper

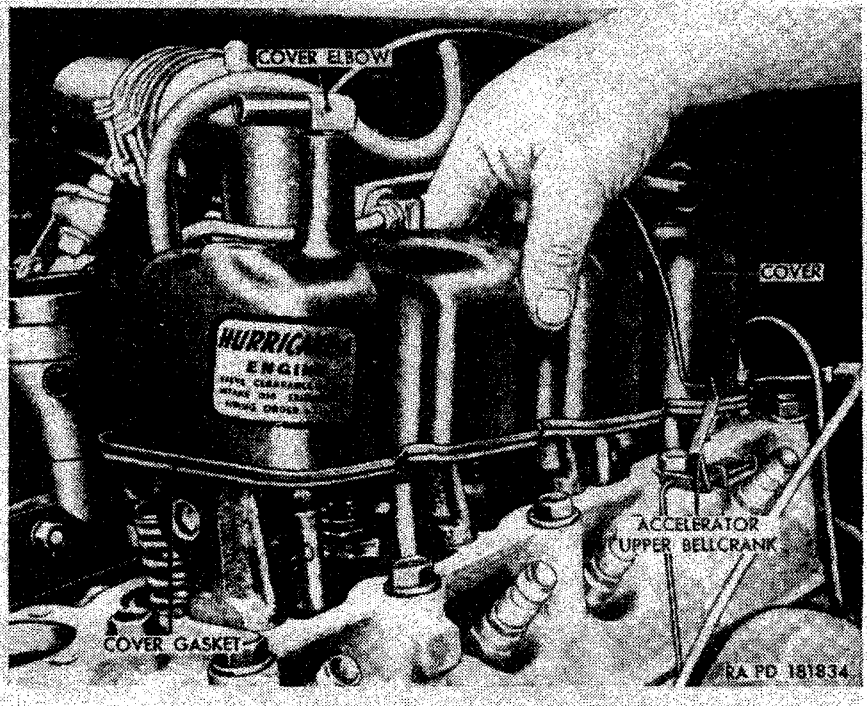


Figure 41. Removing rocker arm cover assembly.

washer from each stud. Lift the rocker arm cover (fig. 41) off the cylinder head. Remove and discard the rocker arm cover gasket.

(6) Unscrew the rocker arm cover elbow from the top of the cover.

(7) Do not remove the two studs (fig. 43) from the two end rocker arm shaft brackets unless they are damaged. To remove the studs, unscrew them from the tops of the brackets and remove the internal-teeth lock washer from each stud.

b. Installation.

(1) If the studs (fig. 43) securing the rocker arm cover assembly were removed, install them. Using one $\frac{5}{16}$-inch internal-

teeth lock washer between each stud and rocker arm shaft bracket, install the 5/16-inch studs so the short threaded ends enter the tapped holes in the brackets.

(2) Screw the rocker arm cover elbow (fig. 40) into the opening provided at the top front of the rocker arm cover assembly. Position elbow so its opening faces approximately 30° to the right.

(3) Coat a new rocker arm cover gasket with plastic-type gasket cement and position the gasket in place on the bottom of the rocker arm cover (fig. 41).

(4) Position the rocker arm cover in place on top of the cylinder head. Install a 5/16-inch gasket-type copper washer on each stud. Install three spark plug cable clips (fig. 40) with the longest first and following with the next longest and then the shortest in that order on the front stud. Install one short clip on the rear stud. Secure the cover by installing one 5/16-inch plain nut on each stud.

(5) Slip the free end of the oil filler tube-to-rocker arm cover hose over the end of the rocker arm cover elbow (fig. 41). Secure the hose to the elbow with the hose clamp.

(6) Install the throttle rod (B, fig. 65) in the accelerator upper bellcrank assembly (D, fig. 65) and the carburetor throttle valve lever (U, fig. 65). Secure the rod to the bellcrank and the lever with No. 8 flat washer and 1/16 x 1/2 cotter pins.

(7) Position the throttle control conduit clamp (V, fig. 65) in place on top of the carburetor and secure the bracket to the carburetor with two No. 8 x 5/16 lockwasher screws. Insert the end of the throttle control wire (S, fig. 64) through the adjusting block mounted on the throttle rod. Slide the hand throttle control wire stop with screw (M, fig. 64) over the free end of the control wire (S, fig. 64). Lock the stop to the wire by tightening the setscrew (N, fig. 64) in the stop.

(8) Connect the spark plug cables (fig. 40) to the spark plugs. Secure each cable in the clips installed on the studs that secure the rocker arm cover.

(9) Adjust the hand throttle control wire stop (par. 135*h*(1)). Lower the hood (par. 255*b*).

109. Valve Compartment Cover and Gasket
(fig. 42)

a. Removal.

(1) Raise the hood (par. 255*a*).

(2) Disconnect the accelerator pedal return spring (T, fig. 65) from the lower accelerator bellcrank and the pipe plug in the cylinder block. Remove the cotter pin and the flat washer

securing the accelerator bellcrank link rod to the bellcrank and free the rod from the bellcrank. Unscrew the compartment cover special stud, with the accelerator lower bellcrank attached, from the cover and the cylinder block. Remove the plain washer from the stud. Lower the stud and bellcrank as far as the link of the accelerator pedal assembly will allow.

(3) Unscrew the special cap screw securing the crankcase vent body and valve compartment cover to the cylinder block. Remove the gasket-type washer from the outer side of the body. Remove the hose clamp securing the crankcase vent

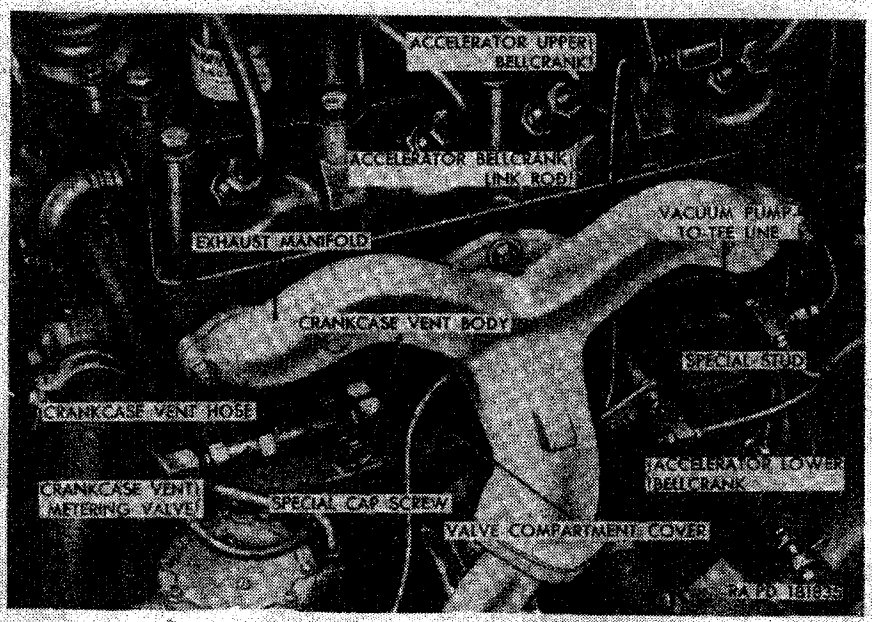


Figure 42. Valve compartment cover—installed.

hose to the crankcase vent metering valve. Pull the hose with the vent body from the metering valve. Remove and discard the crankcase vent body-to-valve cover gasket from the inner side of the vent body.

(4) Move the valve compartment cover to the rear, as necessary, and then forward until it is on the outside of the vacuum pump-to-tee line. Maneuver the cover to the rear again until it is on the left of the brake pedal shank and pull the cover up and out of the engine compartment.

(5) Remove the valve compartment cover gasket from either the cover or the cylinder block.

b. Installation.

(1) Clean the valve compartment cover and the mating surfaces of the cylinder block of all gasket material. Coat a new valve

compartment cover gasket with plastic-type gasket cement and position it in place on the inner side of the valve compartment cover.

(2) Maneuver the rear of the compartment cover to the left of the brake pedal shank; then move it forward and then rearward again to the right of the shank and then forward again to the right of the shank and then forward again, making sure it is on the inner side of the vacuum pump-to-tee line.

(3) Coat a new crankcase vent body-to-valve cover gasket with plastic-type gasket cement. Position the gasket on the inner side of the vent body. Slip the hose that is attached to the crankcase vent body onto the crankcase vent metering valve and secure the hose to the valve by installing the hose clamp. Aline the valve compartment cover holes with the cylinder block holes. Place the vent body over the hole in the front of the compartment cover and install the $\frac{5}{16}$-inch gasket-type washer on the $\frac{5}{16}$ x $3\frac{1}{16}$ special cap screw, and install the cap screw through the vent body, compartment cover, and into the cylinder block. Tighten the screw.

(4) Install the $\frac{5}{16}$-inch plain washer on the $\frac{5}{16}$-inch compartment cover special stud. Secure the rear of the compartment cover to the cylinder block by installing the stud with the accelerator bellcrank attached. Connect the lower end of the accelerator bellcrank link rod to the bellcrank and secure the rod to bellcrank with a $\frac{1}{16}$ x $\frac{1}{2}$ cotter pin. Connect the accelerator pedal return spring (T, fig. 65) to the bell crank and to the pipe plug in the cylinder block.

(5) Close the hood (par. 255*b*).

110. Valve Clearance Adjustment

Note. Adjust valves with engine cold.

a. Intake Valves.

(1) Remove the rocker arm cover assembly and gasket (par. 108*a*(1) through (5)).

(2) Using a suitable socket wrench and extensions, turn the engine crankshaft, as necessary, to bring each intake valve in turn to the fully closed position. Check the valve clearance by inserting a feeler gage between the valve stem cap and the rocker arm (fig. 43). The valve clearance should be 0.018 inch.

(3) Adjust the valve clearance by loosening the plain nut on the valve rocker arm adjusting screw and turning the adjusting screw (fig. 44) in or out, as necessary, to obtain the proper clearance between the end of the valve stem cap and the rocker arm. Turn the screw clockwise to close the gap and counter-

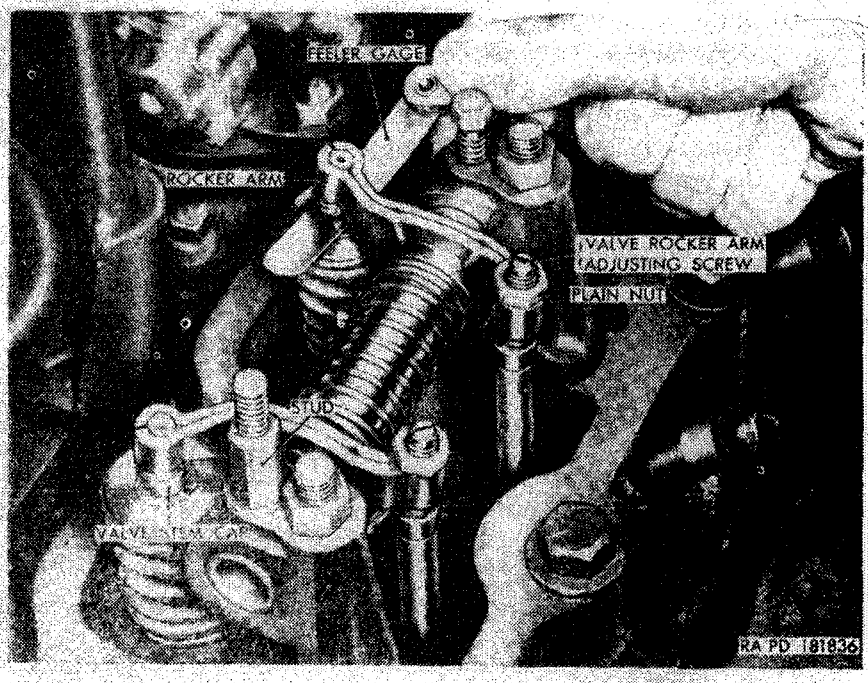


Figure 43. Checking intake valve clearance.

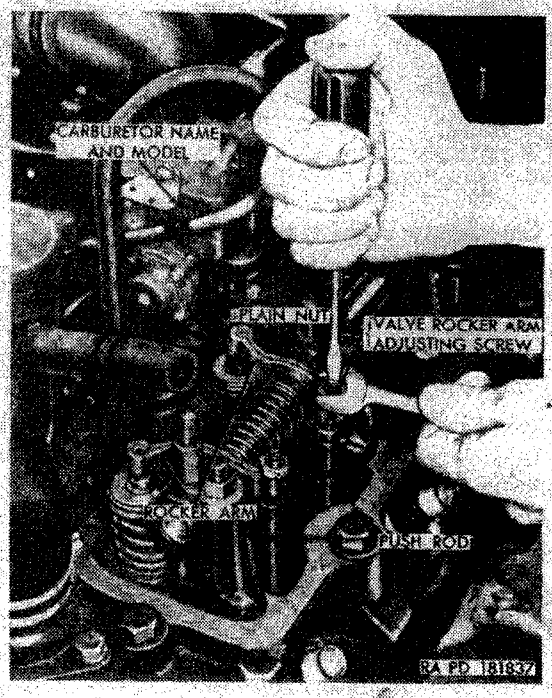


Figure 44. Adjusting intake valve clearance.

clockwise to open the gap. When the gap is adjusted so an 0.018-inch feeler gage can be inserted with only a slight drag, hold the screw in that position and tighten the plain nut to lock the screw in place. When all valves are adjusted, check clearance again to make certain the nut tightening did not disturb the adjustment.

(4) Install the rocker arm cover assembly and rocker arm cover gasket (par. 108*b*(3) through (9)).

b. Exhaust Valves.

(1) Remove the valve compartment cover and gasket (par. 109*a*).

(2) Using a suitable socket wrench and extensions, turn the engine crankshaft, as necessary to bring each exhaust valve (fig. 45) in turn to full closed position (exhaust valve tappet all the way down).

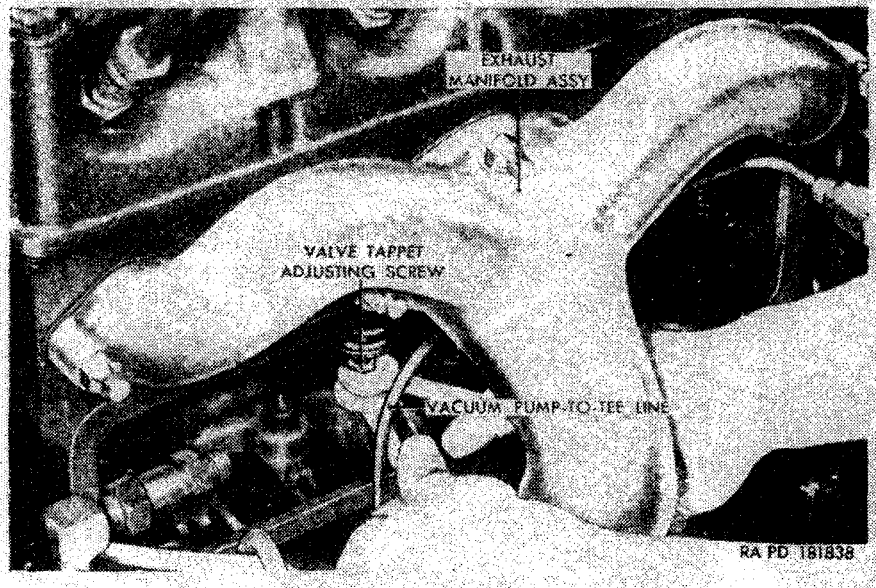


Figure 45. Adjusting exhaust valve clearance.

(3) Check the exhaust valve clearance by inserting a feeler gage between the end of the valve tappet adjusting screw (fig. 45) and the bottom of the exhaust valve rotator cap and measure clearance. The clearance should be 0.016 inch.

(4) Adjust the valve clearance by placing one wrench on the exhaust valve tappet and another wrench on the valve tappet adjusting screw, hold tappet from turning and turn the adjusting screw in or out, as necessary, to obtain the correct clearance.

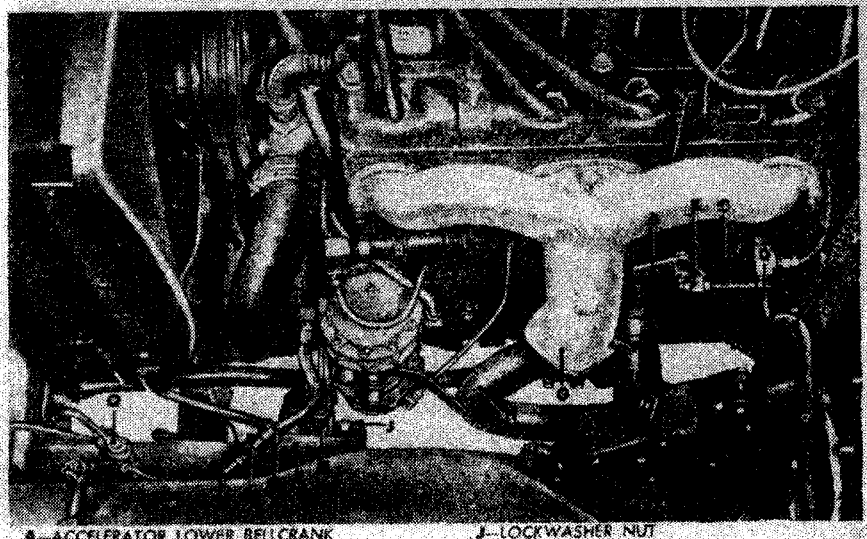
(5) Install the valve compartment cover and gasket (par. 109*b*).

(1) Turn the fuel shutoff valve (Q) to the OFF position. Unscrew the nut (N) from the flexible fuel line (M).

(2) Pull the air regulating valve-to-distributor tee line hose (E) off the tee-to-windshield wiper line (D).

(3) Unscrew the two nuts securing the exhaust pipe (H) to the exhaust manifold assembly (G) and remove the bolt (F). Separate the flanges and discard the exhaust pipe flange gasket.

(4) Remove a cotter pin and flat washer and separate the throttle rod adjusting block (B) from the accelerator lower bellcrank



A—ACCELERATOR LOWER BELLCRANK W BUSHING ASSY
B—THROTTLE ROD ADJUSTING BLOCK
C—LINK ROD
D—TEE-TO-WINDSHIELD WIPER LINE
E—AIR REGULATING VALVE-TO-DISTRIBUTOR TEE LINE HOSE
F—BOLT
G—EXHAUST MANIFOLD ASSY
H—EXHAUST PIPE
J—LOCKWASHER NUT
K—FRONT MOUNTING SUPPORT CUSHION ASSY
L—FRONT MOUNTING SUPPORT CUSHION BRACKET
M—FLEXIBLE FUEL LINE
N—NUT
P—LINE (FUEL SHUT-OFF VALVE-TO-FLEXIBLE FUEL LINE)
Q—FUEL SHUT-OFF VALVE
RA PD 181847

Figure 55. Power plant removal—disconnect points left side of vehicle.

with bushing assembly (A). Push the link rod (C) up through the upper front floor pan cover into the driver's compartment.

(5) Unscrew the two lockwasher nuts (J) and remove the bolts and flat washers from the front mounting support cushion assembly (K) and the bracket (L).

d. Driver's Compartment Disconnections.

Note. **The key letters noted in parentheses refer to figure 56, except where otherwise indicated.**

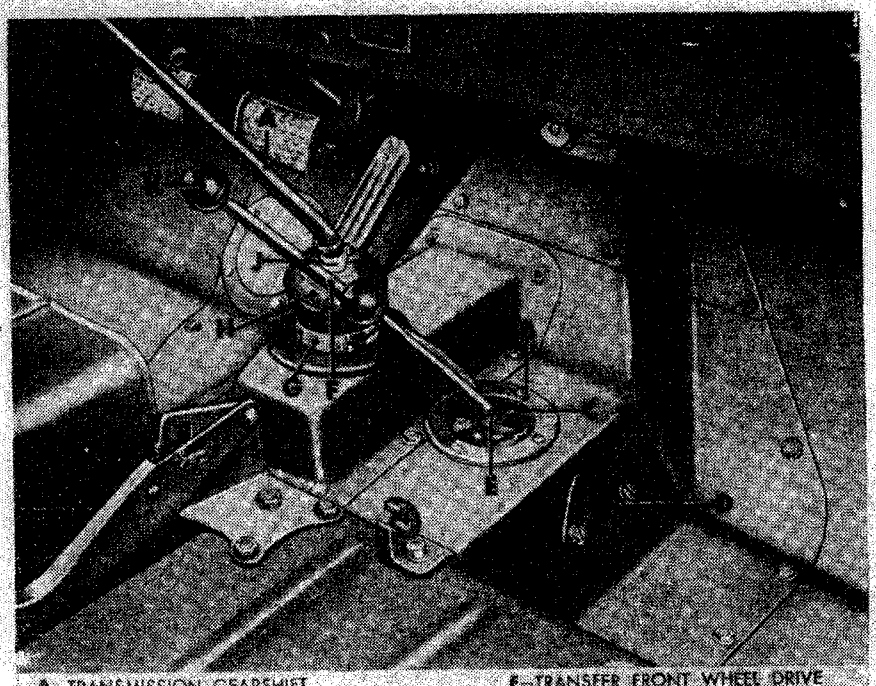


Figure 56. Power plant removal disconnect points—driver's compartment.

(1) Remove the gearshift lever knob from the transmission gearshift lever (A) and the knobs (K) from the transfer high and low range gearshift lever (E) and the transfer front wheel drive gearshift lever (F).

(2) Remove the sheet metal screws from the boot retaining ring (B) and slide the boot (C) up and off the levers. Loosen the screw in the clamp (G). Loosen the clamp (J) and remove the transmission gearshift lever boot (H) and the clamps from the lever.

(3) Loosen the lockwasher screws in the transfer gearshift lever pivot pin access plate (D) and swing the plate back. Reach through the opening and unscrew the gearshift lever pivot pin (J, fig. 57). Pull the pin with lockwasher (H, fig. 57) out through the opening, and remove the gearshift levers and springs (N, fig. 57).

(4) Unscrew the transmission gearshift lever housing cap from the housing and remove the lever. Stuff a clean rag in the housing opening.

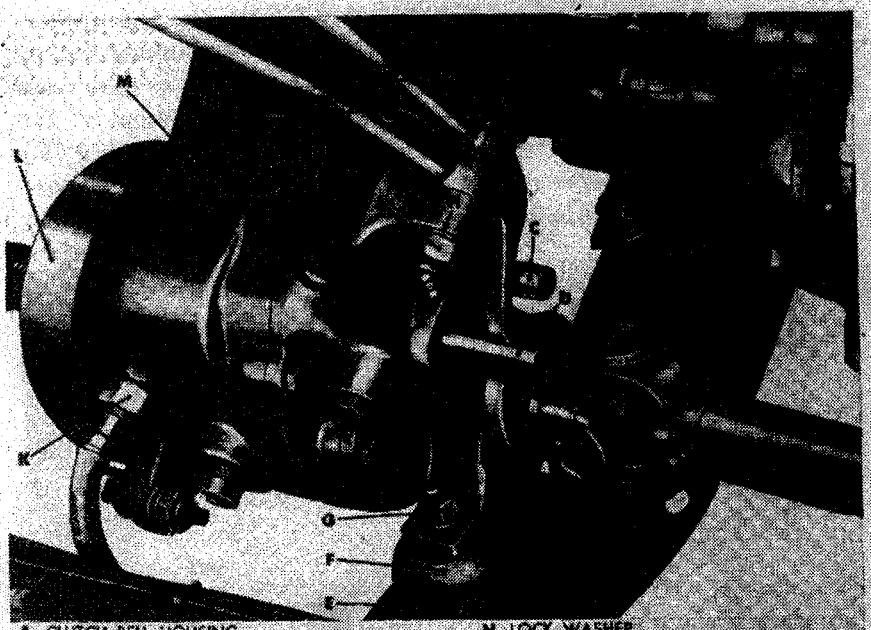


Figure 57. Power plant removal—transfer disconnect points.

e. Under-the-Vehicle Disconnections.

Note. The key letters noted in parentheses refer to figure 58, except where otherwise indicated.

(1) Disconnect the rear end of the front propeller shaft (par. 202*a*(1)), and the front end of the rear propeller shaft (par. 202*b*(1)).

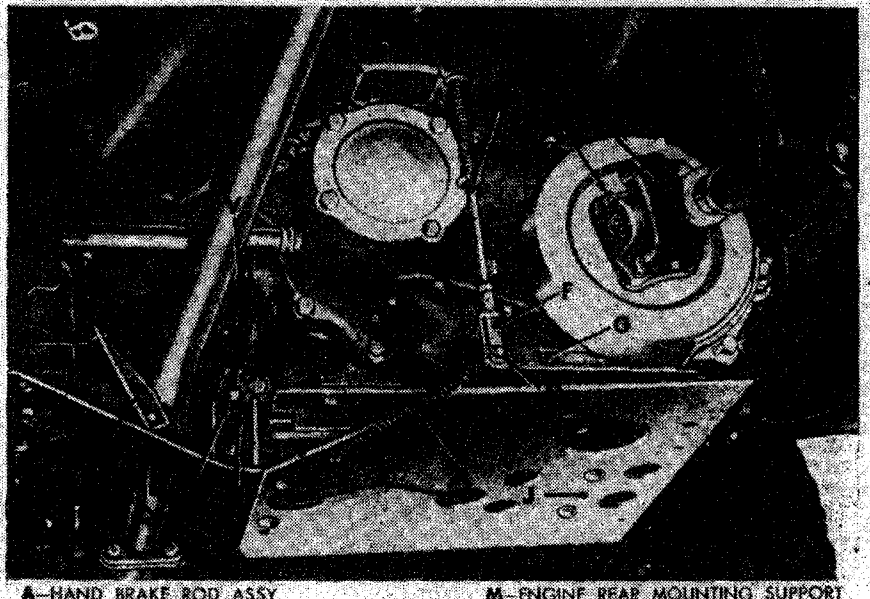
(2) Unhook the spring (K) from the skid plate (J) and the brake rod adjusting yoke (F). Remove the cotter pin and separate the clevis pin (H) from the yoke and hand brake cam lever (G).

(3) Remove the two lockwasher nuts (L) and flat washers from the studs of the engine rear mounting support cushion with studs assembly (M).

(4) Remove the lockwasher nut on the stay cable assembly (P) and remove the cable. Unhook the service brake pedal retracting spring (T) from the bracket (R). Remove the cotter pin and clevis pin from the control tube lever release cable yoke (V).

(5) Unscrew the transfer case support insulator snubber bolt from the nut (G, fig. 57) on top of the right side of the engine

rear support cross member (Q) and remove the lockwasher. Pull the bolt with two flat washers and the snubber out of the transfer case support insulator (F, fig. 57) and the cross member. Unscrew the nut (K, fig. 57) on the end of the speedometer flexible shaft with core and casing assembly (E) from the transfer speedometer drive gear sleeve, and remove shaft with core and casing assembly from the sleeve.



A—HAND BRAKE ROD ASSY
B—NUT
C—UNIVERSAL JOINT ASSY
D—PROPELLER SHAFT WITH UNIVERSAL JOINT ASSYS
E—SPEEDOMETER FLEXIBLE SHAFT WITH CORE AND CASING ASSY
F—BRAKE ROD ADJUSTING YOKE
G—HAND BRAKE CAM LEVER
H—CLEVIS PIN
J—SKID PLATE
K—SPRING
L—LOCKWASHER NUT
M—ENGINE REAR MOUNTING SUPPORT CUSHION WITH STUDS ASSY
N—STAY CABLE REAR BRACKET
P—STAY CABLE ASSY
Q—ENGINE REAR SUPPORT CROSS MEMBER
R—BRACKET
S—NUT
T—SERVICE BRAKE PEDAL RETRACTING SPRING
U—CLUTCH CONTROL LEVER WITH TUBE ASSY
V—YOKE
RA PD 181850

Figure 58. Power plant removal—disconnect points under vehicle.

(6) Place a jack under the clutch bell housing to support the power plant rear end. Unscrew the two nuts (S) from the bolts on the right and left side of the vehicle, remove the lockwashers, the engine rear support cross member (Q) with the skid plate (J) and the bolts.

f. Lifting Power Plant From Vehicle (fig. 59).

Caution: Before lifting power plant from vehicle, turn the front wheels to the extreme right to permit the power plant to clear the Pitman arm of the steering system.

(1) Connect a suitable lifting device to the rear eye of the lifting hook. Carefully raise the engine sufficiently to lift the engine front mounting support cushion assemblies from the brackets on the frame.

(2) Using a pry bar, slide the power plant rear toward the vehicle right side until the clutch control lever with tube assembly (U, fig. 58) is off the control lever tube ball stud on the transfer.

(3) Raise the power plant sufficiently to clear the frame front cross member, and roll the vehicle back while guiding the power plant out of the vehicle. Place the power plant on a suitable stand.

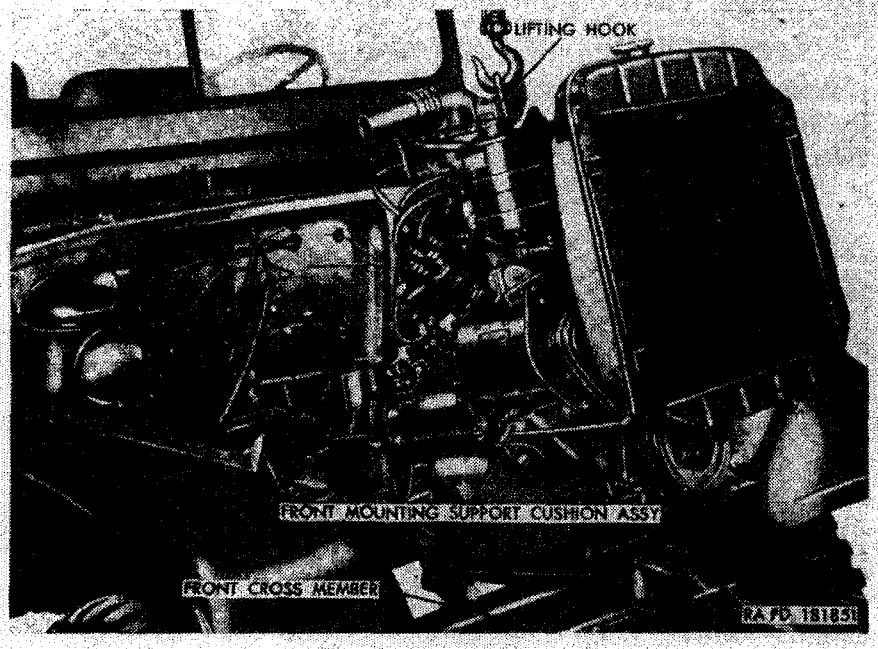


Figure 59. Lifting power plant from vehicle.

121. Power Plant Removal (M170)
(fig. 54)

Procedures for power plant removal of the M170 are the same as those for the M38A1 (par. 120) except for substituting *a* and *b* below for paragraph 120*b*(2) and (3).

a. Unscrew the connector (Y) from the generator receptacle (Z). Unscrew the nut from the starter switch assembly (V) terminal stud (W) and remove the lockwasher, battery-to-starter cable assembly 82 (Q), and the generator regulator-to-starter cable 4 (P).

b. Remove the two sheet metal screws and flat washers from the shield (J) and remove the shield.

122. Engine Removal From Power Plant

a. Remove the transmission and transfer by separating the transmission from the engine (par. 195*c* through *g*).

b. Drain the cooling system (par. 127*a*(1)) and remove the radiator with shroud assembly (par. 128*a*).

123. Engine Installation on Power Plant

a. Install the radiator with shroud assembly on the power plant (par. 128*b*).

b. Install the transmission and transfer on the engine by connecting the transmission to the engine (par. 196*a* through *e*).

124. Power Plant Installation (M38A1)

a. Lowering Power Plant Into Vehicle (fig. 59).

Caution: Before lowering the power plant into the vehicle, turn the front wheels to the extreme right to permit the power plant to clear the steering system Pitman arm.

(1) Connect a suitable lifting device to the lifting hook rear eye. Raise the power plant sufficiently to clear the frame front cross member.

(2) Roll the vehicle forward and lower the power plant into the engine compartment, tilting the power plant rear end down. Place a jack under the clutch bell housing and raise the power plant rear end sufficiently to aline the transfer ball stud with the clutch control lever with tube assembly (U, fig. 58).

(3) Using a pry bar, slide the power plant to the left and guide the control lever onto the ball stud.

b. Under-the-Vehicle Connections.

Note. The key letters noted in parentheses refer to figure 58, except where otherwise indicated.

(1) Position the engine rear support cross member (Q) with the skid plate (J) under the rear of the power plant. Position the transfer case support insulator cup, insulator, and ½-inch washer on the right side of the cross member. Raise the cross member and guide the studs in the engine rear mounting support cushion with studs assembly (M) through the holes in the cross member. Insert two ⅜-inch bolts through the frame side rail and the cross member on both sides of the vehicle. Install a ⅜-inch lockwasher and ⅜-inch nut on each bolt.

(2) Place a ½-inch flat washer, the transfer case support insulator snubber, and a $^{17}/_{32}$-inch ID flat washer on the ½-inch transfer case support insulator bolt. Push the bolt through

the cross member, the case support insulator retaining cup, the case support insulator, the ½-inch washer, and through the hole in the transfer case support. Install a ½-inch lockwasher and ½-inch nut (G, fig. 57). Connect the speedometer flexible shaft with core and casing assembly to the speedometer gear sleeve on the transfer.

(3) Push the engine stay cable assembly (P) threaded end through the clutch bell housing hole, and slide the opposite end into the stay cable rear bracket (N) slot. Install a ⅜-inch lockwasher nut on the cable. Position the yoke (V) on the clutch control lever, and secure with a 5/16 x 27/32 clevis pin and 3/32 x ½ cotter pin.

(4) Install a 7/16-inch ID flat washer and a ⅜-inch lockwasher nut (L) on each of the two studs of the engine rear mounting support cushion with studs assembly (M).

(5) Place the brake rod adjusting yoke (F) on the hand brake cam lever (G) and secure with a 5/16-inch clevis pin and 3/32 x ½ cotter pin. Hook the spring (K) to the yoke and skid plate (J). Hook the service brake pedal retracting spring (T) into the bracket (R).

(6) Install the rear end of the front propeller shaft (par. 203*a* (2)), and the front end of the rear propeller shaft (par 203*b* (1)).

c. Driver's Compartment Connections.

Note. The key letters noted in parentheses refer to figure 56, except where otherwise indicated.

(1) Insert the transmission gearshift lever (A) in the housing and screw the transmission gearshift lever housing cap onto the housing. Slide the boot (C) and clamp (G) over the lever and tighten the screw in the clamp. Slide the clamp (J) over the lever and boot and tighten the clamp.

(2) Position the transfer high and low range gearshift lever (E) in the shifter shaft (D, fig. 57) slot. Place a ⅝-inch internal-teeth lockwasher on the gearshift lever pivot pin (J, fig. 57). Working through the access plate opening, push the pin into the transfer hole and part way through the lever hole. Position the transfer front wheel drive gearshift lever (F) in the shifter shaft (C, fig. 57) slot and slide the pivot pin through the lever hole. Install the springs (N, fig. 57) over the pivot pin and onto the levers. Screw the pivot pin into the transfer.

(3) Swing the gearshift lever pivot pin access plate (D) into position and tighten the two lockwasher screws. Slide the boot (C) and the boot retaining ring (B) over the levers and install the four sheet metal screws in the ring.

(4) Install the transmission gearshift lever knob on the lever. Install the transfer high and low range gearshift lever (E) and the transfer front wheel gearshift lever knobs (K) on the levers.

d. Left Side Connections.

Note. The key letters noted in parentheses refer to figure 55, except where otherwise indicated.

(1) Insert two 5/16 x 7/8 bolts, with flat washers, through the front mounting support cushion bracket (L) and through the front mounting support cushion assembly (K) and secure with a 5/16-inch lockwasher nut on each bolt.

(2) Pull the link rod (C) down through the upper front floor pan cover and insert the throttle rod adjusting block (B) into the accelerator lower bellcrank with bushing assembly (A). Secure the bellcrank to the block with a No. 8 flat washer and a 1/16 x 1/2 cotter pin.

(3) Install the exhaust pipe on the exhaust manifold (par. 146*b*(1) and (3).

(4) Push the air regulating valve-to-distributor tee line hose (E) onto the tee-to-windshield wiper line (D).

(5) Screw the nut (N) on the line (P) into the flexible fuel line (M) and turn the fuel shutoff valve (Q) to the ON position.

e. Right Side Connections.

Note. The key letters noted in parentheses refer to figure 54, except where otherwise indicated.

(1) Push the choke control assembly (P, fig. 64) through the choke control conduit clamp (Q, fig. 64) and the choke valve lever pivot (U, fig. 64). Make certain that the choke control on the instrument panel is pushed in. Tighten the screw in the pivot and clamp.

(2) Push the throttle control assembly (D, fig. 64) through the throttle control conduit clamp and the throttle rod (L, fig.64) pivot. Make certain the throttle control on the instrument panel is pushed in. Slide the throttle control wire stop with screw (M, fig. 64) on the control wire (S, fig. 64) up to the, throttle rod (L, fig. 64) pivot. Slide the stop off the wire slightly and tighten the screws in the stop and clamp.

(3) Insert a 5/16 x 7/8 bolt, with 5/16-inch flat washer, through the bracket (G) and the front mounting support cushion assembly (E) at the front of the cushion, and secure with a 5/16-inch lockwasher nut (F). Insert a 5/16 x 7/8 bolt, with 5/16-inch flat washer, through the frame bracket (G) and the front mounting support cushion assembly (E). Place a 5/16-inch internal- and external-teeth lockwasher and ground

strap (H) over the bolt and secure with a 5/16-inch lockwasher nut (F).

(4) Connect cable 33 (R) to the engine water temperature sending unit assembly (S) and cable 36 (T) to the engine oil pressure sending unit assembly (U).

(5) Insert the terminal plug of cable 12 (X) into the wiring harness receptacle on the distributor housing and secure by tightening nut (X).

(6) Position the shield (J) on the frame side rail and the generator regulator mounting brackets on the frame, and insert but do not tighten a sheet metal screw through the shield and into the frame. Position the generator regulator assembly (M) with the mounting brackets on the shield.

(7) Install the four lockwasher screws through the mounting brackets, shield, and supports on the frame side rail. Tighten the sheet metal screws securing the shield to the frame. Place the generator regulator-to-starter cable 4 (P), the battery-to-starter cable 82 (Q), and a 3/8-inch lockwasher on the starter switch terminal stud (W) in the order named. Secure with a 3/8-inch nut. Insert cable 4 in the clip on the shield (J) and install connector (K) on the receptacle of the generator-regulator assembly (M). Connect the generator-to-generator regulator cable (L) to the generator receptacle (Z).

(8) Install the air cleaner-to-air intake pipe flexible hose (C) and tighten the screws in the two hose clamps (B).

f. Final Operations.

(1) Install the radiator guard (par. 257*b*).

(2) Push the ground cable (fig. 99) through the grommet in the battery box and position the cable end on the negative post terminal of battery B. Secure with a 3/8-inch nut.

(3) If a new power plant was installed, fill the cooling system (par. 127*a*(2)), fill the transmission, transfer, and crankcase (par. 69).

(4) Install the hood (par. 255*d*).

(5) Start the engine and check for proper operation, and fuel, oil, or water leaks.

(6) Make a record of replacement on DA Form 478.

125. Power Plant Installation (M170)
(fig. 54)

Procedures for the power plant installation of the M170 are the same as those for the M38A1 (par. 124) except for substituting *a* and *b* below for paragraph 124*e*(6) and (7).

a. Position the shield (J) on the frame side rail and install the two sheet metal screws and flat washers securing the shield to the frame.

b. Place the generator regulator-to-starter cable 4 (P), the battery-to-starter cable 82 (Q), and a 3/8-inch lockwasher on the starter switch terminal stud (W) in the order named, and secure with a 3/8-inch nut. Connect the generator-to-generator regulator cable (L) to the generator receptacle (Z).

Section VII. COOLING SYSTEM

126. Description and Data

a. Description. The cooling system (fig. 60) includes the radiator, fan, water pump, water temperature thermostat, fan and generator drive belts, and connecting hose and fittings. The radiator is the cellular-type with upper and lower tanks. A pressure-type filler neck cap permits cooling system pressure to rise to 4½ psi. The four-blade fan and the centrifugal-type water pump are driven from the generator drive pulley by a matched pair of V-belts. The water temperature thermostat is a bellows-type, located on top of the cylinder head in the thermostat housing. With the coolant below normal operating temperature (160° to 180° F.), the thermostat blocks coolant return to the top of the radiator, returning the coolant directly to the pump through the water pump bypass.

b. Data.

Radiator:	
Manufacturer	Blackstone
Type	cellular
Capacity	11½ qt
Filler cap	4½ psi pressure-type
Water pump and fan:	
Water pump type	centrifugal
Fan	four blade, 15 in. diam
Drive	double V-belts
Location	front of cylinder block
Drive belts:	
Type	V, matched pair
Width	⅝ in.
Thermostat:	
Location	Thermostat housing
Range (opening)	148°–155° F.

127. Organizational Maintenance

Caution: The cooling system is pressurized. Be sure the engine coolant temperature is below 200° F., before loosening or removing filler cap.

a. Draining and Filling.

