

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

7. Purpose

a. When a new or reconditioned vehicle is first 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, sub-assemblies, and accessories to be sure they are properly assembled, secure, clean, and correctly adjusted and/or lubricated. Check all tools and equipment (pars. 62-65) to be sure every item is present, in good condition, clean, and properly mounted or stowed.

b. In addition, perform a "break-in" of at least 500 miles on all new or reconditioned vehicles and a sufficient number of miles on used vehicles to completely check their operation, according to procedures in paragraph 9.

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

8. Preliminary Services

a. General Procedures.

- (1) Uncrate vehicle, if crated. Remove metal strapping, plywood, tape, seals, wrapping paper, and dehydrant bags. If any exterior surfaces are coated with rust-preventive compound, remove it with dry-cleaning solvent or volatile mineral spirits.
- (2) Read processing 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 to the switch.
- (3) Remove the spark plugs and crank engine with starter 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) Perform a general inspection to see if items are in good condition, correctly assembled or stowed, secure, not excessively worn, not leaking, and adequately lubricated. These instructions apply to most items in the preventive-maintenance and inspection procedures (table II).

Note. 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.

- (5) Refer to paragraph 73b for general procedure for all services and inspections.

b. Specific Procedures. For preliminary service, perform the "D" (6 months or 6,000 miles, whichever occurs first) (table III) preventive-maintenance service, with the variations in (1) through (6) below.

- (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 a torque of 65-75 pound-feet (par. 103) and in the sequence prescribed in figure 25.
- (3) Perform item 27 before starting the road test. If the processing tag (a (2) above) 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 engine has been thoroughly warmed up to operating temperature, check the tightness of the cylinder-head nuts as prescribed in (2) above.
- (5) Perform item 35. Inspect breaker points.
- (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.

9. Break-In

a. General. Refer to paragraphs 42 through 53 for operating instructions. After the preliminary service has been performed (par. 8), 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 not use excessive speeds, skip speeds in

shifting gears, use rapid acceleration, or in any way load the engine or power train to capacity during the break-in period. If the vehicle was driven to the using organization, include the mileage traveled in the break-in mileage.

b. Service After 500 Miles. After 500 miles of vehicle operation, perform the "C" (1,000 miles) preventive-maintenance service (table III, par. 6) with variations in (1) and (2) below.

(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 "C" (1,000 miles) preventive-maintenance service (table III).

10. 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, Unsatisfactory Equipment Report.

Section II. CONTROLS AND INSTRUMENTS

11. General

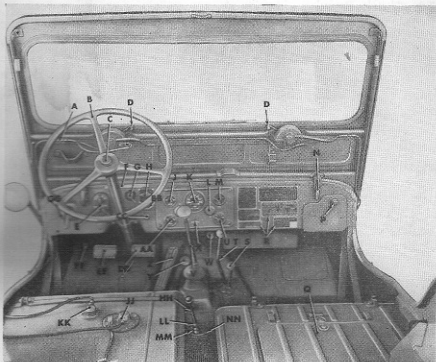
This section describes, locates, and illustrates, the various controls and instruments provided for the proper operation of the vehicle.

12. Steering Wheel

The steering wheel (B, fig. 7) is located on the left side of the driving compartment and is used to turn the front wheels for steering the vehicle. Turn the wheel clockwise to steer the vehicle to the right. Turn the wheel counterclockwise to steer the vehicle to the left.

13. Service Brake Pedal

The service brake pedal (DD, fig. 7) is located to the right of the steering gear jacket. It consists of a shaft and flat padlike surface extending through the upper front floor pan cover. The



A — WINDSHIELD WIPER MOTOR
 B — STEERING WHEEL
 C — HORN BUTTON
 D — WINDSHIELD WIPER MANUAL
 CONTROL HANDLE
 E — LIGHT SWITCH
 F — BELL HOUSING DRAIN PLUG
 DECALCOMANIA
 G — IGNITION SWITCH
 H — DEEP WATER FORDING VENT
 VALVE CONTROL
 J — AMMETER
 K — SPEEDOMETER
 L — INSTRUMENT PANEL LIGHT
 M — FUEL GAGE
 N — WINDSHIELD LOCK ASSY
 P — MAP COMPARTMENT LOCK
 Q — TOOL COMPARTMENT
 R — VEHICLE NAME, DATA, INSTRU-
 CTION AND CAUTION PLATES
 S — TRANSFER HIGH AND LOW
 RANGE GEARSHIFT LEVER

T — TRANSFER FRONT WHEEL DRIVE
 GEARSHIFT LEVER
 U — OIL PRESSURE GAGE
 V — TRANSMISSION GEARSHIFT LEVER
 W — STARTER PEDAL
 X — HEAD LIGHT HIGH BEAM
 INDICATOR LIGHT
 Y — ACCELERATOR FOOT REST
 Z — ACCELERATOR PEDAL
 AA — WATER TEMPERATURE GAGE
 BB — THROTTLE CONTROL
 CC — CHOKE CONTROL
 DD — SERVICE BRAKE PEDAL
 EE — CLUTCH PEDAL
 FF — HEAD LIGHT DIMMER SWITCH
 GG — HAND BRAKE HANDLE
 HH — POWER-TAKE-OFF GEARSHIFT
 CONTROL LEVER
 JJ — FUEL FILTER ASSY
 KK — FUEL TANK LEVEL SENDING ASSY
 LL — GROMMET
 MM — GROMMET
 NN — GROMMET RETAINING PLATE

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Figure 7. Driver's compartment—rear view.

service brake pedal is used to operate the hydraulic service brake shoes at all four wheels, for slowing down or stopping the vehicle. Push down the pedal to apply the brakes. The degree of braking effect is dependent upon the amount of pressure applied. When pressure is released, the pedal will return to its normal position.