(1) *Draining.* Open the hood and loosen filler neck cap to relieve pressure in the cooling system. Remove the filler cap. If coolant is to be saved, place suitable containers under the

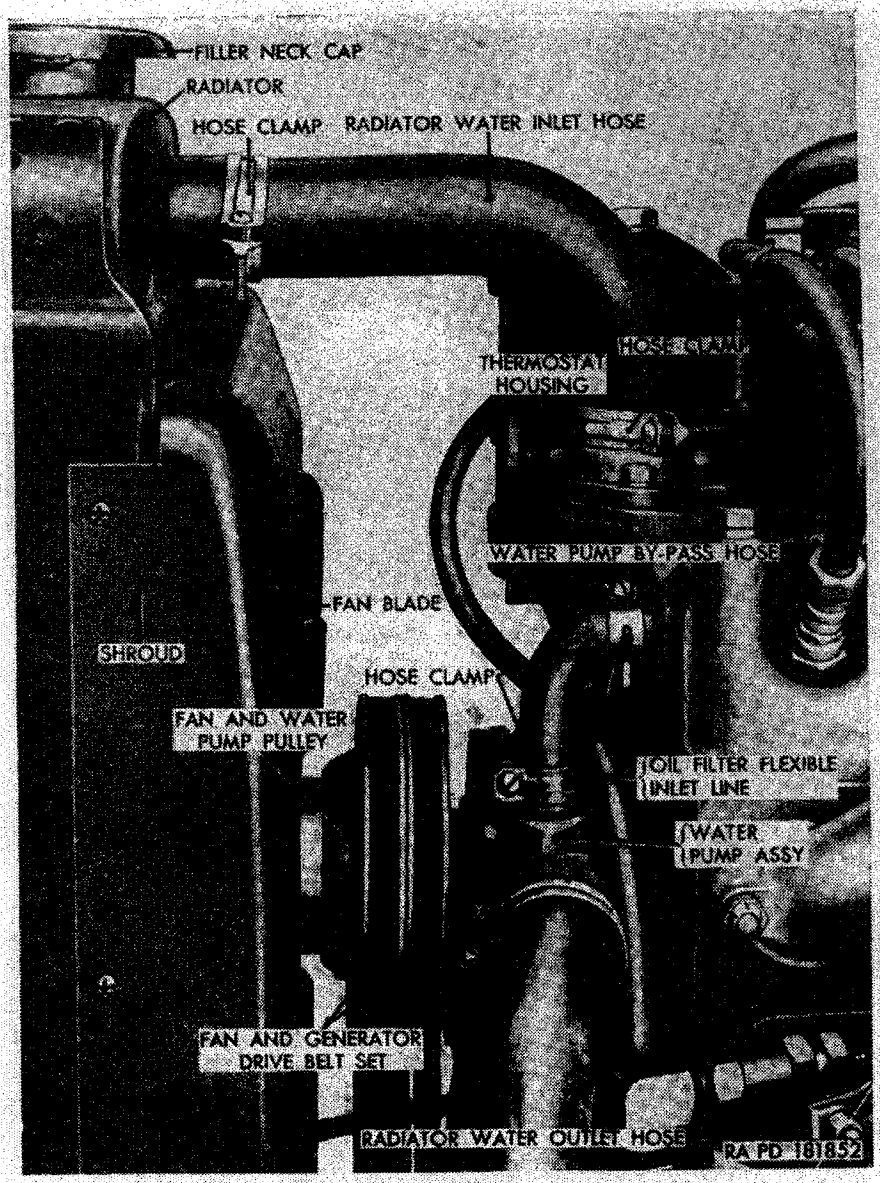


Figure 60. Cooling System.

drain cocks (fig. 61). Open both drain cocks, allow system to drain completely, and close drain cocks.

(2) *Filling.* Be sure both drain cocks (fig. 61) are closed. Fill the cooling system with water, or antifreeze solution of sufficient strength to protect the system against the lowest anticipated temperature, to a level one inch below the filler neck. Be sure rust inhibitor is added to prevent the formation of

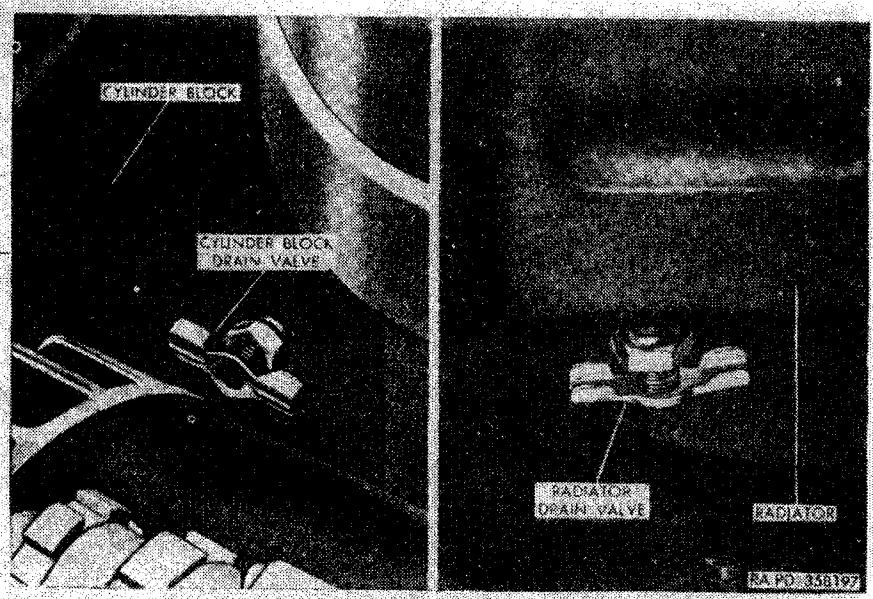


Figure 61. Cooling system drain cocks.

rust. Run the engine to circulate the coolant and expel air from the system, and recheck the coolant level.

b. Cleaning and Flushing. For directions on cleaning and flushing, refer to TM 9-2858.

128. Radiator With Shroud Assembly

a. Removal.

(1) Drain the cooling system (par. 127*a*(1)) and remove the radiator guard (pars. 257*a* for the M38A1 and 266*a* for the M170).

(2) Loosen the hose clamp screws on the radiator water inlet and water outlet hose (fig. 60) and pull hose from connections on radiator.

(3) Lift the radiator with shroud assembly off the radiator-to-engine support rods, taking care that the radiator core does not rub against the fan blade.

b. Installation.

(1) Lift the radiator with shroud assembly into position in front of the fan, being careful not to damage the radiator core. Insert the ends of the radiator-to-engine support rods into the brackets on the bottom of the radiator.

(2) Slip the radiator water inlet and outlet hoses over the connections on the radiator, and tighten the hose clamp screws.

(3) Install the radiator guard (pars. 257*b* and 266*b*) and fill the cooling system (par. 127*a*(2)).

129. Coolant Hose

(fig. 60)

a. Radiator Water Inlet Hose.

(1) *Removal.* Drain the cooling system (par. 127*a*(1)) sufficiently to lower the level of the coolant below the thermostat housing. Loosen the screw in the radiator water hose clamp and pull the end of the radiator water inlet hose from the connection on top of the radiator. Loosen the screw in the hose clamp and remove the hose with clamps from the thermostat housing. Remove the clamps from the hose.

(2) *Installation.* Make sure the connections at radiator and thermostat housing are clean and free of rust or scale. Place a radiator water hose clamp on each end of the radiator water inlet hose. Push one end of the hose over the thermostat housing and the other over the connection on top of the radiator. Tighten the screws in the clamps. Refill the cooling system (par. 127*a*(2)) and check all connections for leaks.

b. Radiator Water Outlet Hose.

(1) *Removal.* Drain the cooling system (par. 127*a*(1)). Loosen the screw in the radiator water hose clamp and pull the end of the radiator water outlet hose from the connection on the bottom of the radiator. Loosen the screw in the clamp and remove the hose with clamps from the connection on the water pump. Remove the clamps from the hose.

(2) *Installation.* Make sure connections at the radiator and water pump are clean and free of rust or scale. Place a radiator water hose clamp on each end of the radiator water outlet hose. Push one end of the hose over the connection on the bottom of the radiator and the other end over the connection on the water pump. Tighten the screws in the clamps. Fill the cooling system (par. 127*a*(2)) and check all connections for leaks.

c. Water Pump Bypass Hose.

(1) *Removal.* Drain the cooling system (par. 127*a*(1)). Loosen the screws in the water pump bypass hose clamps. Pull one end of the hose from the connection on top of the water pump. Remove the hose with clamps from the water bypass hose nipple in the cylinder head. Remove the clamps from the hose.

(2) *Installation.* Make sure water bypass hose nipple and connection on top of water pump are clean and free of rust or scale. Place hose clamp on each end of the water pump bypass hose. Push one end of the hose over the connection on the top of the water pump and the other end over the

nipple. Tighten the screws in the hose clamps. Fill the cooling system (par. 127*a*(2)) and check all connections for leaks.

130. Fan and Generator Drive Belt Set
(fig. 62)

a. Adjustment. Loosen the lockwasher bolt securing the generator belt tension brace to the generator drive end head. Place a straightedge over the fan and generator drive belts between the fan and water pump pulley and the generator drive pulley. Move the generator until the drive belts have a measured ¾-inch deflection, as a result of

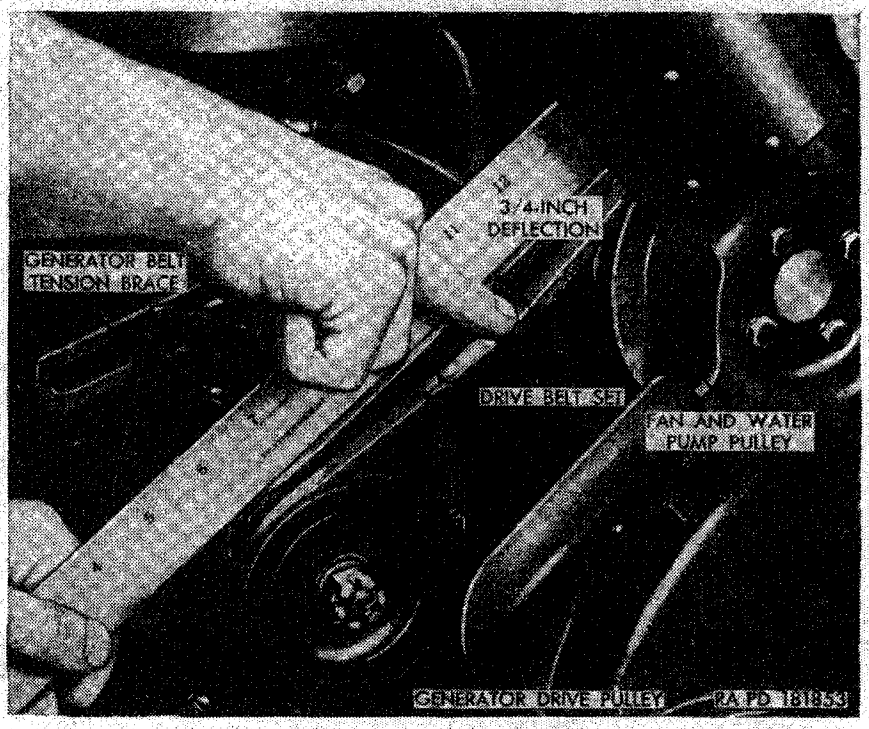


Figure 62. Adjusting fan and generator drive belt set.

a firm push, as shown in figure 62. When adjustment is correct, tighten the lockwasher bolt securing the generator belt tension brace to the generator drive end head.

b. Removal. Loosen the lockwasher bolt securing the generator belt tension brace to the generator drive end head, and push the generator toward the engine as far as possible. Work the front fan and generator drive belt over the front edge of the generator drive pulley. When free, slip the belt over the fan blade and off the fan and water pump pulley. Work the rear belt into the front grooves of both pulleys, and follow the procedure used to remove the front bolt.

c. Installation. Place one fan and generator drive belt over the fan blade and into the front groove of the fan and water pump pulley. Work the belt into the rear grooves of the generator drive pulley and fan and water pump pulley. By the same method, place the second belt in the front grooves of both pulleys. When the belts are in place, adjust their tension (*a* above).

131. Removing Fan and Water Pump Pulley From Water Pump Assembly

a. Removal (fig. 60).

(1) Remove the radiator with shroud assembly (par. 128*a*). Loosen the hose clamps screw on the water pump end of the radiator water outlet hose, and remove hose with clamp from connection on the water pump. Loosen the hose clamp screw on the water pump end of the water pump bypass hose. Remove the fan and generator drive belt set (par. 130*b*).

(2) Remove the four bolts and lockwashers securing the fan blade to the fan and water pump pulley, and remove fan blade.

(3) Remove the four screws and lockwashers securing the water pump to the cylinder block. Pull the pump with pulley and gasket from the cylinder block, at the same time, slipping the connection on the water pump out of the end of the water pump bypass hose. Discard gasket.

(4) Clamp the water pump in a vise with soft jaws. Using puller—41-P-2908-240 (fig. 63), remove the pulley from the pump.

b. Installation.

(1) Place the fan and water pump pulley on the end of the water pump shaft and press it onto the shaft until the front face of the pulley hub is flush with the end of the shaft.

(2) Make sure the gasket surfaces of the cylinder block and water pump body are clean and free of rust or scale. Place a new gasket on the water pump body with the gasket holes alined with the bolt holes in the water pump body.

(3) Position the water pump assembly (fig. 60) in the opening in the front of the cylinder block, at the same time, sliding the water pump bypass hose with clamp over the connection on the water pump.

(4) Insert a $\frac{5}{16}$ x $2\frac{1}{2}$ screw, with lockwasher, through the hole in the water pump body inlet opening. Start the threads but do not tighten. Insert a $\frac{5}{16}$ x $\frac{7}{8}$ screw, with lockwasher, into the top mounting hole in the water pump body and through the clip securing the flexible oil line to the cylinder block, and start the threads. Insert two $\frac{5}{16}$ x $\frac{7}{8}$ screws, with lock-

(5) Screw the nut on the fuel line (A) into the elbow (C). Screw the nut on the vacuum pump-to-tee line (J) end into the elbow (L). Screw the nut on the vent line (F) end into the elbow (H). Screw the nut on the fuel line (P) end into the flexible fuel line (R).

(6) Turn the fuel shutoff valve (Q, fig. 55) on. Start the engine and check for proper pump operation or leaks.

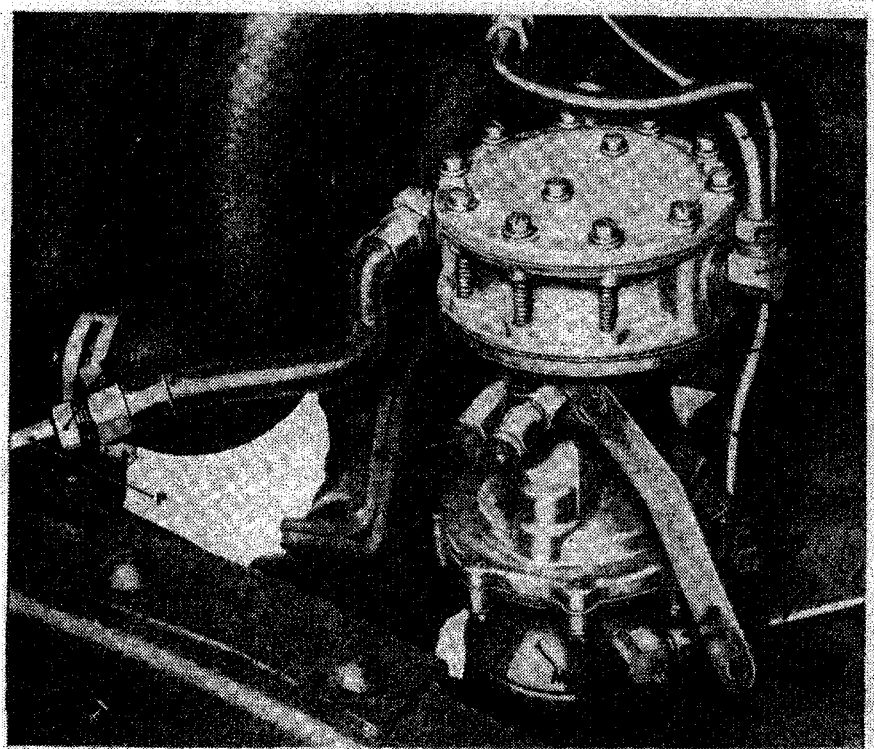


Figure 67. Fuel and vacuum pump assembly—installed.

138. Fuel Filter Assembly

(fig. 69)

a. Removal.

(1) Remove the driver's seat (pars. 261*a*(1) for the M38A1 and 272*a*(1) for the M170).

(2) Unscrew the nut (M) on the fuel line (C) from the fuel filter assembly (H).

(3) Unscrew the 12 screws (L) from the fuel filter assembly and remove the screws and soft copper seal washers. Lift the filter out of the fuel tank and remove and discard the neoprene gasket (J) from the top of the tank.

b. Installation.

(1) Place a new neoprene gasket (J) around the opening in the fuel tank for the fuel filter assembly (H). Install the filter in the tank. Aline the holes in the gasket and the filter with the holes in the tank. Place a soft copper sealing washer over each of the 12 No. 8 x $\frac{7}{16}$ screws (L). Install the screws through the filter and the gasket, screw into the tank, and tighten evenly.

(2) Install the fuel line (C) in the fuel filter assembly and screw the nut (M) on the line end into the filter.

(3) Install the driver's seat (pars. 261*a*(2) for the M38A1 and 272*a*(2) for the M170).

139. Fuel Filter Element

(fig. 68)

a. Removal.

(1) Remove the fuel filter assembly (par. 138*a*).

(2) Unscrew the nut on the line of the upper end plate with line from the cover plate with vent assembly.

(3) Loosen the screw from the nut in the cover plate with vent assembly bracket sufficiently to allow the fuel filter element to slide through the bracket, and remove the element.

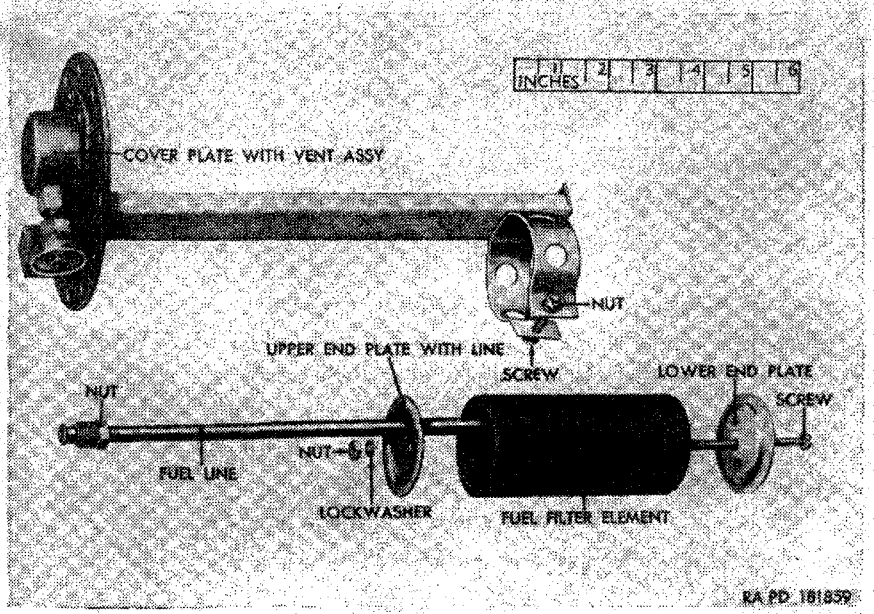


Figure 68. Fuel filter element—exploded view.

(4) Unscrew the nut from the screw in the element and remove the lockwasher. Pull the screw out of the upper end plate and out of the element. Remove the lower end plate from the bottom of the element.

b. Installation.

(1) Slide the lower end plate over the No. 10 x 6 screw. Slide the fuel filter element over the screw and position the element on the end plate. Slide the upper end plate with fuel line over the screw and position the plate on the element. Place a No. 10 lockwasher over the screw and a No. 10 nut onto the screw and tighten.

(2) Slide the fuel filter element into the cover plate with vent assembly bracket. Screw the nut on the line of the upper end plate with line into the cover plate. Tighten the screw into the cover plate with vent assembly bracket nut.

(3) Install the fuel filter assembly (par. 138*b*).

140. Fuel Tank (M38A1)

(fig. 69)

a. Removal.

(1) Remove the drain plug from the bottom of the fuel tank (B) and drain the fuel into a suitable container.

(2) Remove the driver's seat (par. 261*a*(1)).

(3) Remove the fuel level sending unit assembly (T) (par. 189*a*) and remove the sending unit cable 28 (N) from the clips (G).

(4) Remove the fuel filter assembly (par. 138*a*).

(5) Remove the fuel line (C) (par. 142*e*(1)).

(6) Remove the filler cap with chain assembly (E) by turning the cap counterclockwise and unhook the chain from the inside of the fuel tank filler neck (D).

(7) Remove the lockwasher screw (K) at the front and at the rear of the tank from the mounting strap (Q) and remove the strap and antisqueak (P).

(8) Slide the tank to the right of the vehicle until the filler neck (D) has cleared the grommet (F) in the filler neck opening in the side of the body, and remove the tank.

b. Installation.

(1) Position the fuel tank in the vehicle and carefully slide the filler neck (D) through the grommet (F) in the opening in the side of the body.

(2) Position the antisqueak (P) over the top of the tank, install the mounting strap (Q) over the antisqueak, install a $\frac{5}{16}$ x $\frac{7}{8}$

lockwasher screw (K) through the hole in the strap at the front and the rear of the tank, and screw into the floor pan cover.

(3) Place cable 28 (N) in the clips (G) and install the fuel level sending unit (par 189*b*).

(4) Install the fuel filter assembly (par. 138*b*).

(5) Install the fuel line (C) (par. 142*c*(2)).

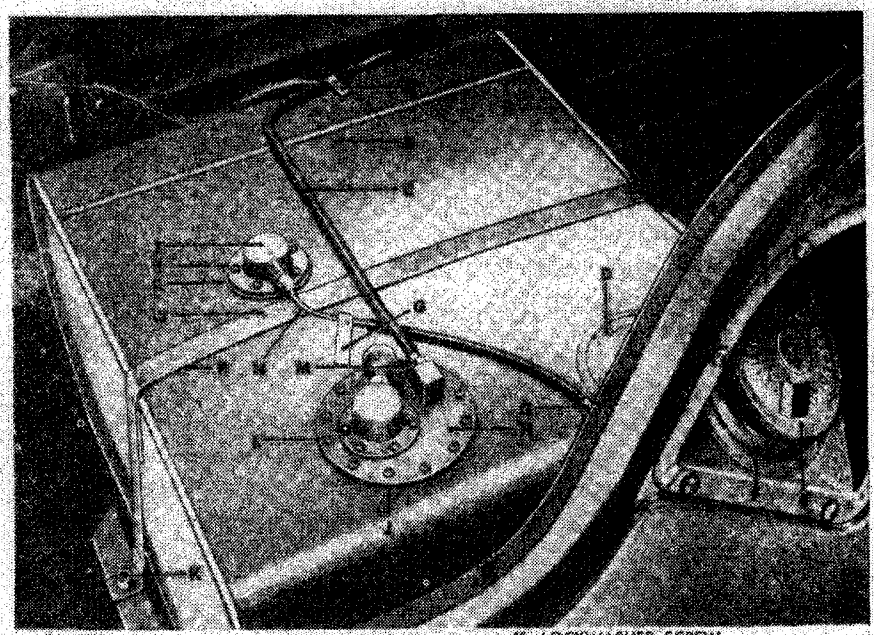


Figure 69. Fuel tank, fuel filter, and fuel level sending unit assemblies (M38A1)—installed—seat removed.

(6) Install the drain plug in the bottom of the fuel tank (B). Install the filler cap with chain assembly (E) by hooking the chain into the loop inside of the filler neck. Fill the tank with fuel, install filler cap on the filler neck, and turn in a clockwise direction to lock the cap on the tank.

(7) Start the engine and make sure there are no leaks at fuel line connections. Check the fuel level gage for proper sending unit operation.

(8) Install the driver's seat (par. 261*a*(2)).

141. Fuel Tank (M170)

(fig. 70)

a. Removal.

(1) Remove the drain plug from the bottom of the tank and drain fuel into a suitable container.

(2) Tilt driver's seat forward and remove (par. 272*a*(1)).

(3) Unscrew the seven lockwasher screws securing the fuel tank unit access plate to the vehicle floor.

(4) Unscrew the fuel line nut.

(5) Disconnect the cable bayonet connector from the fuel level sending unit.

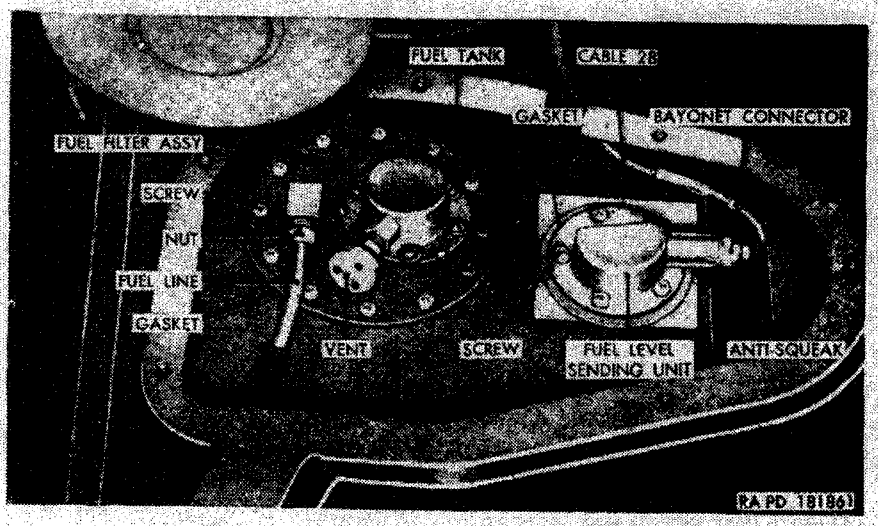


Figure 70. Fuel tank, fuel filter, and fuel level sending unit assemblies (M170)—installed—driver's seat and fuel tank unit access plate removed.

(6) Place a stand or blocking under the tank, making certain that such stand or blocking clears the fuel tank support strap (fig. 71).

(7) Remove the four nuts and flat washers from the studs on the fuel tank support strap attaching brackets at each end of the fuel tank, and remove the two fuel tank shields and support straps.

(8) Remove stands or blocking and lower tank.

(9) Remove the filler cap with chain assembly by turning the cap counterclockwise and unhook the chain from the inside of the fuel tank filler neck.

(10) Remove the 12 screws and soft copper seal washers securing fuel filter assembly to the tank, and remove the filter assembly and gasket.

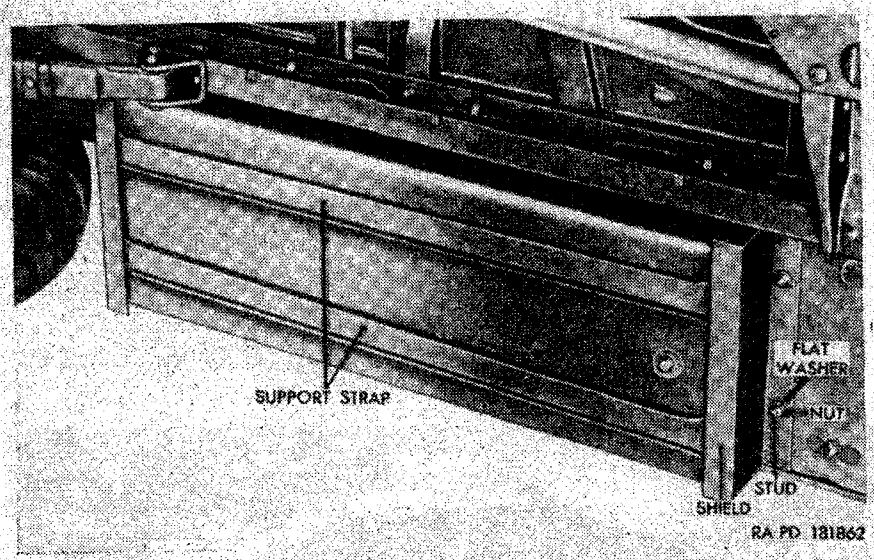


Figure 71. Fuel tank (M170)—installed.

(11) Remove the five screws and soft copper seal washers securing the fuel level sending unit to the tank, and remove the sending unit and gasket.

b. Installation.

(1) Position fuel level sending unit and gasket on top of the fuel tank and secure with No. 8 x ½ screws and soft copper seal washers.

(2) Position fuel filter assembly and gasket on top of the fuel tank and secure with twelve No. 8 x 7/16 screws and soft copper seal washers.

(3) Install new antisqueak strips to top of tank with adequate adhesive.

(4) Raise tank between the fuel tank support strap attaching brackets and position stands or blocking under the tank, making certain such stand or blocking will clear fuel tank support straps.

Caution: Make sure fuel line and fuel level sending cable are accessible through fuel tank unit access plate opening and are free from binding.

(5) Aline the ends of the two fuel tank support straps and one tank shield on the fuel tank support bracket studs at one end of the tank. Start but do not tighten the two ⅜-inch nuts with washers on the two tank support bracket studs. Repeat the procedure for the other end of the tank. Tighten the four tank support bracket stud nuts.

(6) Remove the stands or blocking.

(7) Install the drain plug in the bottom of the tank.

(8) Connect the bayonet connector to the fuel level sending unit.
(9) Install the fuel line nut to the fuel filter assembly.
(10) Fill the fuel tank. Install the filler cap with chain assembly, by hooking the chain into the loop inside of the filler neck, install filler cap on the filler neck, and turn in a clockwise direction to lock the cap on the tank.
(11) Start the engine and make sure there are no leaks at the fuel line connections. Check the fuel level gage for proper sending unit operation.
(12) Position the fuel tank unit access plate over the opening in the floor and secure with seven ¼ x ½ lockwasher screws.
(13) Install driver's seat by tilting the seat forward until seat frame slips into seat brackets on the vehicle floor (par. 272*a* (2)).

142. Fuel Lines and Fittings
(fig. 72)

a. Flexible Fuel Line.
(1) *Removal.* Unscrew the nut on the fuel line (Q) from the flexible fuel line (M). Unscrew the flexible fuel line (M) from the connector on the fuel and vacuum pump assembly (L).
(2) *Installation.* Screw the flexible fuel line (M) into the connector on the fuel and vacuum pump assembly (L). Screw the nut on the fuel line (Q) into the flexible fuel line (M).

b. Fuel Shutoff Valve-to-Flexible Fuel Line.
(1) *Removal.* Unscrew the nut at each end of the fuel line (Q) and remove the line from the vehicle.
(2) *Installation.* Position the fuel line (Q) between the shutoff valve (P) and the flexible fuel line (M) and screw the nut on each end of the line into the flexible fuel line and the fuel shutoff valve.

c. Tee-to-Shutoff Valve Fuel Line.
(1) *Removal.* Unscrew the nut on each end of the fuel line (N). Remove the line from the clips (D), and remove from the vehicle.
(2) *Installation.* Position the fuel line (N) between the tee (A) and the fuel shutoff valve (P) and screw the nut on each end of the line into the tee and the shutoff valve. Secure the line in the clips (D).

d. Rear Fuel Line (Elbow-to-Tee).
(1) *Removal.* Unscrew the nut at each end of the fuel line (E). Remove the line from the clips (D) and remove from the vehicle.

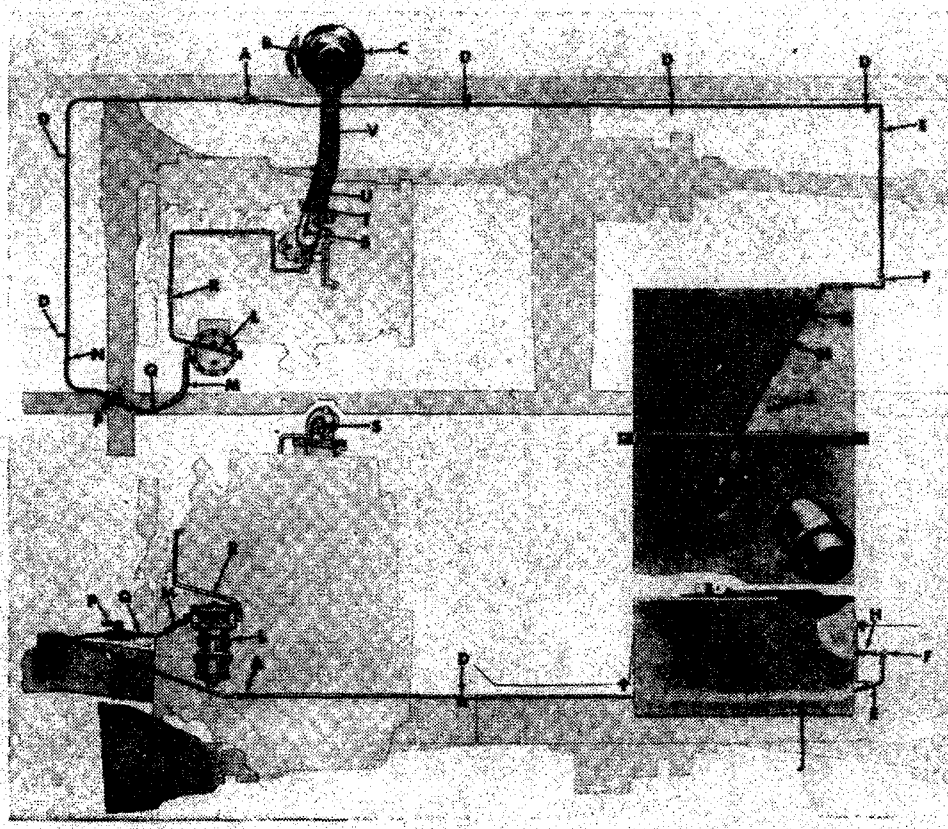


Figure 72. Fuel and air intake system.

(2) *Installation.* Position the fuel line (E) between the tee (A) and the elbow (F) and screw the nut on each end of the line into the tee and the elbow. Secure the line in the clips (D).

e. Tank-to-Elbow Fuel Line With Conduit Asembly.

(1) *Removal.*

(*a*) Remove the driver's seat (pars. 261*a*(1) for the M38A1 and 272*a*(1) for the M170).

(*b*) Unscrew the nut on each end of the fuel line (H). Remove the line from the clip (G), and remove the line from the vehicle.

(2) *Installation.*

(*a*) Position the fuel line (H) between the fuel filter assembly (K) and the elbow (F) and in the clip (G). Screw the nut on each end of the line into the elbow (F) and the fuel filter assembly (K).

(*b*) Install the driver's seat (pars. 261*a*(2) for the M38A1 and 272*a*(2) for the M170).

f. Fuel and Vacuum Pump-to-Carburetor Line Assembly.

(1) *Removal.* Unscrew the nut on each end of the fuel line (R) and remove the line from the vehicle.

(2) *Instalation.* Position the fuel line (R) between the fuel and vacuum pump assembly (L) and the carburetor assembly (S) and screw the nut on each line end into the carburetor and the fuel and vacuum pump elbows.

g. Tee

(1) *Removal.* Unscrew the nuts on fuel line (N and E) from the tee (A), and remove the tee from the vehicle.

(2) *Installation.* Position the tee (A) between fuel line (N and E). Screw the nuts on the end of the lines (N and E) into the tee.

h. Fuel Shutoff Valve.

(1) *Removal.* Unscrew the nut on fuel lines (N and Q) from the fuel shutoff valve (P) and remove the valve from the vehicle.

(2) *Installation.* Position the fuel shutoff valve (P) between the fuel lines (N and Q) and screw the nut on the end of the lines into the valve.

i. Elbow (Rear Fuel Line-to-Elbow and Tank-to-Elbow Line).

(1) *Removal.* Unscrew the nut on the fuel line (H and E) from the elbow (F), and remove the elbow from the vehicle.

(2) *Installation.* Position the elbow (F) between the fuel line (E and H) and screw the nut on the end of the lines into the elbow.

Section IX. EXHAUST SYSTEM

143. Description

The exhaust system (fig. 73) includes the exhaust muffler, the exhaust pipe extension, and the exhaust pipe. The system is supported at three poionts—the exhaust pipe is secured to the exhaust manifold of the engine; the exhaust pipe extension is secured to the frame by a bracket and spacer; and the muffler is secured to the frame by a muffler support clamp bracket around the tail pipe of the muffler assembly.

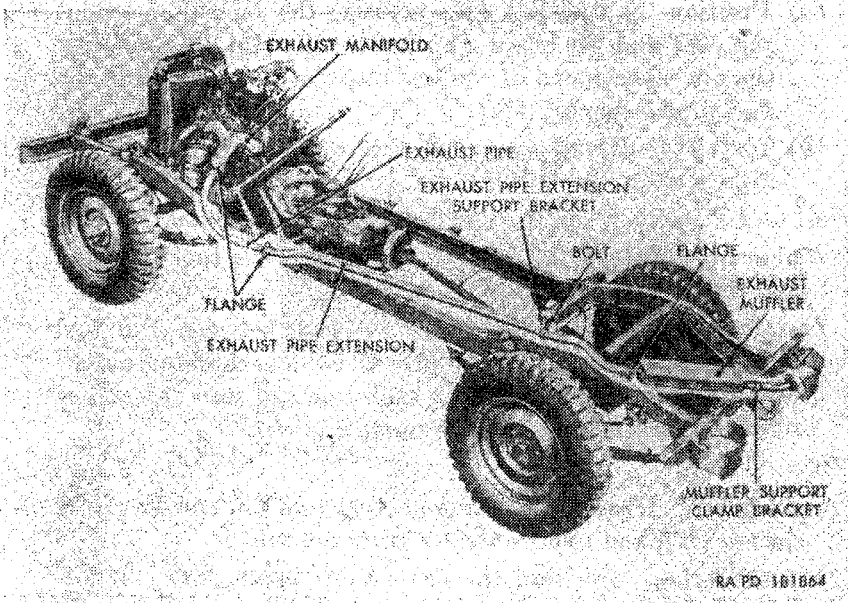


Figure 73. Exhaust system.

144. Exhaust System
(fig. 74)

a. Removal.

(1) Remove the three safety nuts and bolts securing the muffler flange to the exhaust pipe extension rear flange.

(2) Remove the nut and bolt securing the muffler support clamp bracket to the frame rear cross member.

(3) Remove the exhaust muffler with bracket assembly. Separate and discard the gasket from the flange.

b. Installation.

(1) Insert three $\frac{5}{16}$ x 1 bolts through the front flange of the exhaust muffler with bracket assembly, and place a new gasket over the bolts. Raise the muffler into position and insert the

bolts through the exhaust pipe extension rear flange holes. Start but do not tighten three $\frac{5}{16}$-inch safety nuts onto the bolts.

(2) Insert a $\frac{5}{16}$ x $1\frac{1}{4}$ bolt through the hole in the muffler support clamp bracket and the frame cross member. Place a $\frac{5}{16}$-inch nut on the bolt end and tighten the bolt.

(3) Tighten the three safety nuts on the bolts securing the muffler to the exhaust pipe extension.

(4) Start the engine and check all exhaust connections for leaks.

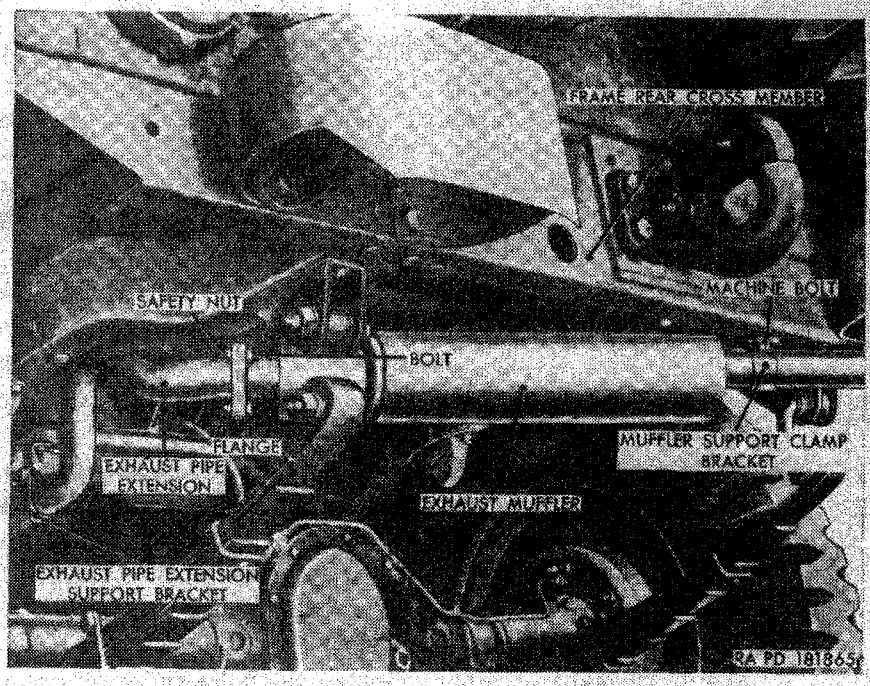


Figure 74. Exhaust muffler with bracket assembly—installed.

145. Exhaust Pipe Extension With Bracket Assembly

a. Removal.

(1) Remove the three nuts and bolts securing the exhaust pipe extension to the exhaust pipe (fig. 73).

(2) Remove the three nuts and bolts securing the exhaust pipe extension to the exhaust muffler (fig. 74).

(3) Loosen the bolt securing the muffler support clamp bracket to the frame rear cross member and slide the muffler back about one inch.

(4) While supporting the exhaust pipe extension, remove the nut, washer, spacer, and bolt securing the exhaust pipe extension support bracket to the frame cross member.

(5) Separate the front flange of the exhaust pipe extension from the rear flange of the exhaust pipe, and remove exhaust pipe extension with bracket. Separate and discard gasket from both flanges.

b. Installation.

(1) Clean the flange gasket surfaces. Loosen the nut and bolt in the clamp at the exhaust pipe extension support bracket (fig. 74). Place the exhaust pipe extension in approximate position under the vehicle with the offset end toward the exhaust muffler (fig. 73).

(2) Insert a $\frac{5}{16}$ x $1\frac{1}{2}$ machine bolt through the bracket (fig. 74) hole and slip the exhaust pipe extension spacer over the bolt. Raise the exhaust pipe extension with bracket into position with the bolt end inserted into the frame cross member hole. Place a $\frac{11}{32}$ ID x $\frac{11}{16}$ OD washer over the bolt and screw a $2\frac{5}{16}$-inch nut on the threads enough to support the exhaust pipe extension weight.

(3) Place a new gasket on the front flange of the exhaust pipe extension (fig. 73) and insert three $\frac{5}{16}$ x 1 bolts through the exhaust pipe flange, gasket, and exhaust pipe extension flange. Start three $\frac{5}{16}$-inch nuts on the three bolts, but do not tighten.

(4) Place a new gasket on the flange of the exhaust muffler (fig. 74). Pull the muffler forward and insert three $\frac{5}{16}$ x 1 bolts through the muffler flange, gaskets, and rear flange of the exhaust pipe extension. Start three $\frac{5}{16}$-inch nuts on the bolts, but do not tighten.

(5) Tighten the bolts and nuts securing the exhaust pipe extension to the exhaust pipe. Tighten the bolts and nuts securing the exhaust pipe extension to the exhaust muffler (fig. 73). Tighten the bolt securing the exhaust pipe extension support bracket to the frame cross member. Tighten the bolt and nut in the support bracket clamp. Tighten the bolt securing the muffler support clamp bracket (fig. 74) to the frame rear cross member.

(6) Start engine and check all exhaust connections for leaks.

146. Exhaust Pipe

(fig. 73)

a. Removal.

(1) Remove the nut from the stud in the exhaust manifold flange. Remove the nut and bolt securing the exhaust pipe front flange to the exhaust manifold.

(2) Separate the flanges. Remove the three nuts and bolts securing the exhaust pipe rear flange to the exhaust pipe extension front flange. Separate the flanges. Remove and discard gaskets.

(3) Drop the exhaust pipe down and remove.

b. Installation.

(1) Clean the gasket surfaces of the exhaust pipe flanges. Place a new gasket on the front flange and position the flange over the 3/8-inch stud in the exhaust manifold. Start a 3/8-inch nut on the stud, but do not tighten. Insert a 3/8 x 1 1/2 bolt through the manifold mounting hole and the flange hole. Start but do not tighten a 3/8-inch nut on the bolt.

(2) Place a new gasket on the exhaust pipe rear flange and position the flange against the exhaust pipe extension front flange, alining the holes in the two flanges. Insert three 5/16 x 1 bolts through the holes in the flanges and gasket, and start but do not tighten three 5/16-inch nuts on the bolts.

(3) Tighten the nuts on the stud and bolt securing the exhaust pipe to the exhaust manifold.

(4) Tighten the three nuts and bolts securing the exhaust pipe to the exhaust pipe extension.

(5) Start the engine and check all exhaust connections for leaks.

Section X. IGNITION SYSTEM

147. Description and Data

a. Description. The ignition system consists of the batteries, ignition switch, distributor with coil assembly, spark plugs, and circuit cables. The batteries are discussed in paragraph 162 and the ignition switch in paragraph 181. The distributor with coil assembly consists of the distributor, two capacitors, and ignition coil, in a single unit mounted on the right side of the engine block and driven from the oil pump. The primary, or low voltage circuit includes the batteries, ignition switch, breaker points, primary capacitor, breaker point capacitor, and the primary windings of the ignition coil. The secondary, or high voltage circuit, consists of the secondary winding of the coil, distributor rotor, distributor cover, cap assembly, spark plug cable assemblies, and spark plugs. The entire ignition system is waterproofed and includes devices for suppressing radio interference as described in paragraph 280. Ignition system components and cables are identified in figures 75 and 76.

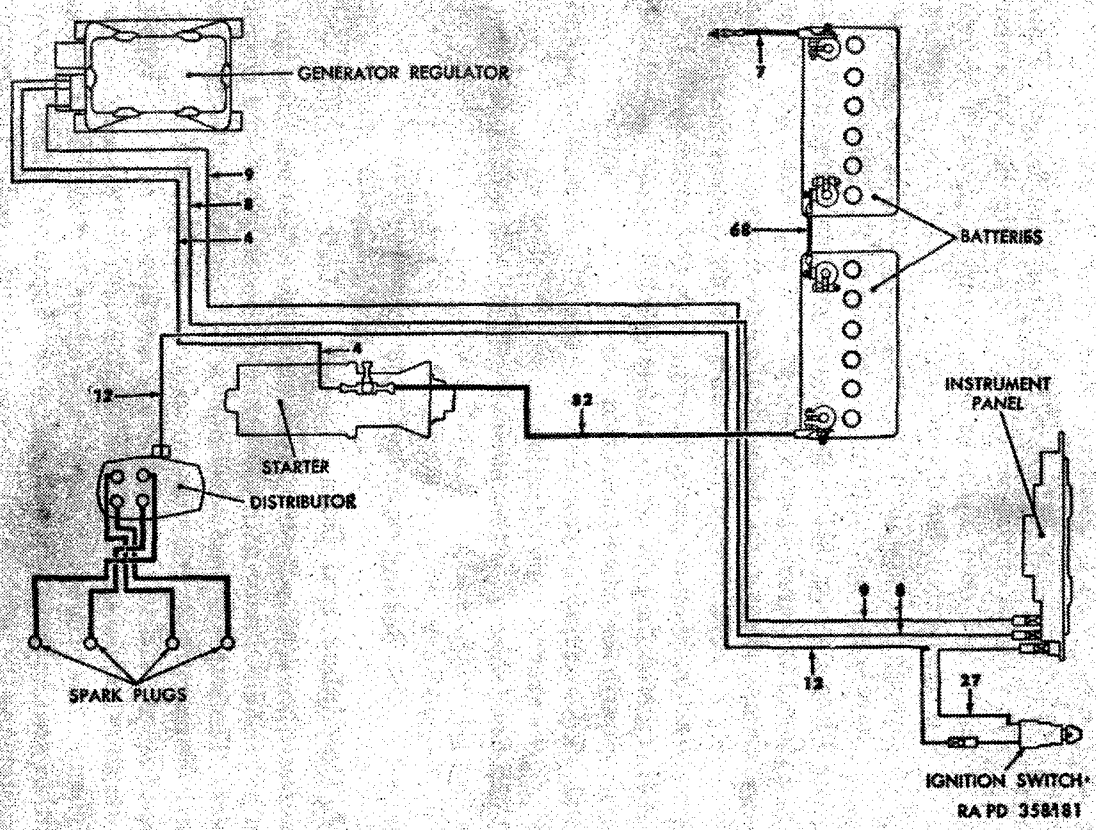


Figure 75. Ignition system components and cables identification (M38A1).

rear, adjacent to the clutch bell housing, remove the nut and copper washer from the bolt and then remove the bolt and copper washer from the clutch and pinion housing of the starter and the clutch bell housing. Working at the starter top, adjacent to the clutch bell housing, remove the screw and lockwasher securing the clutch and pinion housing of the starter to the clutch bell housing.

(4) Pull the starter straight forward toward the vehicle front until the clutch and pinion housing is clear of the clutch bell

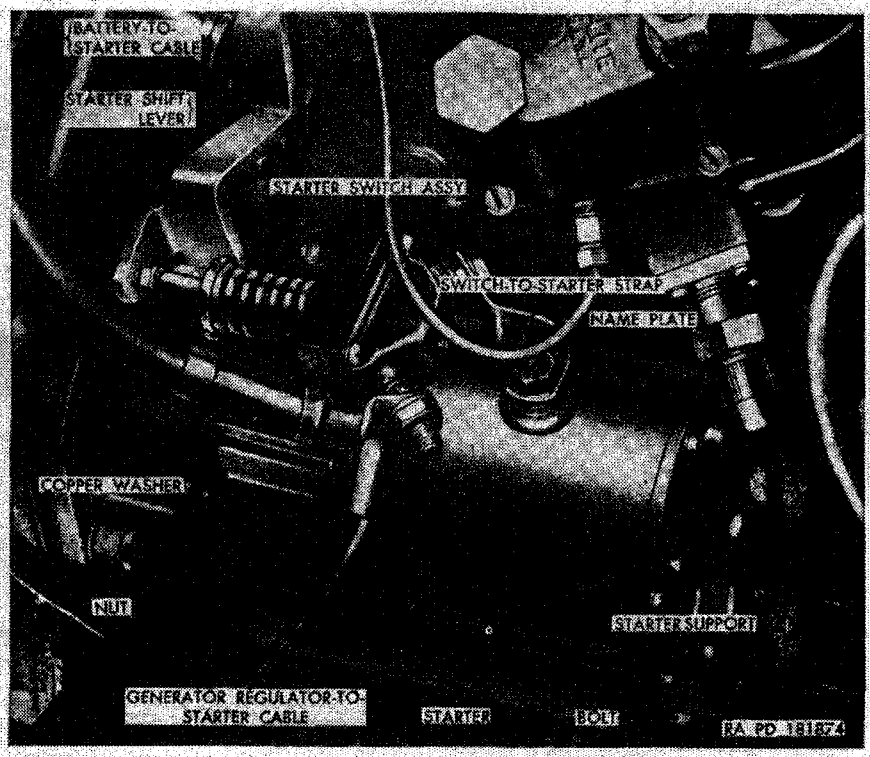


Figure 87. Starter assembly—installed.

housing, and lift the starter out of the engine compartment. Remove and discard the starter mounting gasket from either the starter or clutch bell housing.

b. Installation.

(1) Make sure all the old gasket is removed from mating surfaces of the clutch and pinion housing of the starter assembly and clutch bell housing. Coat a new starter mounting gasket with plastic-type liquid cement and place the gasket in position on the starter clutch and pinion housing.

(2) Insert the starter clutch and pinion housing into the clutch bell housing hole at the right side of the engine and position

the starter against the clutch bell housing. Place a ½-inch copper washer on the ½ x 3½ bolt. Working on the bottom of the starter, adjacent to the clutch bell housing, insert the bolt through the clutch bell housing flange, through the starter clutch and pinion housing, and install a ½-inch copper washer and ½-inch nut on the bolt. Working on the top of the starter, secure the starter to the clutch bell housing with a ½-inch lockwasher and ½ x 1¼ screw. Secure the front of the starter to the starter support with a ⅜ lockwasher and ⅜ x ⅞ bolt.

(3) Place the terminals of the auxiliary power receptacle cable (if used), generator regulator-to-starter cable, and the battery-to-starter cable on the starter switch terminal stud. Secure the cables to the stud by installing the ⅜-inch lockwasher and nut. Coat the starter switch terminal and cable terminals with *ignition insulation compound.*

(4) Connect the battery "B" ground cable (par. 162*b* (9) (*b*) and (*c*)).

156. Starter Switch Assembly

(fig. 87)

a. Removal.

(1) Disconnect the battery "B" ground cable (par. 162*b* (8) (*a*) and (*b*)).

(2) Disconnect the battery-to-starter cable, generator regulator-to-starter cable, and auxiliary power receptacle cable (if used) from the starter switch assembly (par. 155*a*) terminal.

(3) Remove the nut and lockwasher securing the switch-to-starter strap to the terminal stud on top of the starter. Remove the four screws and lockwashers, securing the starter switch to the top of the starter.

(4) Lift the starter switch off the starter. Remove the nut and lockwasher securing the switch-to-starter strap to the switch terminal stud and lift the strap off the stud.

b. Installation.

(1) Position the straight side of the switch-to-starter strap on the starter switch assembly terminal stud, which will be nearest engine when switch is installed. Secure strap to stud with a ⅜-inch lockwasher and nut.

(2) Position the starter switch with the switch plunger facing the clutch bell housing, on top of the starter making sure the strap free end is installed on the starter terminal stud. Secure switch to the starter with four No. 10 x ⅝ lockwashers and screws. Secure the strap to the starter terminal stud with one ⅜-inch lockwasher and nut.

(3) Connect the auxiliary power receptacle cable (if used), generator regulator-to-starter cable, and battery-to-starter cable to the starter switch assembly terminal (par. 155*b*).

(4) Connect the battery "B" ground cable (par. 162*b* (9) (*b*) and (*c*)).

Section XII. GENERATING SYSTEM

157. Description and Data

a. Description. The 24-volt, single-wire, waterproof generating system (figs. 88 and 89) consists of the generator and generator regulator assemblies, connecting cables, and batteries. Refer to paragraph 162 for information relative to the batteries. The system functions to keep the batteries fully charged. A two-brush, 25 ampere, 24-volt generator (fig. 90), mounted on the right side of the engine, is driven in conjunction with the water pump by a matched pair of V-belts from the engine crankshaft. A belt tension brace provides for drive belt adjustment. The generator regulator (figs. 92 and 94) assembly consists of three units; the voltage regulator, which controls the generator output voltage to prevent overcharging the batteries; the current regulator, which prevents overloading the generator; and the circuit breaker, which opens to prevent discharging the batteries when the generator output falls below the level required to charge the batteries.

b. Data.

Generator:

Controlled output	25 amp
Ground polarity	neg
Manufacturer	Delco-Remy or Electric Auto-Lite
Model	DR-117495 *or* AL-GHA4802UT
Voltage	24

Generator regulator:

Amperes	25
Ground polarity	neg
Manufacturer	Delco-Remy or Electric Auto-Lite
Model	DR-118606 or AL-VBC4002UT
Voltage	24

158. Generator Assembly

Caution: Disconnect the batteries before attempting any work on the generator assembly. See WARNING on top of the right front fender.

a. Removal.

(1) Disconnect the ground cable of battery "B" (par. 162*b* (8) (*a*) and (*b*)).

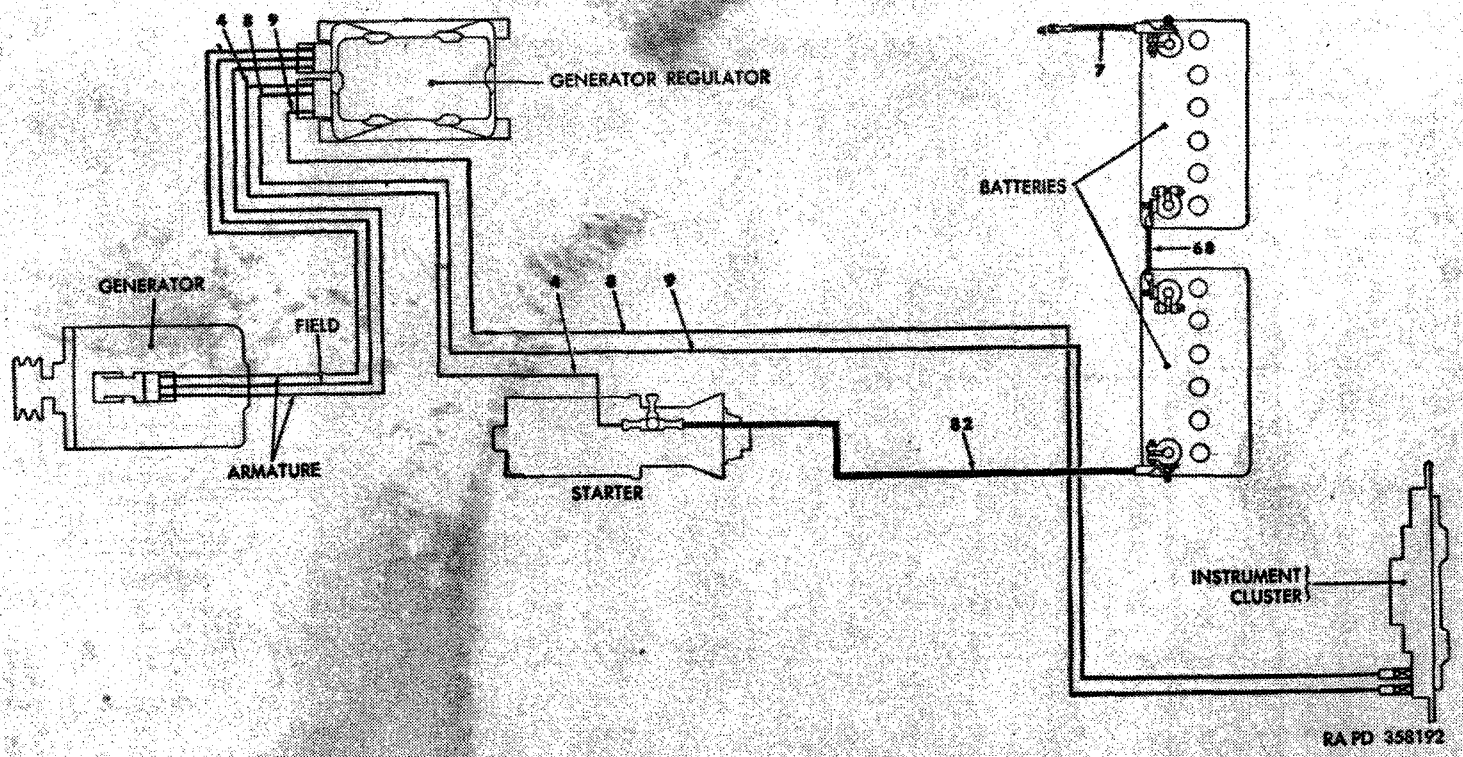


Figure 88. Generating system components and cables identification (M38A1).

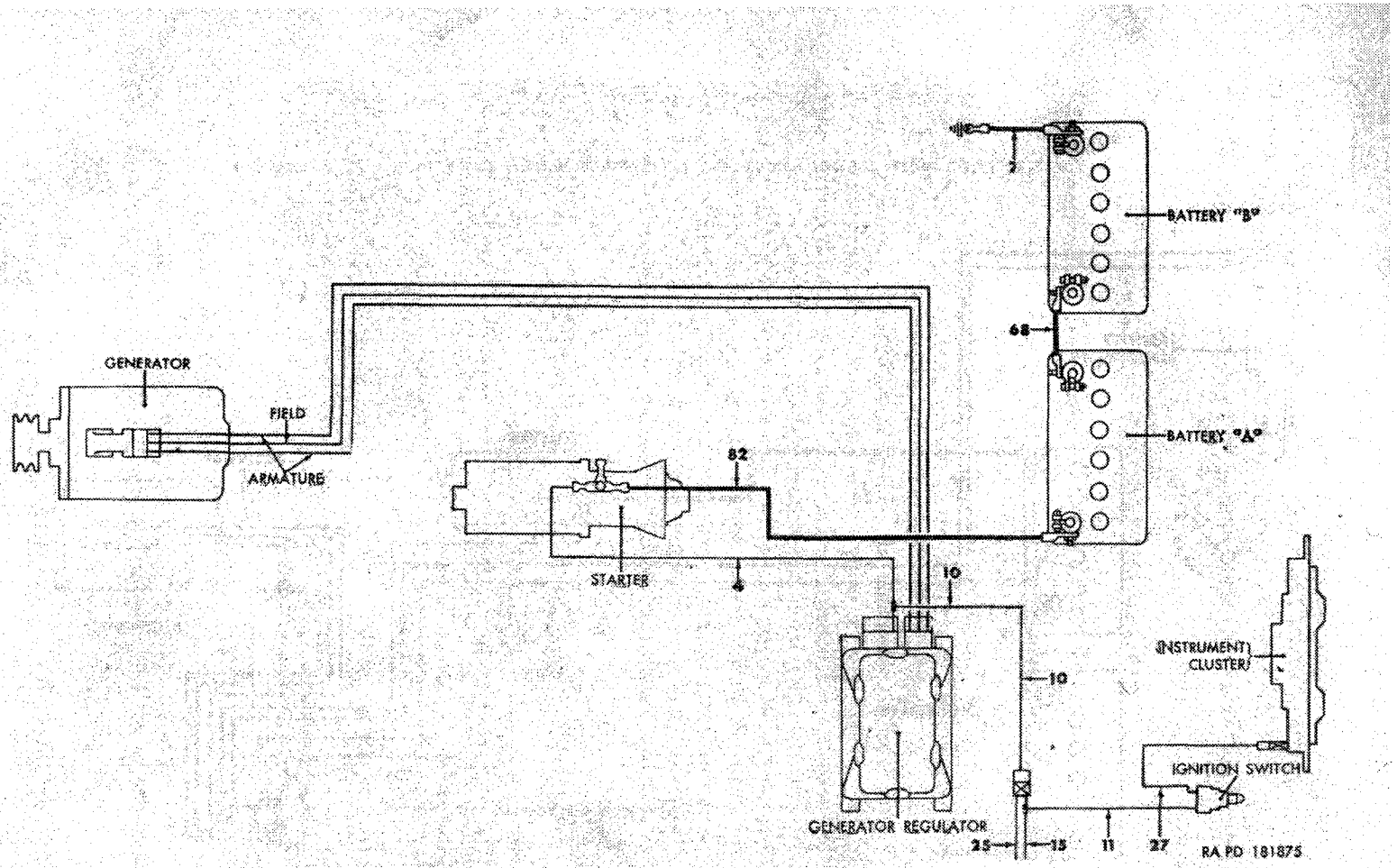


Figure 89. Generating system components and cables identification (V170).

(2) Unscrew the coupling nut securing the generator-to-generator regulator cable (fig. 90) to the wiring harness receptacle. Pull the cable plug from the receptacle.

(3) Remove the lockwasher screw and lockwasher securing the belt tension brace to the drive end head. Swing the generator toward the engine as far as it will go, and remove the two fan and generator drive belts from the drive pulley. If the belt tension brace is to be removed, remove the bolt, nut, and lockwasher securing the brace inner end to the engine front mounting plate, and remove the brace.

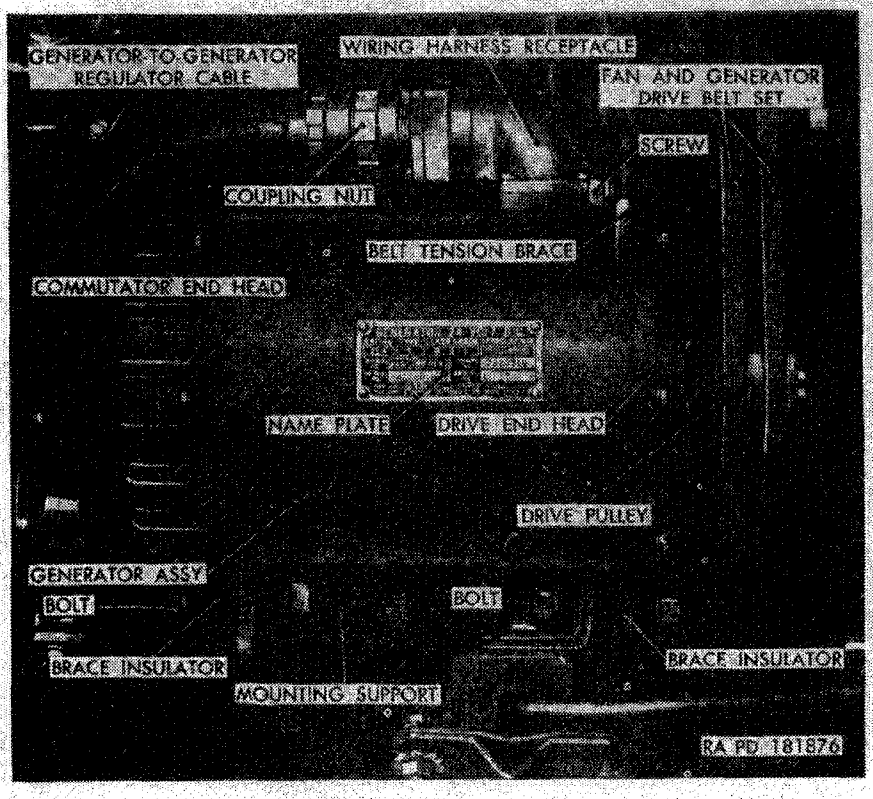


Figure 90. Generator assembly—installed.

(4) Remove the nut and external-teeth lockwasher from the bolt securing the commutator end head to the mounting support. Remove the bolt and flat washer from the commutator end head and mounting support.

Note. Another flat washer is used on the bolt. The washer, which is adjacent to the brace insulator in the mounting support on the nut side of the bolt, may drop when the bolt is removed. Recover or remove the flat washer after removing the generator.

(5) Disconnect the drive end head from the engine front mounting support in the same manner as that outlined for the commutator end head ((4) above).

(6) Lift the generator straight up until it clears the brace insulators in the mounting support and engine front mounting plate, and remove the generator.

(7) Remove the cotter pin, castellated nut, and lockwasher securing the drive pulley to the armature shaft. Using a conventional puller, pull the drive pulley off the shaft. Remove the woodruff key from the shaft. Discard cotter pin.

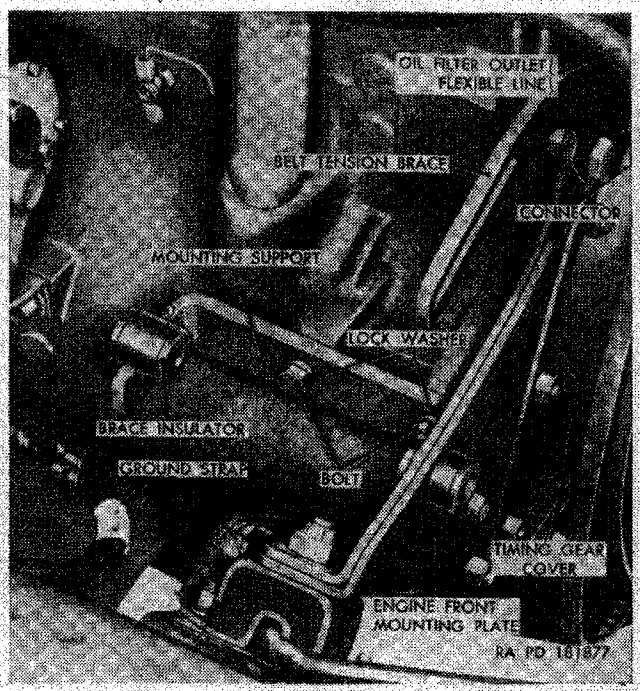


Figure 91. Generator mounting support—installed.

(8) Inspect the two brace insulators (fig. 91) for damaged or deteriorated condition. One insulator is mounted in the mounting support, while the other is mounted in the engine front mounting plate. If the insulators are damaged, remove them.

(9) Remove the two bolts and lockwashers securing the mounting support to the cylinder block and remove the support.

b. Insulation.

(1) Place the mounting support (fig. 91) in position on the right side of the cylinder block. Secure the support to the block with two 3/8-inch lockwashers and 3/8 x 7/8 bolts.

(2) Install the brace insulators if removed, one in the mounting support and one in the engine front mounting plate.

(3) Install the 1/8 x 7/8 woodruff key in the generator armature shaft keyway. Aline the keyway in the drive pulley (fig. 90) bore with the key in the shaft and install the pulley (long end of hub leading) on the shaft. Shove the pulley onto the shaft until the pulley inner end rests against the shaft shoulder. Install one 1/2-inch lockwasher on shaft against pulley outer end and secure pulley to shaft with one 1/2-inch castellated nut. Tighten nut as much as possible and then aline shaft cotter pin hole with nut serrations. Lock the nut to the shaft with a new 3/32 x 1 cotter pin. Bend the cotter pin ends over.

(4) If the belt tension brace was removed, secure it to the engine front mounting plate with a 3/8 x 7/8 bolt, 3/8-inch lockwasher, and 3/8-inch nut. Position brace so its curved end faces down.

(5) Lower the generator assembly into the engine compartment and position its commutator and drive end heads on the brace insulators, mounted in the mounting support and engine front mounting plate.

(6) Start one 7/16 x 2 1/4 bolt with 17/32-inch ID flat washer through the mounting support brace insulator. Place one 15/32-inch ID flat washer between the generator insulator and commutator end head. Push the bolt through the flat washer and commutator end head. Place one 7/16-inch external-teeth lockwasher over the bolt end and install the 7/16-inch nut, but do not tighten.

(7) Start one 7/16 x 2 1/4 bolt with 17/32-inch ID flat washer through the engine front mounting plate brace insulator. Place one 15/32-inch ID flat washer between the generator insulator and drive end head, and push the bolt through the washer and drive end head. Place one 7/16-inch external-teeth lockwasher over the bolt end and install a 7/16-inch nut, but do not tighten.

(8) Position the fan and generator drive belts over the drive pulley and pull the generator away from the engine until belts are snug in place in all pulleys. Place the 3/8-inch flat washer over the 3/8 x 1 lockwasher screw and insert screw through the belt tension brace slot and into the generator drive end head. Start screw into drive end head threads, but do not tighten.

(9) Adjust belt tension (par. 130*a*).

(10) Tighten the nuts and bolts securing the generator to the mounting support and engine front mounting plate.

(11) Insert the generator-to-generator regulator cable plug into the wiring harness receptacle, making sure to aline the plug

slot with the receptacle pin. Push the pin in as far as possible and screw the coupling nut onto the receptacle, using a spanner wrench.

(12) Connect the ground cable of battery "B" (par. 162*b*(9)(*b*) and (*c*)).

159. Generator Regulator Assembly (M38A1)

Caution: Disconnect the batteries before attempting any work on the generator regulator assembly. See WARNING on top of the generator regulator cover and on top of the right front fender.

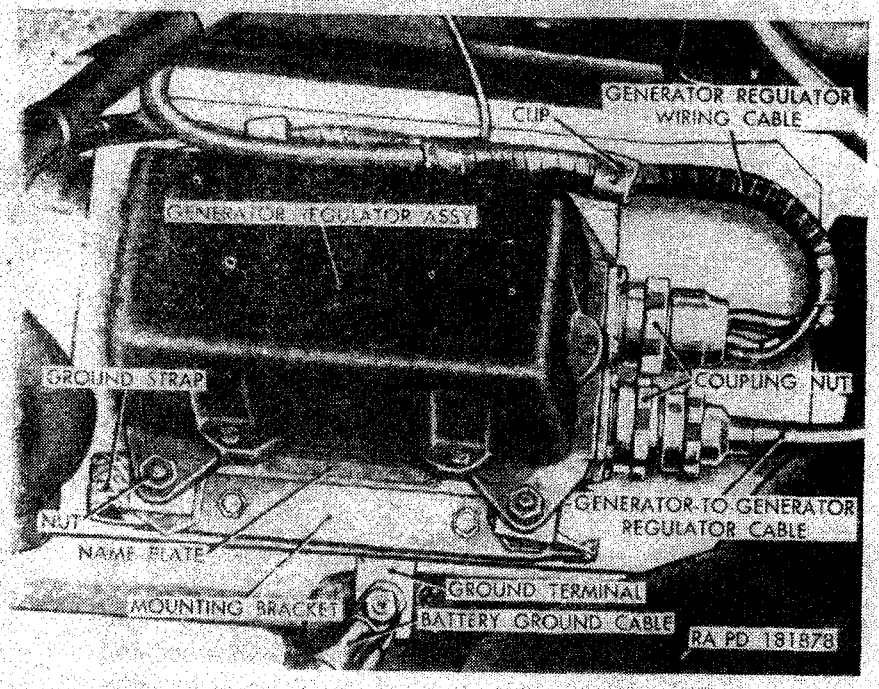


Figure 92. Generator regulator assembly installed (M38A1).

a. Removal.

(1) Disconnect the ground cable of battery "B" (par 162*b*(8)(*a*) and (*b*)).

(2) Using a spanner wrench, unscrew the coupling nut of the generator-to-generator regulator cable (fig. 92) and pull the cable plug out of the receptacle.

(3) Using a spanner wrench, unscrew the generator regulator wiring cable coupling nut and pull the cable plug out of the receptacle.

(4) Remove the four plain nuts and lockwashers securing the generator regulator assembly to the mounting bracket cush-

(4) Connect the generator-to-generator regulator cable to the outer receptacle on the generator in the same manner as described in (3) above for the generator regulator wiring cable.

(5) Connect the ground cable of battery "B" (par. 162*b*(9)(*b*) and (*c*)).

Section XIII. BATTERIES AND LIGHTING SYSTEM

161. Description and Data

a. Description.

(1) *General.* The 24-volt batteries and lighting system (figs. 95 and 96) is completely waterproofed. All cable connectors are bayonet-type with interlocking sleeves. Rubber grommets in the sleeves protect the connections from moisture. A single circuit breaker in the generator regulator protects both the ignition and lighting systems from overload. All light circuits are controlled by the light switch (E, fig. 13) on the instrument panel. The continuity of all circuits is described in paragraph 171, table IV, and cables are identified by number in figures 95 and 96. On the vehicle, cables are identified by numbered tags near each cable end.

(2) *Batteries* (fig. 99). The 24-volt primary circuit is supplied by two 12-volt lead- and acid-type storage batteries, connected in series. The batteries and connections are designed for under water operation. The batteries compartment is in front of the dash on the right side of the vehicle.

(3) *Service headlights* (fig. 101). The sealed beam-type service headlights are mounted in the radiator grille. High or low beam is selected by a foot-operated switch.

(4) *Blackout driving light* (fig. 104). A single blackout driving light is mounted on the left front fender. This driving light supplies a diffused, low-intensity light beam, for use when the tactical situation prohibits use of the service headlights.

(5) *Signal blackout marker and service parking lights* (fig. 105). Two light assemblies, one mounted directly below each service headlight, serve the dual purpose of signal blackout marker lights and service parking lights.

(6) *Blackout tail and stop light* (fig. 106). The blackout tail and stop light is mounted on the right rear corner of the vehicle body. The unit includes two lamps, a blackout stop light in the upper half, and a blackout taillight in the lower half.

(7) *Service tail and stop light assembly* (fig. 107). The service tail and stop light assembly is mounted in the left rear corner of the vehicle body. The upper half of the assembly houses

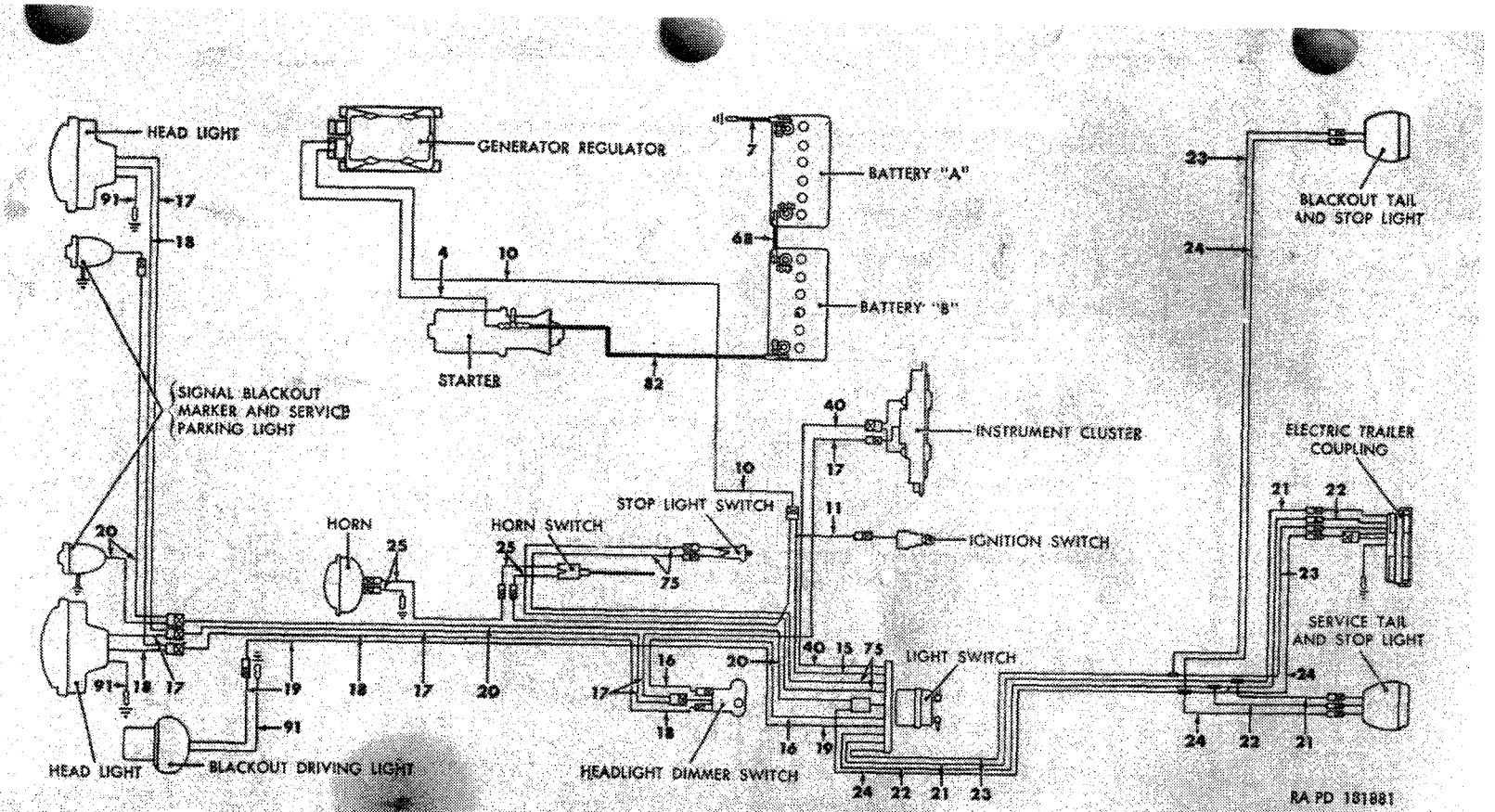


Figure 95. Batteries and lighting system components and cable identification (M38A1).

(5) *Battery "B" removal* (fig. 99). Battery "B" removal is the same as battery "A" removal ((4) above).

(6) *Battery "A" installation.*

(*a*) Lower battery "A" (fig. 99) into batteries compartment with the positive post facing left side of vehicle (see Caution (4) (*d*) above).

(*b*) Install holddown frame assembly on holddown bolts and battery, then secure frame in position with two $\frac{5}{16}$-inch wing nuts.

Note. In order to prevent any possibility of excessive battery movement, make sure to install lockwashers under the wing nuts.

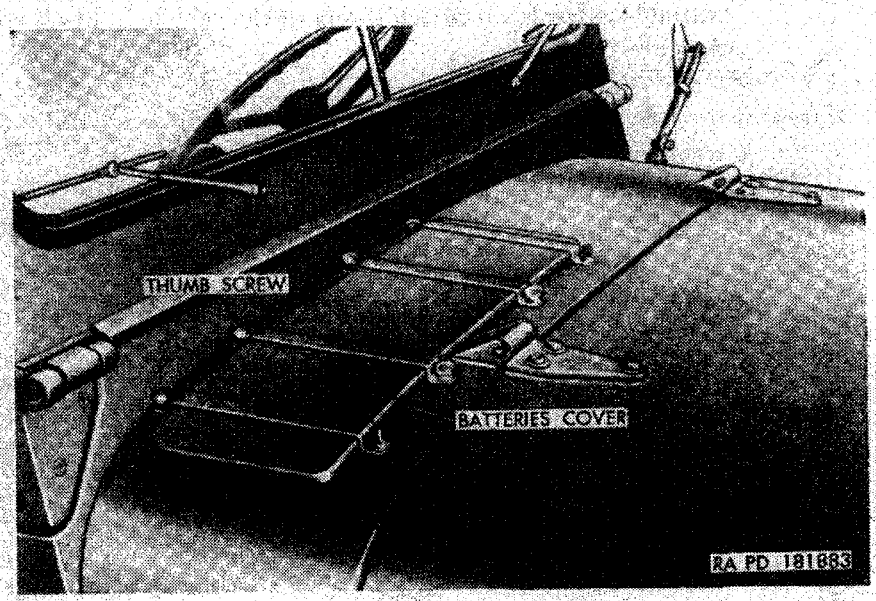


Figure 97. Batteries location—batteries cover installed (M38A1).

(*c*) Install the negative post terminal with bolt and nut assembly and positive post terminal with bolt and nut assembly (*b* (9) (*a*) below).

(*d*) Position the batteries cover (fig. 97) on M38A1 over batteries compartment and slide towards left side of vehicle to engage cover slots with thumb screws, then tighten thumb screws securely.

Note. On the M170, the hinged cover is lowered and clamped on (fig. 98).

(*e*) Check polarity ((8) below).

(7) *Battery "B" installation* (fig. 99). Battery "B" installation is the same as battery "A" installation ((6) above).