14. Clutch Pedal

The clutch pedal (EE, fig. 7) is to the left of the steering gear jacket. It is of the same design as the service brake pedal (DD, fig. 7) and also extends through the upper front floor pan. The clutch pedal is used to engage or disengage the clutch. When engaged, the clutch transmits the engine driving power to the transmission; when disengaged, the clutch releases the engine driving power from the transmission. Depress the clutch pedal to disengage the clutch. Allow the pedal to return to its normal position to engage the clutch.

15. Accelerator Pedal

The accelerator pedal (Z, fig. 7) is located to the right of the brake pedal and is mounted on the lower portion of the upper floor pan. Its purpose is to accelerate or decelerate the speed of the engine. Depress the accelerator pedal to increase the speed of the engine. Release the pressure to decrease the speed of the engine. The amount of pressure exerted on the accelerator pedal controls the speed of the engine.

16. Starter Pedal

The starter pedal (W, fig. 7) is located to the right of the accelerator pedal at the upper edge of the upper front floor pan. It is foot-operated and, when depressed, engages the starter motor gear with the engine flywheel ring gear and actuates the starter switch to crank the engine. The starter pedal automatically returns to normal position when pressure is released.

17. Transfer Front Wheel Drive Gearshift Lever

The transfer front wheel drive gearshift lever (T, fig. 7) is located in the center of the driving compartment to the left of the transfer high and low range gearshift lever. It extends downward through the lower front floor pan to the transfer front output shaft bearing housing. This lever is used to engage or disengage the front wheel drive. It has two positions which are indicated on the shifting instruction plate (fig. 4) as IN and OUT. Operation of transfer front wheel drive gearshift lever is covered in paragraphs 44 and 47.

18. Transfer High and Low Range Gearshift Lever

The transfer high and low range gearshift lever (S, fig. 7) is located to the right of the transfer front wheel drive gearshift lever. The lever extends downward through the lower front floor pan to the transfer front output shaft bearing housing. This

lever is used to engage the transfer gears in high or low gear ratio as shown on the shifting instruction plate (fig. 4). Operation of transfer high and low range gearshift lever is explained in paragraphs 44 and 47.

19. Transmission Gearshift Lever

The transmission gearshift lever (V, fig. 7) is located on top of the transmission in the transmission gearshift lever housing. The lever extends through the transmission (front floor board) to the left of the transfer gear shifting levers. The lever is manually controlled for selecting any one of four gear ratios, three forward and one reverse, as indicated on the shifting instruction plate (fig. 4). Operation of the transmission gearshift lever is explained in paragraphs 44 and 47.

20. Handbrake Handle

The handbrake handle (GG, fig. 7) is located on the left side of the instrument panel to the left of the light switch. The handle is manually operated. When pulled out, it applies a mechanical brake at the rear of the transfer case. It may be used in an emergency, due to failure of service brakes, but is primarily used for holding the vehicle while parked. Pull back the handle to apply the brake. If pulled back without turning, the handle will be prevented from moving forward by a ratchet. To release the brake, turn the handle either clockwise or counterclockwise and allow to slide forward.

21. Throttle Control

The throttle control (BB, fig. 7) is located on the instrument panel to the left of the instrument cluster. It provides a hand operated control for acceleration of the engine when starting and during warm up period. To accelerate the engine, pull out throttle control from instrument panel for desired engine speed. When pulled out, the throttle control is held in position by a ratchet. Release the throttle by a quarter turn to the right or left.

22. Choke Control

The choke control (CC, fig. 7) is located on the instrument panel to the left of the instrument cluster. This control is connected to the choke valve shaft and closes and opens the choke valve plate when starting a cold engine and during the warming up procedure. To choke the carburetor, pull out the control. After engine has started, push the choke control in, by degrees, until engine is warmed up and running smoothly. The choke control must be pushed in all the way when the engine is operating smoothly.

23. Deep Water Fording Vent Valve Control

The deep water fording vent valve control (H, fig. 7) is located on the instrument panel to the left of the instrument cluster. The control closes the deep water fording vent valve for underwater operation when the fording kit has been installed. Pull out the control before fording (fig. 5) and push in the control handle after fording is completed.

24. Winch Controls

The power-take-off gearshift control lever (fig. 12 and HH, fig. 7) is located in the driving compartment between the driver and passenger seats. The winch shifting handle (fig. 11) is located on the winch mounted at the front of the vehicle. The lever, in the driving compartment, engages the gears of the power-take-off with the transfer gears to supply power to the winch. Pull back the lever to disengage the power-take-off and push forward to engage. The handle, on the winch (fig. 11), engages and disengages the winch drum clutch which connects the winch drum with the winch drive mechanism. When the handle is down the clutch is engaged. When the handle is up, the clutch is disengaged.

25. Oil Pressure Gage

The oil pressure gage (U, fig. 7) is located on the instrument panel in the lower right corner of the instrument cluster (fig. 83), and shows the amount of pressure in the engine lubricating system. The luminous face of the gage is graduated in 30 psi readings from 0 to 120 psi. Normal reading should be 30 psi with a warm engine. When engine is cold, the reading may be slightly higher.

Note. The oil pressure gage does not indicate the amount of oil in the crankcase.

When lack of oil pressure or fluctuation of needle is observed, the engine should immediately be stopped and checked for low oil level in crankcase, oil line leaks, or faulty sending unit (fig. 87).

26. Fuel Gage

The fuel gage (M, fig. 7) is located on the instrument panel in the upper right corner of the instrument cluster (fig. 83). It indicates the fuel level of the gasoline in the fuel tank. The fuel gage readings are graduated E (empty) $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and F (full) and are luminous enabling them to be read at night.

Note. Ignition switch (fig. 5 and G, fig. 7) must be in ON position to operate fuel gage.

27. Fuel Tank Level Sending Unit

The fuel tank level sending unit (KK, fig. 7) is located on the top of the fuel tank under the driver's seat. The unit electrically transmits to the fuel gage (M, fig. 7) the amount of fuel which the tank contains.

28. Fuel Filter Assembly

The fuel filter assembly (JJ, fig. 7) is located on top of, and extends into, the fuel tank located under the driver's seat. This assembly filters the fuel before it is sent to the fuel pump.

29. Water Temperature Gage

The water temperature gage (AA, fig. 7) is located on the instrument panel in the lower left corner of the instrument cluster (fig. 83). The face of the water temperature gage is graduated from 60° to 260° F. and has readings of 40° F. intervals. The gage indicates the temperature of the engine coolant. For normal operating, the temperature should show between 160° and 180° F.

Caution: If the temperature goes below 140° F. or above 200° F. stop the engine and investigate the cause.

30. Ammeter

The ammeter (J, fig. 7) is located on the instrument panel in the upper left corner of the instrument cluster (fig. 83). The ammeter is used for determining the rate of discharge of electrical energy from the battery and for indicating the amount of electrical energy being supplied by the generator to the battery. It indicates discharge by DIS and charge by CHG. Normally the indicating needle will show a slight charge while operating the vehicle; however, a greater amount of charge will be shown immediately after using the starter.

31. Speedometer

The speedometer (K, fig. 7) is located on the instrument panel in the center of the instrument cluster (fig. 83). The speedometer registers the speed of the vehicle in miles per hour from 0 to 60 mph and has readings at each 10-mile interval. It also incorporates an odometer which registers the total accumulated mileage of the vehicle.

Note. Speedometer flexible shaft assembly 7527480 is 54¾ inches in length and is used on vehicle serial No. 44033 and below. Speedometer flexible shaft assembly 7389881 is 56¾ inches in length and is used on vehicle serial No. 44032 and above.

32. Ignition Switch

The ignition switch (fig. 5 and G, fig. 7) is located on the instrument panel to the left of the deep-water fording vent valve control. The ignition switch is used to complete the electrical circuit to the ignition system. A lever on the switch turned to the ON or OFF position controls the electrical current. When in the ON position, it energizes the water temperature gage, the ammeter, the oil pressure gage, and the fuel gage and causes them to register.

33. Light Switch Assembly

The light switch assembly (E, fig. 7 and fig. 8) is located on the instrument panel to the left of the steering gear jacket. It consists of three levers, for three individual switches, incorporated into one switch unit. The levers are the main switch, auxiliary switch, and mechanical switch. The switches control the various lighting circuits of the vehicle. Operation of the light switch is covered in paragraph 52.

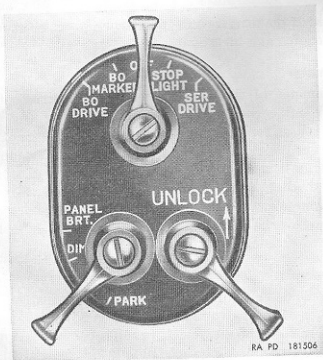


Figure 8. Light switch assembly.

34. Headlight Dimmer Switch

The headlight dimmer switch (FF, fig. 7) is located on the left upper corner of the upper front floor pan. The purpose of the

switch is to enable the driver to raise or lower the headlight beam. Depressing the button of the switch with the left foot alternately raises or lowers the beam.

35. Horn Button

The horn button (C, fig. 7) is located at the center of the steering wheel. To sound the horn, depress the horn button.

36. Windshield Wiper Motor Air Regulating Valve

The windshield wiper motor air regulating valve (A, fig. 7) is located in the vacuum line, to the windshield wipers, at the left of the steering wheel above the instrument panel. The air regulating valve controls the flow of air operating the windshield wiper motors. To start wipers, turn valve handle clockwise. To stop wipers, close valve by turning valve handle counterclockwise.

37. Windshield Wiper Manual Control Handles

The windshield wiper manual control handles (D, fig. 7) are located on each windshield wiper motor. They allow hand operation of the windshield wiper in the event of a failure of the windshield wiper motors. To operate, swing the handles back and forth sideways.

38. Windshield Lock Assemblies

The windshield lock assemblies (N, fig. 7) are located above the instrument panel on the lower right and left sides of the windshield. They are provided to lock the windshield in its upright position. To unlock the windshield, pull lock handle outward, releasing it from locking catch.

39. Instrument Panel Lights

The two instrument panel lights (L, fig. 7) are located on the instrument cluster panel on each side of the speedometer. The lights provide illumination for the instruments and gages in the instrument cluster panel. They are actuated by the auxiliary switch lever, on the light switch (fig. 8), which is covered in paragraph 52.

40. Headlight High Beam Indicator Light

The headlight high beam indicator light (X, fig. 7) is located on the instrument panel, under the speedometer, in the instrument cluster panel. The light indicates whether the headlights are on the high or low beam. When light is on, the headlights are on high beam. When the light is out, they are on low beam.

41. Map Compartment Lock

The map compartment lock (P, fig. 7) is located on the upper edge of the map compartment door on the extreme right side of the instrument panel. To operate the lock, press the button in the center of knob and swing door back and down.

Section III. OPERATION UNDER USUAL CONDITIONS

42. General

This section contains instructions for the mechanical steps necessary to operate the $\frac{1}{4}$ -ton 4 x 4 utility truck M38 under conditions of moderate temperature and humidity. For operation under unusual conditions, refer to paragraphs 101 through 113.

43. Starting the Engine

Caution: Perform the before-operation services prescribed in table II before starting and warming up the engine.

a. Before starting and warming up the engine, the driver should familiarize himself with the controls and instruments shown in figure 7 and listed in paragraphs 11 through 41. See paragraph 58 for extreme cold weather starting.

b. Make sure transmission gearshift lever (V, fig. 7) is in N (neutral) position.

c. Pull out the throttle control (BB, fig. 7) approximately $\frac{3}{4}$ to 1 inch. Refer to paragraph 21 for operating instructions.

d. Pull the choke control (CC, fig. 7) all the way out (par. 22).