(8) *Polarity test.* Test polarity by turning on headlights. If lights illuminate, and ammeter registers DIS, polarity is

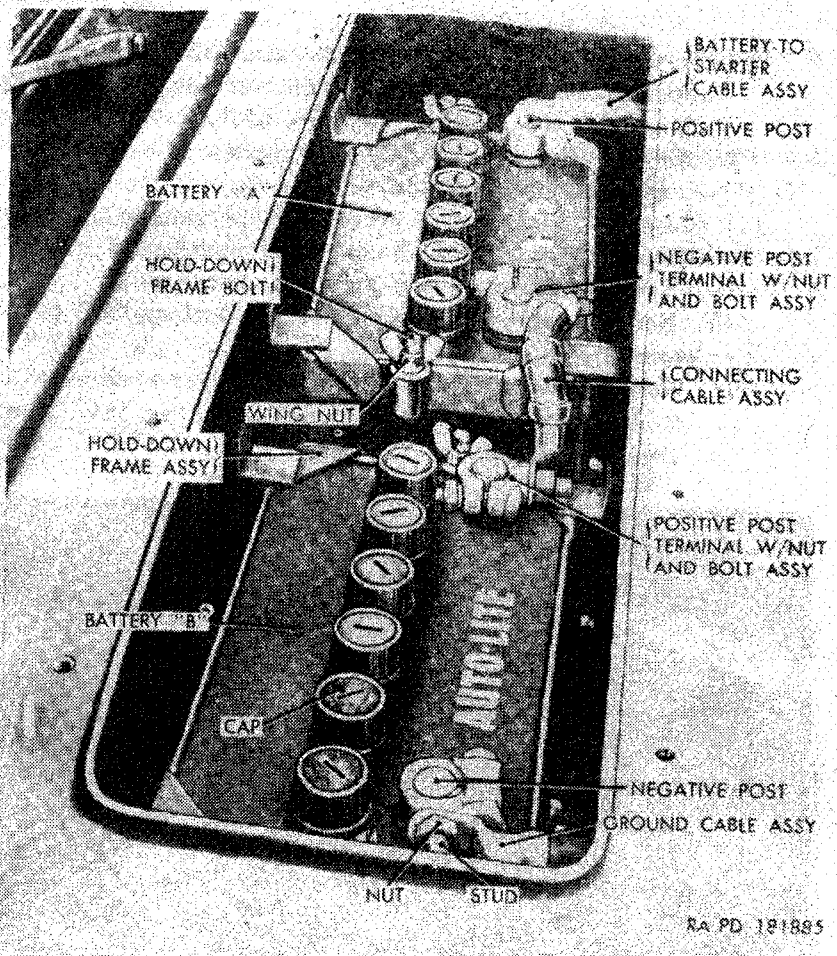


Figure 99. Batteries installed—batteries cover removed.

(*c*) Position a ⅝-inch clip on the ground cable and secure clip to dash with a No. 10 x ½ lockwasher screw. Position another ⅝-inch clip on the cable and secure to fender splash apron with a No. 10 x ½ lockwasher screw.

(*d*) Install batteries cover (*a*(6) (*d*) above).

(4) *Battery-to-starter cable assembly No. 82 removal.*

(*a*) Remove batteries cover (*a*(4) (*a*) above).

(*b*) Remove the battery-to-starter cable 82 ((8) (*b*) below).

(*c*) Remove the lockwasher screw from the clip securing the cable to the dash, spread clip, and remove from cable.

(*d*) Remove the nut and lockwasher securing the cable to starter switch terminal and pull cable off terminal (fig. 87).

(*e*) Withdraw cable from batteries compartment and remove from vehicle.

(2) Remove the grommet, headlight cable assembly, and the ground cable 91 from the headlight housing assembly (fig. 104).

(3) Remove the seven lockwasher screws from the front, and one lockwasher screw from the rear, securing the headlight housing assembly and the ground cable 91, to the radiator guard assembly, and remove the headlight housing assembly with the lamp-unit mounting assembly (fig. 102) and the headlight assembly mounting pad from the vehicle.

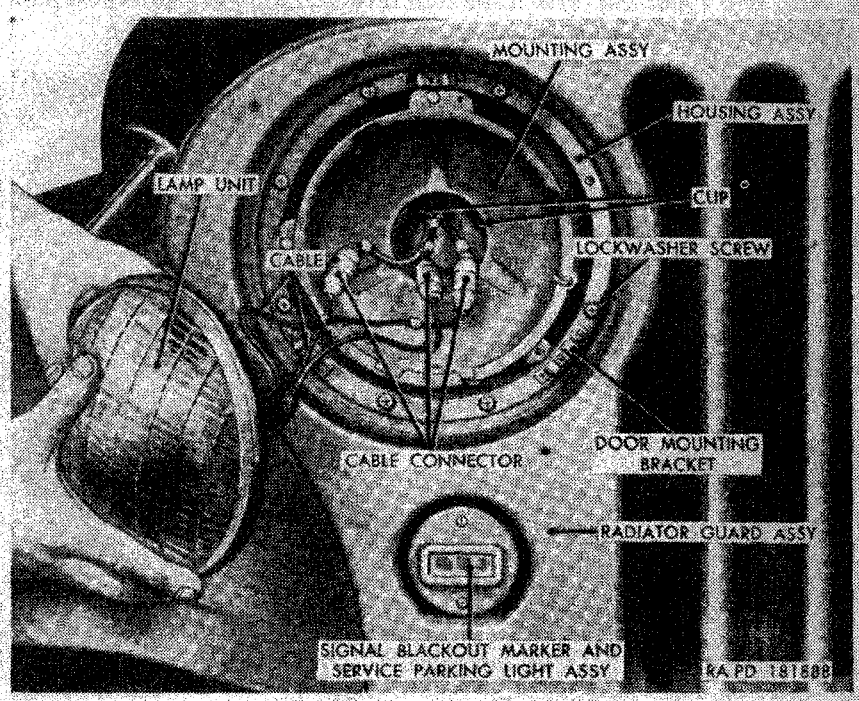


Figure 102. Removing headlight lamp-unit with cables assembly.

d. Headlight Assembly Installation.

(1) Position the mounting pad on the rear of the housing assembly and aline pad mounting holes with housing mounting holes.

(2) Position the housing assembly and mounting pad in radiator guard assembly (fig. 102) and aline housing and pad mounting holes with radiator guard mounting holes. Secure housing and pad to guard with seven No. 10 x ½ lockwasher screws from the front. Position the cable 91 (fig. 104) on the guard assembly at the rear and install a No. 10 x ½ lockwasher screw.

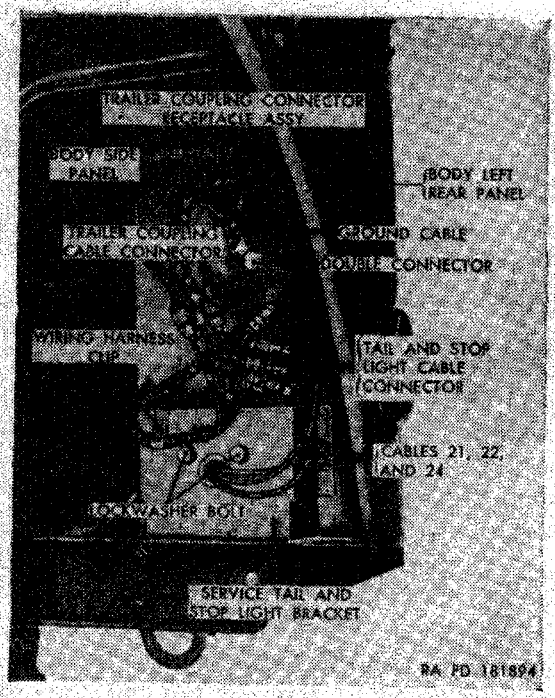


Figure 108. Trailer coupling electrical connector receptacle and service tail and stop light assemblies (M38A1)—disconnect points in wheel house—guard removed.

c. Installation.

(1) Position service tail and stop light assembly at vehicle body and connect cables 21, 22, and 24 connectors.

(2) Position light in vehicle body and aline mounting holes in bracket welded to body.

(3) Working from underneath vehicle, install two $\frac{3}{8}$ x $\frac{5}{8}$ lockwasher bolts through rear of bracket and into mounting holes in the light housing. Tighten bolts uniformly.

(4) Position the service tail and stop light and the trailer coupling electrical connector receptacle guard in the wheel house.

(5) Install the four $\frac{1}{4}$ x $\frac{5}{8}$ lockwasher screws as located in *b*(1) and (2) above.

168. Instrument Panel Lights and Headlight High Beam Indicator Light

The removal, installation, and lamp replacement for the instrument panel lights and high beam indicator lights are contained in paragraphs 179 and 180.

(2) Remove top lockwasher screw securing emergency reel lamp mounting bracket to mounting pad.

(3) Remove bottom lockwasher screw, cable 39A bracket, and internal-external-teeth lockwasher, and remove reel assembly.

c. Light Assembly Installation.

(1) Position holes in reel mounting bracket on mounting pad holes on the left side of the driver's seat and start the top ¼ x ½ lockwasher screw, but do not tighten.

(2) Aline holes in cable 39A bracket, internal-external-teeth lockwasher, and mounting bracket bottom hole and secure with a ¼ x ½ lockwasher screw.

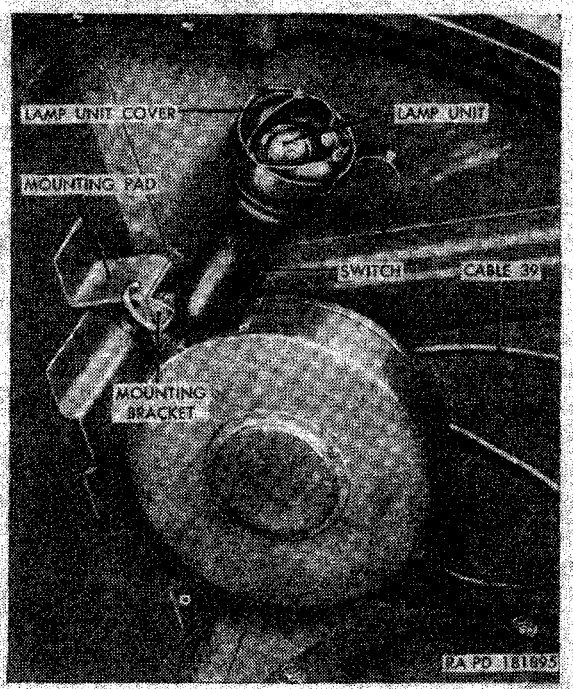


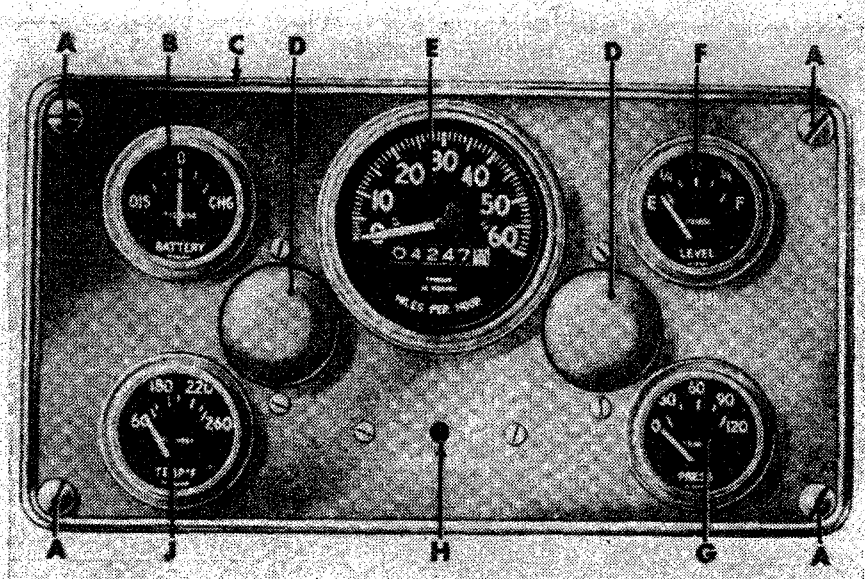
Figure 109. Emergency reel lamp assembly (M170)—installed.

(3) Tighten the mounting bracket top lockwasher screw.

(4) Connect cable 39 bayonet connector and slip cable behind retaining clip.

171. Electrical Components and Cables

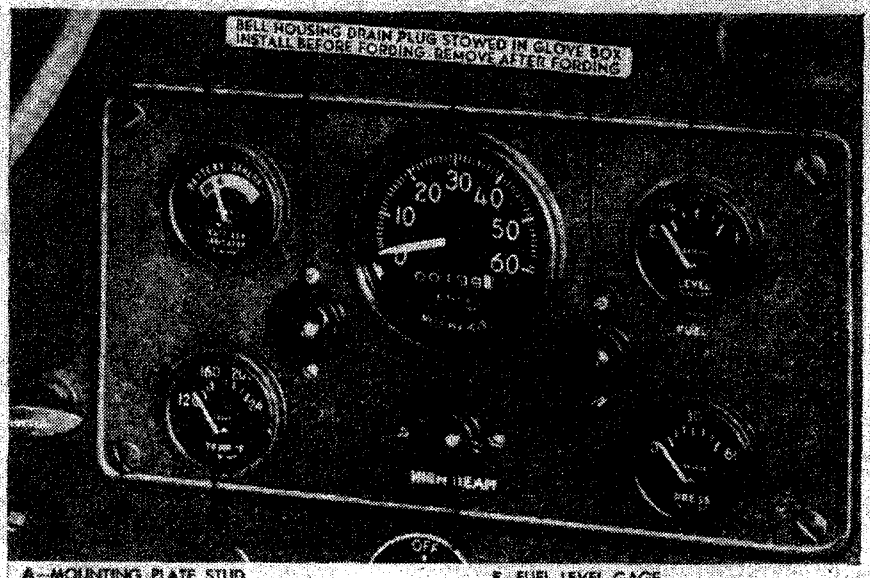
a. General. Each electrical cable, with the exception of spark plug cables, is identified by a numbered metal tag at each end of cable. All cables in a single circuit are identified by the same number; however, when cables are connected through more than one connector, they may connect to a different numbered terminal at each connector. Reference should be made to figures 110 or 111 when making cable replacements.



A—MOUNTING PLATE STUD
B—AMMETER
C—INSTRUMENT CLUSTER
D—INSTRUMENT PANEL LIGHT SHIELD
E—SPEEDOMETER
F—FUEL LEVEL GAGE
G—ENGINE OIL PRESSURE GAGE
H—HEAD LIGHT HIGH BEAM INDICATOR LIGHT
J—ENGINE WATER TEMPERATURE GAGE

RA PD 181898

Figure 112. Instrument cluster (M38A1)—front view.



A—MOUNTING PLATE STUD
B—BATTERY GENERATOR INDICATOR
C—INSTRUMENT CLUSTER
D—INSTRUMENT PANEL LIGHT COVER
E—SPEEDOMETER
F—FUEL LEVEL GAGE
G—ENGINE OIL PRESSURE GAGE
H—HEADLIGHT HIGH BEAM INDICATOR LIGHT
J—ENGINE WATER TEMPERATURE GAGE

RA PD 181899

Figure 113. Instrument cluster (M170)—front view.

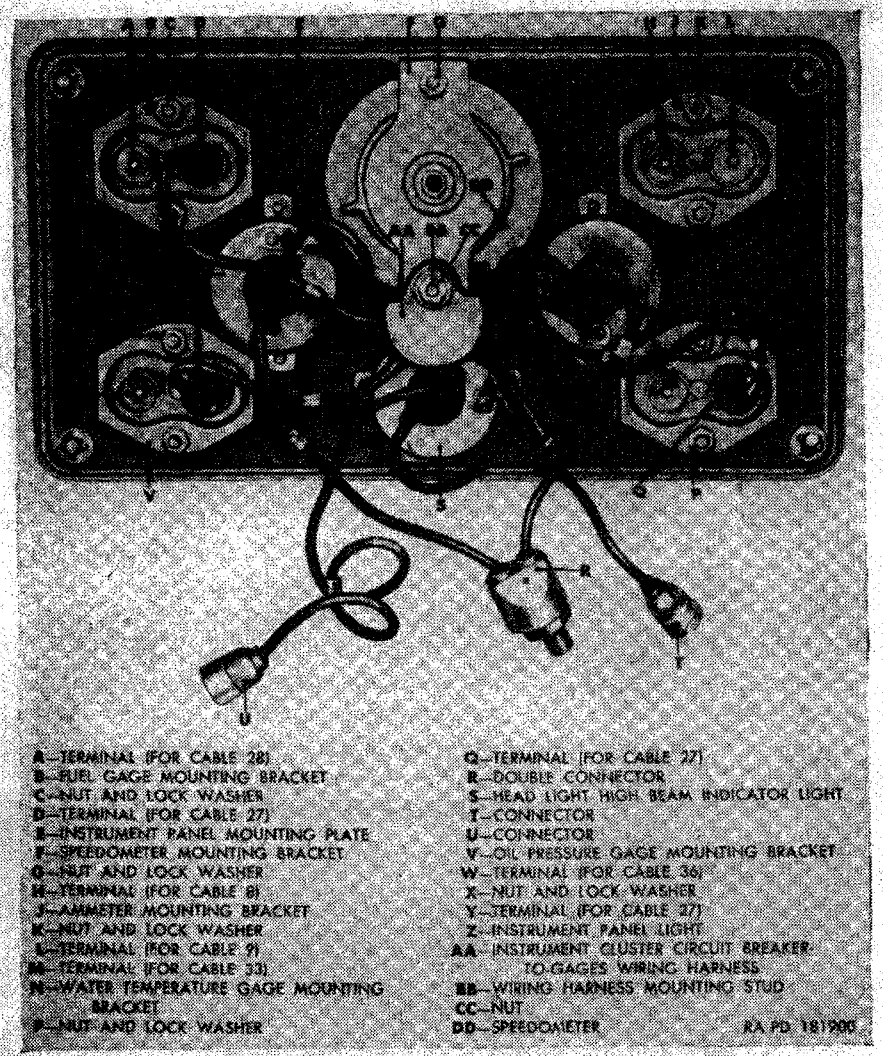


Figure 114. Instrument cluster (M38A1)—rear view.

speedometer flexible shaft assembly to the speedometer (DD) and pull shaft from speedometer. Disconnect cable 27 at connector (T), from instrument cluster circuit breaker-to-gages wiring harness (AA). Disconnect cable 17 at connector (U). Disconnect cable 40 at double connector (R). Disconnect cables 8 and 9 at terminals (H and L). Disconnect cable 33 at terminal (M). Disconnect cable 36 at terminal (W). Disconnect cable 28 at terminal (A). Remove instrument cluster from instrument panel.

b. Installation. Position the instrument cluster at instrument panel so cables may be connected. Connect cable 36 at terminal W, and cable 33 at terminal M. Connect cable 28 at terminal A. Connect cable 8 at terminal H and cable 9 at terminal L. Connect cable

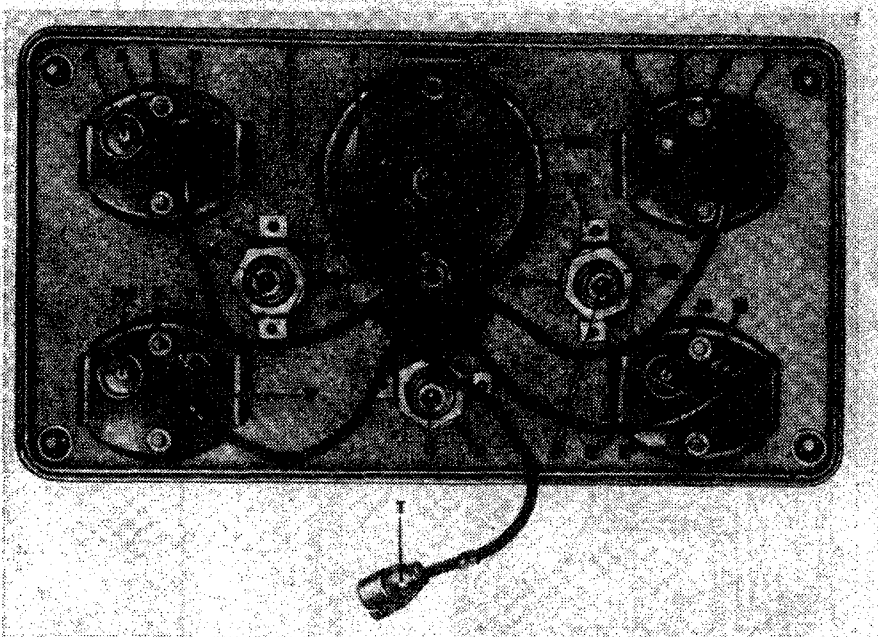
40 at double connector R. Connect cable 17 at connector U. Connect cable 27 to connector T. Position speedometer flexible shaft assembly in rear of speedometer and tighten nut securing shaft to speedometer (DD). Install instrument cluster in instrument panel and secure in position by turning the four instrument cluster mounting plate studs (A, fig. 112) one-half turn clockwise. Connect ground cable 7 (par. 162*b*(9)(*b*) and (*c*)).

174. Ammeter (M38A1) and Battery Generator Indicator (M170)

a. Ammeter Removal (M38A1).

Note. The key letters noted in parentheses refer to figure 114, except where otherwise indicated.

Disconnect ground cable 7 (par. 162*b*(8)(*a*) and (*b*)). Turn the four instrument cluster mounting plate studs (A, fig. 112) one-half



A—TERMINAL (FOR CABLE 28)
B—FUEL GAGE MOUNTING BRACKET
C—NUT AND LOCK WASHER
D—TERMINAL (FOR CABLE 27)
E—INSTRUMENT PANEL MOUNTING PLATE
F—SPEEDOMETER MOUNTING BRACKET
G—NUT AND LOCK WASHER
H—NUT AND LOCK WASHER
J—BATTERY GENERATOR INDICATOR MOUNTING BRACKET
K—NUT AND LOCK WASHER
L—TERMINAL (FOR CABLE 27)
M—TERMINAL (FOR CABLE 33)
N—WATER TEMPERATURE GAGE MOUNTING BRACKET
P—NUT AND LOCK WASHER
Q—CABLE 27
R—CONNECTOR (FOR CABLE 40)
S—HEAD LIGHT HIGH BEAM INDICATOR LIGHT
T—CONNECTOR TERMINAL (FOR CABLE 27)
U—TERMINAL (FOR CABLE 17)
V—OIL PRESSURE GAGE MOUNTING BRACKET
W—TERMINAL (FOR CABLE 36)
X—NUT AND LOCK WASHER
Y—TERMINAL (FOR CABLE 27)
Z—INSTRUMENT PANEL LIGHT
AA—INSTRUMENT CLUSTER CIRCUIT BREAKER-TO-GAGES WIRING HARNESS
BB—WIRING HARNESS MOUNTING STUD
CC—NUT
DD—SPEEDOMETER
EE—BRACKET
FF—NUT

RA PD 181901

Figure 115. Instrument cluster (M170)—rear view.

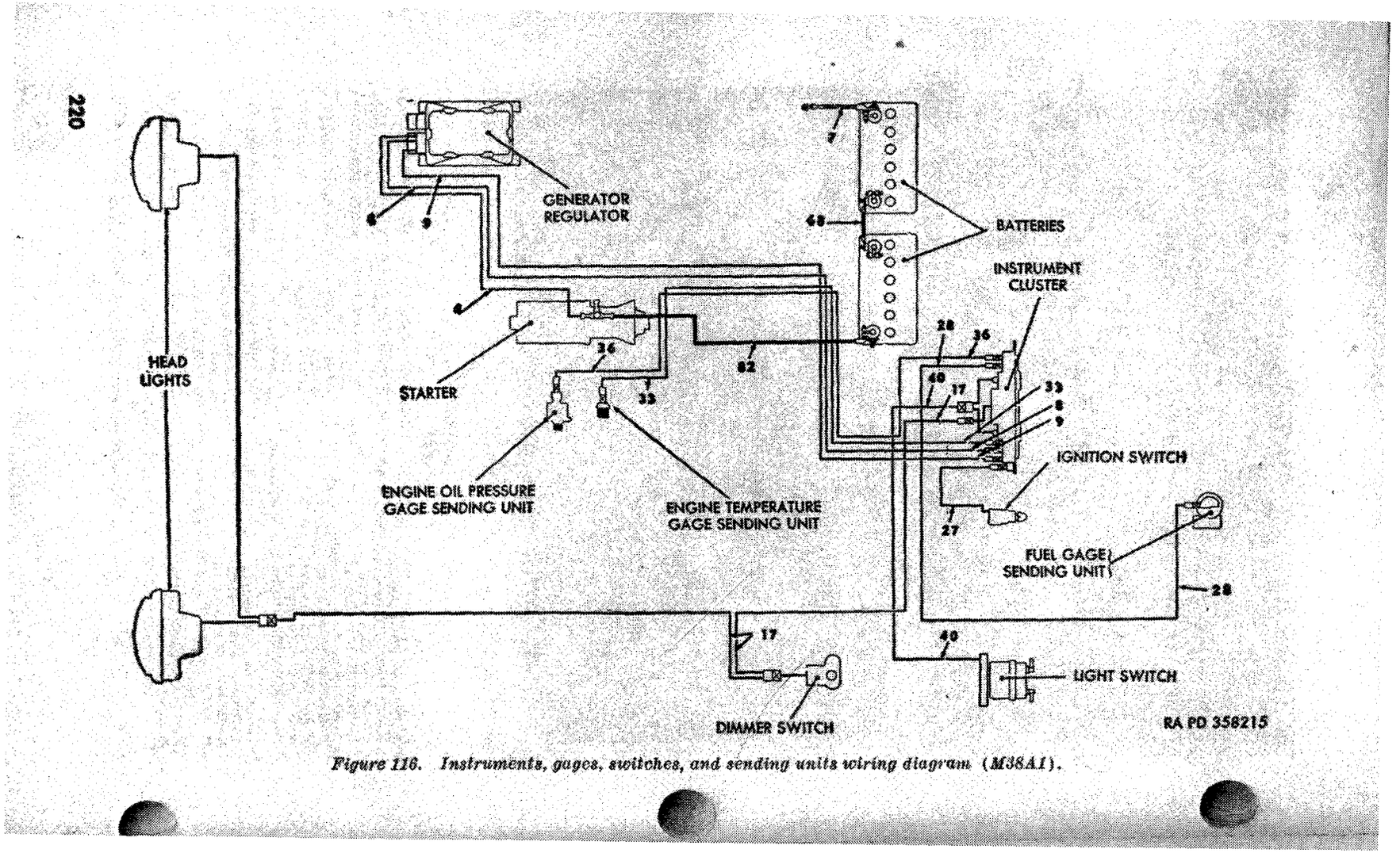


Figure 116. Instruments, gages, switches, and sending units wiring diagram (M38A1).

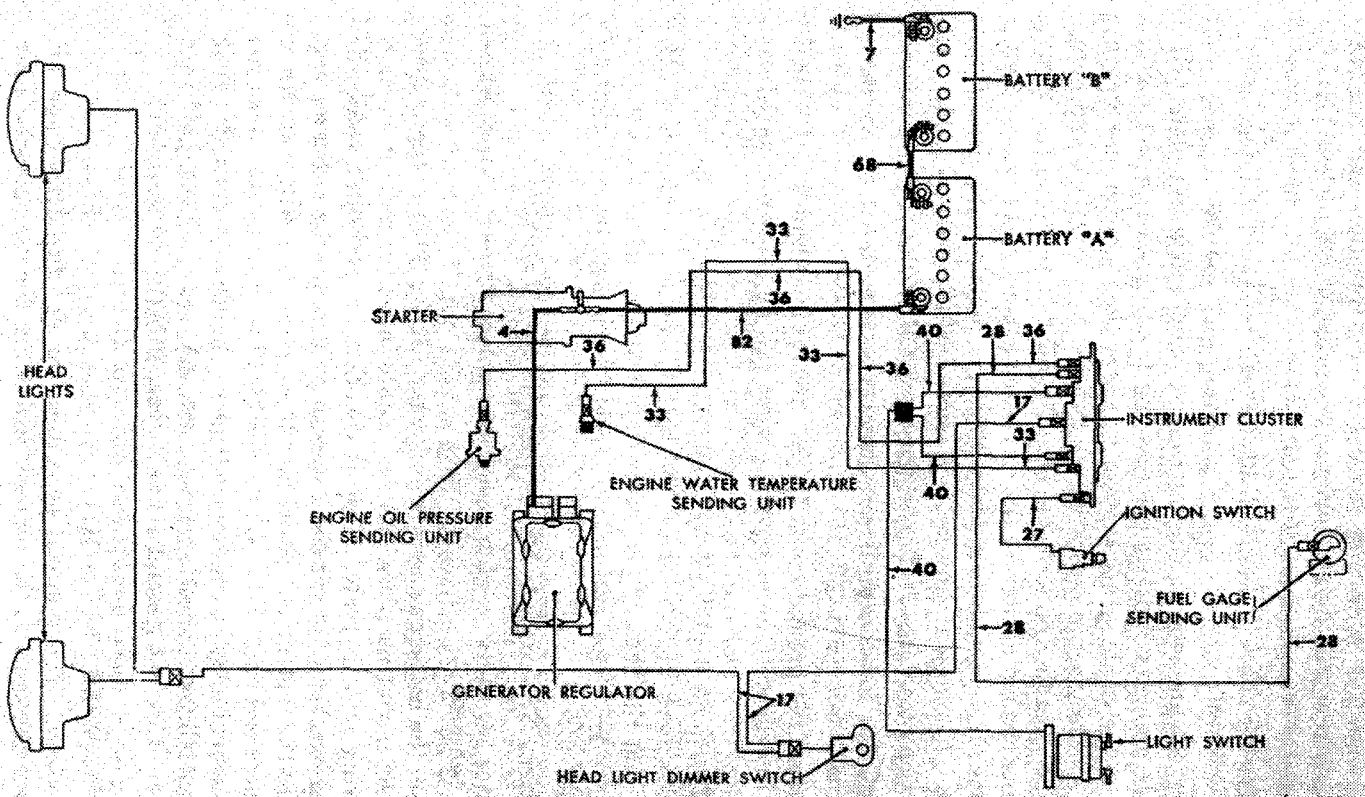


Figure 117. Instruments, gages, switches, and sending units wiring diagram (M170).

c. Slide the release bearing carrier (fig. 124) and release bearing on to the input shaft, making certain to position the two flanges vertically as shown in figure 124. Connect the release bearing carrier spring to the bearing cover on the transmission. Install the release fork ball stud in the bearing cover hole.

d. Aline the input shaft splines with the clutch driven disk (fig. 125) hub splines and insert the input shaft through the disk hub until it seats in the engine flywheel clutch pilot bearing. Secure the

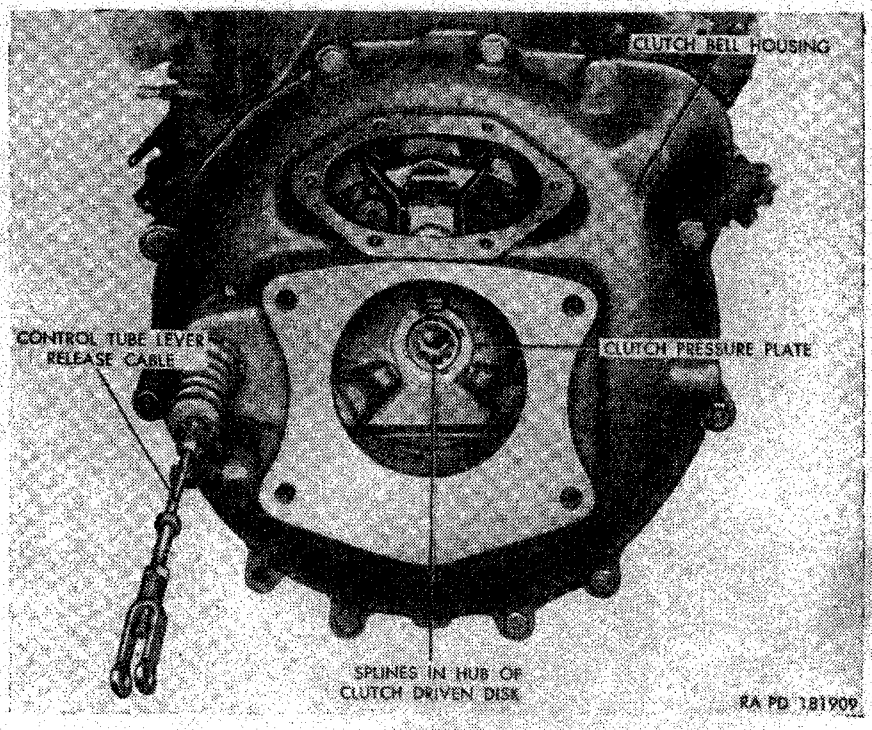


Figure 125. Clutch bell housing—rear view—transmission removed.

transmission to the clutch bell housing with four 7/16-inch copper washers and 7/16 x 1¼ bolts (*fig.* 123). Tighten the bolts evenly.

e. Working through the inspection hole in the top of the bell housing, install the release fork so the fork recess engages the bearing cover ball stud, and with the two large ends of the fork behind the release bearing carrier flanges. Engage the control tube lever release cable ball behind the two projections at the small end of the fork. Coat a new linkage inspection cover gasket with plastic-type liquid cement. Place the gasket and the inspection cover in position on top of the clutch ball housing (fig. 123). Secure cover and gasket to bell housing with six ¼ x ½ lockwasher screws.

f. Install transfer (par. 200).

g. Install the power plant (par. 124).

h. Record the replacement of the transmission on DA Form 478.

Section XVII. TRANSFER

197. Description and Data

a. Description. The transfer is an auxiliary, two-speed gear unit, attached to the rear of the transmission. The transfer transmits power from the transmission to the front and rear differentials through propeller shafts. By manipulation of two transfer gearshift levers (T, fig. 11), additional high and low speed ranges can be selected, and power to the front axle can be connected or disconnected. The hand brake drum (fig. 126) and shoes are mounted on the rear of the transfer. A cover at the rear of the transfer provides access to the interior of the assembly when installing a power takeoff.

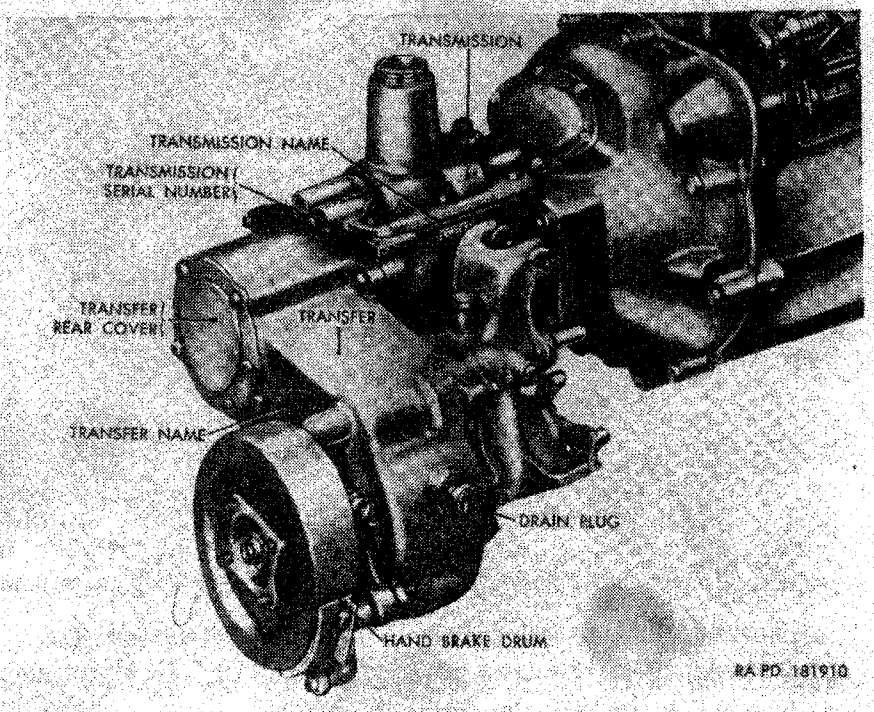


Figure 126. Transfer and transmission assemblies installed on engine—power plant removed from vehicle.

b. Data.

Make	Spicer Mfg Corp
Model	18
Ratios:	
Low range	2.43 to 1
High range	1.00 to 1
Lubricant capacity	3 pt

198. Coordination With Ordnance Maintenance Unit

Refer to paragraph 2 for information on coordination with an ordnance maintenance unit.

199. Transfer Removal

a. Remove the power plant (par. 120).

b. Remove the drain plugs from the transmission (fig. 123) and transfer (fig. 126) and permit the lubricant to drain. After draining completely, install the drain plugs.

c. Remove five bolts and external-teeth lockwashers securing the transfer rear cover (fig. 126) to the transfer case. Remove the cover and rear cover gasket. Discard gasket.

d. Shift transmission out of neutral and remove the cotter pin, nut (fig. 127), and washer securing the transfer drive gear to the transmission main shaft. Shift transmission back to neutral. Pull the drive gear off the shaft.

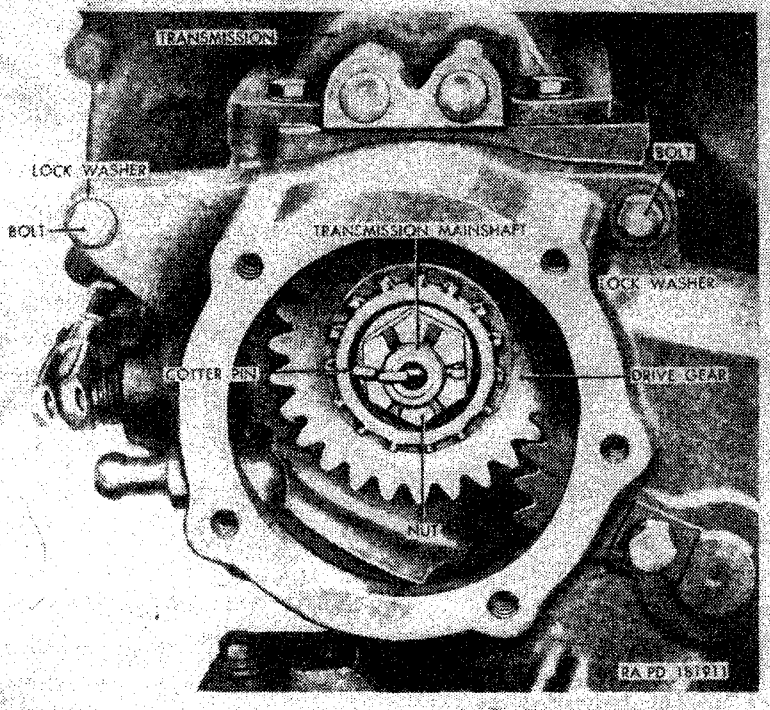


Figure 127. Transfer drive gear installed.

e. While supporting the transfer, remove the four bolts and lockwashers (fig. 127) two at the top, and two at the bottom, securing the transfer to the transmission. Remove a fifth bolt and lockwasher securing the transfer to the transmission from the lower right rear of the transmission flange.

f. Pull the transfer straight back until it clears the bearing mounted on the transmission main shaft.

g. Remove and discard the transfer case-to-transmission gasket.

h. Remove the nut (fig. 128) and washer securing the companion flange to the rear axle output shaft. Using a suitable puller, pull the

companion flange and hand brake drum off the shaft. Remove the four bolts securing the drum to the flange and separate the drum from the flange.

i. Remove the nut and lockwasher securing the anchor pin (fig. 128) to the transfer. Pull the anchor pin, with inner and outer shoes attached, from the transfer.

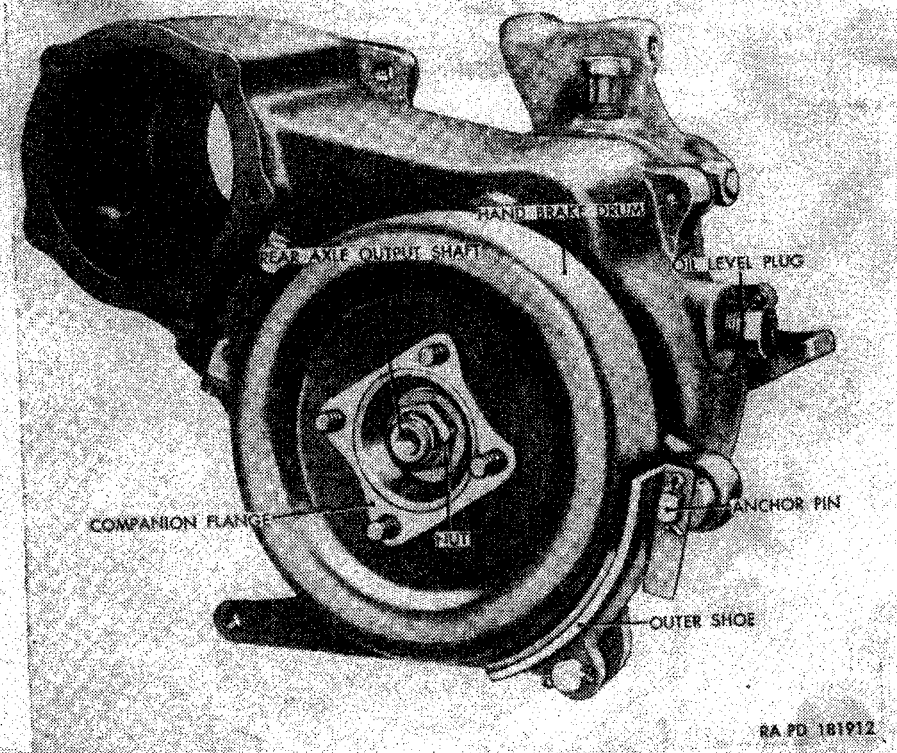


Figure 128. Transfer removed.