Note. Choking is not necessary when engine is warm.

e. Turn ignition switch (fig. 5 and G, fig. 7) to ON position. Ignition switch in ON position also operates gage sending units for fuel, oil pressure, and water temperature gages.

f. Depress clutch pedal (EE, fig. 7) to disengage clutch while cranking engine for starting.

g. Depress starter pedal (W, fig. 7) (par. 16) for cranking the engine. When engine has started, release pressure on starter pedal immediately.

Caution: Do not hold starter engaged for periods in excess of 30 seconds at a time.

If starter has been engaged without results, wait 15 seconds, then crank engine again. If, after several attempts, the engine fails to start, determine the cause (pars. 77-84). Release clutch pedal after engine is running.

h. After engine starts, and during warm up period, adjust choke control (CC, fig. 7) and throttle control (BB, fig. 7) for smooth operation and idling speed.

i. Check the readings on the oil pressure gage and ammeter (U and J, fig. 7). The oil pressure gage should indicate 30 psi with engine warm and slightly higher when cold. Ammeter reading should indicate a slight charge after running engine a few minutes, but will show a slightly higher reading immediately after using the starter when engine is running.

j. Check the readings on the water temperature gage and fuel gage (AA and M, fig. 7). After engine has warmed up for several minutes, note reading on water temperature gage. Normal reading should be between 160° and 180° F. If temperature reading exceeds 180° F. during warm up, stop engine and check for cause (par. 85); check fuel gage to see that there is sufficient fuel in fuel tank.

44. Placing the Vehicle in Motion

Note. Before a new or reconditioned vehicle is placed in service, perform the break-in procedure (par. 9).

a. In placing the vehicle in motion, depress clutch pedal and shift transfer high and low range gearshift lever (S, fig. 7) into HIGH position (fig. 4). If the front wheel drive is to be used for four-wheel driving, shift transfer front wheel drive gearshift lever (T, fig. 7) to the IN position (fig. 4). If the front wheel drive is to be disengaged, shift front wheel drive gearshift lever to OUT position (fig. 4).

b. With clutch pedal still depressed, shift transmission gearshift lever (V, fig. 7) to engage transmission in "1" (first) gear position (fig. 4).

c. Release hand brake handle (GG, fig. 7 and par. 20) by turning the handle a quarter turn to the right or left and pushing handle into the instrument panel.

d. Depress accelerator pedal (Z, fig. 7) slightly to increase engine speed and, at the same time, slowly release the clutch pedal (EE, fig. 7). As the clutch engages and the vehicle begins to move, gradually increase engine speed by increasing pressure on accelerator pedal.

e. Increase speed to 10 mph, depress clutch pedal and, at the same time, release pressure on the accelerator pedal. While clutch pedal is depressed, shift transmission gearshift lever (V, fig. 7) from "1" (first) to "2" (second) gear position (fig. 4). Slowly release clutch pedal and accelerate engine speed to 20 mph.

f. When vehicle has attained a speed of 20 mph, follow procedure for shifting into "2" (second) gear but shift from "2" (second) to "3" (third) gear and govern speed according to driving conditions.

Note. While the vehicle is being operated, make checks given in Table II, under "During-operation."

45. Normal Driving

a. The greater part of the normal driving will be on paved or improved terrain where it is not necessary to use the front axle.

Note. Avoid the use of front axle drive whenever possible.

Transmission should be left in "3" (third) gear position when driving unless the speed of vehicle reduces to a point where the engine begins to labor. If the engine labors, the transmission should be shifted to a lower gear until speed has been increased to a point where it may safely be shifted to "3" (third) gear position without laboring. Shifting to a lower gear is explained in paragraph 46.

b. The amount of pressure on the accelerator pedal determines the speed of the engine and vehicle. The vehicle may be slowed down, when there is no necessity for using brakes, by releasing pressure on the accelerator pedal. After slowing down, it is not necessary to shift from "3" (third) gear to a lower gear if accelerating from a speed above 20 mph.

c. To maintain normal speed when approaching a small grade or hill, depress accelerator pedal.

Caution: When descending a grade or hill, release pressure on accelerator pedal, but never depress clutch pedal or shift transmission into "N" (neutral) position.

d. When driving on wet or slippery roads, gage speed of vehicle to maintain maximum control at all times. Avoid turning steering wheel too sharply or negotiating hills or trenches in excess of limits as specified in tabulated data (par. 6b). Do not exceed speeds indicated on the vehicle road speed caution plate (fig. 4).

46. Shifting Transmission to Lower Gear While in Motion

a. When approaching steep grades, rough terrain, soft terrain, or when vehicle speed has been reduced necessitating shifting to a lower gear ratio, the shifting may be accomplished without severe clashing or grinding of gears by "double clutching." Shifting to a lower gear should be accomplished before the engine starts to labor and the vehicle loses momentum.

b. The following operations must be accomplished in sequence and as rapidly as possible to accomplish shifting, and avoid as much as possible the loss of vehicle speed.

- (1) Depress clutch pedal and quickly shift transmission gear-shift lever (V, fig. 7) into "N" (neutral) position.
- (2) Release clutch pedal and accelerate the engine to a speed approximately, or slightly higher, than needed to maintain the same vehicle speed in the lower gear. This brings

the tooth speed of the transmission drive gear to approximately the tooth speed of the transmission driven gear.

- (3) Quickly depress the clutch pedal, shift transmission gearshift lever from "N" (neutral) position to next lower gear desired, release clutch pedal, and depress accelerator pedal as required to attain desired vehicle speed.

47. Shifting Gears in Transfer

The transfer (fig. 90) is provided for engaging the front axle for front wheel drive and to obtain lower gear ratios for the transmission. The transfer has two shift levers: the transfer front wheel drive gearshift lever (T, fig. 7) and the transfer high and low range gearshift lever (S, fig. 7). The high and low range lever must be engaged in HIGH or LOW range positions (fig. 4) at all times to drive the vehicle.

Caution: Do not shift high and low range gearshift lever from HIGH to LOW position at speeds above 5 mph.