200. Transfer Installation

a. Insert the anchor pin (fig. 128), with inner and outer shoes attached, through the hole in the retainer of the transfer. Secure the pin to the retainer with one ⅝-inch washer and nut.

b. Position the hand brake drum (fig. 128) on the companion flange, with the drum rim toward the flange hub. Secure the drum to the flange with four ⅜ x 1⅛ bolts with bolts in position shown in figure 128. Aline the flange splines with the rear axle output shaft splines. Install the flange on the shaft, making certain the inner and outer shoes are alined to mate with the brake drum rim. Using a soft mallet, tap the flange into position on the shaft. Secure the flange to the shaft with one ¾-inch washer and ¾-inch nut.

c. Make certain the transfer and transmission mating surfaces are clean and free of old gasket material. Coat a new transfer case-to-transmission gasket with plastic-type gasket cement and position the gasket on the front side of the transfer case. Make certain the transmission main shaft bearing is in place against the transmission rear flange. Position the transfer assembly on the rear of the transmission assembly. Secure the transfer to the transmission with four 3/8 x 1 1/8 bolts (fig. 127).

Note. The four 3/8 x 1 1/8 bolts are installed from the rear side of the transfer flange into the transmission. The 3/8 x 1 bolt is installed through the rear flange of the transmission into the transfer.

Draw the bolts up evenly.

d. Working through the opening at the rear of the transfer, slide the transfer drive gear onto the transmission main shaft. Making certain the drive gear teeth are mated with the transfer countershaft gear teeth. Secure the gear to the shaft with one 7/8-inch washer, 7/8-inch nut, and 1/8 x 1 1/4 cotter pin.

Note. Shift transmission out of neutral, if necessary, to prevent main shaft turning when nut is tightened.

e. Coat a new rear cover gasket with plastic type gasket cement and position gasket and transfer rear cover (fig. 126) on the rear of the transfer case. Secure the cover to the case with five 3/8-inch external-teeth lockwashers and five 3/8 x 3/4 bolts.

f. Install the power plant (par. 124).

g. Record the replacement of the transfer on DA Form 478.

Section XVIII. PROPELLER SHAFTS WITH UNIVERSAL JOINTS

201. Description and Data

a. Description. The front propeller shaft (fig. 129) with universal joints transmits power from the transfer to the front axle. The rear propeller shaft (fig. 130) with universal joints transmits power from the transfer to the rear axle. Each assembly includes a propeller shaft, a universal joint sleeve yoke, and two universal joints. Corresponding parts of the front and rear assemblies are similar except for the length of the shaft, and the front universal joints of the rear propeller shaft. This universal joint includes the propeller shaft flange yoke, and is modified accordingly.

b. Data.

Manufacturer	Spicer Mfg Corp
Type of shaft	tube, with welded seam
Type of joints	roller bearing

202. Front Propeller Shaft With Universal Joints
(fig. 129)

a. Removal.

(1) Remove the four safety nuts from the two U-bolts securing the rear universal joint to the transfer-front axle output shaft yoke. Remove the U-bolts and separate the universal joint from the yoke.

(2) Loosen and remove the four safety nuts from the two U-bolts securing the front universal joint to the front axle end yoke with shield assembly. Remove the U-bolts, and remove the front propeller shaft with universal joints from under the vehicle.

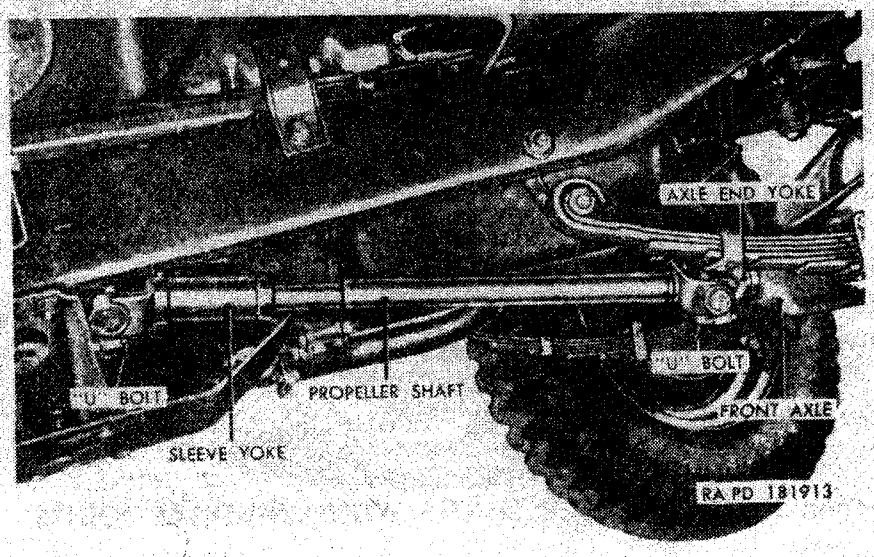


Figure 129. Front propeller shaft with universal joint assembly—installed.

b. Installation.

(1) Position the front propeller shaft with universal joints under the front of the vehicle and insert the front universal joint into the front axle end yoke with shield assembly. Place the two U-bolts over the two exposed journal bearings and insert the U-bolt ends through the holes in the axle end yoke. Secure the U-bolts to the yoke with four $^{5}/_{16}$-inch safety nuts.

(2) Insert the rear universal joint into the transfer-front axle output shaft yoke. Place the two U-bolts over the two exposed journal bearings and insert the U-bolt ends through the holes in the yoke. Secure the U-bolts to the yoke with four $^{5}/_{16}$-inch safety nuts.

203. Rear Propeller Shaft With Universal Joints (fig. 130)

a. Removal.

(1) Remove the four safety nuts from the two U-bolts securing the rear universal joint to the rear axle end yoke. Remove the U-bolts, and separate the universal joint from the yoke.

(2) Loosen the four nuts on the bolts securing the rear propeller shaft flange yoke to the transfer companion flange. Remove the nuts and lockwashers, and remove the propeller shaft with universal joints from under the vehicle.

b. Installation.

(1) Position the rear propeller shaft with universal joints under the rear of the vehicle. Position the rear propeller shaft

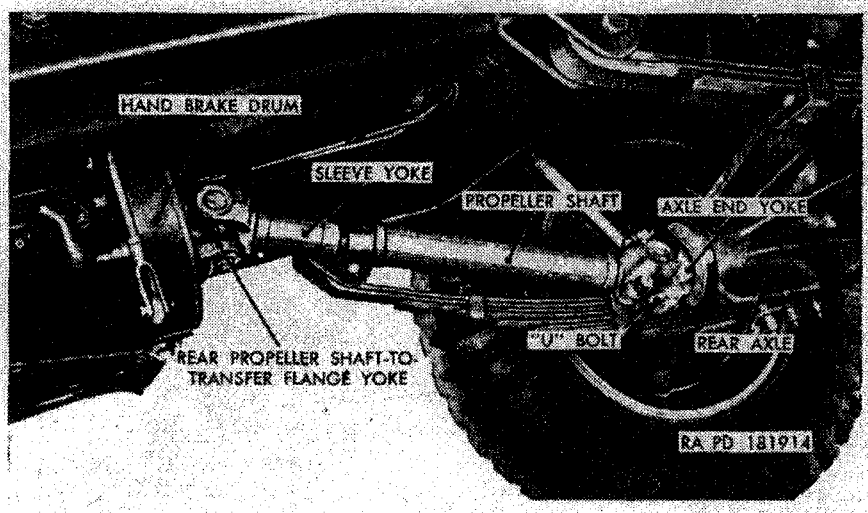


Figure 130. Rear propeller shaft with universal joints—installed.

flange yoke on the four 3/8-inch bolts projecting from the transfer companion flange. Place four 3/8-inch lockwashers and 3/8-inch nuts on the ends of the bolts, and tighten the nuts.

(2) Insert the rear universal joint into the rear axle end yoke. Place two U-bolts over the two exposed journal bearings, and insert the ends of the U-bolts through the holes in the yoke. Secure the U-bolts to the yoke with four 5/16-inch safety nuts.

204. Universal Joints

a. Front Propeller Shaft Universal Joints Disassembly (fig. 131). Procedures for disassembly of both universal joints of the front propeller shaft with universal joints are the same.

(1) Remove front propeller shaft with universal joints (par. 202*a*).

(2) Remove the two loose journal bearings and oil seals from journal, being careful not to lose the rollers. Do not remove the plug.

(3) Remove the two journal bearing snap rings from the yoke by squeezing the open ends of the ring together with pliers. Place a brass drift against the end of one of the bearings and drive the bearing into the yoke until the bearing on the opposite end of the journal is driven out of the yoke. Pull the protruding bearing and journal bearing oil seal from the

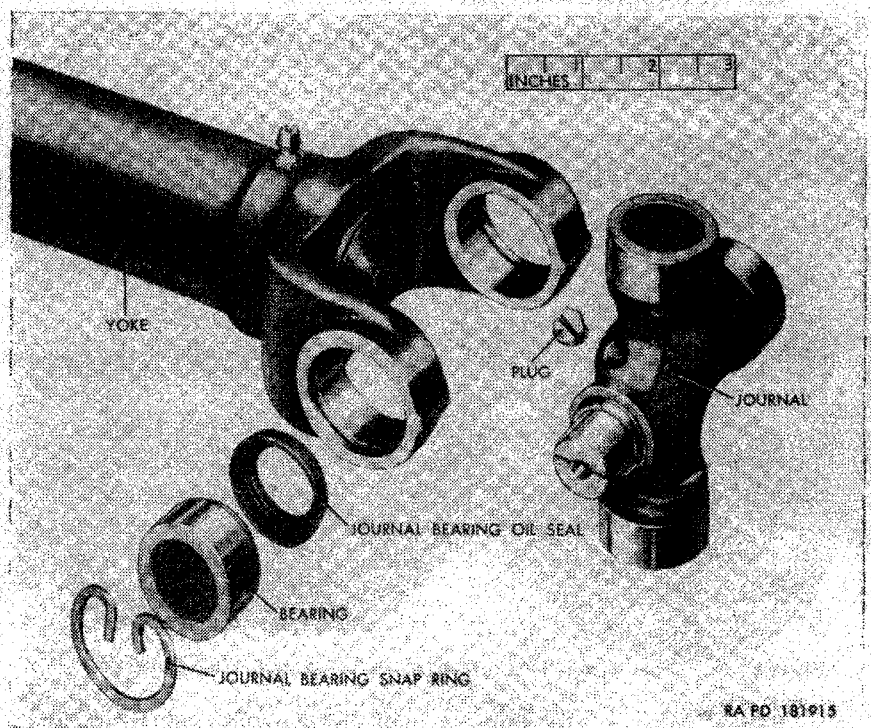


Figure 131. Front propeller shaft universal joint and yoke—partially exploded view.

journal, being careful not to lose the rollers. Using the brass drift against the end of the journal from which the bearing has been removed, drive the journal back until the other bearing has been driven out of the yoke. Pull the second bearing and the journal bearing oil seal from the journal, being careful not to lose the rollers. Slide the yoke to one side of the journal and work the journal out of the yoke.

b. Front Propeller Shaft Universal Joints Assembly (fig. 131). Procedures for assembly of both universal joints of the front propeller shaft with universal joints are the same.

(1) Push a journal bearing oil seal onto each of the two journal ends, convex side first. Insert the journal into the yoke holes.
(2) Carefully start the two bearings onto the journal ends and into the yoke holes. Using a brass drift, carefully tap the bearings in until their outer ends are just inside the snap ring grooves in the holes. Install the two journal bearing snap rings by squeezing the ends together with pliers.
(3) Push a journal bearing oil seal onto each of two journal ends, convex side first. Push a bearing onto each journal end.
(4) Install the front propeller shaft with universal joints (par. 202*b*).

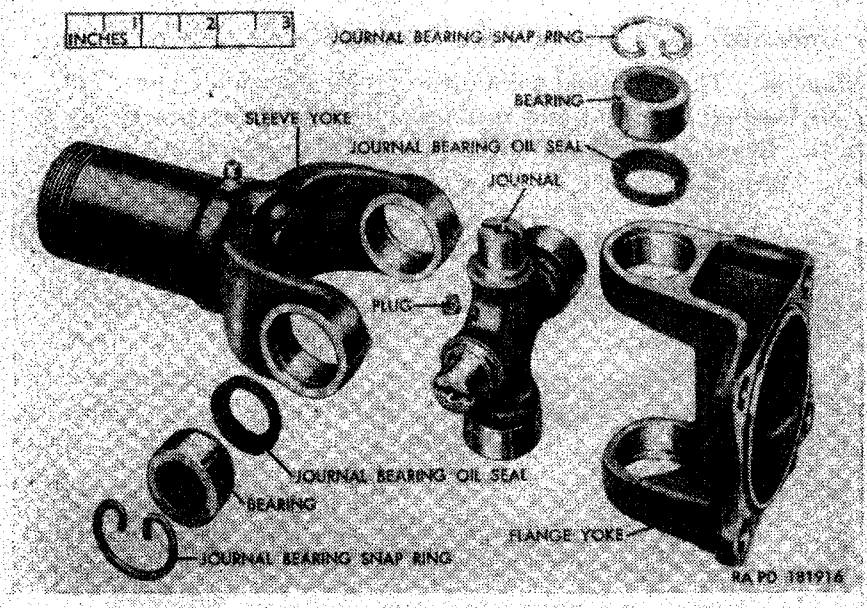


Figure 132. Rear propeller shaft front universal joint and rear propeller shaft-to-transfer flange yoke—partially exploded view.

c. Rear Propeller Shaft Universal Joints Disassembly. Remove the rear propeller shaft with universal joints (par. 203*a*). Procedure for disassembly of the rear universal joint of the rear propeller shaft is the same as the procedure for disassembly of the universal joints of the front propeller shaft (*a*(2) and (3) above). For disassembly of the front universal joint of the rear propeller shaft, refer to figure 132.

(1) Follow the procedure of *a*(3) above to remove journal and bearings from the sleeve yoke.
(2) Follow the procedure of *a*(3) above to remove journal and bearings from the rear propeller shaft-to-transfer flange yoke.

(10) Withdraw the shaft with universal joint assembly (E, fig. 136) from the axle housing.

b. Installation.

(1) Insert the shaft with universal joint assembly (E, fig. 136) through the steering knuckle flange with arm assembly (F, fig. 136) and into the axle housing. Rotate the shaft until it can be started into the differential side gear. With a soft mallet, tap the shaft until it seats in the housing.

(2) Place the spindle with bearing assembly (D, fig. 136) on the shaft with the spindle mounting holes alined with the steering knuckle flange mounting holes, and tap the spindle into position against the flange. Place the brake backing plate

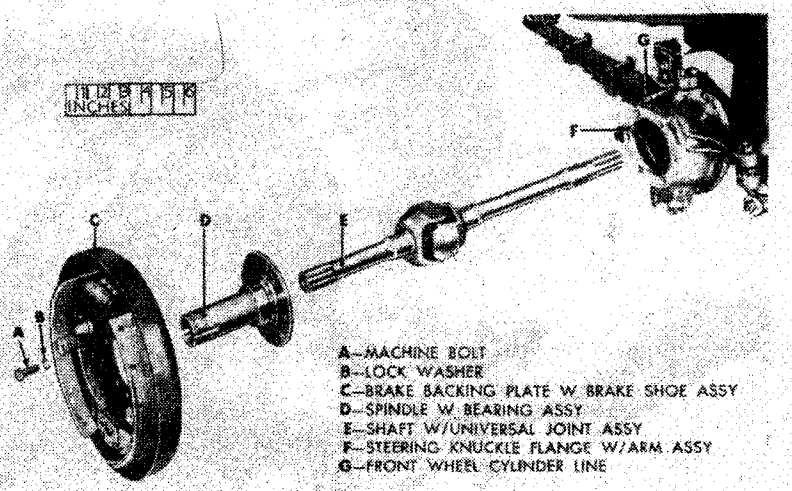


Figure 136. Shaft with universal joint, spindle with bearing, and brake backing plate with brake shoe assemblies—partially exploded view.

with brake shoe assembly (C, fig. 136) on the spindle with the backing plate mounting holes alined with the spindle and steering knuckle flange mounting holes. Secure the backing plate and spindle to the flange with six 3/8-inch lockwashers and 3/8 x 3 3/4 bolts (A and B, fig. 136).

(3) Screw the front wheel cylinder line (G, fig. 136) nut into the front wheel cylinder assembly.

(4) Place the hub and brake drum (P) on the spindle. With the small end of the bearing taper toward the vehicle, insert the hub bearing cone (outer) (L) into the hub, and press into position.

(5) Slide the hub bearing washer (K) on the spindle shaft with the washer tang in the shaft slot. Screw the hub bearing adjusting nut (J) on the spindle shaft, fingertight.

(6) Position the wheel on the wheel hub and brake drum. Screw five ½-inch nuts on the hub studs (left wheel, counterclockwise; right wheel, clockwise). Tighten the nuts alternately and evenly.

(7) Adjust the front hub bearing (par. 208*a*(2)).

(8) Slide the hub bearing nut lockwasher (H) on the spindle shaft with the washer tang in the shaft slot. Screw the hub bearing jamnut (G) on the spindle shaft, and tighten nut with the wheel bearing nut wrench—41–W–3825–200 (fig. 135).

(9) Bend the lockwasher edge to engage one flat of the jamnut.

Caution: Never use a point next to the hub mounting holes as a fulcrum.

(10) Apply a little grease to the gasket surface of the drive shaft flange (E) and place a new drive shaft flange gasket (F) on the flange with the gasket holes alined with the flange holes.

(11) Place the flange and gasket on the shaft and aline the flange splines with the shaft splines. With a soft mallet, tap the flange and gasket part way onto the shaft. Turn the hub and drum to aline the flange mounting holes with the hub mounting holes. Tap the flange completely onto the shaft and secure to the hub with six ⅜-inch lockwashers and ⅜ x ¾ bolts.

(12) Slip the hub cap seal (B) over the drive shaft flange end and into the flange recess.

(13) Place the hub cap (A) over the flange end and tap into position.

(14) Bleed the brakes (par. 237).

(15) Remove the safety stands or blocking and lower vehicle to the ground.

208. Front Hub Bearings

a. Adjustment.

(1) Jack up the vehicle and follow the procedure described in paragraph 207*a*(2) through (5).

(2) With wrench 41–W–3825–200 (fig. 135), tighten the hub bearing adjusting nut (J, fig. 134) until the bearings begin to bind when the wheel is turned. Back off on the adjustment one-sixth turn or until the wheel just turns freely.

(3) Follow the procedure described in paragraph 207*b*(8) through (13), and (15).

b. Removal.

(1) Follow the procedure described in paragraph 207*a*(1) through (7).

(2) Using a brass drift, tap the hub (inner) bearing cone and hub bearing oil seal (fig. 137) out of the hub. Discard oil seal.

(3) Install the remover and replacer 41–R–2374–845 and screw 41–S–1047–330 (fig. 138) in the hub bearing cup (inner) (fig. 137) and drive the cup out of the hub. Reverse the hub and, with the remover and replacer 41–R–2374–845 and screw 41–S–1047–330, drive the hub bearing cup (outer) from the hub.

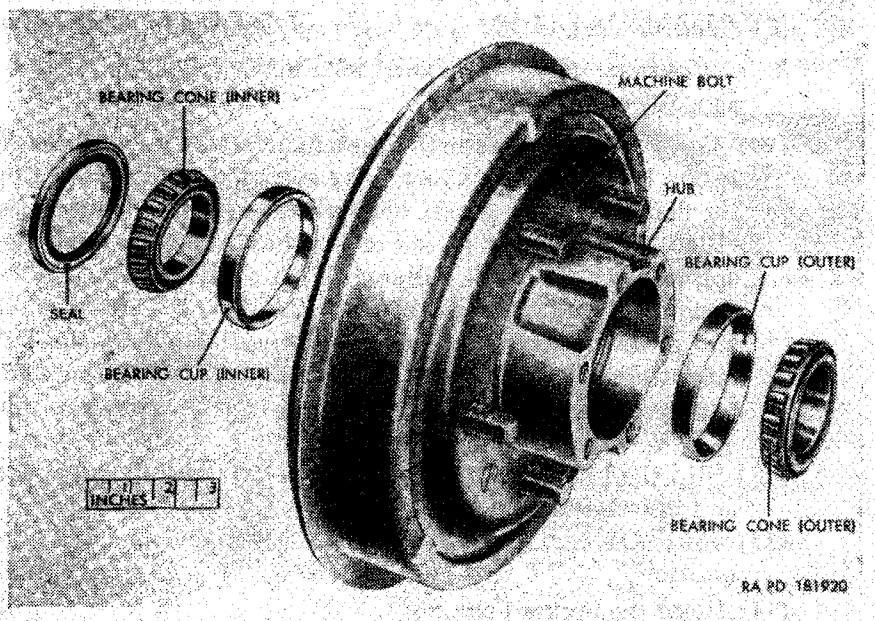


Figure 137. Front hub and drum, inner and outer bearing, and oil seal assemblies—exploded view.

c. Cleaning and Packing. Clean all lubricant from front hub bearing cups and cones with dry-cleaning solvent or volatile mineral spirits. Pack bearing cones with the grease prescribed in paragraph 69. If a bearing packer is not available, pack bearings by hand, working grease into cone rollers. Keep bearing cones clean.

d. Installation.

(1) Insert the small inside diameter end of the hub bearing cup (outer) (fig. 137) into the brake drum side of the hub. Place the remover and replacer 41–R–2374–845 and screw 41–S–1047–330 (fig. 138) in the hub and drive cup into position.

(2) Insert the small inside diameter end of the hub bearing cup (inner) (fig. 137) into the brake assembly side of the hub. Place the remover and replacer 41–R–2374–845 and screw

(2) Withdraw the cotter pin and unscrew the nut securing the steering tie rod end to the steering knuckle arm (fig. 141).

(3) Remove the front brake flexible line assembly (par. 236*b*(1)(*a*)).

(4) Unscrew the two machine bolts (T, fig. 134) and remove the bolts, lockwashers, and flexible line guard (U, fig. 134).

(5) Remove the two remaining bolts and lockwashers, and pry the flange upper cap and shims from the flange.

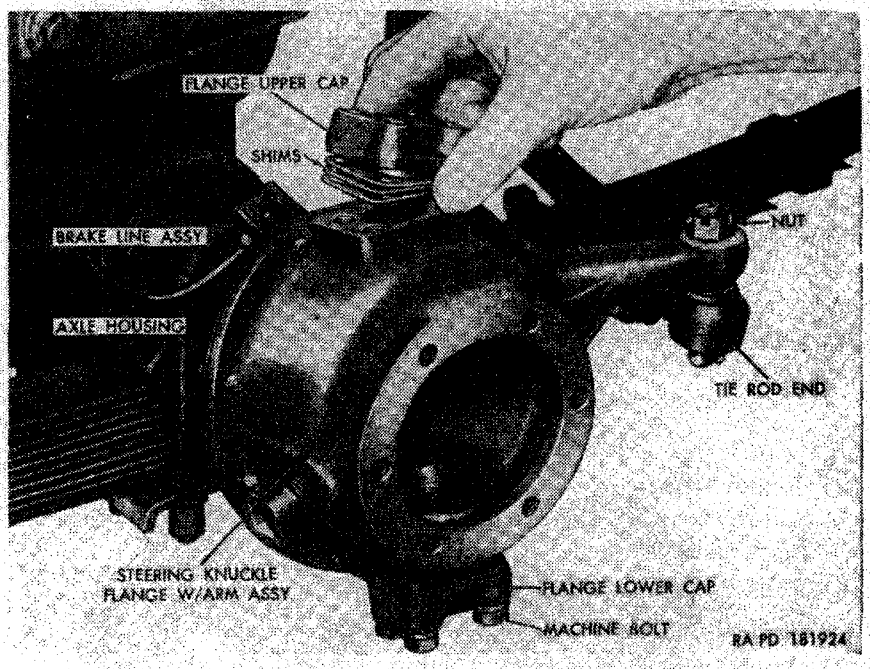


Figure 141. Removing flange upper cap and shims from right steering knuckle flange.

(6) Loosen the four bolts securing the flange lower cap (fig. 141) to the flange and remove the bolts and lockwashers. Pry the cap from the flange.

(7) Remove the steering knuckle flange oil seal with retainer assembly (par. 212*a*).

(8) Pull the steering knuckle flange off the axle housing and steering tie rod end.

(9) Lift one bearing cone out of the flange and the other out of the axle housing.

(10) Position the remover and replacer 41–R–2374–750 and screw 41–S–1047–300 (fig. 142) in the axle housing and drive one steering knuckle flange cap bearing cup out of the housing. Remove the other cup in the same manner.

214. Front Axle Assembly

a. Removal.

(1) Place a jack under the front axle and raise the vehicle until the front tires clear the ground. Place safety stands or suitable blocking under the frame side rails to the rear of the front springs. Leave the jack in position to support the axle during removal.

(2) Remove both front wheels (par. 250*a*).

(3) Disconnect the tie rod ends from the right and left steering knuckle arms (par. 225*a*).

(4) Unscrew the nut from the flexible line that connects the front master cylinder line to the front axle tee (Z, fig. 162). Remove the clip securing the flexible line to the mounting bracket on the engine bracket, located on the frame side rail.

(5) Remove the universal joint of the propeller shaft from the axle end yoke (par. 202*a*(2)).

(6) Disconnect the two shock absorbers at the lower end only par. 247*a*).

(7) Disconnect the stabilizer bar links (par.243*a*(2)) on the M170.

(8) Remove the U-bolt plates from both sides of the vehicle (par. 245*a*(3)).

(9) Remove the spring pivot bolt from the front end of each front spring (par. 244*a*(3)). Lower the front ends of both springs to the ground.

(10) Lower the jack and remove the axle assembly from the front of the vehicle.

b. Installation.

(1) Jack the axle into position and install suitable blocking.

(2) Raise the front ends of both springs into position and install the pivot bolts (par. 244*b*(1) and (2)).

(3) Aline the axle over the spring center bolts and install the U-bolt plates (par. 245*b*(3) and (4)).

(4) Connect the stabilizer bar link (par. 243*b*(5)) on the M170.

(5) Connect the lower ends of the two shock absorbers.

(6) Install the universal joint of the propeller shaft in the axle end yoke (par. 202*b*(1)).

(7) Insert the flexible line fitting end connecting the front master cylinder line to the front axle tee through the bracket hole on the engine bracket on the frame side rail. Drive the clip into the fitting recess. Connect the master cylinder front line to the flexible line by tightening the sleeve nut.

(8) Insert the steering tie rod end stud into the steering knuckle arm tapered hole and secure in position with a ½-inch

(2) Place the bearing cone, with small end of taper facing out, on the shaft tapered end and force the cone against the shaft shoulder.

(3) Insert the shaft with cone into the axle housing. Rotate the shaft to aline the splines and push the shaft into the differential.

(4) Install the bearing cup over the cone and tap the cup until it is well started into the housing.

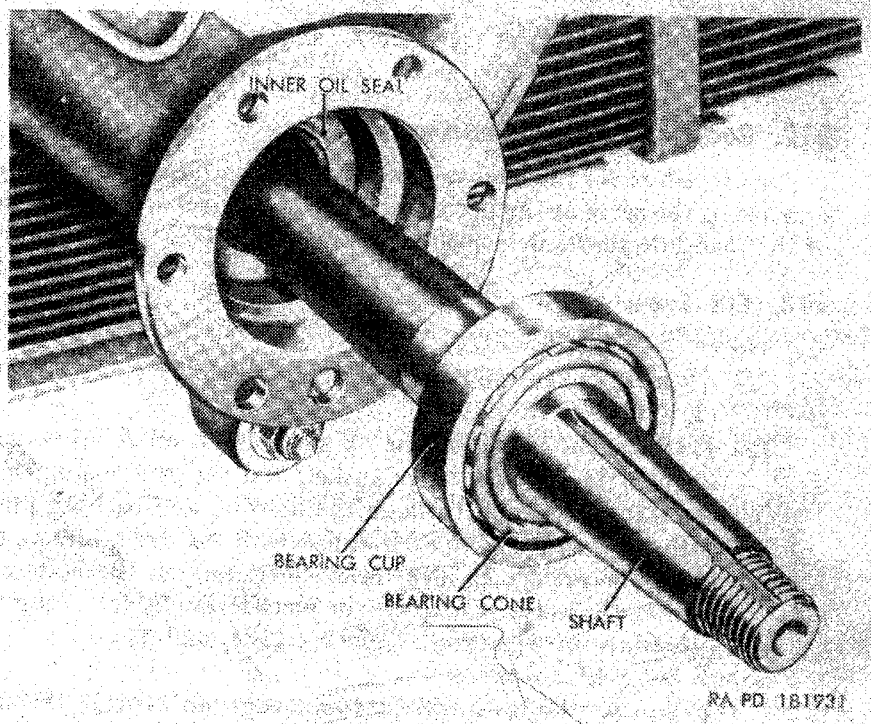


Figure 148. Rear axle shaft with bearing assembly—partially withdrawn from housing.

(5) Position the shims and bearing retainer (fig. 147) over the shaft, alining the retainer and shim drain holes with the housing drain hole. Insert three 3/8 x 1¼ bolts through alternate holes in the housing, shims, and retainer.

(6) Position the backing plate with brake shoe assemblies against the bearing retainer with the plate drain hole alined with the bearing retainer and housing drain hole.

(7) Position the oil seal gasket, the outer oil seal, the grease slinger gasket, and the grease slinger on the backing plate, with the drain hole in each alined with the drain hole in the plate. Insert the remaining three 3/8 x 1¼ bolts through

the holes in the axle housing and positioned parts. Place six ⅜ lockwasher nuts on the bolts and tighten the nuts.

(8) Connect the brake line to the brake wheel cylinder.

(9) Place the hub and drum (fig. 146) on the shaft, with the hub keyway alined with the shaft keyway. Insert the key into the keyway and tap the key and hub and drum into position on the shaft.

(10) Place the shaft washer on the shaft, screw the shaft nut on the end of the shaft and secure the nut with a ⅛ x 1½ cotter pin.

(11) Install the wheel (par. 250*b*), and lower the vehicle to the ground. Bleed the brakes (par. 237).

217. Rear Axle Shaft Bearings

The procedure for the removal and installation of the rear axle shaft bearings is the same as the procedure for the removal and installation of the rear axle shafts described in paragraph 216.

218. Oil Seals

a. Outer Oil Seal Assembly.

(1) *Removal.* Remove the outer oil seal assembly (par. 216*a*(1), (2), (3), and (5)).

(2) *Installation.* Position the oil seal gasket, outer oil seal assembly, the grease slinger gasket, and the grease slinger on the bolts projecting through the housing and backing plate, with the drain hole in each alined with the drain hole in the plate. Place six ⅜-inch lockwasher nuts on the bolts and tighten the nuts. Complete the installation by following the procedure in paragraph 216*c*(9), (10), and (11).

b. Inner Oil Seal Assembly.

(1) *Removal.* Follow procedure in paragraph 216*a*(1) through (8).

(2) *Installation.* Follow procedure in paragraph 216*c*(1), and (3) through (11).

219. Rear Brake Drums

a. Removal.

(1) Remove the wheel (par. 250*a*).

(2) Remove the three bolts (figs. 139 and 146) securing the drum to the hub, and pull the drum from the hub (fig. 139).

b. Installation.

(1) Position the drum (fig. 139) on the hub, alining the drum mounting holes with those in the hub. Secure the drum to the hub with three ¼ x ⅝ bolts.

(2) Install the wheel (par. 250*b*).

220. Rear Hubs

a. Removal.

(1) Follow the procedure of paragraph 216*a*(1), (2), and (3).

(2) Remove the drum from the hub (par. 219*a*(2)).

(3) If it is necessary to replace any hub studs, drive them out of the hub.

b. Installation.

(1) If any hub studs were removed, drive new studs into the hub, using studs with left-hand threads in hubs on the left side of vehicle, and studs with right-hand threads on the right side of the vehicle.

(2) Install the brake drum (par. 219*b*(1)).

(3) Follow procedure of paragraph 216*c*(9), (10), and (11).

221. Rear Axle Assembly

a. Removal.

(1) Remove both rear wheels (par. 250*a*). Install suitable blocking under both frame side rails in front of the rear springs. Leave the jack in position to support the axle during removal.

(2) Unscrew the nut on the master cylinder rear line (J, fig. 162) from the flexible line. Remove the clip securing the end of the flexible line to the bracket on the frame cross member.

(3) Remove the universal joint of the propeller shaft from the rear axle end yoke (par. 203*a*(1)).

(4) Disconnect the stabilizer bar links (par. 243*a*(2)) on the M170.

(5) Remove the four U-bolt nuts and lockwashers from the two U-bolts (fig. 165) securing the U-bolt plate and spring to the axle housing and remove the U-bolts. Swing the lower end of the shock absorber, with U-bolt plate (fig. 165), toward the front of the vehicle. Repeat this procedure on the other side of the vehicle.

(6) Remove the spring shackles from both rear spring assemblies (par. 242*a*(2) and (3)). Lower the ends of the springs to the ground.

(7) Remove all brake lines, connections, and fittings by following the procedure of paragraph 236.

b. Installation. Any parts not supplied with a new axle should be removed from the old axle.

(1) Install all brake lines, connections, and fittings on the axle assembly (par. 236).

(2) Position the axle assembly between the rear springs and frame.

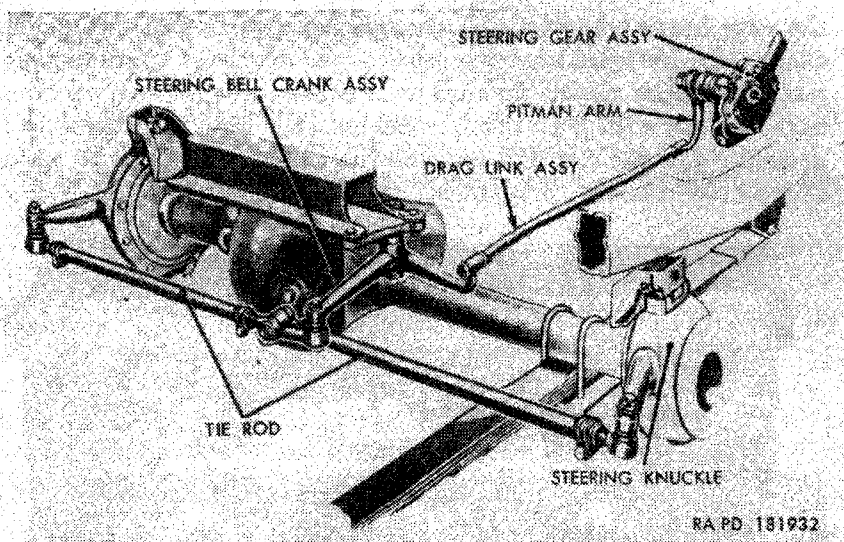


Figure 140. Steering system linkage.

223. Organizational Maintenance

Organizational maintenance consists of lubrication (par. 69), periodic inspection (par. 71), and toe-in adjustment (par. 224), as required. Any operation involving correction of steering geometry (except toe-in) is the responsibility of the ordnance maintenance unit.

224. Toe-In Adjustment

Loose hub bearings, worn bushings in steering knuckle supports, damaged wheels and bent steering knuckles, a bent axle housing, or a bent or improperly adjusted tie rod will affect toe-in. Inspect and correct or notify ordnance maintenance personnel if any damaged units are found.

a. Inflate tires to correct pressure (par. 248*b*), and check for proper front hub bearing adjustment (par. 208*a*). With the vehicle on a smooth level surface, turn the steering wheel until the steering bell-crank is at right angles to the front axle. Place a straightedge or line against the outside of the left wheels; check to make certain that the left front wheel is in line with or straightahead of the left rear wheel. If not, loosen the nuts and screws on the clamps of the ends of the left tie rod with ends assembly, and turn the tie rod to obtain a straightahead position. After adjustment is completed, tighten clamps on ends of tie rods. Repeat the procedure to check the right front wheel. Use right tie rod to adjust right front wheel.

Note. **The right ends of both tie rod with ends assemblies have right-hand threads; the left ends of both assemblies have left-hand threads.**

b. After both wheels are in straightahead position, place toe-in adjustment gage between the wheels ahead of the axle, with the ends of

(3) Using a suitable puller, separate the two tie rod ends.

Note. Do not hammer on the tie rod ends.

(4) Remove the cotter pin and nut securing the left tie rod with ends assembly to the left steering knuckle arm.

(5) Using a suitable puller, separate the tie rod end from the arm.

(6) Remove the cotter pin and nut securing the right tie rod with ends assembly to the steering bellcrank.

(7) Using a suitable puller, separate the tie rod end from the bellcrank.

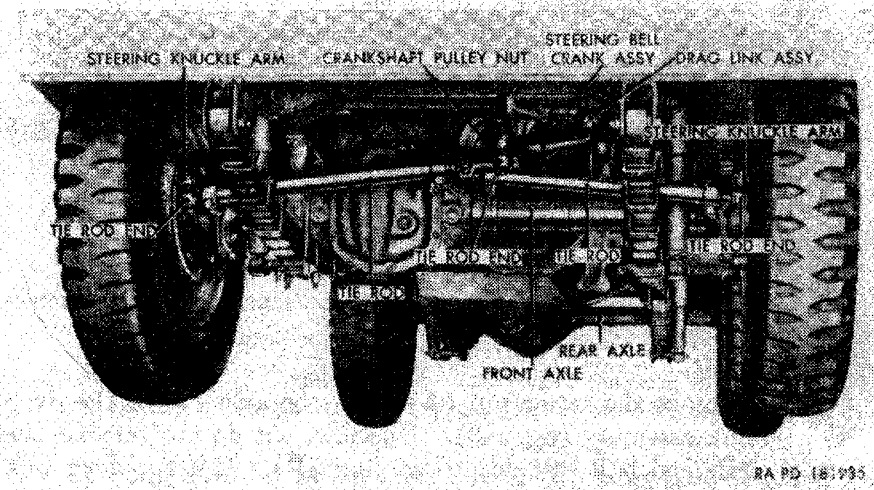


Figure 152. Tie rod with end assemblies—installed.

(8) Remove the cotter pin and nut securing the right tie rod with ends assembly to the right steering knuckle arm.

(9) Using a suitable puller, separate the tie rod end from the arm.

b. Installation.

(1) Position the right end of the right tie rod with ends assembly in the right steering knuckle arm and secure with a ½-inch slotted nut and $^{3}/_{32}$ x $^{7}/_{8}$ cotter pin.

(2) Position the left end of the right tie rod with ends assembly in the steering bellcrank and secure with a ½-inch slotted nut and $^{3}/_{32}$ x $^{7}/_{8}$ cotter pin.

(3) Position the left end of the left tie rod with ends assembly in the left steering knuckle arm and secure with a ½-inch nut and $^{3}/_{32}$ x $^{7}/_{8}$ cotter pin.

(4) Position the right end of the left tie rod with ends assembly in the left end of the right tie rod with ends assembly. Secure with a ½-inch slotted nut and $^{3}/_{32}$ x $^{7}/_{8}$ cotter pin.

(5) Adjust the toe-in (par. 224).

226. Tie Rod Ends

a. General. The right ends of both tie rod with ends assemblies have right hand threads; the left ends of both assemblies have left-hand threads. With this exception, the removal and installation of all tie rod ends are the same. The following procedure refers to the right end of the right tie rod with ends assembly.

b. Removal.

(1) Remove the right end of the right tie rod with ends assembly from the right steering knuckle arm (par. 225*a*(8) and (9)).

(2) Loosen the bolt and nut in the clamp of the tie rod end.

(3) Unscrew and remove the end with clamp from the tie rod.

(4) Slip the clamp off the tie rod end.

c. Installation.

(1) Place the clamp on the tie rod end.

(2) Screw the end with clamp on the tie rod.

(3) Install the right end of the right tie rod with ends assembly in the right steering knuckle arm (par. 225*b*(1)).

(4) Adjust the toe-in (par. 224).

227. Drag Link Assembly

Note. The key letters noted in parentheses are in figure 153, except where otherwise indicated.

a. Removal.

(1) Remove the cotter pin (A) from the axle end of the drag link assembly (fig. 149). Unscrew, but do not remove, the axle end ball seat adjusting plug (B). Lift the drag link assembly off the ball of the bellcrank.

(2) Remove the cotter pin (A) from the steering gear end of the drag link assembly (fig. 149). Unscrew, but do not remove,

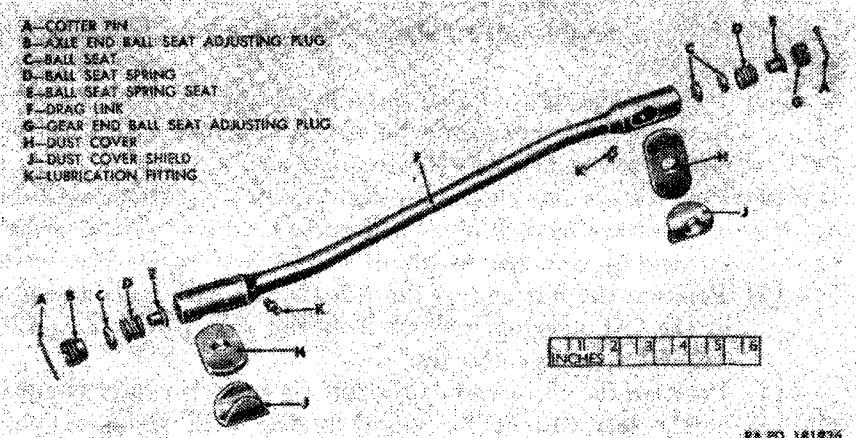


Figure 153. Drag link assembly—exploded view.

the gear end ball seat adjusting plug (G). Lift the drag link assembly off the ball of the Pitman arm.

b. Disassembly.