The transfer front wheel drive gearshift lever (T, fig. 7) has two positions, IN and OUT, as illustrated on shifting instruction plate (fig. 4). It is used to engage the front axle for four-wheel driving. The vehicle may be driven by the rear axle alone or by both front and rear axles. The front axle cannot be used independently for driving except in *emergencies* and then only when the rear propeller shaft is removed.

Caution: Always observe maximum permissible speeds given on the vehicle road speed caution plate (fig. 4).

a. Engaging Front Axle.

- (1) To engage front axle, depress clutch pedal and shift transfer front wheel drive gearshift lever (T, fig. 7) to IN position and shift transfer high and low range gearshift lever (S, fig. 7) (par. 44) into LOW or HIGH position. The front wheel drive gearshift lever must be shifted to IN position before high and low range gearshift lever can be shifted to LOW position. This may be accomplished while the vehicle is standing or during driving.

Caution: Never attempt to shift into LOW range position at a speed greater than 5 mph.

- (2) The front axle should be engaged only for off-the-road, slippery roads, steep grades, during hard pulling, or deep water fording operations (par. 61).
- (3) To disengage front wheel drive, depress the clutch pedal and shift the transfer front wheel drive gearshift lever (T, fig. 7) to OUT position (fig. 4).

b. Engaging Transfer In High and Low Range.

- (1) For normal operation, the transfer will be used in HIGH range position (fig. 4). With the gearshift lever in this position, the vehicle may be operated with either two or four-wheel drive.
- (2) To shift transfer to LOW range position, depress clutch pedal and shift the transfer front wheel drive gearshift lever (T, fig. 7) to IN position and then shift the transfer high and low range gearshift lever (S, fig. 7) to LOW position (fig. 4). The transfer front wheel drive gearshift lever must be in the IN position before the transfer can be shifted into LOW range position.

Caution: Never attempt to shift transfer gears into LOW range position at speeds in excess of 5 mph.

In some cases, when shifting the transfer gears, it may be necessary to "double clutch" (par. 46).

- (3) To shift transfer to HIGH range position, depress the clutch pedal and shift the lever to location shown on shifting instruction plate (fig. 4).

48. Stopping the Vehicle

a. When stopping the vehicle, remove foot from accelerator pedal and place it on service brake pedal before reaching point where vehicle is to be stopped. Depress service brake pedal gently, increasing pressure, as needed to bring vehicle to a stop; avoiding skidding of tires, and shifting of load by too harsh an application of brakes. During braking period, the clutch should be engaged as this will assist slowing the vehicle down by means of engine compression, but only until such time as the engine begins to labor, then depress clutch pedal, complete stop with service brake and shift transmission to "N" (neutral) position (fig. 4).

b. When vehicle is completely stopped, pull handbrake handle (GG, fig. 7) on instrument panel until sufficient pressure is applied to hand brake to keep vehicle from moving, then release service brake pedal and clutch pedal.

c. When stopping vehicle on icy or slippery terrain, the brakes should be applied in a series of gentle applications and releases, to maintain traction. Holding brakes applied on icy or slippery terrain will cause skidding.

d. When stopping a vehicle with a towed load such as a trailer, the weight of the towed load should be considered to determine the distance needed for stopping. Stops should be made as easily and smoothly as possible to prevent "jack-knifing" the trailer and towing vehicle thereby causing damage to trailer or towing ve-

hicle or both. If trailer is equipped with brakes, the trailer brakes should be applied before the towing vehicle service brakes. When icy or slippery roads are encountered, extra caution should be taken in applying brakes.

49. Parking the Vehicle

a. When the vehicle is parked, make sure all switches are in the OFF position unless tactical situation requires otherwise.

b. When parking on a hill or grade, make sure hand brake is applied and, if grade is extremely steep, chock front or rear wheels to prevent accidental movement of the vehicle.

c. Avoid parking in mud or water, if possible, to prevent damage to tires in the event of freezing.

d. If parking in formation or in line, leave sufficient space between vehicles to avoid bumping in maneuvers and damage to vehicle. Always apply handbrake when vehicle is left unattended.

50. Reversing the Vehicle

a. Before attempting to reverse the vehicle, bring the vehicle to a complete stop and make sure the area behind is clear. If the vision to the rear is obscured, station someone outside to direct reversing operation.

b. Depress clutch pedal and shift transmission gearshift lever (V, fig. 7) to "R" (reverse) position (fig. 4).

c. Release clutch slowly and accelerate engine speed sufficiently to move vehicle slowly.

Caution: Do not attempt to drive vehicle at excessive speeds while in reverse gear. See vehicle road speed caution plate (fig. 4).

51. Stopping the Engine

After the vehicle is at a complete stop, turn the ignition switch (G, fig. 7) to the OFF position.

52. Operation of Light Switches

a. *General.* To operate, the light switch for various lights incorporated in the vehicle requires three switch levers (fig. 8). The levers are the main switch lever, located at top of switch assembly, mechanical switch lever, located at lower right side of switch assembly, and auxiliary switch lever located at lower left side of switch assembly. When the main switch lever is vertical, it is on the OFF position and all vehicle lights will be off. Lights on the vehicle can be used only by positioning the mechanical switch lever in the UNLOCK position and the main switch lever in other than the OFF position. Any lights which are on, and which are con-

trolled by other levers of the switch assembly, will automatically go off when main switch lever is moved to the OFF position.

b. Mechanical Switch Lever. The mechanical switch lever (fig. 8) is a locking switch lever with two positions. They are the UNLOCK position, indicated on the switch assembly, and the locked position. The locked position is not identified but this lever is always in locked position until raised and held in UNLOCK position. Releasing the switch lever returns it to locked position. It must first be raised to the UNLOCK position to permit positioning the main switch lever or auxiliary switch lever.

c. Main Switch Lever. The main switch lever (fig. 8) has five positions. They are indicated on the switch assembly, and show the respective lights being used. When the lever is in a vertical position it is OFF. The stop light position of the lever is used for daytime driving to illuminate the left rear service stop light when brakes are applied.

d. Auxiliary Switch Lever. The auxiliary switch lever (fig. 8) has four positions. The positions are indicated on the switch assembly and show the lights being used and the OFF position. The PARK position on this switch lights only the left rear tail light and cuts off the circuit to service headlights.

e. Headlight Dimmer Switch. The headlight dimmer switch (FF, fig. 7) is used to switch the service headlights from one beam to another. When the high beam of the service headlights is in use, the headlight high beam indicator light (X, fig. 7) on the instrument cluster panel will be illuminated.

f. Trailer Coupling Connector Receptacle. The trailer electric receptacle (fig. 9), located at the left rear corner of the body, is interconnected with the light switch. When a trailer that is equipped with lights is being towed, the receptacle provides an electrical connection from vehicle to trailer.

53. Towing the Vehicle

a. Towing to Start Engine. In cases of emergency, the engine can be started either by pushing or towing the vehicle; however, the succeeding instructions must be carefully followed to avoid damage to vehicle being towed.

- (1) Place transfer high and low range gearshift lever (S, fig. 7) of vehicle being towed in HIGH range position and transfer front wheel drive gearshift lever (T, fig. 7) in OUT position (fig. 4).
- (2) Depress clutch pedal (EE, fig. 7) and shift transmission gearshift lever (V, fig. 7) in "3" (third) gear position (fig. 4).

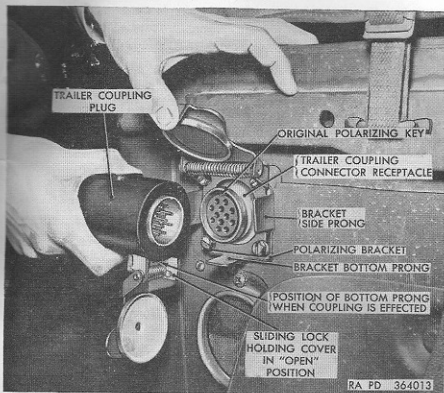


Figure 9. Trailer coupling connector receptacle.

- (3) Turn ignition switch (G, fig. 7) to ON position, pull out choke control (CC, fig. 7) (if engine is cold), pull out the throttle control (BB, fig. 7) approximately $\frac{3}{4}$ to 1 inch, and release hand brake handle (GG, fig. 7).
- (4) If vehicle is being towed, move the towing vehicle slowly to take up slack in cable between towing vehicle and vehicle being towed and increase speed gradually. Do not exceed a speed which will give engine revolutions much higher than given by a properly operating starting motor.
- (5) After vehicle is under way, release clutch pedal slowly and depress accelerator pedal slightly. When engine starts, depress clutch pedal and, if vehicle is being towed, operate service brake pedal to keep towing cable taut and prevent overrunning the towing vehicle. Shift transmission gearshift lever (V, fig. 7) to "N" (neutral) position (fig. 4). Regulate choke and throttle controls for warming up engine (pars. 21 and 22). Above instructions also apply when vehicle is being pushed to start.

b. *Towing a Disabled Vehicle.* Exercise care when towing a disabled vehicle so no further damage will occur.

(1) *Towing vehicle with four wheels on ground.*

- (a) If the transmission, transfer, front axle assembly, rear axle assembly, or propeller shafts are not damaged, the vehicle may be towed on four wheels. Position transmission gearshift lever (V, fig. 7) in "N" (neutral) position, transfer front wheel drive gearshift lever (T, fig. 7) in OUT position, and position transfer high and low range gearshift lever (S, fig. 7) in "N" (neutral) position.
- (b) If either transmission or transfer is damaged, remove or disconnect front and rear propeller shafts (par. 209). For towing a short distance, they may be disconnected from the axles and suspended from the frame by means of wire or rope.
- (c) If the front or rear propeller shafts are damaged, remove damaged propeller shaft (par. 209). The vehicle does not necessarily require towing in this case, but may be driven by either axle having the propeller shaft intact.

(2) *Towing vehicle with front or rear wheels off ground.*

- (a) If the front or rear axle is damaged, raise the vehicle until wheels of the damaged axle are off the ground.

Caution: Always be sure that transmission and transfer shifting levers are in "N" (neutral) position when vehicle is being towed.

- (b) When towing a vehicle with faulty brakes, do not use a tow line or cable. A tow bar must be used to prevent the possibility of the towed vehicle running into, or overrunning the towing vehicle. When towing, always use the towing pintle (fig. 10).

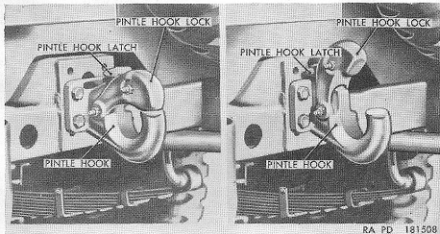


Figure 10. Towing pintle.

- (3) *Use of towing pintle.* The towing pintle (fig. 10) is located at the rear center of the vehicle. It is used as a coupling device for towing a trailer or a disabled vehicle. To open the pintle, release the pintle hook latch and raise the pintle hook lock. To close the pintle, lower the lock.

Section IV. OPERATION OF MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

54. Winch and Power-Take-Off

a. *Description.* The winch (fig. 11) is a horizontal drum-type unit mounted on the front of the vehicle, between the vehicle frame side members, forward of the radiator guard. Power for the winch is supplied by a power-take-off unit attached to the left rear of the transfer. The unit is connected to the winch by a long and a short propeller shaft. The propeller shafts are supported by a center bearing attached to the bell housing.

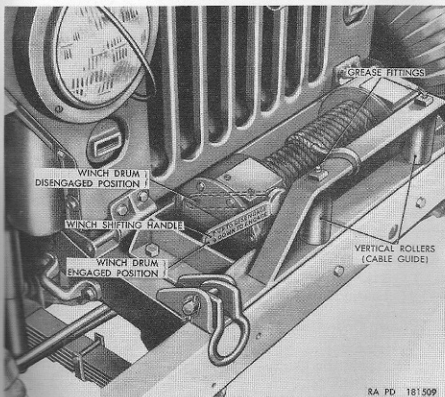


Figure 11. Winch installed.

b. Data.