(1) Unscrew and remove the axle end ball seat adjusting plug (B). Remove, in order, ball seat (C), ball seat spring (D), and the ball seat spring seat (E).

(2) Unscrew and remove the gear end ball seat adjusting plug (G). Remove, in order, the ball seat spring seat (E), the ball seat spring (D), and two ball seats (C).

(3) Remove the dust cover (H) and the dust cover shield (J) from the ball on the Pitman arm. Remove the other dust cover (H) and dust cover shield (J) from the ball on the steering bellcrank.

(4) Remove the two lubrication fittings (K).

c. Assembly.

(1) Install a dust cover shield (J) and dust cover (H) over the ball of the steering bellcrank and over the ball of the Pitman arm.

(2) Install in order in the gear end of the drag link, two ball seats (C), ball seat spring (D), ball seat spring seat (E), and gear end ball seat adjusting plug (G).

Note. The ball opening on the axle end of the drag link is closer to the end of the link than is the ball opening on the gear end of the link.

(3) Install in order in the axle end of the drag link ball seat spring seat (E), ball seat spring (D), ball seat (C), and the axle end ball seat adjusting plug (B).

(4) Install two ⅛-inch NPT lubrication fittings (K) into drag link.

d. Installation.

(1) Position the gear end of the drag link assembly over the ball of the Pitman arm (fig. 149), making certain that the ball enters between the two ball seats (C). Tighten the gear end ball seat adjusting plug (G). Back off the plug one-quarter turn and until one of the slots is alined with the holes in the drag link, and install a ⅛ x 1¾ cotter pin (A) and spread pin ends.

(2) Position the axle end of the drag link assembly over the ball on the steering bellcrank (fig. 149), making certain that the ball enters between the ball seat (C) and the ball seat spring (D). Tighten the axle end ball seat adjusting plug (B). Back off the plug one-half turn and until one of the slots is alined with the holes in the drag link and install a ⅛ x 1¾ cotter pin (A) and spread pin ends.

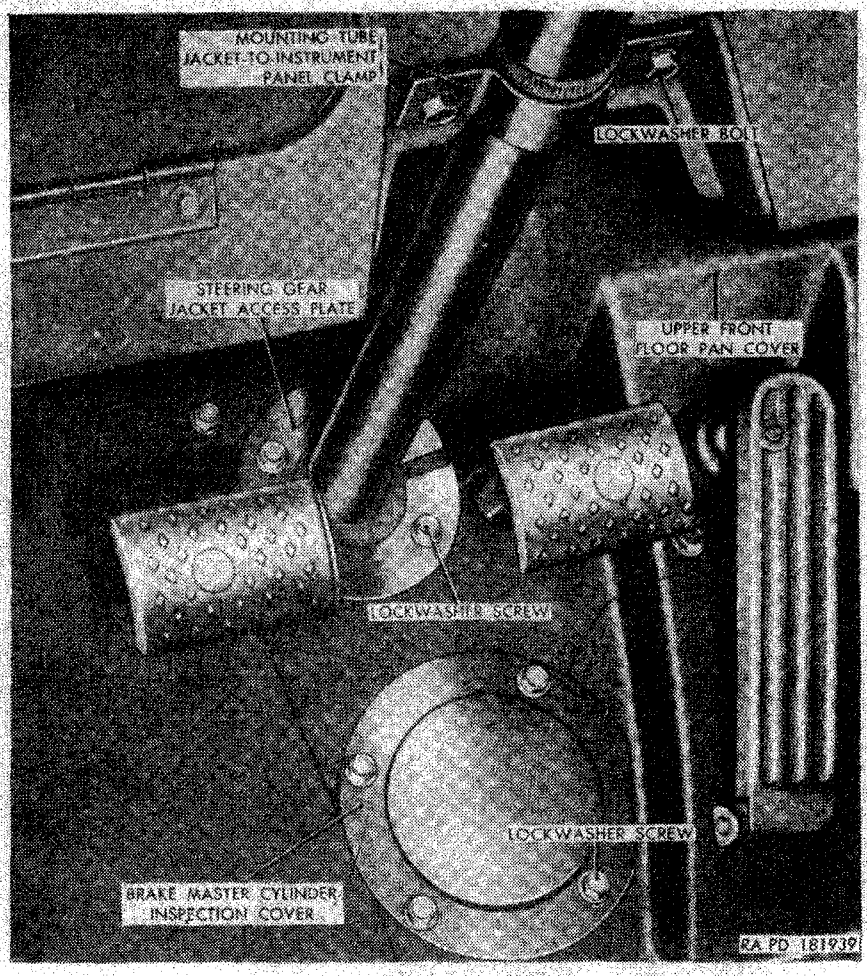


Figure 157. Disconnect points for steering gear removal—driver's compartment.

c. Installation.

(1) Position the Pitman arm on the Pitman shaft with the arm scribe marks alined with the Pitman shaft. Tap the arm onto the shaft and secure with a ¾-inch lockwasher and ¾ x 2 plain nut.

Note. If Pitman arm or Pitman shaft does not have a match mark, set the steering gear shaft in midposition. To place shaft in midposition, rotate shaft to right as far as possible and then in opposite direction as far as possible, noting total number of turns. Turn shaft back one-half number of total turns. Position arm on Pitman shaft so arm is perpendicular to long side of gear housing.

(2) Lower the steering gear with Pitman arm assembly into approximate position through the driver's compartment.

(3) Aline the mounting tube jacket-to-instrument panel clamp (fig. 157) and gasket with the holes in the panel. Attach

clamp to panel with two 7/16 x 7/8 lockwasher bolts and two 7/16-inch plain nuts. Do not tighten the nuts.

(4) Aline the steering gear housing holes with vehicle frame holes. Secure the steering gear to the frame with three 7/16 x 3 steering gear mounting bolts (F, fig. 161), six 7/16-inch internal-external-teeth lockwashers, and three 7/16-inch plain nuts. Tighten the nuts in the mounting tube jacket-to-instrument panel clamp.

(5) Connect the two horn cables 25 (fig. 156) at the connectors at the bottom of the steering gear on the left side of the engine compartment.

(6) Install the brake master cylinder shield (par. 234*c*(8)).

(7) Make certain that the underside of the upper front floor pan cover (fig. 157) edges are coated with permagum seal 7348567. Position the cover in the driver's compartment with the cover holes alined with the body holes. Secure the cover to the body with ten 1/4 x 5/8 lockwasher screws.

(8) Make certain that the underside of the steering gear jacket access plate edges are coated with permagum seal 7348567. Position the plate with the plate holes alined with the body holes. Secure with two 1/4 x 5/8 lockwasher screws.

(9) Make certain that the underside or the brake master cylinder inspection cover edges are coated with permagum seal 7348567. Position the inspection cover on the upper front floor pan cover and secure with four 1/4 x 5/8 lockwasher screws.

(10) From the driver's compartment, insert the brake pad assembly shaft through the upper front floor pan cover from the underside of the cover, slip the draft pad (fig. 156), flat washer, and draft pad spring on the shaft. Insert the shaft into the clamp on end of brake pedal and secure with a 5/16 x 1 1/4 lockwasher bolt.

(11) Insert the accelerator bellcrank link through the upper front floor pan cover. Install the throttle rod adjusting block (B, fig. 55) on the accelerator lower bellcrank with bushing assembly (A, fig. 55). Secure block to bellcrank with one No. 8 flat washer and 1/16 x 1/2 cotter pin.

(12) Connect the drag link to the Pitman arm (par. 227*d*(1)).

(13) Install the steering wheel (par. 229*b*).

(14) Adjust the steering gear (*a* above).

Section XXII. BRAKE SYSTEMS

231. Description and Data

a. Description. The service or foot brake system (fig. 162) is of the hydraulic-type with brakes for all four wheels. Each brake

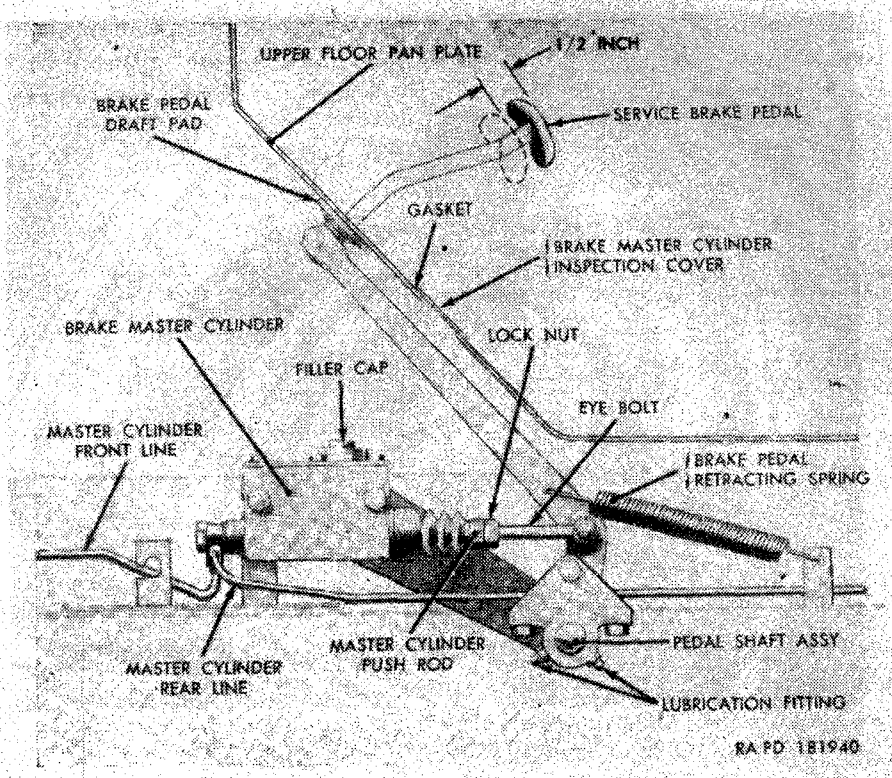


Figure 158. Service brake pedal and brake master cylinder linkage.

(1) Make certain the pedal shaft assembly is lubricated and the brake pedal retracting spring is undamaged and properly connected.

(2) Hold a rule next to the brake pedal and depress the pedal by hand. No resistance should be felt until the pedal has traveled one-half inch. If distance traveled before resistance is felt is incorrect, adjust as shown in (3) below.

(3) Loosen the locknut on the eye bolt and turn the master cylinder push rod clockwise to decrease and counterclockwise to increase the free travel. Tighten the lock nut when adjustment is correct.

b. Service Brake Shoe Adjustment (fig. 159). Except where noted, the procedure for adjusting the service brake shoes is the same for all shoes.

Note. Do not adjust brake shoes if brake drums are hot to the touch.

(1) Jack up the vehicle until tire clears the ground. Block one of the other wheels.

(2) Loosen the brake shoe eccentric lock nut.

(3) Rotate the wheel and, at the same time, turn the shoe adjusting eccentric (clockwise for front shoe, counterclockwise for

rear shoe) until rotating wheel begins to drag. Back off on eccentric just enough to eliminate the drag.

(4) Hold the eccentric in the adjusted position and tighten the lock nut.

(5) Check the fluid level in the brake master cylinder and refill if necessary (par. 69).

(6) Lower vehicle to floor and operate to check brake adjustment.

c. Brake Shoe with Lining Assembly Removed.

(1) Jack up the vehicle and remove the wheel and brake drum (par. 209*a*).

(2) Loosen the brake shoe eccentric lock nut (fig. 159) and turn the brake shoe adjusting eccentric (fig. 160) until the low side of the eccentric touches the brake shoe.

(3) Unhook and remove the shoe retracting spring and the (anchor end) shoe retainer spring.

(4) Press against the shoe holddown spring seat to compress the shoe holddown spring and turn the seat until the flat end of the shoe holddown spring pin is alined with the seat slot. Remove the spring and spring seats. Remove the opposite spring and seats in the same manner.

(5) Remove the pins through the brake backing plate.

(6) Spread both brake shoe with lining assemblies to disengage the upper ends of the shoes from the brake wheel cylinder assembly and the lower ends from the shoe anchor pin plate. Remove both shoes with lining assemblies.

d. Brake Shoe with Lining Assembly Installation (fig. 160).

Note. The front brake shoe with lining assembly has a longer lining than the rear brake shoe with lining assembly.

(1) Position the front shoe with lining in the front half of the brake backing plate with the upper end of the shoe inserted into the wheel cylinder and the lower end engaged in the slot behind the shoe anchor pin plate. Install the rear shoe on the rear half of the backing plate in the same manner.

(2) From the back of the brake backing plate, insert the brake shoe holddown pins through the holes in the plate and shoes.

(3) Install a shoe holddown spring seat over the pin with the seat cupped side facing the shoe. Install a shoe holddown spring and a second spring seat on the pin with the second seat cupped side facing away from the shoe.

(4) Aline the spring seat slot with the pin flat end. Force the seat over the pin and turn the seat 90° to lock it in position. Install the holddown spring and spring seats on the opposite side in the same manner.

(5) Hook the two ends of the (anchor end) shoe retainer spring through the holes in the lower ends of the two shoes. Hook

(4) Secure the cover to the plate with four ¼ x ⅝ screws with internal-teeth lockwashers.

b. Removal.

(1) Loosen the steering gear mounting bolt (F). Loosen the bolt (Q) securing the front end of the master cylinder to the frame side rail. Raise the shield (P) to release the slotted ends of the shield from the loosened bolts and slide the shield toward the rear of the vehicle to remove.

(2) Disconnect the stoplight switch cables number 75 at connectors (H and K).

(3) Unscrew the nuts securing the master cylinder front and rear brake lines (J and B) to the outlet fitting (N) and pull the lines from the fitting. Place a suitable container under the fitting and allow the hydraulic brake fluid to drain into the container.

(4) Remove the cotter pin and plain washer securing the master cylinder eyebolt to the stub shaft on the lower end of the brake pedal assembly (fig. 158) and slide the eyebolt from the shaft.

(5) Work the boot (A) off the master cylinder end and remove the boot, master cylinder push rod, and eyebolt (fig. 158) as a unit.

(6) Loosen the two machine bolts (Q) securing the tie bar (R) and master cylinder to the frame side rail (E), and pull the bolts out sufficiently to clear the side rail. Lower the master cylinder to the floor with the cylinder attached to the tie bar and with the rear end of the tie bar attached to the brake pedal shaft.

(7) Pull the two machine bolts (Q), with lockwashers and plain washers, from the tie bar (R), and remove the master cylinder from the tie bar.

(8) Unscrew and remove the stoplight switch (L) from the outlet fitting bolt (M). Unscrew and remove the bolt (M), outlet fitting (N), and two outlet fitting gaskets. Discard gaskets.

c. Installation.

(1) Install the stoplight switch (L) in the outlet fitting bolt (M). Slip a new outlet fitting gasket, the outlet fitting (N), and another new gasket over the end of the outlet fitting bolt in the order named. Insert the bolt into the front end of the master cylinder and tighten fingertight.

(2) With the master cylinder push rod, eyebolt (fig. 158), and boot (A) assembled as a unit, insert the end of the push rod into the rear of the master cylinder and work the boot open end over the cylinder end.

(*b*) *Installation.* Position the line assembly (Q) between the master cylinder outlet fitting (N, fig. 161) and the flexible line assembly (front tee-to-master cylinder front line) (Y) and install the nuts at each end of the line. Push the line into the clip (R). Install the master cylinder shield (par. 234*c*(8)). Bleed brakes (par. 237).

(5) *Master cylinder rear line assembly.*

(*a*) *Removal.* Remove the master cylinder shield assembly (par. 234*b*(1)). Unscrew the nut at each end of the line assembly (J). Remove the line from the clip (L) and the two clips (M and N), and remove the line from the vehicle.

(*b*) *Installation.* Position the line assembly (J) between the outlet fitting (N, fig. 161) and the flexible line assembly (rear tee-to-master cylinder rear line) (H) and install the nuts at each end of the line. Push the line into the three clips (L, M, and N). Install the master cylinder shield assembly (par. 234*c*(8)). Bleed brakes (par. 237).

(6) *Rear tee-to-left wheel cylinder line.*

(*a*) *Removal.* Unscrew the nut at each end of the line (E). Remove the line from the clip (F) and from the vehicle.

(*b*) *Installation.* Position line (E) between the rear axle tee (D) and the rear wheel cylinder assembly (G) and install the nut at each end of the line. Place the line in clip (F). Bleed brakes (par. 237).

(7) *Rear tee-to-right wheel cylinder line.*

(*a*) *Removal.* Unscrew the nut at each end of line (B). Unscrew the lockwasher bolt holding clip (C) and remove line with clip from the vehicle.

Note. Do not remove the clip from the line unless necessary.

(*b*) *Installation.* Install clip (C) on line (B), if removed. Position the line between the rear axle tee (D) and the right wheel cylinder and install the nut at each end of the line. Aline the clip with the axle cover hole and install a $^5/_{16}$ x $^5/_8$ lockwasher bolt. Bleed brakes (par. 237).

b. Flexible Lines.

(1) *Front brake flexible line assembly (right or left).*

(*a*) *Removal.* Unscrew the nut on the end of the line assembly (front wheel cylinder-to-front brake flexible line) (V) from the line assembly (W). Unscrew the nut on the outside end of the line assembly (front tee-to-front brake flexible line) (S or A) from the inside end of line assembly (V). Remove the clip from the groove at each end of the flexible line and remove the line from the vehicle.

(*b*) *Installation.* Position line assembly (W) between the bracket (X) on the front axle and the front brake flexible

of the line. Position the tee on the axle hole and a ¼ x ⅛ lockwasher bolt. Screw the two nuts on the solid lines into the tee. Bleed the brakes (par. 237).

(2) *Rear axle tee.*

(*a*) *Removal.* Unscrew the nuts on the two solid lines from the rear axle tee (D). Unscrew the lockwasher bolt holding the tee to the bracket on the rear axle. Unscrew the tee from the end of the flexible line and remove the tee and copper gasket.

(*b*) *Installation.* Place the copper gasket on the end of the flexible line and screw the rear axle tee (D) onto the end of the line. Position the tee on the bracket on the rear axle and secure in place with a ¼ x ⅞ lockwasher bolt. Screw the nuts on the two solid lines into the tee. Bleed the brakes (par. 237).

(3) *Master cylinder outlet fitting.*

(*a*) *Removal.* Remove the master cylinder outlet fitting by following the procedure of paragraph 234*b*(1), (2), (3), and (8).

(*b*) *Installation.* Install the master cylinder outlet fitting by following the procedure of paragraph 234*c*(1), and (6) through (9).

237. Bleeding Brake System

The following procedure describes the bleeding on one service brake, but all four brakes must be bled each time.

a. Check the hydraulic fluid level in the brake master cylinder and fill if necessary (par. 234*a*(1) and (2)).

b. Clean the bleeder screw (fig. 159). Attach a bleeder hose to the screw and submerge the lower end of the hose in hydraulic fluid in a transparent bottle.

c. Unscrew the bleeder screw one-half turn. Depress the brake pedal by hand with a slow even pressure and allow the pedal to return to a fully released position slowly. Continue to pump the pedal slowly until no air bubbles flow from the end of the bleeder hose. Depress the pedal and hold it while tightening the bleeder screws. Release the pedal and remove the bleeder hose.

d. Recheck the fluid level in the master cylinder and fill if necessary (par. 234*a*).

238. Hand Brake

(fig. 163)

a. Adjustment.

(1) Place the hand brake handle (U, fig. 11) in fully released position. Check hand brake rod and operating lever to make certain that they are free and not binding.

(2) Disconnect the front end of the rear propeller shaft (par. 203*a*(2)). Remove the brake drum (par. 199*h*).

(3) Unhook the spring extending from the brake rod adjusting yoke to the skid plate (J, fig. 58) from the yoke. Remove the cotter pin and clevis pin securing the operating lever to the adjusting yoke.

(4) Remove the locknut and lockwasher from the anchor pin, and pull the anchor pin, with inner and outer shoes with lining assemblies attached, from the opening in the transfer rear bearing retainer.

(5) Remove the cotter pin from the end of the anchor pin, and remove the anchor pin stop and anchor pin from the outer brake shoe.

(6) Remove the cotter pin securing the outer brake shoe to the operating lever, and remove the shoe from the lever.

(7) Remove the cotter pin securing the inner brake shoe to the operating lever and remove the shoe from the lever.

c. Brake Shoe with Lining Assembly Installation.

(1) Position the inner brake shoe with lining assembly on the brake operating lever and secure it in place with a $\frac{1}{8}$ x $\frac{3}{4}$ cotter pin

(2) Insert the nonthreaded end of the anchor pin through the off-center hole in the outer shoe and the anchor pin stop. Secure with a $\frac{1}{8}$ x $\frac{3}{4}$ cotter pin.

(3) Position the outer shoe, with anchor pin installed, on the operating lever so that the inner and outer shoes are directly opposite each other. Secure the outer shoe to the operating lever with a $\frac{1}{8}$ x $\frac{3}{4}$ cotter pin.

(4) Insert the threaded end of the anchor pin through the opening in the transfer rear bearing retainer, and install the operating lever, with brake shoes attached, to the retainer. Secure the parts in place by installing a $\frac{5}{8}$-inch lockwasher and $\frac{5}{8}$-inch locknut on the threaded end of the anchor pin.

(5) Check and, if necesesary, adjust the brake shoe clearance (*a* above).

(6) Connect the end of the operating lever to the adjusting yoke and secure with the clevis pin and $\frac{3}{16}$ x $\frac{1}{2}$ cotter pin.

(7) Hook the end of the spring (K, fig. 58) extending from the skid plate to the yoke to one leg of the yoke.

(8) Install the brake drum (par. 200*b*). Connect the front end of the rear propeller shaft (par. 203*b*(1)).

(9) Fill the transfer (par. 69).

b. Installation.

(1) Place the spring assembly in approximate position under vehicle, raise pivot end of spring and install pivot bolt (par. 244*b*(1)).

(2) Raise spring shackle end of spring into position and install spring shackle (pars. 242*b*(1), (2), and (3)).

(3) Using the jack beneath the axle housing, slowly lower axle onto spring, making certain that the spring center bolt enters the spring saddle recess on the axle housing underside.

(4) Install the U-bolts over the axle housing.

Note. On the front right spring assembly, the wide U-bolt is installed over the *differential housing.*

(Aline the holes in the U-bolts and place the plate, with its shaft facing wheel, against the bottom of the spring.) Secure the U-bolts to the U-bolt plate with four 7/16-inch lockwashers and U-bolt nuts. Tighten nuts to torque of 50–55 pound-feet.

(5) Install one mounting pin bushing, with the taper facing out, on the U-bolt plate shaft. Install the lower end of the shock absorber assembly on the U-bolt plate shaft. Install another mounting pin bushing, with the taper facing in, on the U-bolt plate shaft. Seat the two bushings in the hole in the shock absorber end. Secure the shock absorber (fig. 165) to the U-bolt plate with one 1/2-inch ID flat washer and 7/16-inch locknut. Tighten nut until a slight bulge is noted in the bushings.

(6) Remove the safety stands or blocking, and lower the vehicle to the ground.

246. Spring Assemblies (M170)

a. Removal.

(1) Remove the spring shackle (par. 243*a*).

(2) Remove the pivot bolt (par. 244*a*(3)).

(3) While supporting the spring assembly, remove the four U-bolt nuts and lockwashers securing the two U-bolts to the U-bolt plate with the U-bolt plate-to-stabilizer bar link and remove the plate from the bolts and the bottom of the spring. Lift the U-bolts off the axle housing. Remove the spring assembly from the vehicle.

b. Installation.

(1) Place the spring assembly in the approximate position under the vehicle. Raise the pivot end of the spring and install the pivot bolt (par. 224*b*(1)).

(2) Raise the shackle end of the spring into position and install the shackle (par. 243*b*(1), (2), (3), and (4)).
(3) Follow procedure in paragraph 245*b*(3) and (4).
(4) Follow procedure in paragraph 243*b*(5), (6), and (7).

247. Shock Absorber Assemblies
(figs. 164 and 165)

a. Removal.

(1) Remove the locknut and flat washer securing the upper end of the shock absorber assembly (fig. 164) to the shock absorber mounting bracket. Remove the locknut and flat washer securing the lower end of the shock absorber (fig. 165) to the U-bolt plate.
(2) Pull the shock absorber and mounting pin bushings off the bracket and plate shafts.
(3) Pull the two mounting pin bushings out of the hole in each shock absorber end.

b. Installation.

(1) Install a mounting pin bushing, with the taper facing out, on the shock absorber mounting bracket shaft and on the U-bolt plate shaft.
(2) Position the shock absorber assembly, small end down, on the shaft bushings. Install another bushing, with the taper facing in, on the bracket shaft and on the plate shaft. Seat the two bushings at each shock absorber end in the hole at the shock absorber end.
(3) Secure the shock absorbers to the bracket and plate with two ½-inch ID flat washers and 7/16-inch locknuts. Tighten each nut until a slight bulge is noted in the bushings.

Section XXIV. WHEELS AND TIRES

248. Description and Data

a. Description. Each vehicle is equipped with four standard drop-center, interchangeable operating wheels and one spare. Each operating wheel is mounted on the wheel hub by five studs, pressed into the hub. A taper on the inside of each hub nut positions the wheel to allow clearance between wheel and hub for ease of removal. Hub studs and nuts on the left side of the vehicle have left-hand threads and are marked with the letter L. Hub studs on the right side of vehicle have right-hand threads and are not marked. The military, nondirectional mud- and snow-type tires are designed for either high or low pressure operation.

b. Data.

Wheels:	
Ordnance number	7387807
Type	std drop-center
Rim size	4.50 x 16.00 in.
Stud circle diameter	5.496 x 5.504 in.
Tires:	
Type	Military nondirectional
Size	7.00 x 16.00 in.
Operating pressures:	
Highway	28 psi
Cross country	22 psi
Mud, sand, or snow	15 psi

249. Organizational Maintenance

a. Wheels. Inspect all wheels at regular intervals for bent rims, worn or elongated mounting stud holes, and signs of rust. Pay particular attention to edges of rims and mounting stud holes. Inspect hub studs and nuts for worn or stripped threads. Replace any defective wheel or hub nut immediately.

b. Tires. Inspect all tires and check pressures daily.

(1) Replace any tire with noticeable cut on tread or side wall. Return old tire to ordnance maintenance unit for repair. If uneven wear is indicated, check toe-in adjustment (par. 224). If incorrect toe-in is not the cause, report to ordnance maintenance personnel.

(2) Check pressures when tires are cold. Dismount any tire showing unusual pressure loss and examine tire tube for cause. Repair tire tube or replace tube or tire if necessary.

(3) Inflate all tires to equal pressures, as unequal pressures will affect steering and braking adversely. Inflate tires to pressures designated in paragraph 248*b*. Under inflated tires are easily damaged. Install all valve caps to prevent air loss.

c. Tire Rotation. To maintain equal wear, rotate tires in accordance with the tire rotation plan shown in figure 169 at intervals of approximately 2,000 miles, if the tactical situation permits.

d. Tire Replacement. Make certain that a replacement tire is of the same design, size, and tread as the tires on the vehicle. Tires of different design or tread sometimes have different rolling diameters, causing excessive scuffing in use.

250. Wheels

a. Removal. Loosen five hub stud nuts (fig. 170) (left side vehicle, clockwise; right side, counterclockwise). Jack up vehicle (fig. 171) until tire clears the ground. Block other wheels to prevent vehicle from rolling. Remove five hub nuts and remove wheel.

at each side of the vehicle. Lift the top bow assembly out of the rear top bow sockets. Place the top bow in a horizontal position on top of the body, aligning the mounting holes in the rear top bow with the mounting holes in the rear top stowage bracket at each side of the vehicle. Secure the top bow to the stowage bracket with the thumb screws of the top bow pivot thumb screw assemblies. Secure the top bow to the body by looping the two top holddown straps around the top bow and through the brackets on the body. Buckle the holddown straps.

(4) Carefully fold and store the top cover with rear curtain assembly. Fold canvas smoothly to avoid cracks and tears.

259. Mirror, Reflectors, and Windshield Wipers

a. Windshield wiper blade assembly (fig. 186).

(1) *Removal.* Lift up on the windshield wiper adjustable arm assembly. Lift the lower end of the windshield wiper blade assembly to unlock the blade from the arm. Remove the blade.

(2) *Installation.* Lift the windshield wiper adjustable arm up. Hook the windshield wiper blade, upside down into the arm, push the lower end of blade toward windshield, and lock blade in position. The position of the blade can be adjusted by loosening the adjusting screw at the end of the arm, setting blade in desired position, and tightening the screw.

b. Windshield Wiper Adjustable Arm Assembly (fig. 186).

(1) *Removal.* Remove the windshield wiper blade assembly (*a*(1) above). Unscrew the blind nut securing the wind-

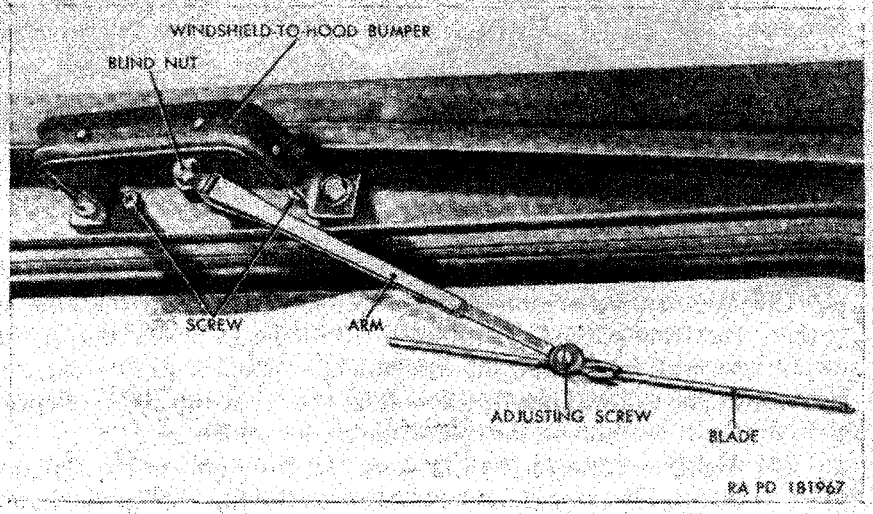
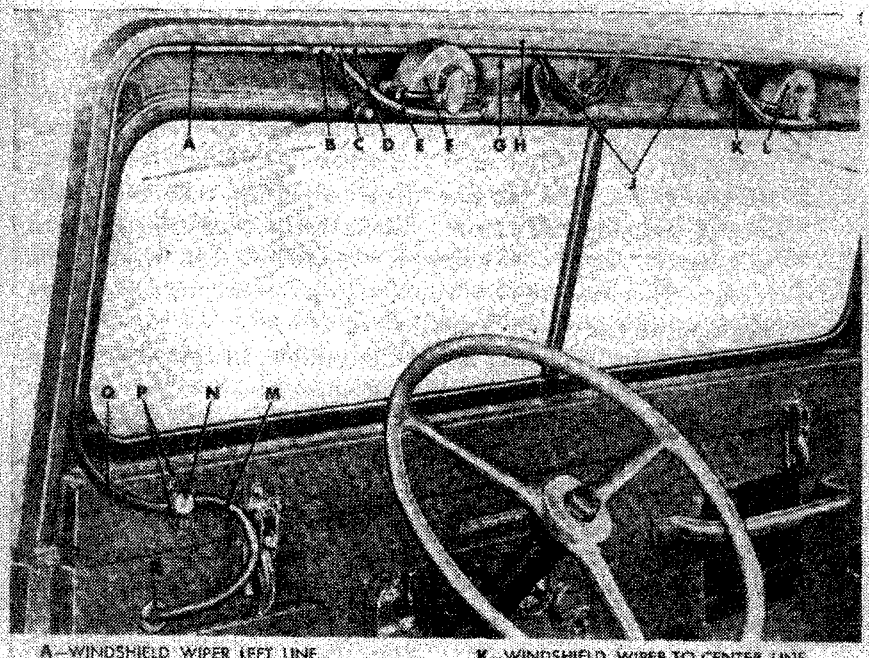


Figure 186. Windshield wiper blade and adjustable arm assemblies—installed.



A—WINDSHIELD WIPER LEFT LINE
B—WINDSHIELD WIPER LEFT LINE-TO-TEE HOSE
C—WINDSHIELD WIPER LINE CONNECTION TEE
D—WINDSHIELD WIPER TEE-TO-CENTER LINE HOSE
E—WINDSHIELD WIPER-TO-TEE HOSE
F—WINDSHIELD WIPER VACUUM MOTOR ASSY
G—CENTER WINDSHIELD WIPER LINE
H—WINDSHIELD FRAME
J—WIPER LINE-TO-WINDSHIELD CLIP
K—WINDSHIELD WIPER-TO-CENTER LINE HOSE
L—WINDSHIELD WIPER VACUUM MOTOR ASSY
M—WINDSHIELD WIPER AIR REGULATING VALVE-TO-DISTRIBUTOR TEE LINE HOSE
N—WINDSHIELD WIPER AIR REGULATING VALVE ASSY
P—NO. 10-24NC-2 x 7/16 INT-TEETH-LOCKWASHER SCREW
Q—WINDSHIELD WIPER AIR REGULATING VALVE-TO-LEFT LINE HOSE
R—WINDSHIELD WIPER HOSE BUSHING

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Figure 187. Windshield wiper vacuum motors—installed.

shield wiper adjustable arm assembly to the serrated shaft of the paddle within the windshield wiper vacuum motor assembly. Pull the arm off the shaft.

(2) *Installation.* Position the windshield wiper adjustable arm on the serrated shaft of the paddle within the windshield wiper vacuum motor. Secure the arm to the shaft with one No. 10 blind nut. Install the windshield wiper blade assembly (*a*(2) above).

c. Windshield Wiper Vacuum Motor Assembly.

Note. Procedures in this paragraph apply to either windshield wiper vacuum motor assembly. The key letters noted in parentheses are in figure 187, except where otherwise indicated.

(1) *Removal.* Remove the windshield wiper blade assembly (*a*(1) above). Remove the windshield wiper adjustable arm assembly (*b*(1) above). Pull the hose (windshield wiper-to-

tee for left motor and windshield wiper-to-center line for right motor) (E and K) from the fitting on the windshield wiper vacuum motor assembly (F and L). Remove one lockwasher screw from the windshield-to-hood bumper assembly (fig. 186), loosen the other lockwasher screw, and let one end of the bumper drop to permit removal of the screws securing the motor. Remove the two internal-teeth lockwasher screws securing the motor to the windshield frame. Remove the two windshield wiper mounting spacers and remove the motor from the frame.

(2) *Installation.* Working inside the vehicle, insert the serrated shaft of the paddle within the windshield wiper vacuum motor through the hole in the windshield frame. Slide the hose (windshield wiper-to-tee for left motor and windshield wiper-to-center line for right motor) (E and K) onto the fitting on the motor. Working outside the vehicle, insert two No. 10-32NF-2 x 7/8 internal-teeth lockwasher screws into the windshield frame. From the inside of the windshield frame, insert one windshield wiper mounting spacer on each screw and screw into the motor. Secure the windshield-to-hood bumper (fig. 186) to the windshield frame with two 1/2 x 1/2 lockwasher screws. Install the windshield wiper adjustable arm (*b*(2) above). Install the windshield wiper blade (*a*(2) above). Start engine and check motor for proper operation.

d. Windshield Wiper Lines and Hoses.

Note. The key letters noted in parentheses are in figure 187, except where otherwise indicated.

(1) *Left windshield wiper-to-tee and windshield wiper-to-center line hoses.*

(*a*) *Removal.* Pull the left end of the windshield wiper-to-tee hose (E) from the windshield wiper line connection tee (C). Pull the right end of the hose from the fitting on the left windshield wiper vacuum motor assembly (F) and remove the hose from vehicle. Pull the left end of the windshield wiper-to-center line hose (K) from the center windshield wiper line (G). Pull the right end of the hose from the fitting on the right windshield wiper vacuum motor assembly (L) and remove the hose from the vehicle.

(*b*) *Installation.* Slide one end of the left windshield wiper-to-tee hose (E) onto the windshield wiper line connection tee (C). Slide the other end of the hose onto the fitting on the left windshield wiper vacuum motor (F). Slide one end of the windshield wiper-to-center line hose (K) onto the center windshield wiper line (G). Slide the other

end of the hose onto the fitting on the right windshield wiper vacuum motor (L).

(2) *Center windshield wiper line, windshield wiper tee-to-center line hose, windshield wiper line connection, and windshield wiper left line-to-tee hose.*

(*a*) *Removal.* Remove the two sheet metal screws securing the two wiper line-to-windshield clips (J). Pull the right end of the center windshield wiper line (G) out of the windshield wiper-to-center line hose (K). Pull the left end of the line out of the windshield wiper tee-to-center line hose (D). Pull the tee-to-center line hose off the windshield wiper line connection tee (C). Pull the left end of the left windshield wiper-to-tee hose (E) off the connection tee. Remove the connection tee by pulling it out of the windshield wiper left line-to-tee hose (B). Pull the hose off the windshield wiper left line (A).

(*b*) *Installation.* Slide the windshield wiper left line-to-tee hose (B) onto the end of the windshield wiper left line (A). Insert the end of the windshield wiper line connection tee (C) into open end of the left line-to-tee hose. Slide the left windshield wiper-to-tee hose (E) onto the bottom arm of the connection tee. Slide the windshield wiper tee-to-center line hose (D) onto the upper arm of the connection tee. Insert one end of the center windshield wiper line (G) into the open end of the windshield wiper tee-to-center line hose (D). Insert the other end of the center windshield wiper line into the open end of the windshield wiper-to-center line hose. Secure the two wiper line-to-windshield clips (J) to the windshield frame with two No. 10 x ½ sheet metal screws.

(3) *Left windshield wiper line.*

(*a*) *Removal.* Remove the three sheet metal screws that secure the three wiper line-to-windshield clips (J) on the windshield wiper left line (A) to the windshield frame (H). Pull the upper end of the line out of the windshield wiper left line-to-tee hose (B). Pull the lower end of the line out of the windshield wiper air regulating valve-to-left line hose (Q) and remove the line.

(*b*) *Installation.* Insert the lower end of the windshield wiper left line (A) into the windshield wiper air regulating valve-to-left line hose (Q). Insert the upper end of the line into the windshield wiper left line-to-tee hose (B). Secure the three wiper line-to-windshield clips (J) on the line to the windshield frame (H) with three No. 10 x ½ sheet metal screws.

(4) *Windshield wiper air regulating valve, air regulating valve-to-left line hose, and air regulating valve-to-distributor tee line hose.*

(*a*) *Removal.* Pull the upper end of the windshield wiper air regulating valve-to-left line hose (Q) off the windshield wiper left line (A). Pull the lower end of the hose off the left extension on the windshield wiper air regulating valve (N) and remove hose. Pull the upper end of the windshield wiper air regulating valve-to-distributor tee line hose (M) off the extension on the right side of the air regulating valve. Open the hood and lock in raised position (par. 255*a*). Pull the lower end of the air regulating valve-to-distributor tee line hose off the tee-to-windshield wiper line installed on the tee mounted on the vacuum pump-to-tee line (fig. 188). Remove the internal-teeth lockwasher screw securing the windshield wiper hose-to-cowl clip to the dash panel. Remove the air regulating valve-to-distributor tee line hose by pulling it through the instrument panel, glove compartment, dash panel, and clip. Remove the two internal-teeth lockwasher screws securing the windshield wiper air regulating valve (N) to the windshield frame and remove the valve. Remove two windshield wiper hose bushings (R) from the instrument panel and body cowl.

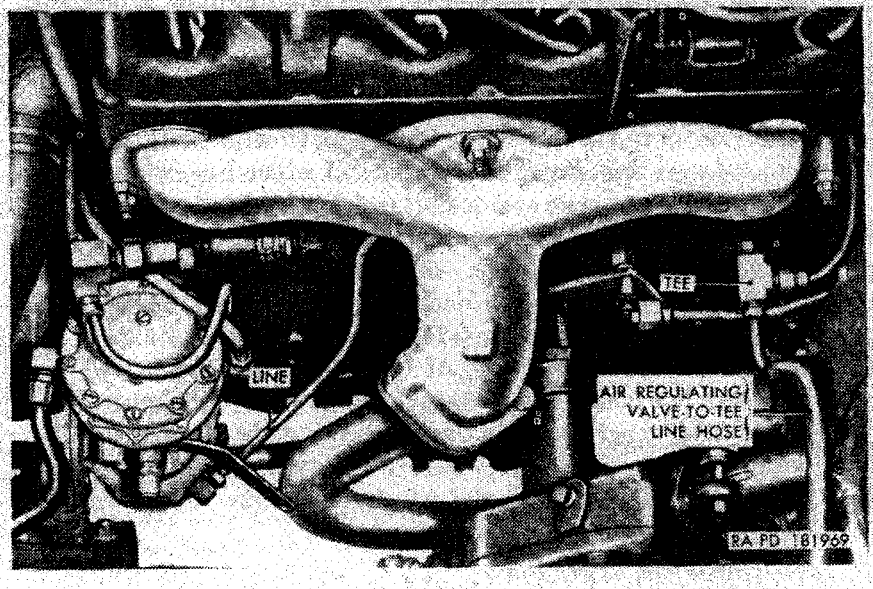


Figure 188. Vacuum pump-to-tee line—installed.