Manufacturer	Ramsey Winch Mfg Co.
Model	50
Ratio	50:1
Capacity	3,500 lb
Cable length	100 ft

c. Controls.

- (1) *Power-take-off gearshift control lever.* The power-take-off gearshift control lever (fig. 12 and HH, fig. 7) is located in the driver's compartment at the rear of the transmission gearshift lever.

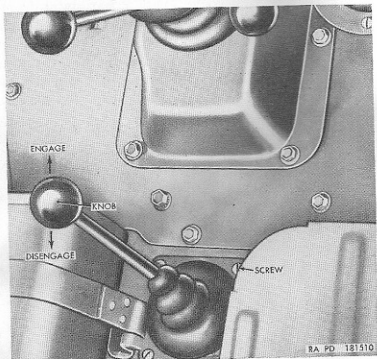


Figure 12. Power-take-off gearshift control lever.

- (2) *Winch shifting handle.* The winch shifting handle (fig. 11) is attached to the front of the winch drum clutch housing at the right of the winch drum.

55. Winch Operation

a. Vehicle Standing.

- (1) Apply the hand brake to hold the vehicle in standing position.
- (2) Check to be sure the transmission gearshift lever (V, fig. 7) is in "N" (neutral) position, and start the engine (par. 43).

- (3) Position the transfer front wheel drive gearshift lever (T, fig. 7) in OUT position. Place the transfer high and low range gearshift lever (S, fig. 7) in "N" (neutral) position (fig. 4). With the winch shifting handle (fig. 11) in the disengaged position, the winch drum is disengaged from the winch power train. In this position, the winch cable can be unwound from the drum by pulling on the cable. Unwind sufficient cable and attach to object to be winched. Move the winch shifting handle to engaged position (fig. 11). Depress the clutch pedal (EE, fig. 7) and push the power-take-off gearshift control lever (fig. 12) toward the front of the vehicle into engaged position. Shift the transmission gearshift lever (V, fig. 7) into "1" (first) gear position (fig. 4). Release the clutch pedal slowly, with the engine idling, and wind slack cable on winch drum. When winch cable is tight, accelerate engine to prevent stalling while load is being winched. To release tension and unwind winch cable, depress the clutch pedal, shift the transmission gearshift lever into reverse gear and, with the engine idling, release the clutch.

Caution: Do not release cable tension by using the winch shifting handle (fig. 11) disengaging drum.

b. Winching Out Vehicle (Using Driving Wheels).

- (1) Pull the winch shifting handle (fig. 11) up to disengage the winch drum, unwind the cable from drum and attach cable to stationary object. Shift the winch shifting handle to engaged position.
- (2) Start the engine (par. 43).
- (3) Shift the transfer front wheel drive gearshift lever (T, fig. 7) to IN position and the transfer high and low range gearshift lever (S, fig. 7) to LOW position (fig. 4).
- (4) Depress the clutch pedal (EE, fig. 7) and push the power-take-off gearshift control lever (fig. 12) toward the front of the vehicle engaging the power-take-off. Shift the transmission gearshift lever (V, fig. 7) into "1" (first) gear position (fig. 4). Release the clutch pedal slowly and accelerate the engine to prevent stalling while vehicle is moving and winch is operating. After vehicle has been winched out, stop the vehicle by depressing clutch pedal and placing transmission gearshift lever in "N" (neutral) position. Place the transfer front wheel drive gearshift lever in the OUT position and the transfer high and low range gearshift lever in the "N" (neutral) position (fig. 4). To release the tension on the cable, de-

press the clutch pedal, shift the transmission gearshift lever into "R" (reverse) gear position and release the clutch pedal with the engine idling.

Caution: Do not release the cable tension using the winch shifting handle (fig. 11).

c. Winding and Care of Cable After Use.

- (1) Maintenance of the cable, consisting of lubrication, is covered in paragraph 66.
- (2) To wind the cable on the drum, attach the end of the cable to a suitable anchor and back vehicle up slowly until cable is taut. Place the transfer front wheel drive gearshift lever in the OUT position and the transfer high and low range gearshift lever in the "N" (neutral) position (fig. 4).
- (3) Push the winch shifting handle (fig. 11) down to engage the winch drum.
- (4) Push the power-take-off gearshift control lever (fig. 12) to the front or engaged position.
- (5) Start the engine (par. 43), depress the clutch pedal (EE, fig. 7), and shift the transmission gearshift lever (V, fig. 7) into "1" (first) gear position (fig. 4). Slowly release the clutch to operate the winch and permit the cable to wind on the drum and pull the vehicle. Make sure the cable winds close and tight on drum.

Note. The cable should not be wound on the drum without being under some tension. The first layer of cable wound on the drum should have the coils close to each other. This eliminates the possibility of the second layer pressing down between the coils of the first layer.

Wind the cable evenly and slowly on the drum.

- (6) After cable has been wound on the drum, hook the cable end into a suitable place to prevent it from hanging or unwinding from the drum. Disengage the winch shifting handle and the power-take-off gearshift control lever, depress the clutch pedal, and place the transmission gearshift lever in "N" (neutral). Release the clutch pedal and shut off the engine. If a winch cover has been supplied, secure the cover around the winch drum and cable.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

56. General Conditions

a. In addition to the operating procedures described for usual conditions (pars. 42-53), special instructions of a technical nature for operating and servicing this vehicle under unusual conditions

are contained or referred to herein. In addition to the normal preventive maintenance service, special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and terrain conditions are present or anticipated. Proper cleaning, lubrication, and storage and handling of fuels and lubricants not only insure proper operation and functioning, but also guard against excessive wear of the working parts and deterioration of the materials.

b. TM 21-300 contains very important instructions on driver selection, training, and supervision and TM 21-305 prescribes special driving instructions for operating wheeled vehicles under unusual conditions.

Caution: It is imperative that the approved practices and precautions be followed. A detailed study of these technical manuals is essential for use of this material under unusual conditions.

c. Refer to paragraph 68 for lubrication under unusual conditions, and to paragraphs 272 through 276 for maintenance procedures.

d. When chronic failure of material results from subjection to extreme conditions, report of the condition should be made on DA Form 468 (par. 3).

57. Extreme-Cold Weather Conditions

a. General Problems.

- (1) Extensive preparation of material 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 FM 31-70 and FM 31-71 as well as 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 Compounds (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.

58. Extreme-Cold Weather Operation

a. General

- (1) The driver 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 and drive vehicle slowly about 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 the 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 temperature gage reading consistently exceeds 200° F., adjust flap on radiator winter front cover to admit more air.

b. Cold-Weather Starting.

- (1) Pull out hand throttle control one third of its travel.
- (2) Pull out choke control all the way.
- (3) Operate primer pump two or three strokes before cranking the engine.
- (4) Crank engine without further use of primer pump.
- (5) After engine has started, push in choke control partially and adjust hand throttle control until engine runs smoothly.
- (6) As engine warms up, push in choke control all the way.

c. 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 control levers in the neutral position to prevent them from 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, paragraph 75, for detailed after-operation procedures. If the winter front and side covers are 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 tanks. Prior to refueling, open fuel tank drains and drain off any accumulated water.
- (6) Immediately after engine "shut-down," 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 kit.
- (7) Correct tire inflation pressure is prescribed in paragraph 6a.
- (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 engine block from freezing. The draining of an engine cooling system to prevent freezing will be done only when no approved antifreeze solution is available.

59. 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. Continually watch the temperature and halt the vehicle for a cooling-off period whenever necessary and the tactical situation permits. Frequently inspect and service cooling unit, oil filter, and air cleaner. 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.

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 6a.
- (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. In sandy or dusty conditions, the oil bath air cleaner should be serviced once every operating day or more frequently if required.

60. 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 straight ahead 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 the 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 cleaners and fuel and oil filters. Engine vents and other exposed vents should be covered with cloth.
- (5) At high altitudes, coolant in vehicle 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.

b. Recommended Tire Pressures. Lowering of tire pressure in cases of sand, ice, mud, and snow will help to increase traction if tire chains are not available.

Note. Do not lower tire pressure to the extent that damage will result. Tire pressures are tabulated in paragraph 6a. When negotiating hard baked sand, avoid breaking through crust. A road bed of canvas or planking is suitable on short stretches to insure against this possibility.

c. After-Operation Procedures. Clean all parts of the vehicle of snow, ice, mud, dust, and sand as soon as possible after operation. Particular care should be taken to remove collections of ice, snow, and mud from the wheels, radiator core, engine components, steering knuckles and arms, tie rod ball joints, hand brake, universal joints, crankcase breathers, air cleaner, and all electrical connections.

Caution: Carefully remove accumulations of ice, caked mud, etcetera, from under fenders and where accumulated.

61. Fording Operations

a. General. In fording, vehicles may be subjected to water varying in depth from only a few inches to a depth sufficient to completely submerge the vehicle. Factors to be considered are spray-splashing precautions, normal fording capabilities, deep-water fording using fording kits, and accidental complete submersion.

b. Normal Fording. Fording of bodies of water up to maximum vehicle fording depth of 30 inches is based on the standard vehicle with waterproofing protection provided for critical units when manufactured, but without deep-water fording kit. Observe the precautions in (1) through (8) below.

- (1) Make sure that battery cell vent caps are snug.
- (2) Make sure that flywheel housing drain plug has been installed in housing.
- (3) Do not exceed the known fording limits of the vehicle (par. 6b).
- (4) The engine must be operated at maximum efficiency before attempting to ford.
- (5) Brake master cylinder must be filled to full to reduce the entrance of water.
- (6) Engage front axle front wheel drive by shifting the transfer front wheel drive gearshift lever (T, fig. 7) to the IN position (fig. 4). Shift transmission gearshift lever (V, fig. 7) into "1" (first) gear position and shift the transfer high and low range gearshift lever (S,

fig. 7) into LOW range position (fig. 4). Follow instructions on deep-water fording vent valve control instruction plate (fig. 5), and decalcomania instructions for bell housing (fig. 5). Speed up the engine to overcome the possibility of a "stall" when the cold water chills the engine. Enter the water slowly. Should the engine stall while submerged, it may be started as prescribed in paragraph 43.

- (7) All normal fording should be at speeds of from 3 to 4 mph to avoid forming a "bow wave." Avoid using the clutch, if possible, because frequent use while submerged may cause the clutch to slip. If the ford is deep enough for the spinning fan blades to catch water, loosen the fan belt (par. 123) before crossing, otherwise, they may throw water over the electrical units. The brakes will usually be "lost" but in some cases may "grab" after emergence. Applying the brakes a few times after dry land has been reached will help dry out the brake linings.
- (8) If accidental complete submersion occurs, the vehicle will be salvaged, temporary preservation applied as outlined in paragraph 275, and then sent to the ordnance maintenance unit as soon as possible for necessary permanent maintenance.

c. Deep-Water Fording. Refer to TM 9-2853 for general information, descriptions, and methods of use of deep-water fording kits, and for general procedures for the operation of vehicles so equipped.

d. After-Fording Operations. Immediately after vehicle emerges from the water, push in the deep water fording vent valve control (H, fig. 7), mounted on the instrument panel, to allow the crankcase ventilating system to operate normally and relieve crankcase pressure. Remove bell housing drain plug. Open all drain holes in body. Also, at earliest opportunity, check the engine oil level and check for presence of water in crankcase. Heat generated by driving will evaporate or force out most water which has entered at various points. Also, any *small* amount of water which has entered the crankcase either through leakage or due to condensation will usually be dissipated by the ventilating system. Refer to paragraph 275 for maintenance operations after fording.