(*b*) *Installation.* Place the windshield wiper air regulating valve (N) in position, with extensions horizontal and lever pointing down, at the bottom of the windshield frame. Secure the valve to frame with two No. 10–24NC–2 x 7/16 internal-teeth lockwasher screws. Insert a 13/32-inch diameter windshield wiper hose bushing into the wiper line hole in the body cowl. Insert a 11/16-inch diameter windshield wiper hose bushing (R) into the wiper line hole in the instrument panel. Insert one end of the windshield wiper air regulating valve-to-tee line hose (M) through the instrument panel, glove compartment, and dash panel until it enters the engine compartment. Slide the windshield wiper hose-to-cowl clip onto the lower end of the hose. Slide the lower end of the hose onto the tee-to-windshield wiper line installed on the tee mounted on the vacuum pump-to-tee line (fig. 188). Secure the clip to the dash panel with one No. 10–24NF–2 x 7/16 internal-teeth lockwasher screw. Slide the end of the hose that is in the driver's compartment onto the right extension on the air regulating valve. Slide one end of the windshield wiper air regulating valve-to-left line hose (Q) onto the left extension on the air regulating valve. Slide the other end of the hose onto the lower end of the windshield wiper left line (A). Lower the hood and lock in closed position (par. 255*b*).

e. Vacuum Pump-to-Tee Line.

(1) *Removal.* Raise the hood and lock in raised position (par. 255*a*). Unscrew the fitting on the vacuum pump-to-tee line (fig. 188) from the elbow at the bottom of the fuel and vacuum pump. Remove the safety nut securing the clip on the line to the lower right stud used to mount the exhaust manifold. Pull the clip off the stud. Unscrew the fitting on the line from the tee that is also mounted on the distributor-to-windshield wiper fitting vent line. Remove the line from the engine compartment. Slide the clip off the line.

(2) *Installation.* Slide the clip onto the vacuum pump-to-tee line (fig. 188). Position the line within the engine compartment. Connect the fitting on the upper end of the line to the tee mounted on the distributor-to-windshield wiper fitting vent line. Install the clip on the lower right stud securing the exhaust manifold. Install one 3/8-inch self-locking nut on the stud and tighten nut to a torque of 29–35 pound-feet. Connect the fitting at the lower end of the line to the elbow at the bottom of the fuel and vacuum pump. Lower hood and lock in closed position (par. 255*b*).

f. Rear Reflex Reflectors (fig. 172).

Note. Removal and installation procedures are the same for each of the three rear reflex reflectors mounted on the body.

(1) *Removal.* Remove the two screws and internal-teeth lockwashers securing the rear reflex reflector to the body. Remove the reflector. Remove the three hub nuts securing the spare wheel and tire to the spare wheel support bracket and lift the wheel off the studs in the support bracket. Remove the two screws and lockwasher nuts securing the rear reflex reflector to the support bracket and remove the reflector.

(2) *Installation.* Place the rear reflex reflector in place on the spare wheel support bracket and secure reflector to bracket with two ¼ x ½ screws and ¼-inch lockwasher nuts. Install the spare wheel and tire on the studs in the support bracket. Secure wheel to studs with three ½-inch hub nuts. Place the rear reflex reflector in position on the body and secure reflector to body with two ¼-inch internal-teeth lockwashers and two ¼ x ½ screws.

g. Outside Rear View Mirror Assembly (fig. 175).

(1) *Adjustment.* Loosen the locknut on the setscrew at the top of the rear view mirror arm. Loosen the setscrew and push the rear view mirror arm extension in or out of the arm, as desired. After setting the extension arm to the desired length, tighten the setscrew and lock it by tightening the locknut on the screw.

(2) *Removal.* Remove four lockwasher screws securing the bracket of the outside rear view mirror assembly to the left side of the body cowl. Remove the mirror from the vehicle.

(3) *Installation.* Position the bracket of the outside rear view mirror on the left side of the body cowl. Secure the bracket to the cowl with four ¼ x ½ lockwasher screws. Adjust length of rear view mirror arm extension if necessary ((1) above).

260. Lifting Shackles, Bumperettes, Towing Pintle, and Bumper Bar

a. Front Lifting Shackles and Brackets (fig. 189).

Note. Removal and installation procedures are identical for both front lifting shackles and brackets.

(1) *Removal.* Remove the snap clip from the hole in the end of the shackle pin. Withdraw the shackle pin from the front lifting shackle bracket and front lifting shackle, and remove the shackle from the bracket. Remove the two bolts and lockwashers securing the shackle bracket to the frame side

rail and bumper bar. Lift the shackle bracket off the side rail and bumper bar.

(2) *Installation.* Position the front lifting shackle bracket, with the spacer end to the rear, on the frame side rail and bumper bar. Secure the bracket to the side rail and bumper bar with one $^{17}/_{32}$-inch ID, $^{7}/_{8}$-inch OD lockwasher, and $^{1}/_{2}$ x 2 bolt at the spacer end (rear) and one $^{17}/_{32}$-inch ID, $^{7}/_{8}$-inch OD lockwasher and $^{1}/_{2}$ x $1^{1}/_{4}$ bolt at the front. Place the front lifting

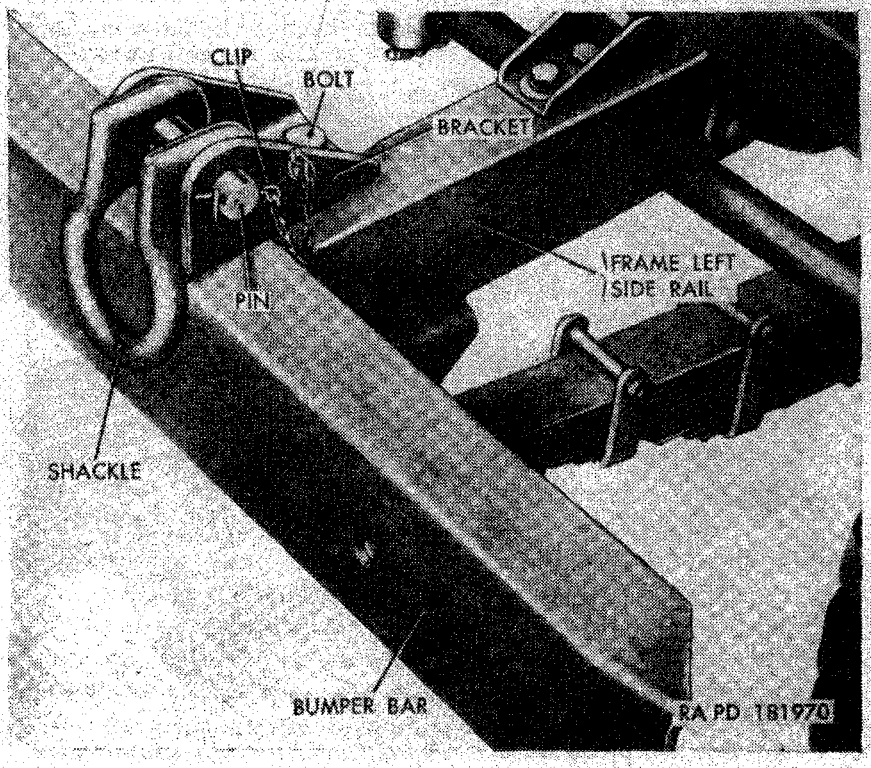


Figure 189. Front lifting shackle and bracket—installed.

shackle between the shackle bracket flanges so the shackle loop points down and the hole ends face toward vehicle. Install the shackle pin, inserting it from the side opposite to the snap clip chain, through the bracket and shackle. Lock pin in place by installing the snap clip.

b. Rear Lifting Shackles and Brackets (fig. 190).

Note. **Removal and installation procedures are identical for both rear lifting shackles and brackets.**

(1) *Removal.* Remove the snap clip from the end of the shackle pin, withdraw the pin from the rear lifting shackle bracket

and shackle, and remove the shackle from the bracket. Remove the two bolts, nuts, lockwashers, and flat washers securing the rear lifting shackle bracket and spacer plate to the bumperette and frame rear cross member. Remove the bracket and spacer.

(2) *Installation.* Insert two ½ x 1¼ bolts into the rear lifting shackle bracket from the shackle side and place the spacer plate on the bolts from the frame side of the bracket. Aline the holes in the bumperette and frame rear cross member with the bolts and insert the bolts through the holes, making

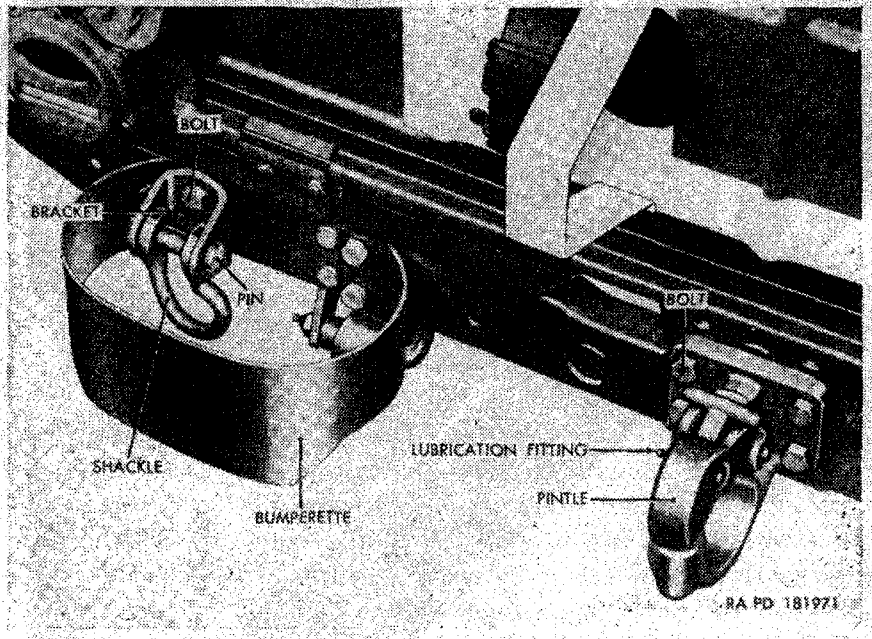


Figure 190. Left rear lifting shackle, bumperette, and towing pintle—installed.

sure the shackle bracket is positioned so the chain side faces away from center of frame. Secure the bracket to bumperette and rear cross member bracket to bumperette and rear cross member by installing a $^{17}/_{32}$-inch ID, $1^{1}/_{16}$-inch OD flat washer, $^{17}/_{32}$-inch ID, ⅞-inch OD lockwasher, and ½-inch nut on each bolt. Place the rear lifting shackle between the flanges of the shackle bracket, with the curved edge of the shackle loop facing the chain side of the bracket. Install the shackle pin, inserting it from the side of the bracket opposite the chain side, through the bracket and shackle pin. Lock the shackle pin in place by installing the snap clip.

and the left rear wheel house. Secure the driver's seat frame to the front and rear floor pans with two $^{11}/_{32}$-inch ID, $^{11}/_{16}$-inch OD, 0.065-inch thick flat washers and $^{5}/_{16}$–18 x $^{7}/_{8}$ lockwasher screws. Secure the frame to the left side panel with a $^{11}/_{32}$-inch ID, $^{11}/_{16}$-inch OD, 0.065-inch thick flat washer and $^{5}/_{16}$–18 x $^{5}/_{8}$ lockwasher screw. Working on the underside of the wheel well panel, secure the frame to the panel with a $^{11}/_{32}$-inch ID, $^{11}/_{16}$-inch OD, 0.065-inch thick flat washer and $^{5}/_{16}$–18 x $^{5}/_{8}$ lockwasher screw.

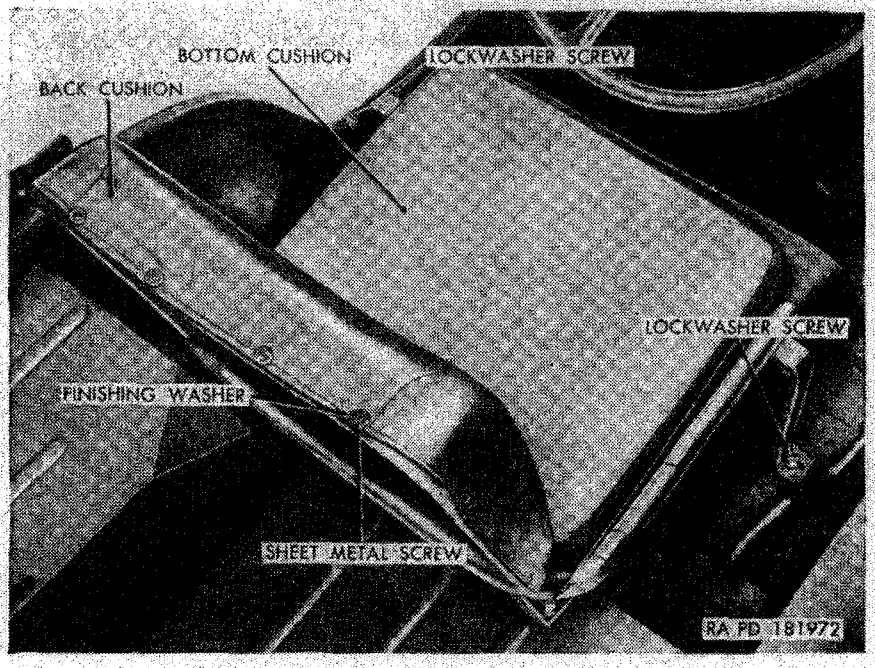


Figure 191. Driver's seat assembly (M38A1)—installed.

b. Passenger Seat Assembly (fig. 192).

(1) *Removal.* Remove the front seat hinge pivot retaining pin from each of the two front seat hinge pivot pins. Tilt the passenger seat assembly forward until the flat sides on the pivot pins are alined with the shaft retainer slots, and lift the seat out of the driver's compartment.

(2) *Installation.* Position the passenger seat assembly over the pivot shaft retainers mounted on the top of the tool compartment, aline the pivot pin flat sides with the retainer slots and insert the pivot pins into retainer. Tilt seat backward to lock it in place. Lock the pivot pins to the retainers by installing one front seat hinge pivot retaining pin in the end of each hinge pivot pin.

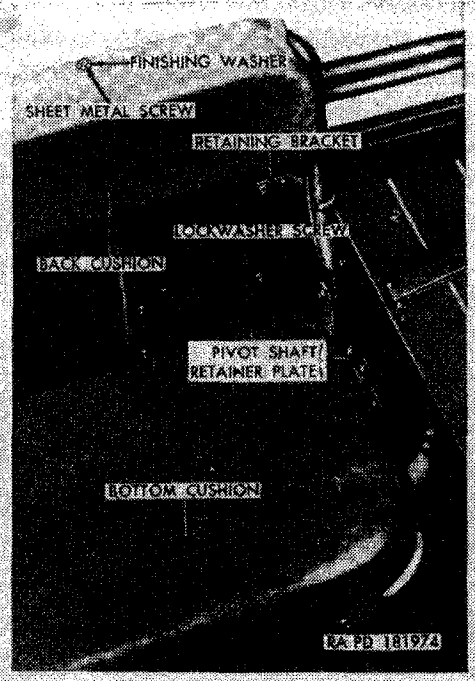


Figure 193. Rear seat assembly (M38A1)—installed—left side view.

d. Driver's and Passenger Seat Cushion Assemblies (figs. 191 and 192).

(1) *Removal.* Remove driver's seat assembly (*a*(1) above). Remove passenger seat assembly (*b*(1) above).

Note. Procedures for removing the front seat cushion assemblies are identical after the respective seats have been removed from the vehicle.

Remove the two lockwasher screws securing the bottom of the seat bottom cushion to the bottom of the seat frame, push the cushion up and forward away from the frame and remove the cushion from frame. Remove the 12 sheet metal screws and finishing washers securing the seat back cushion to the top of the seat frame, and lift cushion off the frame.

(2) *Installation.* Place the seat bottom cushion on the bottom of the seat frame, aline the two integral mounting clips with the mounting brackets on the frame, and slip the cushion into position on the frame. Secure the bottom cushion to the bottom of the frame with two $\frac{5}{16}$ x $\frac{5}{8}$ lockwasher screws. Position the seat back cushion at the top of the seat frame and secure cushion to frame with twelve No. 12 finishing washers and No. 10 x $\frac{1}{2}$ sheet metal screws. Install the driver's seat assembly (*a*(2) above). Install the passenger seat assembly (*b*(2) above).

e. Rear Seat Cushion Assemblies (fig. 193).

(1) *Removal.* Remove the rear seat assembly (*c*(1) above). Remove the 10 sheet metal screws securing the rear seat bottom cushion to the bottom of the rear seat frame and lift cushion off the frame. Remove the 10 sheet metal screws and finishing washers securing the rear seat back cushion to the top of the rear seat frame, and remove the cushion.

(2) *Installation.* Position the rear seat bottom cushion on the bottom of the rear seat frame and secure cushion to frame with ten No. 10 finishing washers and No. 10 x ½ sheet metal screws. Position the rear seat back cushion at the top of the rear seat frame and secure cushion to frame with ten No. 10 finishing washers and No. 10 sheet metal screws.

Section XXVI. BODY AND FRAME (M170)

262. Description and Data

a. Description.

(1) *Body.* The body (fig. 198) is an all steel, open-type of seamed and welded construction. The body is equipped with a driver's seat (fig. 201), front passenger seat, wheel house cushions (fig. 202), tool compartment, two medical supplies stowage compartments, battery stowage box, and bows for the installation of the top cover, side curtains, and doors. A well in front of the right wheel house provides for mounting the spare wheel and tire inside the body. A strap is provided in front of the spare wheel mounting well for stowing spare fuel can. A two-piece, folding-type windshield, with two windshield wiper vacuum motors, is secured to the body cowl. The formed sheet metal hood and front fenders are removable. Access to the rear of the engine compartment, transmission, transfer, master cylinder, and steering gear is provided by removable front floor pan covers and access plates. Reflex reflectors are bolted to the rear and sides of the body.

Note. **Refer to paragraphs 53 through 58 for description and operation of ambulance equipment.**

(2) *Frame.* The frame is constructed of two heavy channel steel side rails and five cross members. The side rails and cross members are reinforced with welded plates. Two rear reinforcements of a V-shape design are welded to the side rails and rear cross member. All cross members, except the engine rear support cross member, are welded to the side rails. A stabilizer bar is mounted at each end of the frame to reduce swaying. Two front lifting shackles and a bumper bar are

mounted on the front of the frame. A towing pintle, two rear lifting shackles, and two bumperettes are mounted on the rear of the frame. Brackets and supports provide mounts for the engine, body, shock absorbers, springs, and stabilizer bars.

b. Data.

Body:	
Construction	welded
Driver's position	left
Length	88⅜ in.
Type	all steel, open
Width	55.40 in.
Windshield type	two piece, folding
Frame:	
Length	148.44 in.
Material	SAE 1020
Number of cross members	5
Width	29.25 in.

263. Windshield Assembly

The procedures for lowering and raising the windshield assembly of the M170 are identical to those of the M38A1 (par. 254*a* and *b*).

264. Hood Assembly

The raising, lowering, removal and installation procedures for the hood assembly of the M170 are identical to those of the M38A1 (par. 255).

265. Front Fenders

a. Left Front Fender Removal. The removal procedures for the left front fender of the M170 are identical to those of the M38A1 (par. 256*a*) with the exceptions listed in (1), (2), and (3) below.

(1) The fuel line is not clipped to the fender (par. 256*a*(4)).

(2) The fender brace is cut off and not connected to the frame side rail (par. 256*a*(7)).

(3) The upper and lower front fender-to-cowl side panel antisqueak (webbing) is not used (par. 256*a*(9)).

b. Right Front Fender Removal. The removal procedures for the right front fender of the M170 are identical to those of the M38A1 (par. 256*b*) except that no fender brace disconnections must be made (par. 256*b*(5)).

c. Left Front Fender Installation. The installation procedures for the left front fender of the M170 are identical to those of the M38A1 (par. 256*c*) with the exceptions listed in (1), (2), and (3) below.

(1) Coat surface of fender that mates with the body cowl with seal (WO-669709) instead of installing the lower and upper antisqueak (webbing) (par. 256*c*(2)).

(2) No fender brace connections must be made (par. 256*c*(4)).

(3) No fuel line connection must be made (par. 256*c*(7)).

d. Right Front Fender Installation. The installation procedures for the right front fender of the M170 are identical to those of the M38A1 (par. 256*d*) with the exceptions listed in (1) and (2) below.

(1) Coat surface of fender that mates with the body cowl with seal (WO–669709) instead of installing the lower and upper antisqueak (webbing) (par. 256*c*(2)).

(2) No fender brace connections must be made (par. 256*c*(4)).

266. Radiator Guard With Deflector

a. Removal.

(1) Proceed as directed in paragraph 257*a*(1) through (4).

(2) Loosen the outer lockwasher nut (fig. 194) on each of the two dash-to-air deflector tie rods sufficiently so that flat washers on the rod will clear the projections on the air deflector of the radiator guard with deflector. Pull the rods outward until they are clear of the deflector.

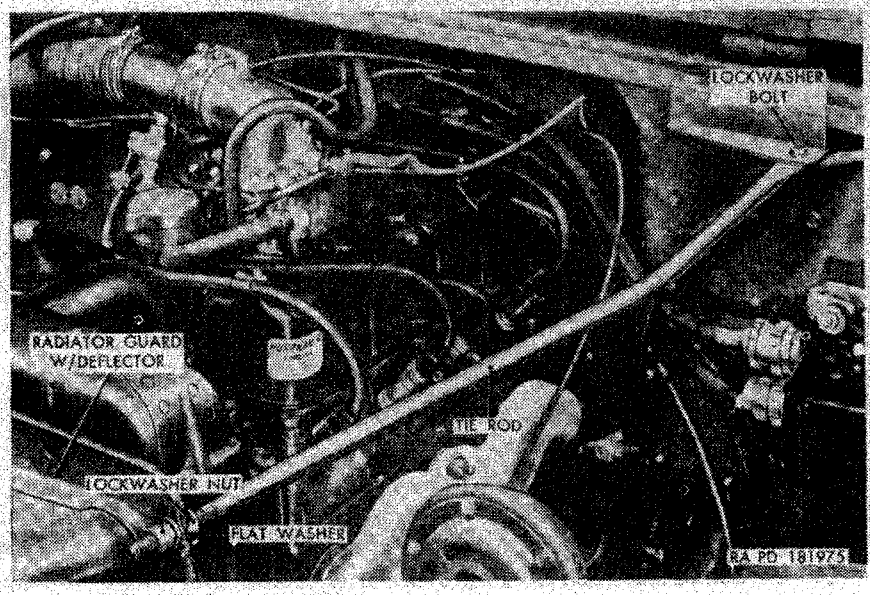


Figure 194. Dash-to-air deflector tie rod—installed on left side of radiator guard.

(3) Remove the locknut and flat washer from the bolt (fig. 195) securing the bottom of the radiator guard with deflector to the bracket on the frame front cross member. Remove the bolt and flat washer from the guard and bracket. Pull the radiator guard forward until the guard slots are clear of the fender screws. Remove the guard from the vehicle.

(4) Pull the rubber washer from the bottom of the spacer installed in the bracket on the frame front cross member. Lift the other rubber washer with the spacer from the top of the bracket.

(5) Remove the nut and lockwasher bolt (fig. 194) securing the rear of each tie rod to the bracket on the dash. Remove the two tie rods.

(6) Proceed as directed in paragraph 257*a*(6) and (7).

b. Installation.

(1) Proceed as directed in paragraph 257*b*(1) and (2).

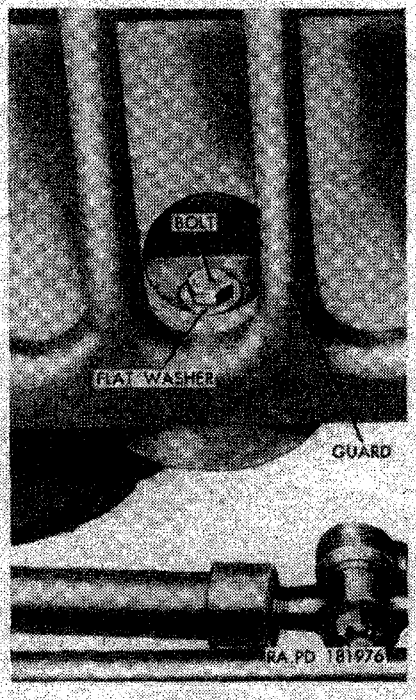


Figure 195. Radiator guard with deflector—bottom connection.

(2) Install the spacer in the opening provided in the bracket on the frame front cross member. Install one rubber washer on the top end of the spacer.

(3) Place the radiator guard with deflector in position at the front of the vehicle. Aline the hole at the bottom of the guard with the spacer hole, install one 7/16-inch flat washer on the 7/16 x 2¼ bolt (fig. 195) and insert the bolt through the guard and space. Install one 7/16-inch ID, 2-inch OD flat washer, and 7/16-inch locknut on the bolt, but do not tighten nut at this time.

(4) Enter the two lockwasher screws on the bottom of the guard into the mounting slots in the fenders. Enter the four lockwasher screws in the fenders into the mounting slots of the guard. Tighten all six screws.

(5) Tighten the 7/16-inch locknut installed on the bolt at the bottom of the guard.

(6) Secure guard to radiator by screwing two 5/16 x 5/8 bolts into the radiator-to-guard panel clips on each side of guard.

(7) Position the flat end of each dash-to-air deflector tie rod on the bottom of the bracket on the dash. Secure each rod to bracket with one 5/16 x 7/8 lockwasher bolt (fig. 194) and 5/16-inch nut.

Note. Install rod with the short bend on the right side of the engine compartment so the bend is up and over the air cleaner-to-air intake pipe flexible hose. Install rod with the long bend on the left side of the engine compartment so the bend is down.

(8) Insert the front end of each rod between the projections on the deflector of the guard, making sure a flat washer is on each side of the projection. Tighten the outer 3/8-inch lock washer nut (fig. 194) on each rod to brace the guard.

(9) Proceed as directed in paragraph 257*b*(5) and (6).

267. Stabilizer Bars, Brackets, and Links (M170)

(fig. 196)

a. Removal.

(1) *Bar (rear).*

(*a*) Remove the cotter pin and nut at the upper end of the link on the right and the left side of the vehicle.

(*b*) Remove the cup shaped washer and the link grommet from the links.

(*c*) Swing the bar up and off the links and remove the grommet and cup shaped washer from the links.

(*d*) Remove the four nuts, lockwashers, and bolts securing the mounting bracket to the support bracket on the frame, and remove the bar assembly from the vehicle.

(2) *Support bracket (rear).* Remove the six nuts, lockwashers, and bolts securing the support brackets to the frame side rail and remove the brackets from the vehicle.

(3) *Links.*

(*a*) Follow procedure in *a*(1) (*a*), (*b*), and (*c*) above.

(*b*) Remove the cotter pin and flat washer from the link shaft of the U-bolt plate and slide the link with the link bushing off the shaft, and remove a flat washer from the shaft.

(4) *Bar (front).* The procedure for removing the front stabilizer bar is the same as the rear ((1) above) except that the mounting brackets are secured directly to the frame side rail.

b. Installation.

(1) *Links.*

(*a*) Install a flat washer and the link with the link bushing over the link shaft of the U-bolt plate. Install a flat washer over the link shaft and secure with a $\frac{1}{8}$ x 1 cotter pin.

(*b*) Follow procedure in (3) (*b*) through (*e*) below.

(2) *Support bracket (rear).* Position the support brackets on the frame side rails. Install three $\frac{7}{16}$ x 1 bolts through each bracket and the frame side rail and secure with $\frac{7}{16}$-inch lockwasher and nut.

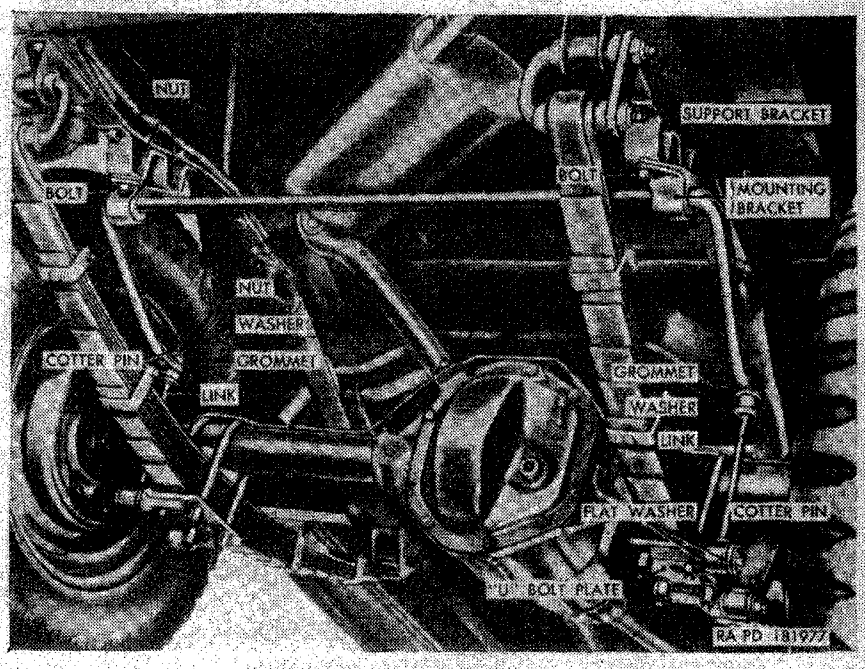


Figure 196. Stabilizer bar, brackets, and links (M170)—Rear.

(3) *Bar (rear).*

(*a*) Position the mounting brackets on the support brackets and install two $\frac{7}{16}$ x 1 bolts through the brackets on each side. Install a $\frac{7}{16}$-inch lockwasher and $\frac{7}{16}$-inch nut on the bolts securing the mounting brackets to the support brackets.

(*b*) Install a cup shaped washer and a grommet over the link on each side.

(*c*) Swing the bar down and slide the eyelet on each end of the bar over the links.

(*d*) Install a grommet and cup shaped washer over the end of each link.

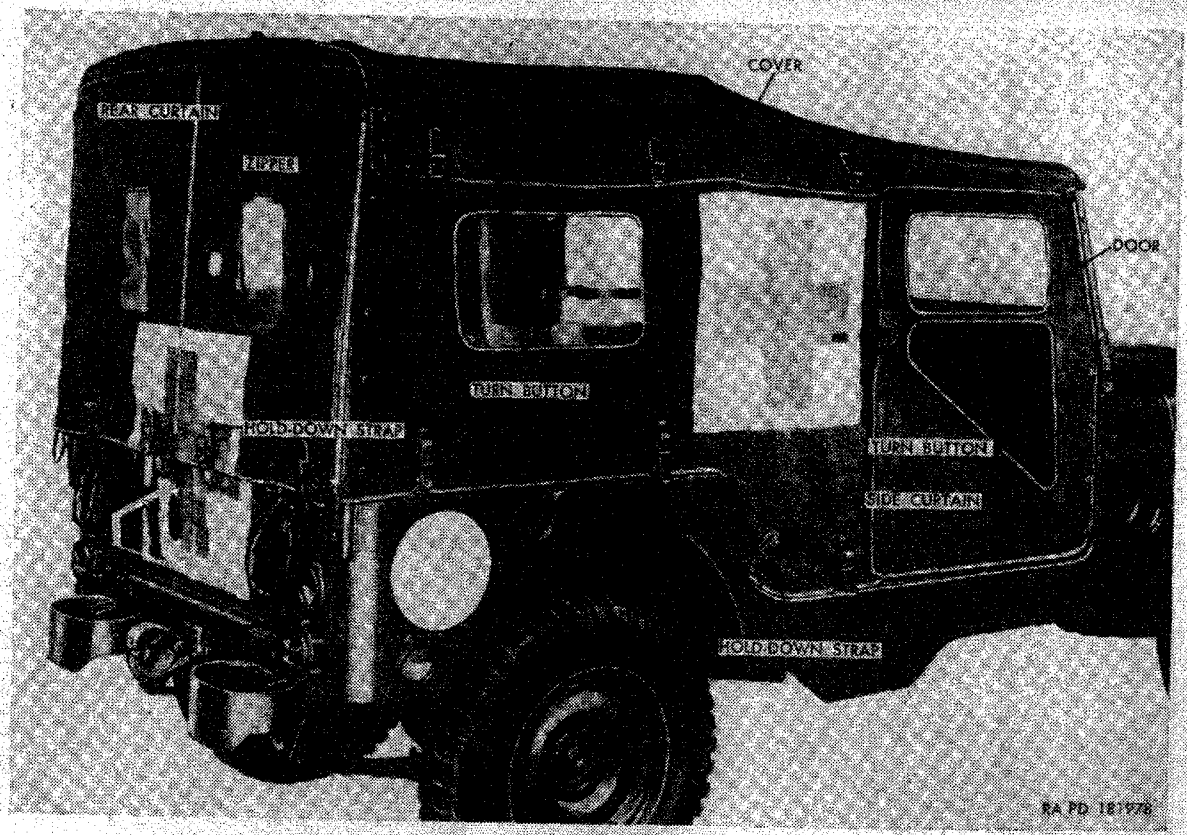


Figure 197. Top cover with rear curtain, right side curtain, and right door—installed.

secure the rest to the brackets with two 5/16 x 7/8 step bolts, 5/16-inch flat washers, and 5/16-inch nuts, making sure to insert bolts from the outside. Proceed in a like manner to install the wheel house seat back rest on the left side of the vehicle.

(6) Insert the center rear top bow ends into the right and left rear side top bow tops, making sure that bracket at center of bow points forward.

(7) Insert the center front top bow ends into the right and left front side top bow tops, making sure that the door stowage straps are at the left. Fasten the straps to the two brackets on the windshield.

(8) Position the windshield-to-front top bow stabilizer board in place beneath the bracket at the top center of the windshield and the bracket at the front of the center front top bow, secure in place with two 5/16 x 7/8 step bolts, 5/16-inch flat washers, and 5/16-inch nuts, making sure to insert bolts from the top.

(9) Position the front-to-rear top bow stabilizer board beneath the brackets on the center front top bow and center rear top bow, and secure in place with two 5/16 x 7/8 step bolts, 5/16-inch flat washers, and 5/16-inch nuts, making sure that the plasma container hooks point to the left of the vehicle.

269. Litter Racks

a. Upper Litter Rack.

(1) *Removal.* Working in the driver's compartment, withdraw the upper litter rack front inner locking pin (fig. 199) from the hole in the bracket front side on the upper litter rack underside to unlock the rack inner side from the upper litter front support. Withdraw the upper litter rack front outer locking pin from the bracket on the rack front outer side and the bracket on the front support to unlock the rack outer side from the front support. Push the middle of the upper litter rack front spreader arm forward to unlock it. Pull the rack inner side toward the outside of the vehicle until it is up against the rack outer side. Working at the rear of the vehicle, withdraw the upper litter rack rear outer locking pin (fig. 200) from the bracket on the rack outer side and the support bracket on the right rear side top bow. Push the middle of the upper litter rack rear spreader arm to the rear to unlock it. Slide the rack inner side toward the outside of the vehicle until it is up against the rack outer side. Unhook the upper litter rack hanger from the center rear top bow. Remove the rack from within the vehicle.

(2) *Installation.* Position the upper litter rack within the vehicle so that rack front end rests on the upper litter front

support and the rear of the inner side rests on the support of the right rear side top bow. Hook the upper litter rack hanger (fig. 200) over the center rear top bow. Lock the rack inner side to the support bracket on the rear side top bow by inserting the upper litter rack rear outer locking pin through the support bracket and the bracket on the rack outer side. Working in the driver's compartment, lock the rack outer side to the upper litter front support, by inserting the upper litter rack front outer locking pin (fig. 199) through the bracket on the rack front outer side and the bracket on the support. Lock the rack inner side to the support by inserting the upper litter rack front inner locking pin through the front side of the bracket on the rack underside. Push the rack inner side toward the center of the vehicle. Lock the rack in extended position by locking the upper litter rack front and rear spreader arms.

Note. To lock front spreader arm, push middle of arm toward rear of vehicle. To lock the rear spreader arm, push middle of arm toward front of vehicle.

b. Lower Litter Rack.

(1) *Removal.* Working from the beneath the vehicle, remove the four lockwasher screws and flat washers securing each rack side to the floor pan. Remove the two sides of the lower litter rack from within the vehicle.

(2) *Installation.* Position the two sides of lower litter rack on the floor pan of the vehicle, with the litter rack stops forward. Working beneath the vehicle, secure each rack side to the floor pan with four 5/16-inch flat washers and 5/16 x 3/4 lockwasher screws.

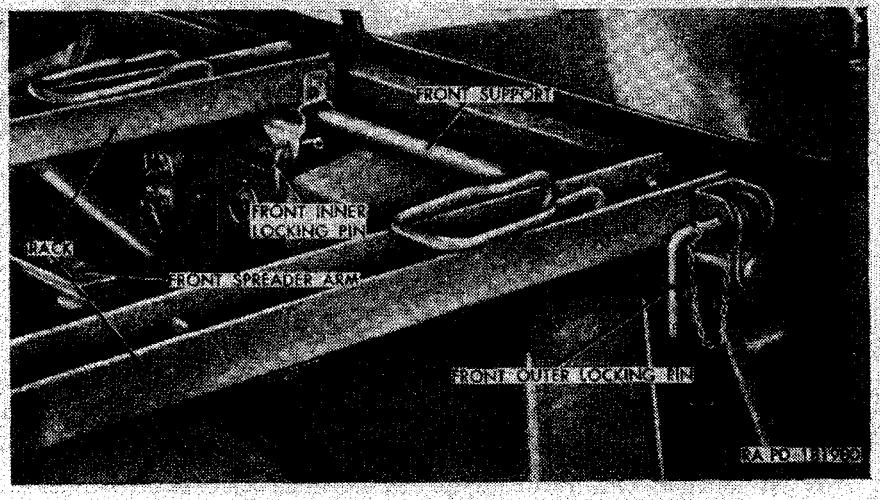


Figure 199. Upper litter rack front connections.

c. Wheel House Cushions (fig. 202).

(1) *Removal.* Remove the four oval-head tapping screws and finish washers securing each of the two right wheel house cushions to the top of the right wheel house and remove cushions from within vehicle. Remove the five oval-head tapping screws and finish washers securing each of the two left wheel house cushions to the top of the left wheel house and remove the cushions from the vehicle.

(2) *Installation.* Position the two right wheel house cushions on the top of the right wheel house and secure each one with four No. 10 finish washers and No. 10 x ½ oval-head tapping screws. Position the two left wheel house cushions on top

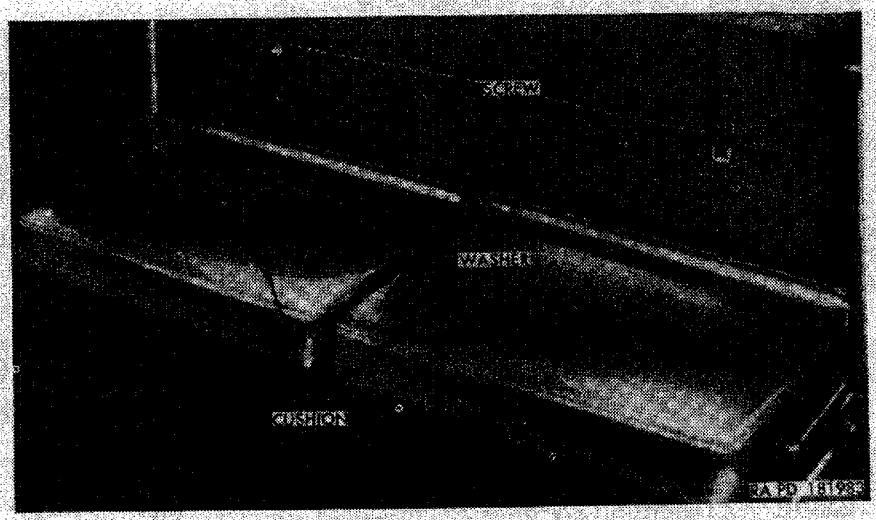


Figure 202. Right wheel house cushions—installed.

of the left wheel house and secure each one with five No. 10 finish washers and No. 10 x ½ oval-head tapping screws.

d. Driver's seat cushion.

(1) *Removal.* Remove the driver's seat (*a*(1) above). Remove the four oval-head cross recess screws securing the driver's seat cushion to the seat frame and remove the cushion from the frame.

(2) *Installation.* Position the driver's seat cushion on the seat frame and secure cushion to frame with four No. 10 x ½ oval-head cross recess screws. Install the driver's seat (*a*(2) above).

e. Driver's Seat Frame Crash Pad and Cover.

(1) *Removal.* Remove the driver's seat (*a*(1) above). Remove the 11 oval-head tapping screws and finish washers securing

seat back frame and remove the cover and pad from frame. Remove the front passenger seat back pad from the front passenger seat back cover.

(2) *Installation.* Place the front passenger seat back pad within the front passenger seat back cover and position the pad and cover on the seat back frame. Secure the cover and pad to the frame with nine No. 10 finish washers and No. 10 x ½ oval-head tapping screws. Install the front passenger seat (*b*(2) above).

i. Front Passenger Seat Frame Crash Pad and Cover.

(1) *Removal.* Remove the front passenger seat (*b*(1) above). Remove the seven oval-head tapping screws and finish washers securing the front passenger seat frame crash pad and cover to the seat frame. Pull the three trim clips on the cover free of the frame and remove the cover and pad. Remove the front passenger seat frame crash pad from the cover.

(2) *Installation.* Place the front passenger seat frame crash pad within the front passenger seat frame crash pad cover and position pad and cover on seat frame. Secure the pad and cover to frame with seven No. 10 finish washers and No. 10 x ½ oval-head tapping screws. Insert the trim clips on the cover into the holes in the frame. Install the front passenger seat (*b*(2) above).

Section XXVII. MAINTENANCE UNDER UNUSUAL CONDITIONS

273. 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 condition probably will not start at all, or only after many hours of laborious main-

Section XXVIII. RADIO INTERFERENCE SUPPRESSION

278. Purpose

a. 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 vehicles without, radios be suppressed properly to prevent interference wtih radio reception of neighboring vehicles.

b. Suppression in this vehicle is accomplished by the use of metallic shielding, capacitors, resistor suppressors, choke, filter, and rectifier. Wiring that may carry interfering surges to a point where interference will affect radio reception is shielded.

279. Description

The ignition and generating system have been designed to accomplish suppression of radio interference. The ignition system radio interference suppression is accomplished by a primary capacitor in the distributor wiring harness receptacle, resistor suppression in the spark plugs, and shielded spark plug cables. Radio interference suppression in the generating system is accomplished by a choke, capacitor, filter, and rectifier in the generator regulator assembly.

280. Ignition System Radio Interference Suppression

a. Description. The primary capacitor is housed in the distributor wiring harness receptacle (fig. 79) and is an integral part of the primary circuit. Spark plugs are shielded individually by metallic braid beneath the rubber insulation.

b. Maintenance.

(1) *Primary capacitor.* Procedure for the replacement of the primary capacitor is outlined in paragraph 151*d*.

(2) *Spark plug suppressors.* The spark plug suppressors are an integral part of the spark plugs. If interference is caused by the spark plugs, the plugs must be replaced (par. 153*c* and *d*).

(3) *Spark plug cables.* The spark plug cables must be replaced if the rubber insulation or the metallic shielding is damaged p(par. 153*a* and *b*).

281. Generating System

a. Description. The generator regulator assembly houses the capacitor, choke, filter, and rectifier.

b. Maintenance. The replacement of the capacitor, choke, filter, and rectifier is the responsibility of ordnance maintenance personnel. If interference is originating in the generating system, refer to paragraph 91*d*.

282. Fasteners and Bond Straps

Four ground straps (fig. 91) are secured to the mounting bracket cushions that support the generator regulator assembly. These straps form a shield about the generator regulator. The engine front plate-to-frame ground strap shields the power plant. It is important that all straps be in good condition and tightly secured to form a good ground.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE AND DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

283. Domestic Shipping Instructions

a. Preparation for shipment in zone of interior. When shipping the ¼-ton 4 x 4 utility truck M38A1 and ambulance M170 interstate or within the zone of interior, except directly to ports of embarkation, the officer in charge of preparing shipments *will be responsible* for furnishing the vehicle to carriers for transport in a *serviceable* condition, properly cleaned, preserved, painted, and lubricated as prescribed in SB 9–4.

Note: For loading and blocking instructions for these vehicles on flatcars, see paragraphs 285 and 286. On-vehicle material (OVM) will be processed, packaged, and stowed as prescribed in paragraph 285*b*.

b. Removal of Preservatives before Shipment. Personnel withdrawing vehicles from limited storage for domestic shipment *must not remove preservatives*, other than to insure that the vehicles are complete and serviceable. If it has been determined that preservatives have been removed, they must be restored prior to domestic shipment. Removal of preservatives is the responsibility of depots, ports, and field installations receiving shipment.

c. Preparation for Shipment to Ports (see AR 747–30).

(1) *Inspection.* All used vehicles destined for oversea use will be inspected, prior to shipment, in accordance with TB ORD 385.

(2) *Processing for shipment to ports.* All vehicles destined to ports of embarkation for oversea shipment will be further processed in accordance with SB 9–4.

Note: Ports of embarkation will perform any necessary supplementary or previously omitted processing upon receipt of vehicles, in accordance with AR 747–30.

(3) *Marking of arctic-lubricated material.* It will be the responsibility of the officer in charge of the organization performing arctic lubrication to insure that the equipment is marked as prescribed in SR 746–30–10. It will be the re-

sponsibility of the officer in charge of the organization shipping arctic-lubricated equipment to insure that each item is so marked. Unit commanders of using organizations will insure that such markings are not obliterated while the equipment is arctic-lubricated. When the equipment is deprocessed of the special lubrication, such marking will be immediately and thoroughly obliterated.

d. Army Shipping Documents. Prepare all Army shipping documents accompanying freight in accordance with TM 38–705.

e. Deep-Water Fording. If deep-water fording is anticipated during shipment, prepare vehicles in accordance with TM 9–2853.

284. Limited-Storage Instructions

a. General.

(1) Vehicles received for storage and already processed for domestic shipment, as indicated on DA Form 9–3, Processing Record for Shipment and Storage of Vehicles and Boxed Engines, must not be processed unless inspection performed, on receipt of vehicles, reveals corrosion, deterioration, etc.

(2) Completely process vehicles upon receipt directly from manufacturing facilities or if processing data recorded on tag indicate that preservatives have been rendered ineffective by operation or freight shipping damage.

(3) Vehicles to be prepared for limited storage must be given a limited technical inspection and processed as prescribed in SB 9–4. Results and classification will be entered on DA Form 461–5, Limited Technical Inspection.

b. Receiving Inspection.

(1) Report on DD Form 6, Receipt of Damaged or Improper Shipment, all vehicles received for storage in a damaged condition or improperly prepared for shipment, in accordance with SR 745–45–5. Report of vehicles received in an unsatisfactory condition (chronic failure or malfunction) will be made on DA Form 468, in accordance with SR 700–45–5.

2. When vehicles are inactivated, they will be processed in accordance with type I as prescribed in SB 9–4. Standby storage will ordinarily be handled by ordnance maintenance personnel only.

(3) Immediately upon receipt of vehicles for storage, they must be inspected and serviced as prescribed in paragraphs 8 through 11. Perform a systematic inspection and replace or repair all missing or broken parts. If repairs are beyond scope of unit and vehicles will be inactivated for an appreciable length of time, place them in limited storage and attach

tags specifying the repairs needed. Report of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

c. Inspection During Storage. Perform a visual inspection periodically to determine general condition. If corrosion is found, remove it and clean, paint, or treat with the prescribed preservatives.

Note. Touchup painting will be in accordance with TM 9-2851.

d. Removal from Limited Storage.

(1) If vehicles are not shipped or issued upon expiration of the limited storage period, they will be further treated for standby storage by ordnance maintenance personnel.

(2) If vehicles to be shipped will reach their destination within the limited storage period, they need not be reprocessed upon removal from storage unless inspection reveals it to be necessary according to anticipated intransit weather conditions.

Note. All vehicles being reissued through the depot supply system to troops within the continental limits of the United States must meet the requirements of TB ORD 385. This is NOT required for so-called reissues, exchanges, or redistribution among troop units, where the depot supply system is not involved.

(3) Deprocess vehicles when it has been ascertained that they are to be placed into immediate service. Remove all corrosion-preventive compounds and lubricate as prescribed in paragraphs 69 through 74. Inspect and service vehicles as prescribed in paragraphs 8 through 11.

(4) Repair and/or replace all items tagged in accordance with *b*(3) above.

e. Storage Site. Whenever possible, store vehicles under cover in open sheds or warehouses. When it is found necessary to store vehicles outdoors, the storage site must be selected in accordance with AR 700-105 and vehicles protected against the elements as prescribed in TB ORD 379.

285. Loading the ¼-Ton 4 x 4 Utility Truck M38A1 and Ambulance M170 on Railroad Flatcar

a. Preparation.

(1) When vehicles are shipped by rail, every precaution must be taken to see that they are properly loaded and securely fastened and blocked to floor of flatcar.

Note. The spare tire for the ambulance M170 illustrated is located inside the vehicle. The spare tire for the utility truck M38A1, however, is attached to the rear of the vehicle. If these vehicles are to be lifted, rather than driven onto the flatcar, the attached spare tires may interfere with lifting devices, and they should be removed and secured with metal strapping at some other suitable location on the vehicle.

(2) Prepare vehicles for rail shipment in accordance with SB 9–4. On-vehicle materiel will be thoroughly cleaned, preserved, packed (boxed or crated), and securely stowed in or on the vehicle as prescribed in *b* below.

(3) Load vehicles on flatcars so they will not form an unbalanced load.

(4) After each vehicle has been finally spotted on flatcar, apply parking brakes.

(5) Increase tire pressure slightly higher than normal except when vehicle is to be shipped to hot weather areas.

b. On-Vehicle Materiel (OVM) Requirements.

(1) *General.* Preserve and package all OVM individually, except items used in sets or in quantities greater than one.

(2) *Battery and electrolyte.*

(*a*) If the materiel is to be shipped within the continental limits of the United States, *except* directly to ports of embarkation, disconnect the battery cables from battery, clean ((*b*) below), if necessary, coat cable terminals and battery posts with automotive and artillery grease (GAA), and wrap with nonhygroscopic adhesive tape. Secure terminals *away* from battery.

(*b*) If materiel is to be shipped directly to ports of embarkation, *except*, when it is to be combat-loaded, disconnect battery cables and remove batteries. Plug vents and clean outside of batteries with a solution containing one-half pound of commercial grade baking soda (sodium carbonate) to one gallon of water. Rinse with *cool* water and remove vent plugs. Scrape or wire-brush and clean cable terminals and battery box (holder) with this cleaning solution, rinse with *cool* water, coat terminals with automotive and artillery grease (GAA) and wrap with nonhygroscopic adhesive tape. Paint battery boxes, if required, with black acid-resisting paint. Battery and electrolyte will be packed in accordance with TM 9–2857 and shipped in vehicle separate from other OVM.

(3) *Publications.* Place technical manual in type 1, grade A, class B bags and heat seal the opening (Method IC–3, TM 9–1005). Pack in the OVM container. Publications provided by separate technical services will be packaged similarly and packed in the same exterior OVM containers as the items to which they are applicable.

(4) *Unit packages.* Unit packages that are not water-resistant and are impracticable for intermediate packaging will be overwrapped in flexible waterproof barrier-material (method IC–2, TM 9–1005) and sealed with waterproof, water-resistant adhesive.

(5) *Intermediate packages.* Whenever possible, unit packages of related items will be grouped together, into intermediate packages in fiberboard cartons. Container closure will be made by sealing all seams with water-resistant, gummed paper tape. When the gross weight exceeds 20 pounds, the container will be sealed with water-resistant adhesive (for sealing fiberboard boxes), in addition to being sealed with tape (TM 9–1005).

(6) *Exterior containers.*

(*a*) Keep the number of exterior containers to a minimum. The size will be governed by the cubic displacement of the packaged OVM. Dimensions will be such that, when assembled in sets as required and stowed on vehicles, the overall cubage of the vehicles will not be increased and lifting devices will not be obstructed.

(*b*) Place heavy materiel or equipment in the bottom of exterior containers and block and brace, as necessary, so they will not damage other contents. Pack fragile materiel and canvas items above other OVM items, at the top of the containers; in addition, pack canvas covers for OVM items in the same exterior containers with the items for which they are intended.

(*c*) Pack unit and intermediate packages in style 2, unlined, snug-fitting, nailed wood boxes, for a type III load (see TM 9–1005), modified as prescribed in *1* through *5* below.

1. Exterior containers over 200 pounds gross weight will have nominal 2 x 4 end cleats. Also, beveled end skids of nominal 2 x 4 lumber will be placed flat, parallel to the ends of the containers, and spaced approximately 6 inches from each end, with span between skids not to exceed 36 inches.

2. The skids will be fastened to the bottom with nails driven through the floor into the skids. Nails will be of sufficient length and size to achieve maximum holding power.

3. Additional battens, when required, will be fastened to the inside faces of the top and side panels; additional battens will be fastened to the inside face of the bottom panel, when skids are not required.

4. Construct the container top of matched lumber and nail to the side and end panels. The container will be weatherproofed, strapped, and marked in accordance with TM 9–1005.

Note. Weatherproofing of container tops will not be necessary, if containers are to be stowed within the vehicle (if the vehicle is covered).

b. Cover exterior surfaces of all OVM exterior containers (except tops) with one coat of quick-drying lustreless enamel.

Note. OVM containers stowed within the vehicle will not require painting if the vehicle is covered.

(7) *Stowage.*

(*a*) Stow all OVM containers inside the body of vehicle, when practical. Containers stowed outside the vehicle must be placed so as not to increase the cubic displacement of the vehicle. Strap, block, or brace all OVM containers to prevent free movement.

Note. OVM containers must receive maximum protection against corrosion, deterioration, and mechanical damage during shipment and prolonged periods of storage.

(*b*) OVM containers constructed without skids, which are to be stowed in exposed locations in contact with platforms, floors, or other boxes, will be placed on nominal 1 x 4 wood cleats to minimize surface contact. Secure cleats in a manner that will prevent shifting or damage to contact surfaces.

(*c*) If vehicle is equipped with steel tool boxes, remove all padlocks and keys from vehicle in order to prevent pilferage while in transit. Secure lids of steel tool boxes by wiring hasp to prevent damage during shipment. Preserve padlocks and keys with preservative engine oil (grade 1) and wrap in greaseproof barrier material for domestic shipment or seal in a waterproof-greaseproof wrapping or bag (Method IC–1) for oversea shipment. Locate all wrapped padlocks and keys in shipping container with parts.

c. Method of Loading the ¼-ton 4 x 4 Ambulance M170 and Utility Truck M38A1 on Flatcars. For method of loading and general loading rules pertaining to rail shipment of ordnance vehicles, see TB 9–OSSC–G.

Warning: The height and width of vehicles, when prepared for rail transportation, must not exceed the limitations indicated by the loading table in AR 700–105 (section II). Whenever possible, local transportation officers must be consulted about the limitations of the particular railroad lines to be used for the movement in order to avoid delays, dangerous conditions, or damage to equipment.

286. Blocking the ¼-Ton 4 x 4 Ambulance M170 for Rail Shipment

a. General. All blocking instructions specified herein are minimum and are in accordance with Pamphlet No. MD–7, Rules Governing the Loading of Defense Materiel on Open Top Cars of the Association

of American Railroads. Additional blocking may be added, as required, at the discretion of the officer in charge. Double-headed nails may be used, except in the lower piece of two piece cleats. All item reference letters in *b* through *e* (5) below refer to details and locations shown in figures 203 and 204. The number of vehicles to be loaded will depend upon the length of flatcar.

Note. Any other loading methods or instructions, regardless of source, which appear to be in conflict with this publication or existing loading rules of the carriers, must be submitted for approval to the Chief of Ordnance, Department of the Army, Washington 25, D. C.

b. Brake Wheel Clearance "A." Load vehicles on flatcars, with a minimum clearance of at least 4 inches below and 6 inches above, behind, and to each side of the brake wheel. Any increase in clearance must be consistent with proper location of load.

Note. Three methods of blocking are given herein; the method to be used will depend on dimensions of flatcars and availability of required blocking materials. These instructions are for vehicles double-loaded as shown in figure 203. Vehicles may also be single-loaded. Double-deck loading, or incline-loading (with the front wheels of the second vehicle positioned in the rear body of the first vehicle, etc.) will be restricted to vehicles shipped unroofed.

c. Method I.

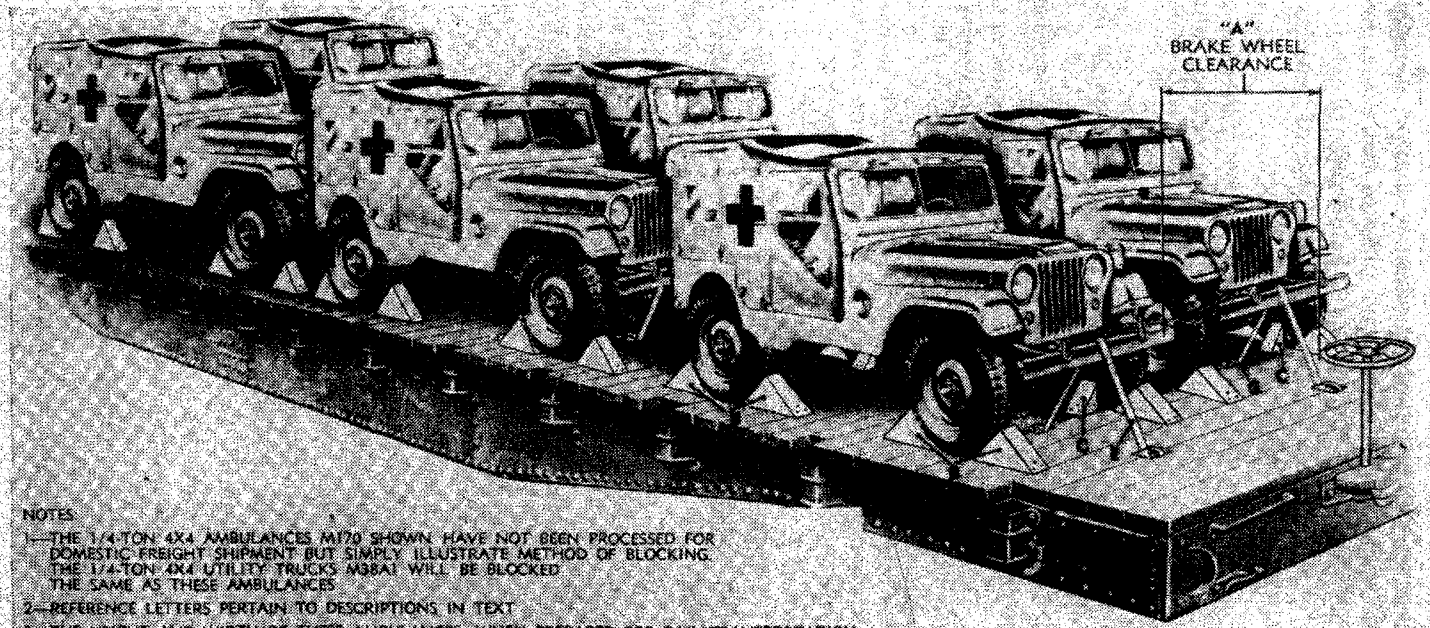
(1) *Chock blocks "B" (6 x 9 x 12, six required per truck, constructed as shown in detail 1, fig. 204).* Locate the 53 degree surface of blocks against the front and rear of each outside wheel, against the front of each inside front wheel, and against the rear of each inside rear wheel. Nail heel of each block to car floor with three forty penny nails and toenail both sides of blocks to car flood with one fortypenny nail each.

Note. Alternate type B–1 or B–2 chock blocks may be constructed as shown in details 2 and 3, figure 204 and located against tires as shown in details 1 and 2, figure 203. Vehicles, single-loaded, require chock blocks at the front and rear of all four wheels.

(2) *Inside wheel blocks "C" (6 x 9 x 12, four required per truck, constructed as shown in detail 1, figure 204).* Locate the 6 x 9 surface of block flush against the inside of each wheel, as shown in figure 203. Nail heel of each block to car floor with fortypenny nails and toenail each side to floor with one fortypenny nail.

Note. Alternate type inside wheel blocks C–1 may be constructed as shown in detail 4, figure 204, and located against tires as shown in detail 2, figure 203. When inside wheel blocks C–1 are used, cushioning material "D" (waterproof paper or burlap) will be placed between blocks C–1 and inside of tire. The material should extend 2 inches beyond block on car floor and 2 inches above block against side of tire.

(3) *Vehicle strapping "E" (1-in. No. 14 BW gage, hot-rolled steel, length to suit, two required per truck).* Locate



NOTES:

1—THE 1/4-TON 4X4 AMBULANCES M170 SHOWN HAVE NOT BEEN PROCESSED FOR DOMESTIC FREIGHT SHIPMENT BUT SIMPLY ILLUSTRATE METHOD OF BLOCKING. THE 1/4-TON 4X4 UTILITY TRUCKS M38A1 WILL BE BLOCKED THE SAME AS THESE AMBULANCES.

2—REFERENCE LETTERS PERTAIN TO DESCRIPTIONS IN TEXT.

3—THE HEIGHT AND WIDTH OF THESE AMBULANCES, WHEN PREPARED FOR RAIL TRANSPORTATION, MUST NOT EXCEED THE LIMITATIONS INDICATED BY THE LOADING TABLE IN AR 700-105 (SECTION II). WHENEVER POSSIBLE, LOCAL TRANSPORTATION OFFICERS MUST BE CONSULTED ABOUT THE LIMITATIONS OF THE PARTICULAR RAILROAD LINES TO BE USED FOR THE MOVEMENT IN ORDER TO AVOID DELAYS, DANGEROUS CONDITIONS, OR DAMAGE TO EQUIPMENT.

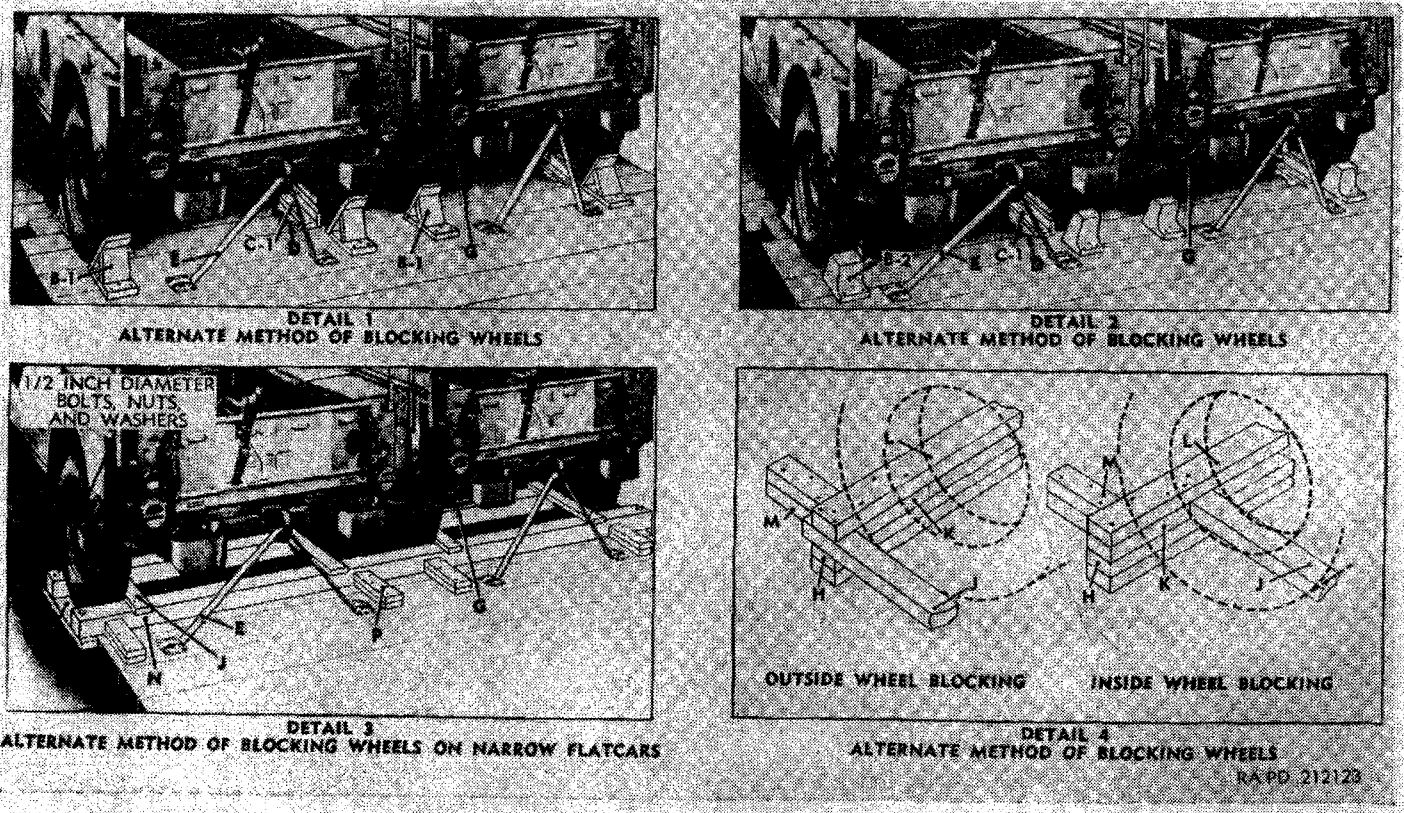


Figure 203. Methods of blocking the ¼-ton 4 x 4 ambulance M170 on flatcars.

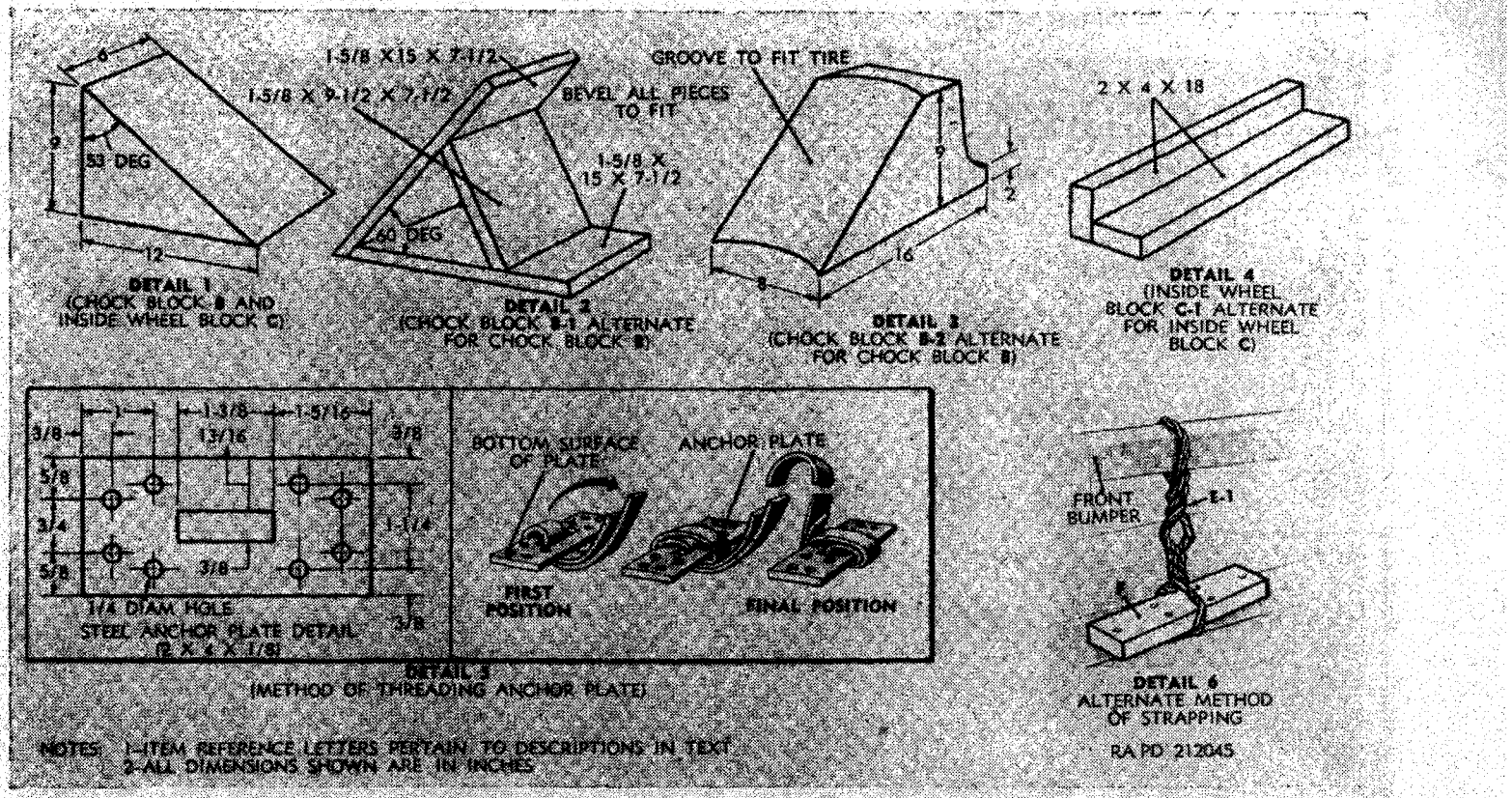


Figure 204. Materials for blocking the ¼-ton 4 x 4 ambulance M170 on flatcars.

strapping "E" over front bumper of vehicle and through rear pulling hook of vehicle, as shown in figure 203. Pass strapping "E" over front bumper of vehicle and through and nail anchor plates to car floor with eight twentypenny nails. Substitute, if desired, four strands of No. 8 gage, black annealed wire, "E–1," twist-tied to form cables. Pass the cable over the bumper or through the pulling hook underneath and around random 2 x 4 x 18 cleat "F" (detail 6, figure 204). Nail cleat lengthwise to car floor and twist-tighten cables to remove all slack.

(4) *Vehicle ties "G" (6 strands, 3 wrappings, No. 8 gage, black annealed wire, length to suit).* Pass cables around frame (bumpers, hooks, brackets, etc.) at front and rear of every two side-by-side vehicles as shown in figure 203. Twist-tighten cables to remove all slack.

d. Method II.

(1) *Wheel cleats "N" (4 in. wide, 6 in. high, 8 inches longer than width of car, four required for every two side-by-side trucks).* Locate a cleat "N" across the front and rear of front and rear wheels as shown in detail 3, figure 203, and toenail each to car floor with four thirtypenny nails.

(2) *Wheel supports "Q" (2 x 4 in., 2 inches longer than distance between outside faces of cleats "N" two required per truck).* Locate the 2-inch side of support "Q" against each side of car floor. Secure each end to cleats "N" with 1-inch diameter bolt, nut, and washer, as shown in detail 3, figure 203.

Note. After the nuts have been assembled to the bolts, nick the threaded portion of each bolt behind the nut to prevent the nut from turning loose.

(3) *Wheel cleats "J" (2 x 4 in. 4 inches longer than distance between outside faces of cleats "N," four required per truck).* Locate cleat "J" across top cleats "N" with sides of cleats "J" flush against inside of tires, as shown in detail 3, figure 203. Nail end of each cleat "J" to cleats "N" with three twentypenny nails.

(4) *Support cleats "P" (2 x 4 x 18 in., eight required per truck).* Locate four cleats "P" equidistant across car floor with ends flush against cleats "N," as shown in detail 3, figure 203. Nail cleat to car floor with four thirtypenny nails. Locate one cleat on top of each lower cleat and nail with four thirtypenny nails.

e. Method III.

(1) *Wheel cleats "H" (2 x 4 in., length to suit, eight required for every two side-by-side vehicles).* Locate a cleat "H" across flatcar close to front and rear of front and rear wheels and

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

288. General

a. Destruction of the ¼-ton 4 x 4 utility truck M38A1 and the ¼-ton 4 x 4 front line ambulance M170 when subject to capture or abandonment in the combat zone will be undertaken by the using organization only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items for the vehicle. The issue of these and related materials, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are—

Mechanical—Requires axe, pick mattock, sledge, crowbar, or similar implement.
Burning —Requires gasoline, oil, incendiary grenades, or other flammables.
Demolition—Requires suitable explosives or ammunition.
Gunfire— Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

In general, destruction of essential parts, followed by burning will usually be sufficient to render the vehicle useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the vehicle must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so the enemy cannot construct one complete unit from several damaged ones.

d. If destruction is directed, due consideration should be given to—

(1) Selection of a point of destruction that will cause greatest obstruction to enemy movement and also prevent hazard to

friendly troops from fragments or ricocheting projectiles which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

289. Destruction of the ¼-Ton 4 x 4 Vehicle

The vehicles covered in this manual are similar with the exception of differences in chassis length and the bodies mounted thereon. Therefore, the methods of destruction described in paragraphs 290, 291, and 292 are applicable to both vehicles.

290. Method No. 1—Destruction by Burning

a. Using an axe, pick mattock, sledge, or other heavy implement, smash all vital elements such as distributor, carburetor, generator, ignition coil, fuel pump, spark plugs, air cleaner, lights, instruments, and controls. If time permits, and a sufficiently heavy implement is available, smash the engine cylinder block and head, crankcase, and transmission.

b. Puncture fuel tank as near the bottom as possible, collecting gasoline for use as outlined in *e* below.

c. Slash tires. If tires are inflated exercise care to prevent injury should the tire blow out while being slashed. Whenever practicable, it is usually preferable to deflate tires before slashing.

d. Explosive ammunition, if available nearby, should be removed from packing or other protective material. Place ammunition in and about the vehicle so that it will be fully exposed to the fire and in such locations that the greatest damage will result from its detonation. Remove any safety devices from ammunition.

e. Pour gasoline and oil in and over the entire vehicle. Ignite by means of an incendiary grenade fired from a safe distance, a burst from a flame thrower, a combustible train of suitable length, or other appropriate means. Take cover immediately. If gasoline and oil are not available, use other flammables such as oily rags or waste, wood, or paper. Ignite by means of incendiary grenades or other suitable means.

Caution: Cover must be taken without delay since an early explosion of the explosive ammunition, if present, may be caused by the fire. Due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns. Elapsed time: about 6 minutes.

291. Method No. 2—Destruction by Demolition

a. Prepare two 2-pound charges of EXPLOSIVE, TNT (two 1-lb blocks or equivalent per charge together with the necessary detonating cord to make up each charge). Set the charges as follows:

(1) The *first*, on *top* of the clutch housing.

(2) The *second*, as low on the *left* side of the engine as possible.

(3) Connect the *two* charges for simultaneous detonation with detonating cord. Provide for dual priming to minimize the possibility of a misfire.

(4) For priming either a nonelectric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 ft in a prx 40 sec; test before using) or an electric blasting cap and firing wire may be used. Safety fuse, which contains black powder, and nonelectric blasting caps must be protected from moisture at all times. The safety fuse may be ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Keep the blasting caps, detonating cord, and safety fuse separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the pertinent provisions of FM 5-25. Training and careful planning are essential.

b. Destroy the tires as in paragraph 290*c*.

c. Detonate the charges. If primed with nonelectric blasting cap and safety fuse, ignite and take cover. If primed with electric blasting cap, take cover before firing the charges. The danger zone is approximately 200 yards. Elapsed time: about 5 minutes.

292. Method No. 3—Destruction by Gunfire

a. Destroy the tires as in paragraph 290*c*.

b. Destroy the vehicle by gunfire using artillery, machine guns, rifles using rifle grenades, or launchers using antitank rockets. Fire on the vehicle aiming at the engine, axles, body, and wheels. Although one well-placed direct hit may destroy the vehicle, several hits are usually required for complete destruction unless an intense fire is started, in which case the vehicle may be considered destroyed.

Caution: Firing artillery at ranges of 500 yards or less should be from cover. Firing rifle grenades or antitank rockets should be from cover. Elapsed time: about 5 minutes.

APPENDIX

REFERENCES

1. Publication Indexes

Special Regulations in the 310–20-series, DA Pam 108–1, DA Pams in the 310-series, and FM 21–8 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

The following manuals of the Department of the Army Supply Manual pertain to this materiel:

a. Destruction to Prevent Enemy Use.

Land Mines and Components; Demolition Explosives and Related Items; and Ammunition for Simulated Artillery, Booby Trap, Hand Grenade, and Land Mine Fire.	ORD 3 SNL R–7

b. Maintenance and Repair.

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNL K–1
Items of Soldering, Metallizing, Brazing and Welding Materials; Gases and Related Items.	ORD 3 SNL K–2
Lubricating Equipment, Accessories, and Related Dispensers.	ORD (*) SNL K–3
Lubricating Fittings, Oil Filters, and Oil Filter Elements.	ORD 5 SNL H–16

c. Vehicle.

Truck, Ambulance, Front Line, ¼-Ton, 4 x 4, M170, and Truck, Utility, ¼-Ton, 4 x 4, M38A1.	
Field and Depot Maintenance Allowances	ORD 8, SNL G–758
Organizational Maintenance Allowances	ORD 7, SNL G–758
Truck, Utility, ¼-Ton, 4 x 4, M38A1; List of All Service Parts.	ORD 9, SNL G–758

d. General.

Introduction	ORD 1

*See DA Pamphlet 310–20, Index of Supply Manuals—Ordnance Corps, for published types of manuals of the Ordnance section of the Department of the Army Supply Manual.

3. Forms

The following forms pertain to this materiel:

Standard Form 91, Operator's Report of Motor Vehicle Accident.
Standard Form 93, Report of Investigating Officer.
Standard Form 94, Statement of Witness.
DA Form 9–3, Processing Record for Storage and Shipment of Vehicles and Boxed Engines.
DA Form 9–4, Vehicular Storage and Servicing Record.
DA Form 9–68, Spot Check Inspection Report for Wheeled and Half-Track Vehicles.
DA Form 9–75, Daily Dispatching Record of Motor Vehicles.
DA Form 285, Accident.
DA Form 348, Driver Qualification Record.
DA Form 460, Preventive Maintenance Roster.
DA Form 461, Preventive Maintenance Service and Inspection for Wheeled and Half-Track Vehicles.
DA Form 461–5, Limited Technical Inspection.
DA Form 468, Unsatisfactory Equipment Report.
DA Form 478, Organizational Equipment File.
DA Form 811, Work Request and Job Order.
DA Form 811–1, Work Request and Hand Receipt.
DA Form 1089, Claim for Personal Property.
DD Form 6, Report of Damaged or Improper Shipment.
DD Form 313, U. S. Government Operator's Permit.
DD Form 317, Preventive Maintenance Service.

4. Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

a. Camouflage.

Camouflage, Basic Principles	FM 5–20
Camouflage of Vehicles	FM 5–20B

b. Decontamination.

Decontamination	TM 3–220
Defense Against CBR Attack	FM 21–40

c. Destruction to Prevent Enemy Use.

Explosives and Demolitions	FM 5–25

d. General.

Cleaning and Black Finishing Equipment of Ferrous Metals	TM 9–1861
Cooling Systems: Vehicles and Powered Ground Equipment	TM 9–2858
Driver's Manual	TM 21–305
Driver Selection and Training	TM 21–300
Fording Kits for Combat and Transport Vehicles	MIL–F–3201
Fuel-Burning Heaters for Winterization Equipment	TM 9–8662
Inspection of Ordnance Materiel in the Hands of Troops	TM 9–1100
Instruction Guide: Operation and Maintenance of Ordnance Materiel in Extreme Cold (0° to —65° F.).	TM 9–2855
Military Vehicles	TM 9–2800

Motor Transportation Operations	FM 25–10
Mountain Operations	FM 70–10
Operations in the Arctic	FM 31–71
Precautions in Handling Gasoline	AR 850–20
Preparation of Ordnance Materiel for Deep Water Fording	TM 9–2853
Principles of Automotive Vehicles	TM 9–2700 (to be renumbered TM 9–8000–1)
Prevention of Motor Vehicle Accidents	AR 385–55
Accident Reporting	SR 385–10–40
Spark Plugs	TB ORD 313
Storage Batteries, Lead-Acid Type	TM 9–2857
Supplies and Equipment: Motor Vehicles	AR 700–105
Supplies and Equipment: Unsatisfactory Equipment Report	SR 700–45–5

e. Maintenance and Repair.

Abrasive, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Materiel.	TM 9–850
Instruction Guide: Care and Maintenance of Ball and Roller Bearings.	TM 37–265
Lubrication	TM 9–2835
Maintenance and Care of Hand Tools	TM 9–867
Maintenance and Care of Pneumatic Tires and Rubber Treads	TM 31–200
Maintenance of Supplies and Equipment: Maintenance Responsibilities and Shop Operation.	AR 750–5
Painting Instructions for Field Use	TM 9–2851
Preparation of Ordnance Materiel for Deep Water Fording	TM 9–2853
Tactical Motor Vehicle Inspection and Preventive Maintenance Services.	TM 9–2810

f. Shipment and Limited Storage.

Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage and Shipment.	TM 9–1005
Manual of Approved Packaging Instructions for Major Items and Spare Parts for Ordnance General Supplies.	PS 1000[1]
Marking of Arctic-Lubricated Materiel and Equipment	SR 746–30–10
Marking of Oversea Supply	SR 746–30–5
Shipment Digit Marking	SR 746–30–6
Military Standard, Marking of Shipments	MIL STD 129[2]
Ordnance Storage and Shipment Chart—Group G	TB 9–OSSC–G
Packaging and Packing for Shipment and Storage of Spare Parts for Military Vehicles.	MIL–P–11443 (ORD)
Packaging of On Vehicle Materiel (OVM) for Military Vehicles, Transport and Combat.	MIL–P–12841 (ORD)
Preparation of Supplies and Equipment: Processing of Unboxed and Uncrated Equipment for Oversea Shipment.	AR 747–30
Preservation, Methods of	MIL–P–116B

[1] Copies may be obtained from the Raritan Arsenal Publications Division, Metuchen, N. J.
[2] Copies may be obtained from Aberdeen Proving Ground, Aberdeen, Md.

Preservation, Packaging, and Packing of Military Supplies and Equipment.	TM 38-230
Preservation, Packaging, and Packing Materials, Supplies and Equipment Used in the Army.	SB 38-100
Processing of Motor Vehicles and Related Unboxed Materiel for Shipment and Storage.	SB 9-4
Protection of Ordnance General Supplies in Open Storage	TB ORD 379
Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment.	SR 745-45-5
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel other than Ammunition and Army Aircraft.	TB ORD 385

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